



SINGAPORE

**32ND ASIA-PACIFIC
★ ACADEMY OF ★
OPHTHALMOLOGY
★ CONGRESS ★**

**I - 5 March 2017
Final Program - Abstract Book**



ORGANISERS



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Cataract

Mar 2, 2017 (Thu)

09:00 - 10:30

Venue: 301

Posterior Capsular Rupture: A Video-Based Course

Chief Instructor: Amar **AGARWAL**

Instructor(s): Athiya **AGARWAL**, David **CHANG**, Soon-Phaik **CHEE**, Boris **MALYUGIN**, Marie-Jose **TASSIGNON**

Objective: Posterior capsular ruptures are tricky cases which have to be handled well. One should perform vitrectomy by learning to use trocar anterior chamber (AC) maintainer and how to fix an intraocular lens (IOL) in such cases.

Synopsis: In posterior capsular ruptures, the nucleus might still be inside. This course will teach delegates how to manage that with the IOL scaffold technique. Glued IOL and IOL implantation in the sulcus will also be taught. Subluxated cataracts, posterior polar cataracts, and so on will be shown through videos regarding how to handle posterior capsule ruptures in those cases.

Course Outline: This course will be taught through videos.

1. Introduction
2. Posterior Capsular Ruptures: The Event and Aftermath
3. Vitrectomy, Trocar AC Maintainer
4. IOL Scaffold
5. IOL Implantation in Eyes with Deficient Capsules
6. Challenging Cases Producing Posterior Capsular Ruptures

Mar 3, 2017 (Fri)

09:00 - 10:30

Venue: 300

Conquering Capsule Complications

Chief Instructor: David **CHANG**

Objective: To use video cases to systematically review techniques of preventing, recognizing, and handling complications with either the capsulorhexis or posterior capsule, and with zonulopathy.

Synopsis: Video cases will illustrate a spectrum of techniques for anterior and posterior capsule complications: capsule dye, vitreous tap for crowded AC, torn anterior capsulotomy options, secondary CCC enlargement, flap tear-out rescue technique, posterior CCC, CCC capture of the optic, early recognition of PC

rupture, conversion from top/clear corneal incision to extracapsular cataract extraction, posterior polar cataracts, IOL fixation with torn anterior or posterior capsule, CTR and capsule hooks for weak zonules, small pupil/IFIS strategies (hooks, Malyugin, and expansion rings), pars plana bimanual anterior vitrectomy (\pm triamcinolone staining), IOL fixation with zonulopathy, and posterior-assisted levitation (PAL) + trap for descending nuclei.

Course Outline: The course is organized into 3 major sections:

- 1) Avoiding and managing anterior capsule complications. This section will cover avoiding anterior capsule tears, managing shallow AC, intumescent white cataract, elastic and pseudoelastic anterior capsules, and strategies for phaco with a radial anterior capsular tear.
- 2) Avoiding and managing posterior capsule complications. This section will cover posterior CCC and reverse optic capture for IOL fixation with torn PC, principles of anterior vitrectomy (both limbal and pars plana), triamcinolone staining, PAL retrieval of descending nuclei, and the viscoelastic trap technique.
- 3) Weak zonules: phaco and IOL fixation. This section will cover the use and timing of CTR and capsule retractors for zonulopathy, secondary CCC enlargement, IOL fixation with absent or deficient zonules, and preventing late IOL-bag dislocation.

For each section edited high quality videos will illustrate specific teaching points in a comprehensive fashion.

Mar 4, 2017 (Sat)

11:00 - 12:30

Venue: 300

Biometry Course

Chief Instructor: Han-Bor **FAM**

Instructor(s): Arthur **CHENG**, Sabong **SRIVANNABOON**, Tun Kuan **YEO**

Objective: To enable attendees to understand the basics of intraocular lens (IOL) power calculation and approach IOL selection with confidence.

Synopsis: The course will give an overview of IOL power calculation and focus on improving accuracy. It will cover selection of the appropriate toric IOL, IOLs in post-LASIK cases, and atypical eyes by explaining the various formulae and methods available.

Course Outline: After a brief overview of the importance of IOL power calculation and the various types of biometry, the course will focus on the essential steps to improve the predictability of biometry. It will cover navigating through various formulas and their uses in atypical eyes. It will also provide tips on improving toric



IOL outcomes and address the challenges of post-refractive surgery IOL power calculation. Newer formulae and the latest techniques will be presented.

Mar 5, 2017 (Sun)

09:00 - 10:30
Venue: 309

Breaking the Formation of Deadliest of All Complex Cataract with New Innovative Surgical Techniques

Chief Instructor: Rajendra PRASAD
Instructor(s): Sudhank BHARTI, Arup CHAKRABARTI, Rohit PARKASH, Amit PORWAL, Harshul TAK

Objective: The objective of this video-based course is to demonstrate innovative new surgical techniques to conquer challenging surgical situations in difficult and complex cataracts.

Synopsis: Complex cataracts have always been a challenge to all of us. In this video course a step-by-step demonstration of innovative techniques using new technologies to manage these challenging and complex situations will be done. The choice of phaco settings, variation of fluidics, phaco tips, and new chopping methods will be vividly shown and discussed. A unique blunt olive tip chopper good enough to hold the hardest of hard cataracts in terminal chop will be introduced. The use of capsule staining techniques, capsular bag stabilization devices, and pupil expanding devices will be demonstrated.

Course Outline: This course will demonstrate innovative new surgical techniques to conquer the challenging situations in the “deadliest of all formation of complex cataract.” Presenters will highlight the following: 1) terminal chop: new technique for full thickness nuclear segmentation in hard mature cataracts; 2) new suture ring fixation of capsular bag in complex subluxated cataract; 3) new pupil expanding devices to manage small pupil with hard cataract; 4) new technique fixing the Argentinian flag sign in morgagnian white and intumescent white cataract; 5) BMCEC new technique to prevent posterior capsular disruption in posterior polar cataract; and 6) visco flip: new technique for complex soft cataracts.

Comprehensive Ophthalmology

Mar 2, 2017 (Thu)

11:00 - 12:30
Venue: 300

Modern Laser Vitreolysis: How to Get Started

Chief Instructor: Inder SINGH

Objective: To help physicians understand how laser vitreolysis is now able to safely provide appropriate vaporization of floaters and thus management of these disturbing symptoms as well as how to start performing it.

Synopsis: This course will help attendees learn how to effectively incorporate laser vitreolysis into practice. Attendees will understand the impact of symptomatic floaters; compare and contrast older laser technology to that recently available for treatment of symptomatic floaters; discuss how to optimize treatment with clinical pearls for the successful preoperative, intraoperative, and postoperative management of patients undergoing laser vitreolysis; and explore how to incorporate laser vitreolysis into ophthalmic practice from a logistics perspective.

Course Outline:

- 1) Impact of Floaters on Patient Quality of Life
 - a) Physiology of the Vitreous: Classifying Floaters
 - b) The Significance of Floaters: Objective Data
- 2) What is Laser Vitreolysis?
 - a) Technology: Review of the Equipment Needed to Perform the Procedure
 - b) Old vs New Generation Laser Vitreolysis
- 3) Clinical Pearls of Wisdom: How to Maximize Visualization and Treatment of Floaters
 - a) Preoperative Procedures and Treatment Criteria
 - b) Intraoperative Guidelines
 - c) Postoperative Care
- 4) How to Incorporate Laser Vitreolysis in Ophthalmic Practice
 - a) Review of the Benefits and Patient Satisfaction
 - b) Review of a Few Cases

Mar 5, 2017 (Sun)

11:00 - 12:30
Venue: 309

Ignorance Is Not Bliss. Sterilization of Ophthalmic Surgical Instruments: Myths and Facts

Chief Instructor: Bharathi MEGUR
Instructor(s): Sunil GANEKAL, K V Satyamurthy KODUR, Deepak MEGUR, H M RAVINDRANATH

Objective: To teach attendees the preferred practice



patterns related to sterilization protocols for ophthalmic surgical instruments and how to avoid the common pitfalls.

Synopsis: Inefficient sterilization processes continue to be one of the most important reasons for post cataract surgery endophthalmitis in developing countries. This course teaches the basic concepts of cleaning, sterilizing, and storing of surgical instruments. The complexities of sterilizing hollow instruments like phaco headpiece, tubing, cannula, and vitrector will be dealt with. The principles, indications, technique, and protocols for both steam and chemical sterilization will be taught. Choosing the right type of sterilizers and using appropriate parameters for effective sterilization will be highlighted. Special emphasis will be placed on the protocols for documentation, monitoring, and validation of sterilization procedures.

Course Outline:

1. Introduction
 - I. Steam Sterilization Principles
 - II. Chemical Sterilization Principles
2. Cleaning Protocols
 - I. Hollow Tubular Instruments
 - II. Solid Instruments
3. Steam Sterilization
 - I. Choosing the Right Sterilizers
 - II. Evaluating the Instrument Load
 - III. Wrapped and Unwrapped Instrument Sets
 - IV. Customizing the Parameters
 - V. Documentation and Monitoring Process
 - VI. Validation Process
 - VII. Flash Autoclave: Busting the Myth
 - VIII. Storage and Transfer of Sterile Instruments
4. Chemical Sterilization: ETO Sterilization
 - I. Indications
 - II. The Process
 - III. Avoiding Common Pitfalls

Cornea, External Eye Diseases & Eye Bank

Mar 3, 2017 (Fri)

09:00 - 10:30

Venue: 304

Paradigm Shift in the Management of Microbial Keratitis

Chief Instructor: Namrata **SHARMA**

Instructor(s): Neelima **ARON**, Yoshitsugu **INOUE**, Vikas **MITTAL**, Jeewan **TITIYAL**

Objective: At the end of the course, the attendee will be familiar with the conclusive algorithm for cases of microbial keratitis.

Synopsis: This course will highlight the clinical and microbiological workup in recalcitrant cases of mi-

crobial keratitis. The role of topical monotherapy and combination fortified antibacterial therapy and steroids in bacterial keratitis will be discussed. Indications, technique, and outcomes of intracameral, intrastromal, and systemic antimycotic agents will be elucidated. The antimicrobial therapy for various types of parasitic keratitis, as well as the role of antiviral therapy in viral keratitis, will be highlighted. Indications, technique, and outcomes of therapeutic keratoplasty will also be discussed. The course will conclude with the truths and myths about the role of collagen crosslinking in microbial keratitis.

Course Outline:

1. Fungal Keratitis: Standard Therapy, Intracorneal, and Intracameral Injections
2. Therapeutic Keratoplasty in Microbial Keratitis
3. Parasitic Keratitis: Is Combination Therapy the Answer?
4. Bacterial Keratitis: Monotherapy or Combination Antimicrobial Therapy
5. Viral Keratitis: Clinical Spectrum and Management

Mar 4, 2017 (Sat)

11:00 - 12:30

Venue: 304

Applications of Corneal Collagen Crosslinking in Ophthalmology

Chief Instructor: Vishal **JHANJI**

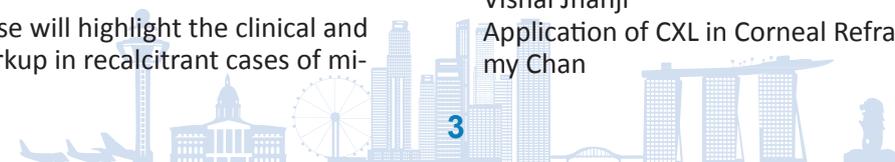
Instructor(s): Tommy **CHAN**, Osama **IBRAHIM**, Alex Lap Ki **NG**, Gaurav **PRAKASH**

Objective: The course provides an overview of corneal collagen crosslinking (CXL) in ophthalmology.

Synopsis: Corneal collagen crosslinking (CXL) uses ultraviolet A irradiation (UVA) and riboflavin to induce crosslinks within corneal stroma aiming to increase the tensile strength and stability of the cornea. It has been recently approved by the US Food and Drug Administration for the treatment of keratoconus, which is an ectatic disorder due to biomechanical weakening of the cornea. The success of CXL in stabilizing keratoconus has led to an expanded indication of CXL, including the management of infectious keratitis and prophylactic application of CXL during LASIK (LASIK-CXL). The course aims to provide an overview of applications of CXL in ophthalmology.

Course Outline:

- Introduction to CXL: Alex Ng
- Application of CXL in Keratoconus and Corneal Ectasia: Gaurav Prakash
- Application of CXL in Microbial Keratitis (PACK-CXL): Vishal Jhanji
- Application of CXL in Corneal Refractive Surgeries: Tommy Chan



Future Advances in CXL: Osama Ibrahim

16:30 - 18:00

Venue: 301

Endothelial Keratoplasty: Techniques to Conquer Difficult Situations

Chief Instructor: Samar **BASAK**

Instructor(s): Rajesh **FOGLA**, Vikas **MITTAL**, Rajesh **SINHA**, Jeewan **TITIYAL**

Objective: To highlight surgical steps of endothelial keratoplasty (EK) in complex situations and overcoming the intraoperative and postoperative problems. The attendees will gain adequate knowledge to perform EK in difficult situations.

Synopsis: This video-assisted instruction course will highlight important practical tips for performing endothelial keratoplasty (DSEK, DSAEK, DMEK) in difficult situations. Demonstration of surgical techniques to achieve appropriate donor lenticule/DM roll and difficult scenarios such as DSAEK in pediatric eyes, aphakic/vitrectomized eyes, failed graft, DSAEK in eyes with AC-IOL in situ, and EK with cataract surgery will be presented. Difficulties and challenges in performing DMEK will be demonstrated. Management of various postoperative complications of EK will be highlighted.

Course Outline: The course will cover preoperative considerations such as clinical evaluation and investigations relevant to EK and preoperative counselling and surgical planning; surgical management in different case scenarios with step-by-step video-based discussion and modifications; postoperative considerations such as treatment regimen and management; and discussion. Finally, there will be adequate time to address queries of the audience and discuss, in greater depth, any of the points made during the instruction course.

Mar 5, 2017 (Sun)

11:00 - 12:30

Venue: 304

Management of Ocular Complications of Stevens-Johnson Syndrome and Toxic Epidermal Necrolysis in Asians

Chief Instructor: Kendrick **SHIH**

Instructor(s): Sayan **BASU**, Vanessa **CHOW**, Tommy **CHAN**, Alex Lap Ki **NG**

Objective: This course will enable participants to select appropriate treatment for acute ocular surface inflammation to minimize long-term morbidity and offer comprehensive long-term care for visual and ocular surface rehabilitation.

Synopsis: The course is divided into 1) acute ocular care of patients with Stevens-Johnson syndrome (SJS)/toxic epidermal necrolysis (TEN); 2) long-term care of late ocular manifestations; and 3) surgical options for visual and ocular surface rehabilitation. The procedures discussed for this session will include autologous serum treatment, scleral contact lens fitting, amniotic membrane transplantation, ocular surface reconstruction, simple limbal epithelial transplantation, and keratoprostheses. This instruction course is intended for general ophthalmologists who are keen to develop a systematic and effective approach in the management of severe inflammatory ocular surface disease.

Course Outline: This is a comprehensive course on management of early and late ocular complications of SJS and TEN taught by experts from tertiary referral centers in Asia: Dr Alex Ng, Diagnosis and Classification: Prognostic Implications; Dr Kendrick Shih, Management of Acute Ocular Surface Inflammation: Paradigm Shift Towards Early Amniotic Membrane Transplantation; Dr Tommy Chan, Autologous Serum Use and Ocular Surface Reconstruction; Dr Vanessa Chow, Use of Scleral Contact Lenses for Visual and Ocular Surface Rehabilitation; Dr Bhupesh Bagga, Limbal Epithelial Transplantation and Keratoprosthetics: the LV Prasad Experience.

11:00 - 12:30

Venue: 310

Pediatric Keratoplasty: Challenges and Management Concerns

Chief Instructor: Radhika **TANDON**

Instructor(s): Divya **SINGH**, Murugesan **VANATHI**, Shikha **YADAV**

Objective: To make the target audience understand the indications, role, technique, complications, and postoperative management of pediatric penetrating and lamellar keratoplasty.

Synopsis: Congenital eye disorders are important causes of childhood blindness. Keratoplasty remains the surgery of choice for the management of pediatric corneal disorders. Penetrating keratoplasty in children is a highly challenging and demanding procedure associated with a high risk of graft failure or failure of amblyopia therapy in clear grafts. This course intends to outline and discuss the indications, preoperative assessment, surgical technique, complications, and postoperative management of pediatric keratoplasty. The emergence and role of lamellar procedures in children will also be elucidated. Postoperative follow-up and care of these patients and the role of amblyopia management will be covered.

Course Outline:

1. Pediatric Corneal Disorders
2. Difficulty in Pediatric Penetrating Keratoplasty



3. Pediatric Lamellar Procedures
4. Postoperative Management and Amblyopia Therapy

Glaucoma

Mar 3, 2017 (Fri)

14:30 - 16:00

Venue: 302

Micro-Invasive Glaucoma Surgery

Chief Instructor: *Chelvin SNG*

Instructor(s): *Keith BARTON*

Objective: Attendees will learn about the appropriate patient selection, surgical technique, associated complications, and postoperative management for micro-invasive glaucoma surgery.

Synopsis: The course will provide an overview of micro-invasive glaucoma surgery and the guidelines for appropriate patient selection. It will also present the techniques for implanting various micro-invasive glaucoma surgery devices (trabecular bypass devices, subconjunctival devices, and suprachoroidal devices), associated surgical complications, and the appropriate postoperative management. Videos will illustrate the correct surgical technique and tips to avoid common surgical pitfalls.

Course Outline: This course will begin with an overview of clinical need and patient selection, followed by discussion of trabecular bypass devices, subconjunctival devices, and suprachoroidal devices.

Intraocular Inflammation, Uveitis & Scleritis

Mar 3, 2017 (Fri)

11:00 - 12:30

Venue: 301

Exogenous Endophthalmitis: Management Pearls

Chief Instructor: *Bhuvan CHANANA*

Instructor(s): *Shorya AZAD, Rajvardhan AZAD, Gopal S PILLAI*

Objective: In this course the attendee will learn to diagnose and manage acute postoperative endophthalmitis. Endophthalmitis which require a different treatment approach, like bleb-related and traumatic endophthalmitis, will also be discussed.

Synopsis: Endophthalmitis is one of the gravest complications, and the key to better outcomes is early detection. In this course we will discuss signs to detect endophthalmitis at the earliest and its management. Indications for vitrectomy in endophthalmitis and

controversies in timing of surgical intervention will be discussed during the course.

Course Outline:

1. Early Detection: Endophthalmitis vs Sterile Reaction
2. Management of Acute Endophthalmitis
3. Vitrectomy for Endophthalmitis: Conventional Guidelines vs Early Vitrectomy
4. Chronic Endophthalmitis: Diagnosis, Etiology, and Management
5. Special Cases: Bleb-Related Endophthalmitis and Traumatic Endophthalmitis

Ocular Imaging

Mar 5, 2017 (Sun)

09:00 - 10:30

Venue: 303

Introduction to OCT Angiography for General Ophthalmologists

Chief Instructor: *Marcus ANG*

Instructor(s): *Dan MILEA, Dawn SIM, Anna TAN*

Objective: To introduce clinical applications of optical coherence tomography angiography as an imaging modality for the retina, choroid, optic disc, and anterior segment.

Synopsis: Optical coherence tomography (OCT) angiography is rapidly becoming a common imaging technique in our clinical practice. In this instructional course, we have a series of lectures and case discussions to introduce the concept of OCT angiography and its clinical applications to diseases in the retina, choroid, optic disc, and anterior segment. All instructors have international experience in this relatively new technology with multiple peer-reviewed publications in *Ophthalmology*, *Retina*, and *British Journal of Ophthalmology*.

Course Outline:

1. Introduction to OCTA and Applications for the Retina, Dr Dawn Sim
2. OCTA Applications for Choroidal Diseases, Dr Anna Tan
3. How to Interpret OCTA for the Optic Nerve, Prof Dan Milea
4. Basics of OCTA for the Anterior Segment, Dr Marcus Ang
5. Case Discussions, All Faculty



Ophthalmic Education

Mar 3, 2017 (Fri)

11:00 - 12:30

Venue: 303

Defending the Ophthalmologist in a Medical Malpractice Lawsuit: Global Comparative Overview of Multiple Legal Systems

Chief Instructor: Robert **RITCH**

Instructor(s): David **KAN**, Kenneth **LARYWON**, Kenji **MINEMURA**, Sunil **MOREKER**

Objective: The current medical malpractice crisis presents ever-increasing challenges to ophthalmologists. This course aims to both educate and present physicians with effective approaches to minimize liability and maximize an effective defense.

Synopsis: This course will provide an overview of medical malpractice cases specific to ophthalmology in each speaker's country in order to educate and present physicians with effective approaches to minimize liability and maximize an effective defense. Topics include malpractice litigations and terms important to an understanding of malpractice, a review of the malpractice lawsuit process, and common theories of liability against ophthalmologists. Informed consent and the importance of preparation will be highlighted.

Course Outline: The course will be an 80-minute symposium with 5 speakers. The speakers will explore medical malpractice law in each speaker's country and then, with the aid of case presentations, will demonstrate how the physician in question could have better approached the case, including better use of documentation, to avoid litigation. At the end of the course, participants will be able to list the common reasons for litigation in his/her country, common precautions he/she can take to prevent litigation, common defense arguments that favor the doctor, and identify cases in his/her country which could have been avoided.

Orbital and Oculoplastic Surgery

Mar 3, 2017 (Fri)

09:00 - 10:30

Venue: 302

Recent Advances in Orbital Diseases

Chief Instructor: Gangadhara **SUNDAR**

Instructor(s): Jyotirmay **BISWAS**, Santosh **HONAVAR**, Timothy **SULLIVAN**, Alejandra **VALENZUELA**, David **VERITY**

Objective: The aim of the course is to provide attend-

ees with newer developments and advances in the complex field of pediatric and adult orbital diseases and surgery.

Synopsis: Radical changes have been made in the knowledge and understanding of orbital disorders over the past decade. This instruction course, provided by international experts in the field, shall provide an overview of recent concepts and developments in the diagnosis, medical, and surgical management of complex adult and pediatric developmental and acquired orbital disorders. Imaging, diagnostic tests, surgical techniques, implants, and devices shall be covered, without financial conflicts of interest. Emphasis will be placed on newer techniques and technology in the management of these complex conditions.

Course Outline:

Introduction, Pediatric Orbital Tumors: Dr Alejandra Valenzuela

Adult Orbital Tumors: Dr Santosh Honavar

Congenital Deformities: Dr Mohamed A Hafez

Thyroid Eye Disease: Dr Dan Rootman

Orbital Pathology: Dr Hardeep Mudhar

Orbital Trauma: Dr Gangadhara Sundar

Mar 4, 2017 (Sat)

09:00 - 10:30

Venue: 300

Endoscopy in Oculoplastics

Chief Instructor: Akshay **NAIR**

Instructor(s): Adit **GUPTA**, Raghuraj **HEGDE**, Debarati **SAHA**, Swati **SINGH**

Objective: This course aims to familiarize practicing oculoplastic surgeons with the instrumentation and use of endoscopes in the diagnosis, surgery, and management of various orbital and lacrimal disorders.

Synopsis: Endoscopic surgery offers a minimally invasive route into the nasal cavity and the orbit. Other advantages include lesser morbidity, earlier rehabilitation, and possibly higher success rates. Lacrimal surgery (dacryology) is one such area that has undergone a paradigm shift with the advent of endoscopy—the diagnosis and management of congenital and acquired nasolacrimal duct obstruction have become easier and better. Also, transorbital endoscopic decompression and skull base surgeries for tumor excision avoid external scarring and minimize the need for bone removal. This course systematically gives an overview of the instrumentation and endoscopic anatomy with detailed presentations and surgical videos.

Course Outline:

1. An Introduction to Endoscopy: Instrumentation and Set Up



2. The View from Below: Nasal Endoscopic Anatomy Simplified
3. Endoscopy-Assisted Probing: Changing the Diagnosis and Management of Congenital Nasolacrimal Duct Obstruction
4. Endoscopic Dacryocystorhinostomy: Case Scenarios
5. Endoscopic Orbital Decompression and Beyond

09:00 - 10:30
Venue: 301

“Less For More”: Minimally Invasive Eyelid Procedures in Asians

Chief Instructor: Chee-Chew YIP
Instructor(s): Kelvin Kam-Lung CHONG, Wendy LEE, Chi-Lai LI, Hunter YUEN

Objective: To enable participants to learn the principles and techniques of performing minimally invasive eyelid procedures in Asians including ptosis surgeries, entropion repair, epicanthoplasty, lateral canthoplasty, and non-surgical periorbital rejuvenation procedures.

Synopsis: With advancements in surgical techniques, many common reconstructive and aesthetic eyelid procedures can be performed with smaller, fewer, or hidden incisions and reduced anatomical disruption to hasten postoperative recovery. Precision and good understanding of the surgical anatomy and the basis for treatment are crucial factors to optimize the success of these minimalistic surgeries. The faculty will present the pearls and pitfalls in performing these procedures and illustrate with video demonstration. The procedures to be covered include ptosis surgeries (anterior and posterior approaches), epicanthoplasty, lateral canthoplasty, tarsotomy, lower eyelid entropion repair, and periorbital rejuvenation with lasers, lights, and devices.

Course Outline: This 80-minute course will comprise didactic lectures with video demonstration. The procedures to be covered include the following: Small Incision Ptosis Surgery (Kelvin Chong); Posterior Ptosis Surgery (Wendy Lee); Frontalis Suspension with Fewer Incisions (Hunter KL Yuen); Small Incision Medial Epicanthoplasty (Kelvin Chong); Lateral Canthoplasty Without Cantholysis (Chee-Chew Yip); Posterior Tarsotomy for Cicatricial Entropion (Hunter KL Yuen); Trans-Conjunctival Lower Eyelid Entropion Repair (Chi-Lai Li); Non-Surgical Eyelid Procedures: Lasers, Light, and Devices (Wendy Lee).

11:00 - 12:30
Venue: 301

Minimally Invasive Orbito-Facial Surgery

Chief Instructor: Gangadhara SUNDAR
Instructor(s): Kasturi BHATTACHARJEE, Dongmei LI, Toru SUZUKI, Wencan WU, Kyung In WOO

Objective: This course will educate attendees regarding minimally invasive approaches to eyelid, lacrimal, orbital, and facial surgery. Techniques will be taught and demonstrated by international experts.

Synopsis: This instruction course will highlight small and non-incisional approaches to various disorders of the eyelid (ptosis), lacrimal (nasolacrimal duct obstruction), orbit (fractures, tumors), and face (functional and esthetic procedures) through a combination of didactic and video teaching aimed at the mid- and advanced level ophthalmologist and orbitofacial surgeons. This course will highlight the use of both technology and refined techniques to achieve preoperative and intra-operative goals with early postoperative recovery and excellent outcomes. The faculty are renowned experts in the Asia-Pacific region and globally.

Course Outline:

Introduction, Minimally Invasive Ptosis Surgery: Dr Milind Naik
 Lacrimal Endoscopy and Endoscopic Luminal Duct Recanalization: Dr Toru Suzuki
 Endoscopic DCR: Dr Kyung In Woo
 Endoscopic Orbital Decompression, Canal Decompression: Dr Wu Wen Can
 Small Incision Orbital Fracture Repair: Dr Gangadhara Sundar
 Approach to Brow/Midface Lifts: Dr Bobby Korn

Mar 5, 2017 (Sun)

09:00 - 10:30
Venue: 304

Botulinum Toxin for Facial Dystonias

Chief Instructor: Muhammad MOIN
Instructor(s): Zafar Ul ISLAM, Yasser KHAN

Objective: To enable participants to inject botulinum toxin with confidence in patients with various grades of facial dystonias.

Synopsis: The course will discuss in detail the mechanism of action of botulinum toxin, rationale and techniques of making various dilutions, facial muscles for injection, dosage of botulinum toxin at various sites, technique of injection in various muscles, and a discussion on hemifacial and blepharospasm. The course will use a mannequin to identify muscles and help participants practice the injection sites.



Course Outline: The course will include the following talks: Introduction, Facial Anatomy Demonstration on Mannequin, Preparation of Injection and Doses of Botulinum Toxin, Videos of Different Cases of Blepharospasm and Hemifacial Spasm with Problem Solving by Participants. The course will include a pretest followed by a post-test. Handouts regarding consent, injection sites, and dosage will be given.

11:00 - 12:30

Venue: 300

Management of Eyelid Trauma

Chief Instructor: Pete **SETABUTR**

Instructor(s): Gary **LELLI JR**, Peter **MACINTOSH**, Michael **YOON**

Objective: To present the evaluation and management of eyelid trauma in an organized and systemic fashion.

Synopsis: Eyelid and periocular trauma are common and can range from simple lacerations to complex injuries with soft tissue loss and canalicular trauma. The evaluation and management of eyelid and periocular trauma are presented in an organized and systematic way in this course. Attendees of this course should be able to evaluate patients with eyelid trauma and describe the management of all major types of injuries. In addition, the choice and implementation of surgical interventions are presented. Finally, complications, postoperative care, and considerations for special populations are discussed.

Course Outline:

- I. Overview of Periocular Trauma
 - A. Epidemiology
 - B. Etiology
 - C. Soft-tissue trauma classification
- II. Evaluation of the Periocular Trauma Patient
 - A. Triaging injuries and examination for systemic and ocular injuries
 - B. Diagnosis of eyelid trauma and classification
 - C. Diagnosis of lacrimal system trauma
 - D. Use of imaging and diagnostic testing
- III. Medical Management of the Periocular Trauma Patient
 - A. Systemic injuries
 - B. Facial injuries
 - C. Tetanus prophylaxis, antibiotic coverage
- IV. Surgical Management of the Periocular Trauma Patient
 - A. Simple partial thickness lacerations
 - B. Full thickness eyelid laceration without tissue loss
 - C. Full thickness eyelid laceration with tissue loss
 - D. Lacrimal system injuries
 - E. Extended periocular soft tissue trauma
 - F. Options for tissue substitutes or local flaps and grafts for tissue loss

11:00 - 12:30

Venue: 302

Periorbital Applications of Botulinum Toxin Type A

Chief Instructor: Mary Rose **YAN**

Objective: This course aims to discuss the functional and cosmetic applications of botulinum toxin type A with general ophthalmologists and oculoplastic surgeons.

Synopsis: This course is divided into 4 lectures that will discuss the basics of botulinum toxin, functional and cosmetic applications in ophthalmology, and how to incorporate botulinum toxin into clinical practice.

Course Outline:

1. Introduction to Botulinum Toxin
2. Periorbital Functional Applications of Botulinum Toxin
3. Cosmetic Applications of Botulinum Toxin to the Upper Face
4. Incorporating Botulinum Toxin in Clinical Practice

Pediatric Ophthalmology & Strabismus

Mar 3, 2017 (Fri)

16:30 - 18:00

Venue: 303

Management of Intermittent Exotropia: From Assessment to Surgical Management

Chief Instructor: Jason **YAM**

Instructor(s): Simon **KO**, Connie **LAI**, Jane **YEUNG**

Objective: At the conclusion of this course, attendees will be able to assess and manage patients with exotropia confidently.

Synopsis: This course covers all you need to know about intermittent exotropia, from assessment, non-surgical management, and surgery to complications and their management. Tips and pearls in the management of exotropia and its variants such as "V" pattern, large angle exotropia (at least 60 prism diopters), and adult patients with exotropia will also be discussed.

Course Outline:

1. Introduction
2. Evaluation of Patients with Exotropia
3. Non-Surgical Management of Intermittent Exotropia
4. Surgical Management of Intermittent Exotropia
5. Questions and Answers



09:00 - 10:30

Venue: 310

Management of Pediatric Cataracts

Chief Instructor: Sudarshan **KHOKHAR**

Instructor(s): Seo Wei **LEO**

Objective: To make pediatric cataract surgery simple enough for all ophthalmic surgeons, so that they are able to integrate it into their regular practice with confidence.

Synopsis: Pediatric cataract surgery has been thoroughly covered with emphasis on demonstration and in-depth discussion of surgical videos including a few challenging cases. Our aim is to cover most of the challenges that attendees might be facing. Various topics include the background, clinical features, ocular and systemic evaluation, indications for surgery, key surgical techniques, secondary intraocular lens (IOL) implantation, management of visual axis opacification, follow-up, rehabilitation, and newer advances. Challenging cases like persistent hyperplastic primary vitreous, capsular plaques, pre-existing capsular defects, traumatic, and subluxated cataracts have been covered. We share our tried and tested IOL power calculation algorithm for both bilateral and unilateral cataracts.

Course Outline:

1. Background: Epidemiology, Anatomy, Physiology
2. Clinical Evaluation: Ocular, Systemic, Family History, Genetic Workup
3. Key Surgical Techniques
4. IOL Power Calculation
5. Management of Visual Axis Opacification
6. Secondary IOL
7. Management of Challenging Cases
8. Follow-Up and Rehabilitation
9. Newer Advances

Refractive Surgery

Mar 2, 2017 (Thu)

09:00 - 10:30

Venue: 304

Management of Posteriorly Dislocated Lens and Secondary Intraocular Lens Implantation and Fixation in Aphakia

Chief Instructor: Edmund **WONG**

Instructor(s): Shu Yen **LEE**, Laurence **LIM**, Gavin **TAN**, Doric **WONG**, Ian **YEO**

Objective: To review the management of posteriorly dislocated lens and the various techniques for secondary intraocular lens (IOL) fixation in aphakia.

Synopsis: Our course will first review the management of posterior dislocated cataracts and intraocular lens. We will then proceed to discuss the most common techniques for secondary IOL implantation and fixation in aphakia with a special emphasis on advantages and disadvantages of each technique. Video presentations will be used to demonstrate the tips and tricks that will help vitreoretinal surgeons to perform successful secondary posterior chamber IOL fixation and to avoid common pitfalls.

Course Outline:

1. Management of Posteriorly Dislocated Cataracts and Dropped Lens Fragments
2. Retrieval and Explantation of the Posteriorly Dislocated Intraocular Lens
3. Choosing the Appropriate Secondary IOL Techniques and Biometry
4. Sutured Scleral Fixated Intraocular Lens: Discussion of Techniques and Complications
5. Sutureless Scleral Fixation: Tunnels, Flaps, and Glue
6. Iris Fixation: Tip and Pitfalls
7. Anterior Chamber Intraocular Lens: Choosing the Right Patient and Avoiding Complications

Mar 3, 2017 (Fri)

16:30 - 18:00

Venue: 301

Modern Understanding of Ocular Accommodation and Outcomes of Current Surgical Treatment Solutions for Presbyopia

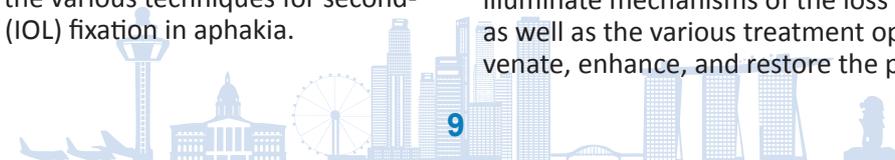
Chief Instructor: Annmarie **HIPSLEY**

Instructor(s): Jorge **ALIO**, Hung Yuan **LIN**, David **MA**, Minoru **TOMITA**

Objective: To illuminate the mechanism of action of modern human accommodation and to present the 3 surgical options and outcomes for presbyopia including corneal correction, accommodating intraocular lenses (IOLs), and accommodative restoration.

Synopsis: The focus of this course is to present the model of modern accommodation as it relates to the most recent new findings in literature regarding the mechanism and action of accommodation as well as the predicting factors associated with the development of presbyopia. Current surgical treatment solutions and the components of presbyopia they are addressing will be discussed including corneal, lenticular, and extralenticular approaches.

Course Outline: This course will address the etiology and development scenarios of the loss of accommodation, which is manifested as presbyopia. It will also illuminate mechanisms of the loss of accommodation as well as the various treatment options to treat, rejuvenate, enhance, and restore the presbyopia condition.



Mar 4, 2017 (Sat)

14:30 - 16:00

Venue: 300

Advanced SMILE Surgery (SMILE+++)

Chief Instructor: Jodhbir **MEHTA**

Instructor(s): Moones **ABDALLA**, Sri **GANESH**, Osama **IBRAHIM**, Mahipal **SACHDEV**

Objective: To teach surgeons already familiar with small incision lenticule extraction (SMILE) surgery some advanced tips to combine their SMILE surgery with other techniques such as lenticule reimplantation, collagen cross linking, or in post graft cases.

Synopsis: SMILE is an all-in-one femtosecond laser surgical procedure. The procedure involves creation of a refractive lenticule in the cornea. The removal will correct the refractive error but also the lenticule may be repurposed. Due to the improved biomechanical stability of SMILE compared to LASIK, the course will cover SMILE in cases combined with collagen cross linking and SMILE in unusual cases, such as following corneal transplantation surgery. It will also cover more recent work on the use of lenticules, namely, lenticule re-implantation for hyperopia correction, use in patients undergoing collagen cross linking, and also in presbyopia.

Course Outline: The course will include both lectures and videos covering the following areas:

1. Introduction to Basic SMILE Technique
2. SMILE in Patients with High Ametropia (eg, post graft surgery)
3. SMILE Combined with Collagen Cross Linking: Indication and Outcomes
4. Lenticule Reimplantation for Hyperopia
5. Lenticule Repurposing: Patch Grafts/Stromal Thickening
6. Lenticules for Presbyopia
7. Q & A

Retina (Medical)

Mar 3, 2017 (Fri)

16:30 - 18:00

Venue: 300

PCV: All You Need to Know!

Chief Instructor: Ian **WONG**

Instructor(s): Lee-Jen **CHEN**, Youxin **CHEN**, Gemmy **CHEUNG**, Ryo **KAWASAKI**

Objective: To outline and discuss all there is to know about polypoidal choroidal vasculopathy (PCV), includ-

ing demographics, imaging diagnostics, genetics, treatment, clinical trial synopsis, latest research, and future directions.

Synopsis: This course discusses everything from the fundamental demographics, genetics, and clinical trial data to the most advanced imaging diagnostics including optical coherence tomography angiogram regarding polypoidal choroidal vasculopathy. Essentially all you need to know will be included!

Course Outline: PCV is sometimes misdiagnosed as neovascular age-related macular degeneration (AMD). With the advent of imaging modalities and deeper understanding of the disease, PCV is now recognized as a separate entity, with its own unique profile of clinical manifestations. Treatment strategy towards PCV has been revolutionized by recent clinical trials. There is a clear need to distinguish PCV from neovascular AMD. Clinical photos, ICG findings, and optical coherence tomography scans will be used to illustrate real cases. A small quiz toward the end of the course will help the audience fortify knowledge acquired. At the conclusion of this course, the audience will be able to distinguish a case of PCV from a case of neovascular AMD. They will know how to formulate treatment strategies for a new case of PCV and the most up-to-date evidence involved.

14:30 - 16:00

Venue: 301

Retinal Dystrophy: Diagnosis and Treatment

Chief Instructor: Heather **MACK**

Instructor(s): Penelope **ALLEN**, Alexander **HEWITT**, David **MACKEY**, Alice **PEBAY**

Objective: To provide an overview of retinal dystrophy and discuss the following: better understanding of the disease, evaluation of patients, electrophysiology testing, genetics in inherited retinal disease, gene therapy, CRISPR technology, stem cell transplants, and bionic eyes.

Synopsis: Rapid advances in medical science are making treatment of retinal dystrophy possible in the near future. However, identifying patients who may potentially benefit from treatment can be challenging. This symposium will cover the diagnosis of patients with retinal dystrophy, with an emphasis on identifying those who benefit from treatment, and treatments including those that are gene dependent (gene therapy, CRISPR technology) and gene independent (stem cells, bionic eye).

Course Outline:

Introduction

Speaker 1: Clinical phenotyping: clinical assessment of patients with retinal dystrophy; history including signs



and symptoms; family history, pedigree construction; examination of pearls and imaging (OCT, autofluorescence, widefield); electrophysiology testing.

Speaker 2: Principles, ethics, and utility of genetic testing; principles of testing, types of tests, limitations, and interpretation; specific tests compared with genome sequencing; counselling; gene therapy models: lessons learnt.

Speaker 3: Update on CRISPR technology.

Speaker 4: Generation and use of stem cells in retinal dystrophy.

Speaker 5: Update on clinical trials of bionic eyes.

Mar 4, 2017 (Sat)

16:30 - 18:00

Venue: 300

Viral Retinitis: An Asian Perspective

Chief Instructor: Ian WONG

Instructor(s): De-Kuang HWANG, Koh-Hei SONODA, Yong TAO

Objective: To understand the various presentations and treatment of viral retinitis, with special notes in relation to the features pertinent to Asian countries

and patients.

Synopsis: This course summarizes the various clinical and pathological features of the 3 main types of viral retinitis, namely, cytomegalovirus (CMV) retinitis, acute retinal necrosis, and progressive outer retinal necrosis (PORN). The background with special concentration on the situation in Asia will be discussed. The diagnosis and treatment aspects will also be discussed in detail.

Course Outline: Viral retinitis is a group of conditions including CMV retinitis, PORN, and acute retinal necrosis. Despite different etiologies, there are similarities. Traditionally, CMV retinitis affected human immunodeficiency virus (HIV) infected patients, but it is now being increasingly recognized outside of this group. Highly active antiretroviral therapy (HAART) has changed the presentation of CMV retinitis, while the advent of intravitreal antivirals has changed the treatment options available. This course aims to highlight these and other trends in viral retinitis via the below talks:

1. Who is at risk? Background and Demographics
2. Situation in Asian vs Western Patients
3. Presenting Signs and Symptoms
4. Diagnostic Challenge: How to make a diagnosis?
5. Therapeutic Challenge: Medical Treatment and Long-Term Prophylaxis
6. Therapeutic Challenge: Surgical Treatment
7. Summary + Case Study + Small Quiz



Cataract

Mar 2, 2017 (Thu)

09:00 - 10:30
Venue: 300

Comparing the Accuracy of Intraocular Lens Power Prediction Using Haigis, SRK-II, and SRK-T Formulas in Eyes of Different Axial Length

First Author: Laxman Singh **JHALA**
Co-Author(s): Ankita **HUMAD**

Purpose: To find out the best formula in eyes with short, normal, and long axial length (AXL).

Methods: This was a prospective study including 300 eyes with senile cataract divided in 3 groups. Group I included 60 eyes with AXL between 18.00-21.99 mm, group II included 180 eyes with AXL between 22.00-24.49 mm, and group III included 60 eyes with AXL between 24.50-30.00 mm. Keratometry and A-scan were done by handheld keratometry and immersion technique, respectively. Intraocular lens (IOL) was implanted according to Haigis in group I, SRK-II in group II, and SRK-T in group III. Clear corneal temporal phacoemulsification was performed in all eyes by a single surgeon. Postoperative refraction was done at 1 month. Refractive error was predicted with other formulas in every group. Mean spherical equivalent (MSE) was calculated with each formula in every group. Paired *t* test and P value were used for analysis.

Results: MSE with Haigis, SRK-II, and SRK-T was -0.45 ± 0.73 diopters (D), $+0.70 \pm 0.85$ D, and $+0.59 \pm 0.81$ D, respectively, in group I. MSE with SRK-II, SRK-T, and Haigis was -0.04 ± 0.48 D, -0.11 ± 0.49 D, and -0.55 ± 0.67 D, respectively, in group II. MSE with SRK-T, SRK-II, and Haigis was -0.32 ± 0.48 D, -0.68 ± 0.73 D, and -0.51 ± 0.66 D, respectively, in group III.

Conclusions: Haigis formula works well, followed by SRK-II and SRK-T in group 1. SRK-II works well, followed by SRK-T and Haigis in group II. SRK-T formula works well, followed by Haigis and SRK-II in group III.

09:00 - 10:30
Venue: 300

Comparing the Lenstar Optical Biometer and the Verion Image Guided System for IOL Power Calculation

First Author: Mun Wai **LEE**
Co-Author(s): Y C **LEE**

Purpose: To compare the keratometry (K) and white-to-white (WTW) measurements obtained from the Len-

star optical biometer (LS) with those from the Verion Image Guided System (VR) and their effect on intraocular lens (IOL) power selection.

Methods: Sixty eyes of 51 patients scheduled for cataract surgery had biometry measurements and IOL calculation with the LS. Axial length from LS was used together with K and WTW measurements (from VR) for IOL calculation as well. IOL selection was done using the Barrett Universal II formula targeting emmetropia. The prediction error (PE), the difference between the final spherical equivalent (SE) at 1-month follow-up, and the target SE, the PE within 0.25 diopters (D), 0.5 D, and 1 D of target, and the mean absolute error (MAE), were calculated for both the LS and VR.

Results: K measurements from the VR were closely correlated with the LS (Pearson correlation coefficient K1, $r = 0.958$; K2, $r = 0.952$) but the steep axis and WTW were less so (axis, $r = 0.670$; WTW, $r = 0.195$). The MAE was 0.317 and 0.347 for LS and VR, respectively. PE within 0.25 D was 48.3% and 40%, within 0.5 D was 83.3% and 76.7%, and within 1 D was 98.3% and 96.7% for LS and VR, respectively. There was no statistically significant difference in MAE between the LS and VR ($P = 0.74$).

Conclusions: Using the K and WTW measurements from the Verion Image Guided System for IOL power calculation provided comparable results with the Lenstar. However, the Lenstar provided better prediction accuracy with a higher proportion of eyes achieving the predicted target.

09:00 - 10:30
Venue: 300

Comparison of Axial Length, Anterior Chamber Depth, and Intraocular Lens Power Between Optical Biometry and Applanation Ultrasound in Short, Normal, and Long Eyes

First Author: Xiaogang **WANG**
Co-Author(s): Yading **JIA**, Su Hua **ZHANG**, Jing **DONG**, Yaqin **ZHANG**

Purpose: To compare the axial length (AL), anterior chamber depth (ACD), and intraocular lens power (IOLP) measured with IOLMaster and A-scan contact ultrasound in short, normal, and long eyes.

Methods: Thirty-one normal eyes, 30 long eyes, and 33 short eyes were included. Measurements were performed on each eye in the following order: IOLMaster and ultrasound. SRKT, Holladay I, and Hoffer Q formulas were used for normal, long, and short eye IOLP calculation, respectively. The interdevice agreements were evaluated with Bland-Altman analyses and paired 2-tailed *t* tests.



Results: For AL measurement, there was a significant difference between the IOLMaster and the ultrasound in all 3 groups ($P < 0.05$). For ACD measurement, ultrasound showed about 0.22 mm deeper than IOLMaster in the normal group ($P < 0.001$) but no difference for the short and long eyes ($P = 0.058$; $P = 0.542$). For IOLP calculation using different formulas for each group, the IOLMaster demonstrated 0.15 and 0.27 diopters higher than ultrasound in normal and short eyes ($P = 0.002$; $P < 0.001$). No significant difference existed between the ultrasound and the IOLMaster in the long eye group ($P = 0.082$). There was strong agreement ($r > 0.90$) between both devices for all the comparison values.

Conclusions: The IOLMaster and applanation ultrasound measurements of AL, ACD, and IOLP correlate well for normal, short, and long eyes. Moreover, the potential difference for these data may not be clinically meaningful.

09:00 - 10:30
Venue: 300

Corneal Astigmatism and Aberrations After Combined Femtosecond-Assisted Phacoemulsification and Arcuate Keratotomy: 2-Year Results

First Author: Tommy **CHAN**
Co-Author(s): George **CHENG**, Vishal **JHANJI**, Alex Lap Ki **NG**, Zheng **WANG**, Victor **WOO**

Purpose: To investigate the stability of corneal astigmatism and higher-order aberrations after combined femtosecond-assisted phacoemulsification and arcuate keratotomy over 2 years.

Methods: Phacoemulsification and arcuate keratotomy were performed using VICTUS (Bausch & Lomb Inc, Dornach, Germany) femtosecond-laser platform. A single, 450- μ m deep, arcuate keratotomy was paired at the 8-mm zone with the main phacoemulsification incision in the opposite meridian. Corneal astigmatism and higher-order aberration measurements obtained preoperatively and at 2 months and 2 years postoperatively were analyzed.

Results: Fifty-four eyes of 54 patients (mean age, 64.5 ± 11.7 years) were included. The mean preoperative corneal astigmatism was 1.48 ± 0.69 diopters (D). This was reduced to 0.81 ± 0.67 D at 2 months and 0.81 ± 0.57 D at 2 years postoperatively ($P < 0.001$). There was no statistically significant difference between postoperative corneal astigmatism over 2 years ($P = 0.911$). Both magnitude of error and absolute angle of error were comparable between the 2 postoperative time points ($P > 0.092$). At postoperative 2 months and 2 years, 72% and 70% of eyes were within 15 degrees of the preoperative meridian of astigmatism, respectively. All

wavefront measurements increased significantly at 2 months and 2 years ($P < 0.009$) except spherical aberration ($P > 0.158$). There was no significant difference in higher-order aberrations between 2 months and 2 years postoperatively ($P > 0.516$).

Conclusions: Our study showed the long-term stability of femtosecond-assisted arcuate keratotomy. Further studies using other platforms and nomograms are needed to corroborate the findings of this study.

09:00 - 10:30
Venue: 300

Effect of Prophylactic Use of Topical Ketorolac in Prevention of Postoperative Macular Volume Increase After Phacoemulsification Assessed by Optical Coherence Tomography Quantification of Total Macular Volume

First Author: Khevna **PATEL**
Co-Author(s): Debdas **MUKHERJEE**

Purpose: Even after uncomplicated phacoemulsification with good visual acuity, patients might not be satisfied with visual outcome because of a variable degree of cystoid macular edema. A prospective open-label single-masked randomized controlled trial was undertaken to determine the effect of the non-steroidal anti-inflammatory drug (NSAID) ketorolac 0.45% on preventing the increase in macular volume in comparison to prednisolone 1% eye drops after uncomplicated phacoemulsification, assessed using spectral domain optical coherence tomography (OCT) quantification of total macular volume (TMV).

Methods: A total of 260 normal patients without pre-existing systemic diseases were enrolled for unilateral phacoemulsification. After exclusion and drop out, 185 remained in the control group (prednisolone) ($n = 94$) and intervention group (ketorolac) ($n = 91$). Ketorolac 0.45% (twice daily) and prednisolone (in tapering doses) were administered as topical instillation after surgery and continued for a total of 6 weeks. TMV was measured preoperatively (baseline), on the first postoperative day, and finally at the sixth week. The outcome measure was postoperative TMV changes, quantified by OCT preoperatively, first postoperative day, and sixth week.

Results: Some amount of macular volume increase was evident in both groups. At the first postoperative day, TMV percentage change in the control group was 1.057 and that of the ketorolac group was 0.962. At 6 weeks the findings were 3.558 and 1.663, respectively. Postoperative macular volume increase was much less with ketorolac than prednisolone at the first postoperative day and sixth week. This was statistically significant ($P = 0.0059$).



Conclusions: Prophylactic use of preservative-free ketorolac 0.45% after uncomplicated phacoemulsification was efficacious in decreasing postoperative macular volume increase and thus in increasing postsurgical patient satisfaction.

09:00 - 10:30
Venue: 300

Evaluation of Visual Outcomes and Rotational Stability of Hydrophobic Acrylic Aspheric Toric IOL: Prospective Study

First Author: Ajay **SHARMA**
Co-Author(s): Premvardhan

Purpose: To evaluate the efficacy in terms of visual and refractive outcomes and rotational stability of aspheric hydrophobic acrylic toric intraocular lens (IOL; Tecnis) implantation in cases of cataract with preexisting corneal astigmatism.

Methods: A prospective study was done on 50 eyes of 43 cataract patients with corneal astigmatism between 1.25 diopters (D) and 3.25 D with visual potential of 20/25 or better after surgery. Phacoemulsification with toric IOL was done and patients were followed up on postoperative day 1, day 7, 1 month, and 3 months. Preoperatively visual acuity, automated and manifest refraction, slit lamp examination, funduscopy, applanation tonometry, optical biometry, and corneal topography were done. At each follow-up visual acuity, objective and subjective refraction, optical biometry, topography, and dilated slit lamp photography were done. IOL position and rotation were ascertained using slit lamp photography.

Results: Mean preoperative corneal astigmatism was 1.95 ± 0.77 D. Mean logMAR uncorrected distance visual acuity (UDVA) was 0.09 ± 0.11 , and mean residual manifest cylinder was 0.38 ± 0.29 at postoperative 3 months. The difference between preoperative corneal astigmatism and refractive astigmatism at all postoperative visits was statistically significant (all $P < 0.001$). Mean absolute IOL rotation was 3.36 ± 3.15 degrees, 3.09 ± 2.83 degrees, 3.28 ± 3.15 degrees, and 3.28 ± 2.95 degrees at 1 day, 1 week, 1 month, and 3 months after surgery, respectively. The difference in IOL rotation between the 1-day and 3-month postoperative visits was not statistically significant ($P = 0.502$).

Conclusions: Tecnis toric IOL is effective in treating corneal astigmatism in patients undergoing cataract surgery. It also shows excellent rotational stability.

09:00 - 10:30
Venue: 300

Evaluation of the Effect of Postoperative Intraocular Lens Decentration on Higher Order Aberrations with Aspheric Balanced Curve Design Intraocular Lens

First Author: Jeewan **TITIYAL**
Co-Author(s): Anubha Rathi, Lalit **BAGESHWAR**, Ashima **BHARGAVA**, Ruchita **FALERA**, Ashutosh **KINKAR**

Purpose: To evaluate the effect of postoperative intraocular lens (IOL) decentration on higher order aberrations in eyes implanted with aspheric balanced curve design IOLs.

Methods: Prospective comparative study of 81 eyes undergoing phacoemulsification with implantation of either AcrySof IQ SN60WF aspheric (Alcon, Hünenberg, Switzerland) (group I, $n = 18$) or Hoya iSert 251 (Hoya Surgical Optics, Singapore) (Group II, $n = 63$). Measurements of postoperative decentration (angle α) and higher order aberrations (HOA) or coma were obtained using the HOYA iTrace Surgical Workstation (Hoya Surgical Optics, Singapore) on day 1, 1 month, and 3 months.

Results: Significant postoperative decentration (angle $\alpha > 0.4$) was seen in 22.2% (4/18) of eyes in group I, and all 4 cases (100%) had HOA (coma $> 0.2 \mu\text{m}$). In group II, 47.61% (30/63) of eyes had angle $\alpha > 0.4$ but only 23% (22/30) of those had HOA (coma $> 0.2 \mu\text{m}$), while 76.63% of eyes had HOA (coma $< 0.2 \mu\text{m}$) ($P = 0.05$). Visual acuity was comparable in both groups at the end of 3 months.

Conclusions: Postoperative IOL decentration can induce HOA (coma) which can lead to deterioration of quality of vision. Aspheric balanced curve (ABC) design (Hoya iSert 251) can provide better visual quality in spite of significant decentration by inducing lesser amounts of HOA.

09:00 - 10:30
Venue: 300

Impact of Intraocular Lens Decentration on Visual Quality

First Author: Ganesan **VAITHEESWARAN**
Co-Author(s): Luci **KAWERI**, Mathew **KURIAN**, Rohit **SHETTY**, Samatha **SHETTY**

Purpose: To study the effect of intraocular lens (IOL) tilt and decentration on visual quality following surgical management of cataracts with deficient zonules or posterior capsule.

Methods: Thirty-one patients with cataracts who were managed using capsule tension rings with or without



capsule tension segments with in-the-bag IOL implantation or by scleral fixated IOLs were included in the study. Six weeks after surgery, anterior segment optical coherence tomography (Tomey, CASIA) was performed and IOL tilt was measured using virtual calipers. The iTrace (Tracey Technology) ray tracing aberrometry was performed to calculate IOL decentration and the quality of vision.

Results: Thirty-one patients with mean age of 54 ± 3.19 years had mean preoperative logMAR best corrected visual acuity (BCVA) of 1.14 ± 0.14 , which improved to mean postoperative logMAR BCVA of 0.24 ± 0.68 with mean refractive spherical equivalent of -0.48 ± 0.17 . Nineteen eyes had IOL decentration greater than 0.5 mm. The mean IOL tilt was 0.20 ± 0.21 mm. A statistically significant difference was noted between IOL tilt and mean postoperative UCVA ($P = 0.049$). IOL decentration directly correlated with mean total astigmatism ($P = 0.05$) and inversely correlated to internal spherical aberration ($P = 0.003$), internal area under the curve of the modulation transfer function (AUC-MTF) ($P = 0.008$), and internal Strehl ratio ($P = 0.023$).

Conclusions: Zero aspheric or spherical IOLs are better options in these cases as the effect of aspheric IOLs is lost due to the high degree of decentration.

09:00 - 10:30

Venue: 300

Microfibrillar Cellular Proliferation over the Anterior Surface of Foldable IOLs in the Postoperative Period: Cause, Prevalence, and Implications

First Author: Deepak MEGUR

Co-Author(s): Bharathi MEGUR

Purpose: To report the occurrence of microfibrillar cellular proliferations extending from the CCC margin onto the anterior surface of foldable intraocular lenses (IOLs).

Methods: This is a prospective comparative study involving 140 eyes that underwent uneventful phacoemulsification for age-related cataract at a single center by a single surgeon using a standardized technique. Seventy eyes were implanted with single-piece hydrophobic IOLs and the other 70 eyes with single-piece hydrophilic IOLs. High resolution slit lamp photographs and high definition video, focused at the CCC margin and the IOL junction, were taken at the end of 1, 3, 6, 12 weeks, and 6 month postoperatively. The photographs were analyzed sequentially for the presence of any microfibrillar cellular growth over the anterior surface of the IOL at the CCC margin and the IOL junction.

Results: Sixty-seven eyes (95.7%) with hydrophobic

lenses showed microfibrillar cellular proliferation while no proliferation was seen in any of the hydrophilic lenses. The growth over the lenses had both the fibrous and cellular component. The fibro cellular growth appeared by the third week and began to resolve after 12 weeks.

Conclusions: The microfibrillar cellular growth over the anterior surface of the hydrophobic lenses provides a visual clue about the reaction of the anterior capsule cells toward the material of hydrophobic IOLs. This essentially seals the CCC margin to the anterior surface of the lens and could explain the sticky nature of these IOLs and possibly the low PCO rates in them.

09:00 - 10:30

Venue: 300

Molecular Mechanism of Long Noncoding RNA MEG3 Regulating Age-Related Cataract as a ceRNA

First Author: Yu QIN

Purpose: To investigate the role of long noncoding RNA MEG3 (lncRNA MEG3) inhibiting miR-125b as a competing endogenous RNA (ceRNA) in the development of age-related cataract.

Methods: The differential expression of lncRNA MEG3 between age-related cataract tissue and normal lens specimen was detected by RT-qPCR. Lens epithelial cell apoptosis model was induced by UV irradiation and transfected with pcDNA-MEG3 or si-MEG3. After 48 hours, the expression of lncRNA MEG3 was examined to identify the transfection effects using RT-qPCR. Then the expression of miR-125b and p53 were detected by RT-qPCR and Western blot, respectively, and cell apoptosis rate was detected by flow cytometry.

Results: lncRNA MEG3 was upregulated in age-related cataract tissue. Overexpression of lncRNA MEG3 led to a remarkable increase in p53 expression and cell apoptosis rate compared with controls but a significant decrease in miR-125b expression. Inversely, p53 expression and cell apoptosis rate in cells transfected with si-MEG3 were remarkably decreased, whereas miR-125b expression level was significantly increased. Previous study indicated that miR-125b regulated lens epithelial cell apoptosis at least in part by directly targeting p53. The differences showed statistical significance ($P < 0.01$).

Conclusions: lncRNA MEG3 regulates lens epithelial cell apoptosis by inhibiting miR-125b as a ceRNA. As a noncoding RNA, lncRNA MEG3 might play a critical role in the pathogenesis of cataract and have the potential to be a new nonoperative targeting treatment of cataract.



09:00 - 10:30

Venue: 300

Monocular Implantation with a Small-Aperture Intraocular Lens to Extend Depth of Focus to Correct Presbyopia During Cataract Surgery

First Author: Robert **ANG**

Purpose: To evaluate 12-month outcomes of patients monocularly implanted with a small-aperture hydrophobic intraocular lens (IC-8 IOL).

Methods: Twelve patients presenting for cataract surgery were implanted monocularly with a single-piece hydrophobic acrylic IOL with a centrally located opaque annular mask measuring 3.23 mm in total diameter with a 1.36 mm central aperture. Uncorrected distance, intermediate, and near visual acuities (UDVA, UIVA, and UNVA) and depth of focus were evaluated for 12 months after implantation. Mean \pm standard deviation visual acuity is reported in logMAR.

Results: The mean monocular UDVA, UIVA, and UNVA improved significantly from 0.44 ± 0.24 , 0.42 ± 0.24 , and 0.52 ± 0.18 preoperatively to 0.06 ± 0.12 ($P = 0.0006$), 0.06 ± 0.11 ($P = 0.0015$), and 0.06 ± 0.11 ($P = 0.0001$) at 1 month, respectively, and remained stable until 12 months. At 12 months, 100% of patients achieved 20/32 or better in the implant eye at distance, intermediate, and near, respectively. A total of 100% of eyes maintained 20/40 or better visual acuity over a range of +0.50 diopters (D) to -1.50 D of defocus.

Conclusions: Monocular IC-8 IOL implantation provides a continuous, broad range of vision and excellent acuity across all focal distances up to 12 months.

09:00 - 10:30

Venue: 300

New IOL Formula Equation Using Anterior Segment 3D-OCT

First Author: Choun-Ki **JOO**

Co-Author(s): Min-Ji **KANG**, Ji-Hye **LEE**, Woong-Joo **WHANG**, Young-Sik **YOO**

Purpose: To compare the prediction errors from the various combinations of biometric data by Catalys 3-dimensional optical coherence tomography (3D-OCT) and develop a new intraocular lens (IOL) calculation formula.

Methods: Ninety-two eyes (49 right eyes, 43 left eyes) were included. After phacoemulsification, AMO ZCB00 1-piece IOL was implanted. Refractive outcomes were measured by manifest refraction at 3 months post-operatively and ELP was back-calculated by vergence formula. ELP prediction equations were developed by

multiple linear regression tests. ELP prediction error, mean error (actual SE – predicted SE), mean absolute error, and median absolute error were calculated for evaluating predictive accuracy.

Results: The mean ACD, LMP, and lens thickness were 3.30 ± 0.40 mm, 4.82 ± 0.32 mm, and 4.60 ± 0.42 mm. Back calculated ELP was 5.24 ± 0.37 mm. The equation derived from axial length, LMP, and the posterior part of LT showed the best predictability in both ELP and refractive outcomes.

Conclusions: The new IOL formula considering LMP and posterior LT provided by Catalys 3D-OCT will be helpful for enhancing the predictive accuracy of IOL power.

09:00 - 10:30

Venue: 300

Objective and Subjective Accommodation Results of AkkoLens Lumina Intraocular Lens

First Author: Jorge **ALIO**

Co-Author(s): Alexander **ANGELOV**, Michiel **ROMBACK**, Daniel **ROMERO**, Aleksey **SIMONOV**

Purpose: The aim of the current study is to report the accommodative response with a model of an accommodative intraocular lens (AIOL), the AkkoLens Lumina.

Methods: This study included 82 eyes of 58 patients with ages ranging between 43 and 85 years. All patients underwent cataract surgery followed by IOL implantation. According to the IOL implanted, 2 groups of patients were differentiated: group A, 59 eyes of 43 patients implanted with the AkkoLens Lumina AIOL, and group B, 23 eyes of 15 patients implanted with the monofocal Acrysof SA60AT IOL. Distance and near visual acuities, defocus curve, and objective accommodation with the Grand Seiko WAM-5500 r Autorefractometer were measured. We report in this study 12-month follow-up data.

Results: Statistically significant differences were observed between groups for defocus levels between -4.50 and -0.50 diopters (D) ($P < 0.01$) with better values for group A. Statistically significant differences were detected between groups in the depth of focus calculated for 0.10, 0.20, and 0.4 visual acuity in log-MAR scale ($P < 0.01$) with higher values for group A. Statistically significant differences were observed for the WAM accommodative stimuli of -2.00, -2.50, and -3.00 D ($P < 0.01$) with higher values for the AIOL.

Conclusions: In conclusion, the AIOL AkkoLens Lumina restores the visual function after cataract surgery. This new AIOL demonstrated an accommodative response and a depth of focus significantly larger than the monofocal control group.

09:00 - 10:30

Venue: 300

Objective and Subjective Visual Outcomes of Extended Range of Focus Intraocular Lenses

First Author: Ramamurthy **DANDAPANI**

Co-Author(s): Shreyas **RAMAMURTHY**, Chitra **RAMAMURTHY**

Purpose: To analyze the objective and subjective visual outcomes of patients bilaterally implanted with extended range of focus intraocular lens.

Methods: Prospective interventional study which included patients who were 18 years or older and bilaterally implanted with extended range of focus multifocal lenses with regular corneal topography and a postoperative astigmatism of <0.75 diopters (D). Any patient with a coexisting ocular morbidity that could affect final visual outcome was excluded. Postoperatively uncorrected and best corrected distance (UDVA, CDVA), intermediate (IVA), and near vision (UNVA, CNVA) were recorded at 6 weeks and 4 months. A subjective questionnaire was administered to gauge photic phenomena, spectacle independence, and patient satisfaction.

Results: One hundred four eyes of 52 patients with a mean age of 60.75 (SD, 12.83) were included in the study. At 8 weeks' follow-up the mean binocular UDVA was 0.83. The uncorrected near and intermediate visual acuity was >0.8 in 100% of patients. A total of 96.4% of patients did not require glasses for distance and 100% of patients were free from glasses for intermediate and near vision. Glare and haloes of moderate grade were seen in 10.7% and 8.9%, respectively. The mean subjective patient satisfaction scores (out of 10) for distance, intermediate, and near vision were 9, 10, and 9 respectively.

Conclusions: The new extended range of multifocal intraocular lenses gave excellent spectacle independence for distance, intermediate, and near vision. The subjective patient satisfaction scores were high for all distances with minimal disturbance from photic phenomena.

09:00 - 10:30

Venue: 300

Topical Proparacaine vs Combined Topical-Intracameral Lidocaine Anesthesia in Phacoemulsification Surgery with Preoperative Counseling About Intraoperative Visual Fear

First Author: Kiran **SHAKYA**

Purpose: To study the anesthetic efficacy of topical 0.5% proparacaine hydrochloride versus combined topical-intracameral 1% lidocaine injection during

phacoemulsification surgery.

Methods: A total of 80 patients, divided into groups A and B each having 40 patients, were enrolled in this study. Phacoemulsification was performed on group A under topical anesthesia with proparacaine hydrochloride 0.5% and on group B under combined topical-intracameral injection of 0.5 cc 1% lidocaine. Preoperatively, all patients received counseling about potential intraoperative visual fear. Each patient was shown a visual analog scale 10 minutes after the completion of surgery and their pain score was recorded. Uncooperative patients and corneal opacities were excluded. All patients in both groups were operated on by a single surgeon.

Results: According to the visual analog scale, in group A, 30% felt no pain, 50% felt mild pain, and 20% felt tolerable moderate pain (level 4); in group B, 80% felt no pain and 20% felt mild pain. Group A perceived more pain than group B ($P < 0.001$). Mean operation time was 10 minutes. Most of the patients in groups A and B had no eye movement (group A, 88%; group B, 95%).

Conclusions: The combined topical proparacaine-intracameral injection of lidocaine anesthesia is better than topical proparacaine during phacoemulsification, ensuring patient and surgeon comfort. Preoperative counseling helps patients to focus on the operating microscope light during surgery.

09:00 - 10:30

Venue: 300

Visual Outcomes and Real Life Performance of Bilaterally Implanted Extended Vision Intraocular Lens: A Prospective Study

First Author: Ajay **SHARMA**

Co-Author(s): Shilpa **GOEL**

Purpose: To study the performance of bilaterally implanted extended vision Symphony intraocular lens (IOL) in terms of 1) postoperative unaided distance (UDVA), intermediate (60 cm) (UIVA), and near visual acuity (33 cm) (UNVA); 2) postoperative contrast sensitivity; 3) photic phenomenon (glare, halos, starburst, if any); and 4) subjective patient and surgeon satisfaction scores (0 to 10).

Methods: A multicentric prospective interventional study including 40 patients of bilaterally implanted Symphony/Symphony Toric IOL operated on after January 2015. All patients underwent uneventful 2.2 mm incision phacoemulsification cataract surgery. Postoperatively patients were followed up at 1 month, 3 months, and 6 months; at each visit unilateral and bilateral distance, near, and intermediate vision and contrast sensitivity were recorded and any complaint of glare or halos was noted.



Results: Mean postoperative decimal UDVA, UIVA, and UNVA at 6 months was 0.93, 0.92, and 0.91, respectively. Thirty-three patients had UDVA \geq 1.0, while 36 patients had UIVA \geq 1.0. UNVA was \geq in 27 out of 40 patients. Only 7.5% of patients needed glasses for intermediate and near vision in their daily activities. A total of 12.5% of patients complained of mild to moderate glare and halos in the initial postoperative period that was not significant until the last follow-up. Mean postoperative binocular contrast sensitivity at 6 months was 1.52 ± 0.12 . Patient satisfaction score was 9.5 in terms of unaided range of vision and overall surgeon satisfaction score was 9.0.

Conclusions: Extended vision Symphony IOL is effective in reducing spectacle dependence for all ranges of vision with good postoperative contrast sensitivity.

Comprehensive Ophthalmology

Mar 1, 2017 (Wed)

16:30 - 18:00

Venue: 300

Assessment of the Visual Acuity of Simple Congenital Blepharoptosis

First Author: Lyzu **MOMTAZ**

Co-Author(s): Golam **HAIDER**, Syeed **KADIR**

Purpose: To evaluate the refractive status and to assess visual acuity of simple congenital blepharoptosis.

Methods: This observational study was carried out in a tertiary eye hospital in Dhaka from July 1, 2013 to December 31, 2013. All patients presenting with simple congenital ptosis above 8 years were selected as the study population. Refractive status and visual acuity were measured in both eyes.

Results: Sixty ptotic eyelids of 50 patients were evaluated in this study. Male-to-female ratio was 1.3:1. The mean age was 17.7 years. In the unilateral cases, 59.1% had 6/6 to 6/9 visual acuity, 30% had 6/12 to 6/18, and 8.1% cases had $<$ 6/24. In the fellow eyes, visual acuity was 6/6 to 6/9 in 93.2% ($P = 0.0001$). Myopia was found more in ptotic eyes (29.8%) than fellow normal eyes (8.1%). Myopic astigmatism (16.2%) was found more than hypermetropic astigmatism (5.4%) in ptotic eyes. Among the 37 unilateral cases mild ptosis was greater than moderate and severe cases (48.65%, 35.13%, and 16.21%, respectively). Astigmatism was found more in severe cases (50.0%) than moderate (15.4%) and mild (5.5%) cases. Myopia was also more common in severe cases (50.0%) than mild (16.7%) and moderate (7.7%) cases ($P = 0.0284$). All 13 (100.0%) cases of severe ptosis were found in unilateral cases. Amblyopia was found in 54.0% of severe unilateral cases. LPS function was fair in 40% of cases, poor in 28%,

good in 18%, and normal in 14% of cases ($P = 0.9145$).

Conclusions: Amblyopia was more prevalent in severe unilateral ptosis.

16:30 - 18:00

Venue: 300

Impact of Retinal Imaging on Health Behavioral Outcomes in Patients with Diabetic Retinopathy

First Author: Abhas **MEHROTRA**

Co-Author(s): Subrata **MANDAL**, Shubha **NAGESH**

Purpose: A pilot study to assess the impact of visual feedback assisted counseling on behavioral outcomes in patients with diabetic retinopathy.

Methods: Optimal diabetes management is known to reduce the risk and progression of diabetic retinopathy. Retinal imaging is now being used to monitor patients with diabetic retinopathy. Using fundus pictures to explain the disease severity to patients could help motivate them towards positive health behavior. Sixty participants with non-proliferative diabetic retinopathy and suboptimal HbA1c (>53 mmol/mol; $>7\%$) were randomized to receive personal digital images assisted counseling or to a control group of counseling without access to digital images. At baseline and 6-month follow-up, HbA1c, self-care activities, and diabetes-related distress were assessed.

Results: Relative to the control group, the intervention group showed a significant positive improvement in HbA1c at the 6-month follow-up (-0.7% vs $+0.3\%$, $P < 0.01$), as well as higher motivation levels to improve blood glucose management ($P < 0.05$).

Conclusions: This small-scale pilot study provides initial evidence that feedback with an individual's retinal image could become a potential practical strategy for clinicians to improve outcomes in patients with diabetic retinopathy in non-target compliant patients. A more detailed and intensive randomized controlled trial can confirm the above findings and determine the most optimal use of visual feedback to produce consistent long-term effects.

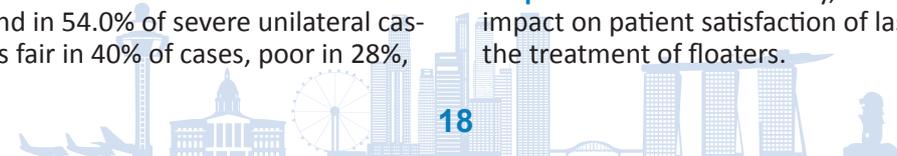
16:30 - 18:00

Venue: 300

Impact on Patient Satisfaction of Laser Vitreolysis in a General Ophthalmology Community

First Author: Inder **SINGH**

Purpose: To assess the safety, treatment specifics, and impact on patient satisfaction of laser vitreolysis for the treatment of floaters.



Methods: This retrospective, observational study included 296 (n = 198 patients) eyes (mean age, 66 years [range, 38 to 89 years]) presenting with floaters who underwent laser vitreolysis with the Ultra Q Reflex system (Ellex, Australia), a neodymium-doped (Nd) YAG laser in an office outpatient setting. Patient satisfaction was assessed with a 1-10 self-rated scale, with higher values indicating greater patient satisfaction, as well as a “Yes” or “No” indicating whether they were satisfied with improvement in daily functioning. Information on complications was recorded for all patients.

Results: In total, 93% (n = 184 patients) answered “yes” when asked if they were satisfied with the improvement in daily visual functioning. The noted average degree of improvement was 8.2 out of 10. On average, patients with Weiss rings required 1.14 sessions (average time of 6 minutes) to vaporize the floater compared to 3.2 sessions (average of 11 minutes per session) in patients with amorphous clouds. The number of laser shots needed to sufficiently vaporize floaters averaged around 315. Power settings varied depending on the floaters and ranged from 2.8 mJ to 8.5 mJ. Best results and higher satisfaction scores were seen with solitary “Weiss rings” versus amorphous “clouds.”

Conclusions: The findings of this preliminary study demonstrate that laser vitreolysis is associated with a high degree of patient satisfaction and low complication rates. The favorable risk/benefit ratio associated with this procedure allows it to be considered as a first-line treatment for symptomatic floaters.

16:30 - 18:00

Venue: 300

Pre- and Postoperative Objective Assessment of Quality of Vision in Patients Undergoing YAG Vitreolysis Using Wavefront Aberrometry

First Author: Inder **SINGH**

Purpose: To assess the impact on quality of internal optics in patients undergoing YAG vitreolysis for the treatment of symptomatic floaters.

Methods: Ten patients undergoing YAG vitreolysis for the treatment of symptomatic floaters using the Ultra Q Reflex YAG laser (Ellex, Australia) were scanned using the iTrace wavefront aberrometer (TRACEY Technologies, USA) preoperatively prior to dilation. These same 10 patients were then re-scanned after YAG vitreolysis had been performed. Postoperative scans were performed within 6 weeks of the procedure and were also obtained prior to dilation. All 10 treated patients were symptomatic, complaining of decreased daily functioning due to the floaters. All patients were preoperatively diagnosed with amorphous floaters that were near the central visual axis. Pre- and postoperative scans were

reviewed and compared for changes in higher order aberrations (HOA), modular transfer function (MTF) curves, and dysfunctional lens index (DLI), which is an assessment of internal quality of vision.

Results: In all 10 patients, the HOA were reduced. Average reduction was 53%, with the greatest reduction seen in trefoil, then coma (average total HOA preoperatively: 0.233, average postoperatively: 0.11). The DLI improved from an average of 5.3 to 8.9. For MTF measurements, the mean area under the curve was also increased by 40% (average preoperatively: 0.290, postoperatively: 4.10). There were no adverse events reported and Snellen visual acuity did not change on postoperative exams.

Conclusions: YAG vitreolysis has the potential to improve quality of vision in patients who suffer from symptomatic floaters.

Cornea, External Eye Diseases & Eye Bank

Mar 5, 2017 (Sun)

09:00 - 10:30

Venue: 302

Accelerated Collagen Cross-Linking of Cornea with Isotonic Riboflavin Solution in Progressive Keratoconus in North Indian Population: Short-Term Results

First Author: Anjum **MAZHARI**

Co-Author(s): Purnendu **CHAKARPANI**, Puneet **MAHAJAN**, Md **RAJA**, Ruchi **SHUKLA**

Purpose: To evaluate the refractive and clinical outcomes of 10-minute protocol of accelerated collagen cross-linking (CXL) with the help of topography, pachymetry, and high definition optical coherence tomography (OCT) in eyes with progressive keratoconus.

Methods: Fifty-four eyes underwent epithelium off accelerated CXL by instilling isotonic riboflavin 0.1% solution every 3 minutes for 30 minutes before and during the 10 minutes of ultraviolet A irradiation (9 mW/cm²) by Lightmed-Lightlink crosslinking system. We measured the uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), refraction, topographic values, pachymetry values, and demarcation lines at 1 week and at 1, 3, and 6 months after surgery and these were compared with preoperative findings.

Results: Mean UDVA and CDVA (in decimal) were 0.18 ± 0.18 and 0.53 ± 0.21 preoperatively, which progressively improved to 0.23 ± 0.19 and 0.54 ± 0.22, respectively, at 6 months. Preoperatively mean spherical refraction was -3.30 ± 3.11 DS and cylindrical refraction was -3.19 ± 2.23 DC, which improved to -2.97 ± 3.12 DS

and -2.61 ± 1.94 DC, respectively. Mean Kmax preoperatively was 50.54 ± 4.27 D, which changed to 48.03 ± 5.14 D at 6 months. Mean minimum corneal thickness (MCT) preoperatively was 449.50 ± 45.43 μm and it was 432.20 ± 49.48 μm at 6 months. Mean demarcation line 1 week postoperatively was 290 ± 14.24 μm , which stabilized to 259.67 ± 23.11 μm at 6 months.

Conclusions: Ectasia due to keratoconus was arrested by accelerated CXL in our cases with stabilization or improvement of mean UDVA, CDVA, refraction, and Kmax after 6 months of follow-up. There were improvements in topography indices, suggesting a more regular corneal surface. We also studied the effect of CXL on corneal stroma by analyzing the demarcation lines during follow-up.

09:00 - 10:30

Venue: 302

Anterior Stromal Puncture and Bowman Cautery with Cryopreserved Human Amniotic Membrane Transplantation for Treatment of Painful Bullous Keratopathy: A Boon for Patients in Countries with Poor Corneal Donation

First Author: Shireen **PANDEY**

Co-Author(s): Prasoon **PANDEY**

Purpose: To report our experience of anterior stromal puncture (ASP) with Bowman cautery (BC) combined with cryopreserved human amniotic membrane transplantation (hAMT) in the management of painful bullous keratopathy (BK).

Methods: A retrospective review of 22 patients with BK who underwent ASP and BC with AMT between 2012 and 2015. In all patients epithelial debridement was followed by ASP and BC and the amniotic membrane was stabilized with 10/0 nylon corneal suture and a bandage contact lens. During a mean follow-up of 7.27 ± 4.36 months symptoms, corneal findings, and visual acuity of the patients were evaluated.

Results: Of the 22 patients, there were 6 men and 16 women with a mean age of 61.90 ± 22.46 years. The clinical diagnosis was pseudophakic BK in 14 (63.63%), aphakic BK in 4 (18.18%), and failed graft in 4 (18.18%). The mean follow-up was 7.27 ± 4.36 months. Sixteen patients (72.7%) had complete relief, whereas 6 patients (27.27%) experienced mild symptoms. Corneal epithelial healing was complete in 20 (90.90%) eyes. Visual acuity decreased in 6 (27.27%) and remained the same in 16 (72.72%) patients. Infection was noted in 1 patient (4.54%) which resolved with medical management.

Conclusions: ASP and BC combined with hAMT is safe and effective, provides symptomatic relief in patients

with BK, and promotes epithelial healing and resolution of bullae in patients with BK. It is an excellent palliative procedure for BK patients in countries with poor corneal donation and long waiting lists for corneal transplants.

11:00 - 12:30

Venue: 301

Biomechanical Properties of Rabbit Cornea Using Inflation Test at Different Corneal Cross-Linking Irradiances

First Author: Shihao **CHEN**

Co-Author(s): Yaru **ZHENG**

Purpose: To investigate the corneal biomechanical properties using inflation test at different corneal cross-linking (CXL) irradiances while the delivered total energy is kept constant.

Methods: Eighty-four healthy purebred Japanese rabbits were randomly divided into 7 groups. All treated eyes were exposed to riboflavin 0.22% and UV-A (370 nm) at different corneal cross-linking irradiation of equal total energy (3 mW/cm² for 30 minutes, 9 mW/cm² for 10 minutes, 18 mW/cm² for 5 minutes, 30 mW/cm² for 3 minutes, 45 mW/cm² for 2 minutes, 90 mW/cm² for 1 minute). The control eyes were exposed to riboflavin 0.22% without irradiation, and all right eyes served as the normal group. All eyes were prepared for inflation test. An inverse modeling technology was used to determine the stress, strain, and tangent elastic modulus.

Results: The biomechanical effect of CXL decreased when using high irradiation/short irradiation time settings. At different stress (0.002 Mpa, 0.004 Mpa, 0.006 Mpa), there were significant differences between the 3 mW group and the NUVA group ($P < 0.05$) and the 9mW group and the NUVA group ($P < 0.05$). The tangent elastic modulus in the 3mW group was significantly increased by 122.1% to 145.7% compared with the NUVA group. The 9mW group increased by 101.9% to 103.6%. There was no difference between the 18mW group and the NUVA group ($P > 0.05$), the 30 mW group and the NUVA group ($P > 0.05$), the 45mW group and the NUVA group ($P > 0.05$), and the 90 mW group and the NUVA group ($P > 0.05$).

Conclusions: The biomechanical properties of rabbit cornea that underwent CXL decreased with increasing irradiance using inflation after a week. Therefore, the Bunsen-Roscoe law cannot be readily used in CXL. Increased oxygen consumption associated with higher irradiances may be a limiting factor leading to reduced treatment efficiency.

09:00 - 10:30

Venue: 302

Cataract Surgery in Chronic Sequelae of Stevens-Johnson Syndrome: Walking the Tightrope Without Fear

First Author: Purvasha **NARANG**Co-Author(s): Vikas **MITTAL**, Ashik **MOHAMED**, Virender **SANGWAN**

Purpose: To describe the various aspects and outcomes of cataract surgery in patients with chronic sequelae of Stevens-Johnson syndrome (SJS).

Methods: Retrospective, non-comparative, consecutive, interventional case series in a tertiary eye care center from March 2003 to May 2014. Of the 1662 consecutive patients with SJS, 32 patients (40 eyes) with chronic sequelae of SJS who underwent cataract surgery were included. The main outcome measures were best-corrected visual acuity (BCVA) expressed in logMAR and ocular surface stabilization.

Results: The study included 12 men (37.5%) and 20 women (62.5%). Eight patients (25%) had bilateral cataract surgeries. The median preoperative BCVA was 1.61 (IQR, 0.80 to 2.78) (only perception of light in 3 eyes). The median BCVA in the immediate postoperative period was 0.60 (IQR, 0.30 to 1.48) (perception of light in an eye), which was significantly different from the preoperative BCVA ($P < 0.0001$). The median BCVA achieved was 0.30 (IQR, 0.00 to 0.80), suggesting further improvement. Median time taken to achieve this postoperatively was 1.5 months (IQR, 8 days to 3 months). The median BCVA during the last follow-up was 0.48 (IQR, 0.18 to 1.00). The preferred type of cataract surgery was phacoemulsification. Ocular surface condition remained stable in 35 eyes (87.5%). Ocular surface breakdown in 4 eyes (10%) was managed appropriately.

Conclusions: Cataract surgery outcomes can be visually rewarding in chronic sequelae of SJS provided ocular surface integrity is adequately maintained preoperatively and postoperatively.

11:00 - 12:30

Venue: 301

Contact Lens Assisted Corneal Collagen Crosslinking with Isotonic Riboflavin in Thin Corneas (<400 μm): An Evaluation of Visual Outcome and Progression of Ectasia

First Author: Moses **RAJAMANI**Co-Author(s): Soosan **JACOB**

Purpose: To evaluate the progression of keratectasia of >1 diopter (D) and refraction in patients with progressive corneal ectasia with a corneal thickness of <400

μm undergoing contact lens assisted corneal collagen crosslinking (CACXL).

Methods: Preoperative evaluation was done following all standard norms. Postoperative parameters were evaluated on day 1 and 7 and at 1, 3, 6, and 12 months. All patients underwent CACXL (epi-off) under topical anesthesia. Iso-osmolar riboflavin 0.1% was applied every 3 minutes for 30 minutes. A contact lens, soaked in iso-osmolar riboflavin for 30 minutes, was then applied on the abraded cornea and exposed to crosslinking by UV-A light (370 nm) at an irradiance of 3 mW/cm² for 30 minutes. At the same time, riboflavin 0.1% was applied both over and under the contact lens to maintain riboflavin saturation in the cornea and also to maintain the pre-contact lens and pre-corneal riboflavin films. After treatment, the riboflavin-soaked contact lens was removed, thorough BSS wash was given, and a bandage contact lens left in situ.

Results: Statistically significant improvement was noted in uncorrected visual acuity, best corrected visual acuity, and manifest refraction cylinder. No statistically significant change was noted between pre- and postoperative spherical refraction, maximum keratometry, minimum keratometry, and SimK. No statistically significant change between the preoperative and postoperative specular counts was noted.

Conclusions: Significant improvement in both uncorrected and best corrected visual acuity over time and stabilization of the keratometric indices implies the halt in the progression of the ectasia. The stable endothelial count indicates that good UV-A attenuation is attained at the endothelial level. Hence, CACXL is a safe and effective procedure in halting the progression of keratectasia in patients with thin corneas.

11:00 - 12:30

Venue: 301

Contact Lenses Loaded with Drugs and Vitamin E: The Effect of Sterilization

First Author: Helena **FILIPE**Co-Author(s): Paula **MATOS**, Benilde **SARAMAGO**, Ana Paula **SERRO**, Ana **TOPETE**

Purpose: To investigate the effect of common sterilization methods (gamma radiation and steam heat) on the release behavior of 2 drugs [levofloxacin (LVF) and chlorhexidine (CHX)] from silicone-based commercial contact lenses (CLs) with and without vitamin E.

Methods: The effect of different doses of gamma radiation and steam heat was assessed with the following: 1) stability of the drugs (LVF and CHX); 2) properties of commercial CLs (Acuvue Oasys and 1-Day Acuvue TruEye), namely, the swelling capacity, ionic permeability, wettability, transmittance, and surface morphology;



and 3) release profiles of drug lenses loaded with LVF and CHX by soaking. Incorporation of vitamin E was used as a strategy to try to improve the drug release profiles, due to its action as a hydrophobic barrier for the drugs. In this case the CLs were pre-loaded with vitamin E prior to the drug loading. The results were compared with those obtained without vitamin E.

Results: Gamma radiation at high doses led to degradation of both CLs and drugs. The lowest dose of gamma radiation and steam heat did not produce significant changes on CL properties or drug degradation. For LVF, the best release kinetics were achieved with vitamin E and sterilization by steam heat for both CLs, while for CHX it was obtained with vitamin E and gamma radiation for Acuvue Oasys and without vitamin E and gamma radiation for 1-Day Acuvue TruEye.

Conclusions: Generally, vitamin E improves drug release profiles. A perfect sterilization method does not exist because for different systems, different sterilization methods should be used.

09:00 - 10:30

Venue: 302

Development of Australian Guidelines for the Management of Herpes Simplex Keratitis

First Author: Maria **CABRERA AGUAS**

Co-Author(s): Yves **KERDRAON**, Peter **MCCLUSKEY**, Dana **ROBAEI**, Richard **SYMES**, Stephanie **WATSON**

Purpose: To determine current prescribing trends and develop local guidelines for the management of herpes simplex keratitis (HSK).

Methods: A retrospective review of all HSK cases aged 18 years and above at a tertiary referral hospital in Sydney, Australia, from January 2012 to December 2013 was conducted. A systematic review of HSK management, pharmacy consultation, and a consensus meeting with corneal and uveitis specialists were undertaken to develop local guidelines.

Results: Three hundred five eyes of 300 patients were included with a mean age of 54 years (range, 18-95) and male to female ratio of 1.4:1. In total, 254/305 (83%) and 51/305 eyes (17%) received antiviral therapy for therapeutic and prophylactic indications, respectively. Overall, antivirals prescribed included valacyclovir 500-1000 mg 1-3 times daily, aciclovir 200-400 mg 1-5 times daily, topical aciclovir 2-5 times daily, trifluorothymidine every 2 hours, or combined oral and topical antivirals. Together 121/140 eyes (86.4%) with epithelial, 2/22 (9%) eyes with stromal without epithelial ulcer, 1/21 eyes (5%) with stromal with epithelial ulcer, 5/18 (28%) eyes with endothelial HSK, 17/53 (32%) eyes with keratouveitis, and 32/51 (63%) eyes on HSK prophylaxis, for a total of 178/305 (58%) eyes,

met local guidelines. The guidelines will be included in this tertiary referral hospital's Pharmacopoeia mobile application and on a lanyard card for medical staff.

Conclusions: Current prescribing patterns for antiviral therapy to treat and prevent recurrence of HSK are diverse. Local guidelines will help to standardize the initial antiviral therapy of HSK with the potential to improve patient care and rationalize the use of health resources.

09:00 - 10:30

Venue: 302

Differences in Presentation of Central and Non-Central Keratoconus and Their Effect on Screening Criteria for Keratoconus

First Author: Gaurav **PRAKASH**

Purpose: To evaluate the differences in central and non-central keratoconus (based on cone location) and their effect on the objective screening thresholds for keratoconus.

Methods: This comparative case series was performed at a tertiary care cornea and refractive surgery service. Fifty consecutive cases each were recruited in 4 groups as follows: KC apex ≤ 2 mm from center (central keratoconus) and apex > 2 mm (non-central keratoconus); normal cases with apex ≤ 2 mm (normal, central apex) and > 2 mm (normal, non-central apex). All cases underwent clinical evaluation and corneal topography (CSO, Sirius, Italy). Maximum keratometry (MaxK), simulated keratometry at 3 mm (SimK), central (CCT) and minimum corneal thickness (MCT), anterior corneal higher order aberrations root mean square (HOARMS), and Zernike coefficients up to the fourth order at different zones were measured.

Results: In spite of the keratoconic groups having comparable MaxK ($P > 0.05$), central keratoconus had higher SimK, thinner CCT, and MCT ($P < 0.001$). Receiver operating curve analysis was done to compare central keratoconus and non-central keratoconus with pooled normal group ($n = 100$). MaxK and HOARMS had best discriminative parameters. Using single parametric suspicion cutoffs of "either SimK steep > 47.2 D or CCT $< 491.6 \mu\text{m}$ " had a good sensitivity (0.98) for central keratoconus but not for non-central keratoconus (0.80). Changing this cut-off to "either SimK steep $K \geq 45.8$ D or CCT $\leq 503 \mu\text{m}$ " gave a sensitivity and specificity of 0.95 and 0.87 for non-central keratoconus and 0.99 and 0.87 for central keratoconus.

Conclusions: Non-central keratoconus has lesser effect on SimK, pachymetry, and smaller-aperture HOARMS. Using a more stringent criteria of SimK steep $K \geq 45.8$ D or CCT $\leq 503 \mu\text{m}$ for corneal topography to rule out keratoconus is highly recommended.

09:00 - 10:30

Venue: 302

Effect of Genotype on FECD Progression

First Author: Yu Qiang **SOH**

Co-Author(s): Jodhbir **MEHTA**, Vinod **MOOTHA**, Gary **PEH**, Eranga **VITHANA**

Purpose: Fuchs endothelial corneal dystrophy (FECD) is characterized by Descemet membrane guttae, endothelial cell loss, and corneal edema. Recently, a CTG trinucleotide repeat expansion in the TCF4 locus within chromosome 18q21.1 (CTG 18.1) has been identified in association with FECD, with evidence of a correlation between expansion size and disease severity. In this longitudinal study, we investigated the relationship between CTG 18.1 repeat expansion size and FECD progression using central corneal thickness (CCT) as an indicator of disease severity.

Methods: Patients diagnosed with FECD between November 2004 and April 2016 were recruited. Baseline CTG 18.1 repeat length was characterized using short tandem repeat and triplet repeat-primed polymerase chain reaction assays. CCT was measured by ultrasound pachymeter at baseline and yearly thereafter. Eyes with previous cataract extraction surgery or keratoplasty were excluded, as was CCT data collected following cataract extraction surgery or keratoplasty during the follow-up period.

Results: A total of 41 eyes were recruited, with a mean duration of follow-up of 4.17 years (range, 2–6 years). The mean number of CTG repeats was 36.6. There was an increase in CCT over time for all patients ($P < 0.001$); eyes from patients with at least 1 allele at the CTG 18.1 locus with repeat length greater than or equal to 37 ($L \geq 37$) demonstrated faster rates of increase in CCT compared to those with fewer than 37 repeats ($L < 37$) ($P = 0.001$).

Conclusions: CTG 18.1 repeat length may be useful for the prognostication of FECD progression, with respect to development of corneal edema.

11:00 - 12:30

Venue: 301

Effects Of Oral Omega-3 Fatty Acid Supplementation on Dry Eye Syndrome Among Patients on Chronic Topical Anti-Glaucoma Medications

First Author: Angelane **SANTOS**

Co-Author(s): Evelyn **MORABE**

Purpose: To compare the effects of oral omega-3 fatty acids and preservative-free artificial tears in improving signs and symptoms of dry eye among patients on chronic topical anti-glaucoma medications.

Methods: Eighty-three patients aged 48 to 74 years (60.33 ± 6.5) with 22 males and 61 females were randomized into 2 groups: 42 patients receiving oral omega-3 capsules [120 mg docosahexaenoic acid (DHA), 180 mg eicosapentanoic acid (EPA)] 3 times daily for 30 days and 41 receiving preservative-free artificial tears (PFAT) 4 times daily. Tear break-up time (TBUT), Schirmer score, and Ocular Surface Disease Index (OSDI) were taken at baseline and after 30 days.

Results: The mean OSDI scores decreased in both groups denoting symptomatic improvement, but mean decrease was significantly greater with oral omega-3 compared to preservative-free artificial tears [10.72 ± 9.05 (omega-3) vs 3.93 ± 6.92 (PFAT); $P = 0.0003$]. TBUT scores increased in both groups but improvement was significantly greater with oral omega-3 [-1.68 ± 0.99 (omega-3) vs -0.40 ± 0.49 (PFAT); $P < 0.0001$]. Schirmer test scores increased in both groups but mean increase was significantly higher with oral omega-3 [-1.44 ± 1.16 (omega-3) vs -0.27 ± 0.55 (PFAT); $P < 0.0001$].

Conclusions: Among patients on chronic topical anti-glaucoma medications, oral supplementation of omega-3 fatty acids significantly decreased the OSDI and increased TBUT and Schirmer scores compared to preservative-free artificial tears.

09:00 - 10:30

Venue: 302

Ethnic Variations of Corneal Biomechanical Properties Between Singaporean Indian and Chinese Adults

First Author: Jacqueline **CHUA**

Co-Author(s): Ching-Yu **CHENG**, Monisha **NONGPIUR**, Tien **WONG**, Wanting **ZHAO**

Purpose: To investigate ethnic variations in corneal hysteresis (CH) and corneal resistance factor (CRF) between Indian and Chinese populations by self-reported ethnicity and genetic ancestry.

Methods: Three hundred eighty-two Indians and 764 age- and gender-matched Chinese, aged 50 and above, were included from the Singapore Indian Eye Study and Singapore Chinese Eye Study, respectively. All participants underwent standardized ocular examination, including intraocular pressure (IOP), central corneal thickness (CCT), CH, and CRF measurements. Genetic ancestry was derived using principal component analysis. Regression models were used to investigate the association of CH and CRF with potential risk factors.

Results: Participants who had undergone intraocular surgery, glaucoma suspects or glaucoma patients, and those with any presence of corneal abnormalities were excluded from the analysis. Two Chinese participants were matched for age and gender with every Indian



participant. There were no differences in the clinical measurements of CH (10.6 ± 1.6 mm Hg; $P = 0.670$) or CRF (10.3 ± 1.7 mm Hg; $P = 0.103$) between ethnic groups. After adjusting for age, gender, self-reported ethnicity, IOP, CCT, corneal curvature, axial length, and body mass index, Indians had, on average, 0.21 mm Hg higher CH levels than Chinese ($P = 0.026$). CRF level was not independently associated with self-reported ethnicity ($P = 0.330$). Indian ancestry was positively associated with elevated CH levels in our Southeast Asian population.

Conclusions: Chinese have lower CH than Indians. In view of the fact that CH is lower in eyes with glaucoma, this may potentially contribute to the greater glaucoma burden in Chinese compared with Indians.

11:00 - 12:30

Venue: 301

Exaggerated Dry Eye Symptoms and Distinct Cytokine Profile in Patients with Low Serum Vitamin D

First Author: Rashmi **DESHMUKH**

Co-Author(s): Tushar **GROVER**, Rohit **SHETTY**, Swaminathan **SETHU**, Rushad **SHROFF**

Purpose: Dry eye is associated with inflammation, pain, and discomfort. Vitamin D is known to modulate immune responses and pain. This study investigates the level of serum vitamin D and tear-inflammatory proteins with relation to exaggerated symptoms in patients with mild dry eye.

Methods: Patients with mild dry eye signs (DEWS severity grade 1) but with exaggerated symptoms and healthy controls ($n = 19$, each) were recruited for this cross-sectional study. Schirmer Test I (mm), TBUT (secs), and ocular surface disease index (OSDI) score were recorded. Serum vitamin D level and tear cytokine levels were measured.

Results: The mean OSDI score in the patient cohort (46 ± 3) was significantly higher than controls (8.4 ± 1.6). TBUT was lower (7.6 ± 0.3 secs) in patients compared to controls (11.0 ± 0.9 secs). Mean Schirmer Test I value in patients (19.3 ± 1.4 mm) was lower than in controls (30.6 ± 1.9 mm). An inverse correlation was observed between serum vitamin D levels and OSDI score ($r = -0.569$; $P = 0.01$). Significantly higher levels of IL-17A/F, IFN γ , MCP1, ICAM1, IL-4, and IL-10 and decreased IL-2 concentrations were observed in the tears of patients compared to controls ($P < 0.05$).

Conclusions: Decreased serum vitamin D was associated with exaggerated symptoms in dry eye patients with mild dry eye signs. In addition, altered tear cytokine profile was observed in these patients.

09:00 - 10:30

Venue: 302

High Resolution OCT Surface Imaging of Bowman Layer in Asymmetric Keratoconus

First Author: Urvija **CHOUDHARY**

Co-Author(s): Rushad **SHROFF**, Abhijit **SINHA ROY**, Rohit **SHETTY**

Purpose: To assess if irregularity of the Bowman layer is altered in asymmetric keratoconus.

Methods: We defined a new index called the Bowman Roughness Index (BRI) to assess the irregularity of the Bowman layer in asymmetric keratoconus (KC) using high resolution optical coherence tomography (OCT; Bioptigen Inc, USA). Central 3 mm cornea was imaged with OCT. Twenty-eight eyes with KC, of which 18 had tomographically normal fellow eyes, were imaged. Twenty-six normal eyes with no clinical signs of KC were also imaged. These were also imaged with Pentacam (v1.20r41). Other indices assessed included BAD-D, KISA, and cone location magnitude index (CLMI).

Results: Mean BRI was 0.00212, 0.00181, and 0.0017 mm² in normal, fellow, and KC eyes, respectively ($P < 0.001$). BAD-D and BRI had the best sensitivity and specificity to detect normal fellow eyes. By combining BAD-D and BRI in a statistical model, sensitivity and specificity improved to 80% and 89.3%, respectively. For KC eyes, BRI did not result in any additional improvement in detection.

Conclusions: BRI was lower in the fellow eye, which may indicate that the normal fellow eye may be in the early stage of the disease. Thus, there may not be any "true" asymmetric KC since BRI indicated that both eyes were affected.

09:00 - 10:30

Venue: 302

Immunopathology and Clinical Phenotype Comparison in Ocular Mucous Membrane Pemphigoid

First Author: Hon Shing **ONG**

Co-Author(s): John **DART**, Darwin **MINASSIAN**

Purpose: Ocular mucous membrane pemphigoid (Oc-MMP) is the commonest cause of cicatricial conjunctivitis in the UK. A recommended diagnostic requirement is positive direct immunofluorescence (DIF+) tissue diagnosis. However, in OcMMP without extraocular involvement (ocular only MMP), only 25/49 (51%) cases from previous studies have been DIF+; the diagnosis in DIF negative (DIF-) patients being made clinically. However, the validity of a diagnosis of MMP, without a DIF+ result to confirm the immunopathology, has been questioned, leading to sight-threatening delays in

therapy. We aim to compare the clinical phenotype of patients with ocular MMP with their immunofluorescence status.

Methods: A cross-sectional phenotyping study on a cohort of 112 MMP patients with known DIF results.

Results: Seventy-three of 112 (65.2%) patients screened had OcMMP; 43/69 (62.3%) were DIF+ and 26/69 (37.7%) were DIF-. DIF results were uncertain in 4/73 (5.5%). Patients were grouped according to sites affected. Twenty of 73 (27.4%) had ocular involvement only; 19/73 (26.0%) ocular and oral; 10/73 (13.7%) ocular, oral, and nasopharyngeal; and 24/73 (32.9%) ocular and other combinations of sites involved. Patients who had ocular only involvement were more likely to have a DIF- status ($P = 0.03$). There were trends to more conjunctival scarring in DIF+ patients (56.3% versus 43.8%) but to more corneal pathology in DIF- patients (68.8% versus 31.3%). Statistically significant differences were only present for the severity of corneal pathology. DIF- patients were more likely to require fornix reconstruction surgery.

Conclusions: DIF- OcMMP patients have phenotypes as severe, or worse, than DIF+ patients, supporting the hypothesis that current immunopathology techniques are too insensitive to be used to exclude a diagnosis of MMP.

09:00 - 10:30

Venue: 302

Inverse Keratoconus, A Late Finding in Keratoconus Patients After DALK

First Author: Jagadeesh Kumar **REDDY**
Co-Author(s): Ameya **INGAWALE**, Siddharthan **K S**,
 Rushita **KAMDAR**, Neeraj **SHAH**

Purpose: To study the incidence of inverse keratoconus in patients who underwent deep anterior lamellar keratoplasty (DALK) for keratoconus, featuring a central island of flattening of the graft associated with thinning.

Methods: A retrospective review of patients who underwent DALK for keratoconus from 2007 to 2016 was done. Uncorrected visual acuity (UCVA), best spectacle corrected visual acuity (BCVA), slit lamp findings, corneal topography, and central corneal pachymetry were analyzed in 122 eyes of 71 patients.

Results: Thirty-one eyes of 31 patients showed topographic evidence of a central island of flattening which correlated with slit lamp findings of subepithelial haze of varying density. Central corneal thickness varied from 400 to 479 μm and correlated with topographic findings. The average onset of central subepithelial haze was at 12 months post DALK. The central haze progressed over time and was associated with thinning

of the cornea and a corresponding decrease in UCVA and BCVA.

Conclusions: Twenty-five percent of keratoconus patients who underwent DALK developed a central island of flattening with associated decrease in visual acuity. The central haze, flattening, and thinning may be a chronic stromal rejection or progressive thinning of the cornea associated with keratoconus or due to reduced corneal sensations.

09:00 - 10:30

Venue: 302

Keratoconus Correction and Treatment with Intrastromal Corneal Ring Segments: 15-Year Experience

First Author: Merab **DVALI**
Co-Author(s): Tea **ABRAMIA**, Bella **SIRBILADZE**, Nana **TSINTSADZE**

Purpose: To evaluate efficacy and stability of visual, refractive, topographic, and aberrometric outcomes using different size (thickness, length, and width) intrastromal corneal implants in eyes with keratoconus aiming to improve functional data and get maximal refractive effect to halt the progression of the disease and assess the possible changes in the structures of the cornea.

Methods: A total of 1583 keratoconic eyes of 921 patients were treated with ISCR implantation of 1 or 2 segments according to nomograms. Pre- and postoperative examination included Snellen uncorrected distance visual acuity (UDVA), best corrected visual acuity (BCVA), manifest refraction, slit lamp biomicroscopy, fundus evaluation, ultrasound pachymetry, corneal topography, and aberrometry.

Results: Preoperatively UCVA, -0.12 ± 0.07 ; BCVA, 0.3 ± 0.2 ; K-readers, 53.1 ± 3.7 (steep meridian), 46.8 ± 3.7 (flat meridian); posterior best fit sphere (PBFS), 54.75 ± 1.9 ; SE, 7.2 ± 3.5 ; astigmatism, 6.1 ± 1.5 . Postoperatively UCVA, 0.7 ± 0.2 ; BCVA, 0.7 ± 0.2 ; K-readers, 45.9 ± 3.7 (steep meridian), 42.8 ± 2.7 (flat meridian); PBFS, 51.0 ± 2.1 ; SE, 2.0 ± 1.5 ; astigmatism, 2.5 ± 0.7 .

Conclusions: ISCR implantation improves all main parameters of corneal topography. The procedure flattens the central optical zone, which results in increased UCVA, and it remained stable over the follow-up period. The reduction in segment diameter seems to be of great importance to better and effective control of astigmatism. Achieved refractive results were stable and in 92% of cases there was no need for additional procedures such as corneal cross-linking, rigid contact lenses, or photorefractive keratectomy (PRK).



11:00 - 12:30

Venue: 301

Molecular Diagnostic Test Development for Ocular Demodex Infestation

First Author: Isabella **CHEUNG**

Co-Author(s): Jennifer **CRAIG**, Andy **KIM**, Trevor **SHERWIN**

Purpose: Blepharitis is one of the most commonly encountered ophthalmic conditions in clinical practice globally. Inflammation of the eyelids causes desiccation of the ocular surface and affected individuals chronically experience fluctuating poor vision and painful dry eyes, leading to a significant decline in quality of life. Infestation of the eyelash follicles and Meibomian glands with parasitic Demodex mites is a major cause of transmissible blepharitis. The current method of diagnosing ocular demodicosis lacks sensitivity and accuracy and is impracticable in a clinical setting. This study aims to develop multiple molecular diagnostic tests for ocular demodicosis.

Methods: Eyelashes were epilated from participants with and without ocular demodicosis. For the polymerase chain reaction (PCR) assay, DNA was extracted from the eyelashes and amplified using primers targeting the Demodex 16s ribosomal RNA (rRNA) gene, followed by gel electrophoresis. For the latex agglutination (LA) assay, latex microspheres were conjugated with wheat germ agglutinin and applied to epilated eyelashes.

Results: The PCR assay consistently amplified a sequence of the Demodex 16srRNA gene from the eyelashes of participants with ocular demodicosis. The PCR of normal eyelashes consistently did not yield this amplicon. Agglutination was consistently observed following application of the LA assay to eyelashes from participants with ocular demodicosis. No agglutination was consistently observed when normal eyelashes were assayed.

Conclusions: The PCR and LA assays are able to detect Demodex-specific molecules in ocular demodicosis. As well as being novel and effective research tools, these assays will greatly improve the diagnosis, and therefore clinical care, of ocular demodicosis.

09:00 - 10:30

Venue: 302

Outcomes of Corneal Cross-Linking for Keratoconus from Routine Clinical Practice: Results from the Save Sight Registries Keratoconus Module

First Author: Stephanie **WATSON**

Co-Author(s): Elsie **CHAN**, Mark **DANIELL**, Mark **GILLIES**, Yves **KERDRAON**

Purpose: To report the 12-month outcomes of 109 eyes undergoing corneal cross-linking for keratoconus performed in routine clinical practice across Australia and New Zealand.

Methods: Index visit characteristics, such as visual acuity (VA, logarithm of the minimal angle of resolution [logMAR] letters), maximum keratometry (Kmax), pachymetry, as well as treatment parameters (epithelial status, riboflavin type, UV duration), outcomes (VA, Kmax, pachymetry), and ocular adverse events were recorded in a prospectively designed electronic database.

Results: Mean change in VA in the cohort 12 months after treatment was 4.07 (95% confidence interval [CI], 0.90 to 7.23; $P = 0.012$); Kmax -0.41 D (95% CI, -1.08 to 0.26; $P = 0.225$) and pachymetry -22.1 μm (95% CI, -31.3 to -13.0; $P < 0.001$). There was a significant difference in change in VA ($P = 0.012$) and a reduction in pachymetry at 12 months ($P < 0.001$) while Kmax was unchanged ($P = 0.649$). Treatments were epithelial-off ($n = 101$) with UV exposure that was accelerated ($n = 55$ [50%]); according to the Dresden protocol ($n = 48$ [44%]) or not recorded ($n = 6$). Adverse event episodes occurred in 18 eyes and included clinically significant haze ($n = 11$), microbial keratitis ($n = 1$), persistent epithelial defect ($n = 3$), and scarring ($n = 3$) and there were no sterile infiltrates from a total of 101 eyes within the first 12 months of follow-up.

Conclusions: Corneal cross-linking can stabilize visual acuity and maximum keratometry when used in routine clinical practice. Post procedure corneal thinning requires further investigation.

09:00 - 10:30

Venue: 302

Post-LASIK Ectasia: Understanding the Mechanistic Pathway Beyond Topography

First Author: Tushar **GROVER**

Co-Author(s): Rashmi **DESHMUKH**, Rohit **SHETTY**, Rushad **SHROFF**

Purpose: To study the association between tear inflammatory biomarkers and ectasia after laser in situ keratomileusis (LASIK).



Methods: Post-LASIK ectasia ($n = 6$) and age-matched controls ($n = 6$) were included in a cross-sectional study. Tears collected on Schirmer strips were analyzed in the cell biology lab. Levels of 22 tear inflammatory mediators (IL-1 α , IL-1 β , IL-2, IL-4, IL-6, IL-8, MCP1, MIP1 β , RANTES, ICAM1, and IFN α) were measured using cytometric bead array and correlated to the clinical parameters.

Results: Inflammatory mediators were observed to be higher in the tears of patients with post-LASIK ectasia. Furthermore, ≥ 2 -fold higher levels of most of these mediators (IL-1 α , IL-2, IL-4, IL-8, MCP1, MIP1 β , RANTES, and IFN α) were observed as compared to controls.

Conclusions: An increase in inflammatory mediators was observed in post-LASIK ectasia. These mediators can be novel targets to possibly manage iatrogenic ectasia and/or delay or halt its progression.

11:00 - 12:30

Venue: 301

Quantitative Corneal Neural Imaging Using In Vivo Confocal Microscopy in Cases of Congenital Corneal Anesthesia: A Prospective Analysis and Clinical Correlation

First Author: Madhumita **GOPAL**

Co-Author(s): Nazia **BEGUM**, R **MURALEEDHARA**

Purpose: Quantitative estimation and comparison of the corneal neural architecture by using real-time, in vivo confocal microscopy (IVCM) in patients with congenital corneal anesthesia (CCA) against a control population.

Methods: Cooperative children ($n = 8$) diagnosed with CCA without excessive scarring of the cornea, as cases, and a consenting blood relative of each ($n = 8$) without any corneal pathology, as controls, underwent IVCM of the superficial corneal nerves using the Nidek Confoscan 4. The clearest 3-5 images from each eye were selected and coded and the nerves analyzed for length, thickness, and density; dichotomous pattern; and beading using ImageJ software. The images were then decoded and the values statistically analyzed.

Results: Twelve eyes of 8 cases and 16 eyes of 8 controls were imaged. Measurements of corneal nerve density showed a significant difference ($P = 0.007$), with cases having a lower mean (4.11 mm per mm²) compared with controls (6.52 mm per mm²). Measurements on corneal nerve length ($P = 0.10$), thickness ($P = 0.24$), and presence of beading ($P = 0.87$) did not reveal a significant separation between cases and controls. On dichotomous patterns, the medians were recorded at 45% and 82% for cases and controls, respectively. Despite marginally overlapping quartile ranges, the determined P value was 0.1.

Conclusions: In this study we found a correlation between the functional loss (absent corneal sensation) and anatomical decrease (reduced subbasal nerve density) of corneal nerves in cases of CCA.

11:00 - 12:30

Venue: 301

Symmetrically Substituted Xanthone Amphiphiles as Potential Therapeutic Agents for Corneal Infections

First Author: Shouping **LIU**

Purpose: The rapid increase in the emergence of multidrug resistance and the declining discovery rate of novel antibiotics are growing threats to public health. Current bacterial infection treatments have become inadequate and are often associated with higher health-care costs and increased morbidity and mortality. The development of new classes of antimicrobial agents with new mechanisms of action is urgently needed.

Methods: We first reported the design and synthesis of a new series of symmetric xanthone derivatives that mimic antimicrobial peptides (AMPs) using a total synthesis approach instead of using semi-modification of natural α -mangostin. This novel design is advantageous because of its low cost, synthetic simplicity and versatility, and easy tuning of amphiphilicity by controlling the incorporated cationic and hydrophobic moieties. The evaluations of in vitro and in vivo antimicrobial activities were systemically carried out.

Results: Two optimized compounds, AM-278 and AM-294, showed potent activities against a panel of Gram-positive bacteria, including MRSA and VRE (MICs = 0.78-6.25 $\mu\text{g/mL}$), with a rapid bactericidal effect, low toxicity, and no emergence of drug resistance. Both compounds demonstrated excellent membrane selectivity that was higher than those of most membrane-active antimicrobial agents in clinical trials. In vivo efficacy of AM-278 and levofloxacin in a mice keratitis model (1 day treatment) showed that AM-278 and levofloxacin had similar efficacy with 4 times/day application in 1 day at the same doses of 5 mg/mL.

Conclusions: These results provide compelling evidence that AM-278 and AM-294 have therapeutic potential as novel antimicrobial agents for multidrug-resistant Gram-positive infections.



Glaucoma

Mar 4, 2017 (Sat)

14:30 - 16:00
Venue: 301

24-Hour Blood Pressure and Disease Progression in Primary Angle Closure Glaucoma

*First Author: Shaoying TAN
Co-Author(s): Nafees BAIG, Poemen CHAN, Clement THAM, Shihui WEI, Marco YU*

Purpose: To study the influence of 24-hour blood pressure (BP) variability and fluctuation during normal daily activities on glaucomatous progression in primary angle closure glaucoma (PACG) patients.

Methods: Continuous BP was recorded by ambulatory 24-hour blood pressure measurement (ABPM) in PACG patients who had been followed up for over 24 months with at least 5 prior visual field (VF) tests by Humphrey automated perimetry (HAP). Glaucoma progression was documented with serial changes in visual field index (VFI). The variability of BP was compared between the progressive and stable groups by Mann-Whitney U test. The 24-hour BP profiles were smoothed using Fourier transform and described by functional data analysis. The signals were compared by permutation tests on functional t-statistics.

Results: Twenty-nine PACG patients were recruited including 6 (20.7%) with VF progression and 23 (79.3%) stable patients. The 24-hour systolic BP (SBP) weighted mean and minimum readings were statistically significantly lower in the progressive group ($P = 0.041$ and $P = 0.005$), especially during the daytime ($P = 0.019$ and $P = 0.009$). Higher hypotensive time index (PTD) and hypotensive load (Leese) were found in the progressive group during 24 hours (PTD, $P = 0.004$; Leese, $P = 0.005$) and daytime (PTD, $P = 0.009$; Leese, $P = 0.014$). Significantly lower SBP profile was found in the progressive group from 14:00 to 15:00, 22:00 to 03:00, and 09:00 to 12:00 ($P < 0.05$).

Conclusions: Significantly lower SBP was found in progressive PACG patients. Hypotension, or over-treated hypertension, may be a risk factor for glaucomatous progression in PACG patients.

09:00 - 10:30
Venue: 310

Anterior Segment Angle-to-Angle Scan of Cirrus High Definition Optical Coherence Tomography: Can It Substitute Visante for Angle Closure Detection?

*First Author: Mani BASKARAN
Co-Author(s): Tin A TUN, Tin AUNG, Rahat HUSAIN, Shayne S TAN*

Purpose: To evaluate the diagnostic performance of the anterior segment angle-to-angle scan of Cirrus high-definition optical coherence tomography (HD OCT) in detecting angle closure.

Methods: Subjects underwent gonioscopy, anterior segment imaging with Cirrus ($n = 202$), and Visante ASOCT ($n = 85$) (Carl Zeiss Meditec, Dublin, CA) under dark-room conditions. Closed angles were defined as those with posterior trabecular meshwork not seen on gonioscopy and if there was any irido-corneal contact anterior to scleral spur in ASOCT images. An eye was defined as angle closure if 2 or more quadrants were closed. Agreement and area under the curve (AUC) were performed for angle closure detection between the 3 methods.

Results: The majority of subjects were Chinese (170/202, 84.2%) with a mean age of 62.26 ± 9.7 years. There were 50 (24.8%) eyes with closed angles. The agreements of angle closure diagnosis between Cirrus HD OCT and gonioscopy ($AC1 = 0.76$) and between Cirrus and Visante OCT ($AC1 = 0.77$) were moderate. The AUC for diagnosing the eye with gonioscopic angle closure by Cirrus HD OCT was good ($AUC = 0.86$; sensitivity = 83.33; specificity = 77.78). The diagnostic performance of Cirrus HD OCT in detecting angle closure was similar to that of Visante ($AUC 0.87$ vs 0.9 , respectively; $P = 0.51$).

Conclusions: Although anterior segment angle-to-angle scans of Cirrus demonstrated similar diagnostic performance as Visante in detecting gonioscopic angle closure, the agreement between Cirrus and gonioscopy was moderate.

09:00 - 10:30
Venue: 310

Anterior Segment Optical Coherence Tomography Parameters in Subjects with Asymmetric Primary Angle Closure Glaucoma

*First Author: Monisha NONGPIUR
Co-Author(s): Tin AUNG*

Purpose: To compare anterior segment parameters, assessed by anterior segment optical coherence tomography (ASOCT), in subjects with asymmetric primary



angle closure glaucoma (PACG).

Methods: Two hundred fifty-eight subjects with PACG in at least 1 eye were recruited from glaucoma clinics. Each subject underwent ASOCT (Visante, Carl Zeiss Meditec, Dublin, CA) imaging, gonioscopy, and visual field (VF) assessment. Visual field asymmetry was defined as a 5-point difference between eyes using the Advanced Glaucoma Intervention Study (AGIS) scoring system; unilateral VF defect was defined as an AGIS score of 0 in the better eye and an inter-ocular score asymmetry of ≥ 5 .

Results: Of the 258 subjects, 53 (20.5%) had VF asymmetry and 33 (12.8%) had unilateral VF defect. The mean age of the 53 subjects was 62.1 ± 7.3 years and there were 26 (49.1%) females. Compared to the better eyes, the worse eyes had significantly higher presenting intraocular pressure (32.7 ± 15.7 vs 18.7 ± 8.1 ; $P < 0.001$), narrower gonioscopic angle width ($P < 0.001$), greater vertical-cup-disc ratio ($P < 0.001$), and use of more glaucoma medications ($P < 0.001$). The worse eyes were also characterized by significantly smaller anterior chamber width (ACW, $P = 0.02$) and smaller posterior corneal arc length (PCAL, $P = 0.016$). The analysis in subjects with unilateral VF defect was largely similar, with the affected eye characterized by significantly smaller anterior vault ($P = 0.015$), in addition to smaller ACW ($P = 0.01$) and smaller PCAL ($P = 0.006$).

Conclusions: About 20% of our clinic-based PACG subjects were found to have VF asymmetry and about 12% had unilateral VF defect. Asymmetric PACG was associated with asymmetry in anterior segment parameters.

09:00 - 10:30

Venue: 310

Application of Isolated-Check Visual Evoked Potential in Early-Stage Open-Angle Glaucoma Patients

First Author: Xiang **FAN**

Co-Author(s): Ling-Ling **WU**

Purpose: To explore whether isolated-check visual evoked potential (icVEP) could detect visual function abnormalities in early-stage open-angle glaucoma (OAG) and the potential and related factors of diagnosing by icVEP.

Methods: Forty-four early-stage OAG patients differentiated by HFA (30-2 SITA program) and 39 control observers were included in a cross-sectional study. Spectral domain optical coherence tomography (SD-OCT; Heidelberg Engineering, Germany) was used to evaluate patients for retinal nerve fiber layer (RNFL) defects. Low-contrast bright isolated-checks were luminance-modulated against a static background at 10 Hz in order to drive preferentially the magnocellular

ON pathway. VEPs were recorded during 1-s epochs of stimulation and responses at the stimulus frequency were measured. Signal-to-noise ratios (SNR) were derived based on a multivariate statistic. Eyes that yielded a $SNR \leq 1$ were considered as abnormal. ROC curve analysis was used to estimate the accuracy of group classification. Correlations between SNR and related factors were analyzed.

Results: By SNR criterion of 1, icVEP had a sensitivity of 68% and specificity of 95% for diagnosing with 81% classification accuracy. However, ROC curve analysis implied that SNR criterion of 0.93 could reach the sensitivity of 66% and specificity of 100%, producing the highest classification accuracy (82%). Both thinning of the RNFL in the temporal superior quadrant on OCT and amount of abnormal test points in the central 11-degree visual field (pattern deviation, $P < 0.5\%$) showed significant correlations with SNR ($P < 0.05$).

Conclusions: The icVEP could detect glaucomatous visual function abnormalities in about 70% of eyes with early-stage OAG with specificity of about 95%. SNR correlated with both the decreases in RNFL thickness and the severity of central visual field loss to some extent.

14:30 - 16:00

Venue: 301

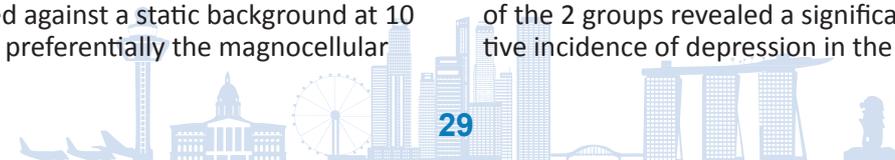
Association Between Glaucoma and Increased Risk of Depression: An 11-Year Population-Based Cohort Study

First Author: Yu-Yen **CHEN**

Purpose: To investigate whether glaucoma patients have higher risks of developing depression and to find out risk factors of developing depression among glaucoma patients.

Methods: We utilized the National Health Insurance Database (NHID) from January 1, 2001 to December 31, 2011 in Taiwan. A total of 8777 subjects with glaucoma were enrolled into the glaucoma group and 35,108 age- and gender-matched subjects without glaucoma into the comparison group. The participants of both groups were followed until the end of 2011 to see whether they had new-onset depression. Kaplan-Meier curves were used to compare the cumulative incidence of depression between the 2 groups. Cox regression analysis was used to estimate the crude and adjusted hazard ratio (HR) of depression. Analyses were adjusted by age, gender, systemic comorbidities, and socioeconomic status. Then we applied similar statistical procedures to find out the risk factors of developing depression among the glaucoma group.

Results: A log-rank test comparing Kaplan-Meier curves of the 2 groups revealed a significantly higher cumulative incidence of depression in the glaucoma group (P



< 0.001). In Cox regression analysis, glaucoma patients had a significantly higher risk of depression (unadjusted HR = 1.71; adjusted HR = 1.70). Among the glaucoma group, the risk factors of developing depression were older age, female gender, less income, and pilocarpine use. Angle closure did not increase the risk.

Conclusions: People with glaucoma are at significantly greater risks of developing depression than those without glaucoma. Among glaucoma patients, pilocarpine use may increase the risk of depression. However, angle closure is not a risk factor.

14:30 - 16:00

Venue: 301

Association Between Physical Activity and Severity of Primary Open Angle Glaucoma in Malaysian Chinese Patients

First Author: Khairuddin **OTHMAN**

Co-Author(s): Siti Azrin **AB HAMID**, Ahmad Tajudin **LIZA-SHARMINI**, Jelinar **MOHD-NOOR**, Thayanithi **SANDRAGASU**

Purpose: To determine the effect of physical activity on the severity of primary open angle glaucoma (POAG) in Malaysian Chinese patients.

Methods: This cross-sectional study involved 150 POAG Chinese patients (150 eyes) residing in Malaysia. Face-to-face interviews were conducted using the International Physical Activity Questionnaire (IPAQ) to assess their physical activity. Based on their ability to recall their physical activity, it was divided into mild, moderate, and heavy. The duration of physical activity and measurement of energy requirement (METs) was also calculated. Body mass index (BMI) was measured. The severity of glaucoma was based on modified Advanced Glaucoma Intervention Study (AGIS) criteria on 2 consecutive reliable Humphrey visual fields (HVF): mild (45 eyes), moderate (51 eyes), and severe (54 eyes). Multiple linear regression was used for the analysis.

Results: There was an inverse relationship between physical activity and AGIS score [adjusted b -4.39, 95% confidence interval (CI) -5.53 to -3.24, $P < 0.001$]. Every increase in physical activity reduced the AGIS score by 4.39 points. Patients with mild glaucoma in the study had significantly higher METs compared to those with severe glaucoma ($P < 0.001$). Increasing physical activity by 1 day in a week reduced AGIS score by 0.20 (95% CI -0.23 to -0.15). A linear relationship was seen between BMI and AGIS score (adjusted b 0.33, 95% CI 0.11 to 0.56, $P < 0.001$).

Conclusions: Active lifestyle and longer duration of physical activities reduce the severity of POAG. POAG patients should be encouraged to perform at least moderate amounts of physical activity to reduce the

possibility of developing further glaucomatous damage.

14:30 - 16:00

Venue: 301

Automated Pupillograph as a Screening Tool in an Ophthalmology Clinic

First Author: Ashwattha **SHETTY**

Co-Author(s): Chaithra **AROOR**, Rohit **SHETTY**

Purpose: To evaluate the efficacy of an automated pupillograph as a screening tool in an ophthalmology clinic.

Methods: We enrolled 110 subjects in the study (80 normal patients and 30 patients with glaucoma). We measured the pupillary reactions in all the patients using RAPDx Expanded Pupil Diagnostics (Konan Medical USA, Inc, Irvine, CA) and compared the same with neutral density filters (NDF). Thirty glaucoma patients also underwent analysis of macular ganglion cell (mGCC) thickness using spectral domain optical coherence tomography (Optovue RTVue XR AVANTI).

Results: The pupillary reactions assessed by NDF were compared with that of RAPDx and we found a statistically significant correlation ($P < 0.001$) between both. Mean amplitude of pupillary reactions on RAPDx (0.14) correlated moderately with mGCC thickness; however, mean latency of the pupillary reactions (0.12) showed a weak correlation.

Conclusions: Our study concludes that RAPDx is comparable to NDF in measuring RAPD and can be used interchangeably. The log-scaled RAPD amplitudes correlated moderately with the differences in mGCC thickness, but the log-scaled RAPD latencies showed a weaker correlation.

14:30 - 16:00

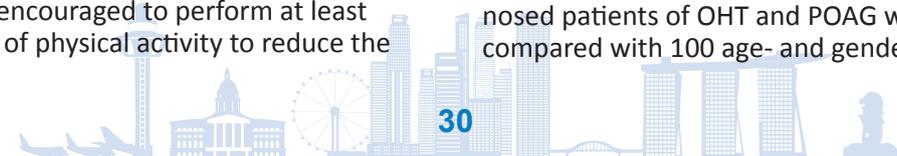
Venue: 301

Blood Pressure in Ocular Hypertension and Primary Open Angle Glaucoma

First Author: Aanal **SHAH**

Purpose: Our study aimed to determine the relationship of ocular hypertension (OHT) and primary open angle glaucoma (POAG) with systemic hypertension and to measure the strength of association between various measures of systemic blood pressure and ocular perfusion pressures.

Methods: This prospective case-control study was conducted at our center between November 2014 and October 2015. One hundred consecutive newly diagnosed patients of OHT and POAG were selected and compared with 100 age- and gender-matched controls



visiting the ophthalmology department for routine assessment. Both cases and controls were subjected to detailed history and examination including blood pressure and intraocular pressure (IOP) measurements. Necessary inclusion and exclusion criteria were applied and statistical analysis was performed.

Results: Out of 100 cases 56% had POAG, 19% had normal tension glaucoma (NTG), and 25% had OHT. Hypertension was present in 21% of cases and 13% of controls. Mean IOP among cases and controls was 23 mm Hg and 17.3 mm Hg, respectively. Odds ratio of hypertension in patients with glaucoma compared to controls was 1.77. Systolic blood pressure (SBP, $P = 0.66$), mean arterial pressure ($P = 0.24$), and systolic perfusion pressure (SPP, $P = 0.08$) were not found to be associated with glaucoma, whereas diastolic blood pressure (DBP, $P = 0.04$), diastolic perfusion pressure (DPP, $P = 0.05$), and mean ocular perfusion pressure (MOPP, $P < 0.0001$) were found to be associated with glaucoma. IOP in both groups showed a positive correlation with SBP ($r = 0.212$, $P = 0.03$) and DBP ($r = 0.246$, $P = 0.01$) but there was a negative correlation observed between SPP ($r = -0.026$, $P = 0.79$), DPP ($r = -0.1$, $P = 0.31$), and MOPP ($r = -0.071$, $P = 0.47$), respectively.

Conclusions: Low MOPP, DPP, and DBP were associated with increased risk of glaucoma. There was a positive correlation of IOP with SBP and DBP. However, hypertension was not found to be a statistically significant risk factor for glaucoma.

09:00 - 10:30

Venue: 310

Changes of Aqueous Proinflammatory Cytokine Levels in Acute Primary Angle-Closure Eyes

First Author: Yaoming LIU

Co-Author(s): Xiulan ZHANG, Shida CHEN

Purpose: To evaluate levels of proinflammatory cytokines in the aqueous humor of patients with acute primary angle-closure (APAC) and age-related cataracts.

Methods: Twenty eyes of 20 APAC patients and 15 eyes of 15 age-related cataract patients were included in this cross-sectional study. Aqueous humor samples were collected prospectively. The levels of 20 proinflammatory cytokines were evaluated in the aqueous humor of the APAC and cataract patients using the multiplex bead immunoassay technique. Clinical data were collected for correlation analysis.

Results: Seven of the 20 proinflammatory cytokines included in the magnetic bead panel were detectable in both APAC eyes and cataract eyes: interleukin (IL)-10, IL-12, IL-15, IL-21, IL-6, chemokine (C-C motif) ligand 20, and tumor necrosis factor alpha (TNF α). IL-27 was

only detectable in APAC eyes. Compared with the cataract eyes, the APAC eyes had significantly elevated concentrations of IL-12 ($P = 0.036$), IL-15 ($P = 0.001$), IL-6 ($P = 0.012$), and IL-27 (only detectable in APAC eyes). Age was positively correlated with IL-12 ($P = 0.022$) and IL-6 ($P = 0.037$), and disease duration was positively correlated with IL-15 ($P = 0.037$), IL-27 ($P = 0.040$), and TNF- α ($P = 0.042$).

Conclusions: Several proinflammatory cytokines including IL-12, IL-15, IL-6, and IL-27 were elevated in the APAC eyes and may be implicated in its pathologic mechanism.

14:30 - 16:00

Venue: 301

Cigarette Smoking and Severity of Primary Open Angle Glaucoma

First Author: Khairuddin OTHMAN

Co-Author(s): Siti Azrin AB HAMID, Ahmad Tajudin LIZA-SHARMINI, Jelinar MOHD-NOOR, Thayanithi SANDRAGASU

Purpose: To determine the association between cigarette smoking and the severity of primary open angle glaucoma (POAG) in Chinese patients.

Methods: A cross-sectional study was conducted on 150 POAG patients (150 eyes) of Chinese ethnicity in Malaysia. Patients who were able to provide 2 consecutive reliable and reproducible Humphrey visual field (HVF) 24-2 analyses were included. Severity of glaucoma was scored by modified Advanced Glaucoma Intervention Study (AGIS) scoring system on HVF: mild (45 patients), moderate (51 patients), and severe (54 patients). Patients with poor memory, history of cerebral vascular accident, optic neuritis, and other optic neuropathies were excluded. Smoking status (active smoker, passive smoker, and ex-smoker), duration, and number of cigarettes per day were obtained by validated questionnaire from the Singapore Malay Eye Study (SIMES). Association of smoking and AGIS score was analyzed using multiple linear regression (MLR).

Results: There was significant association between cigarette smoking and severity of glaucoma ($P < 0.001$). MLR demonstrated significant linear correlation of smoking and AGIS score [adjusted b, 3.26; 95% confidence interval (CI), 1.67-4.86; $P < 0.001$]. There was a significant association between the number of cigarettes smoked per day and AGIS score (adjusted b, 0.50; 95% CI, 0.05-0.86; $P = 0.027$). However, duration of smoking was not associated with AGIS score ($P = 0.070$).

Conclusions: Cigarette smoking is a potential modifiable risk factor for severity of POAG in Malaysian Chinese. Cessation of cigarette smoking may help retard further glaucomatous damage.



09:00 - 10:30

Venue: 310

Comparison of Changes in Minimum Rim Width and Area in Normal, Hypertensive, and Glaucomatous Eyes Following Acute Intraocular Pressure Elevation

First Author: Sourabh **SHARMA**

Co-Author(s): Tin **AUNG**, Tun **AUNG**, Mani **BASKARAN**, Michaël **GIRARD**, Nicholas **STROUTHIDIS**

Purpose: To estimate and compare the effect of acute elevations in intraocular pressure (IOP) on changes in the Bruch membrane opening–minimum rim width (BMO-MRW) and area in normal, hypertensive, and glaucomatous eyes.

Methods: The optic nerve heads (ONHs) of 104 subjects [31 normal, 20 ocular hypertensive (OHT), and 53 with primary glaucoma] were imaged using spectral-domain optical coherence tomography (SD-OCT; Spectralis, Heidelberg Engineering, Germany). IOP was raised twice by gently applying a force (0.64 N, then 0.9 N) to the anterior sclera using an ophthalmodynamometer. After each IOP increment, IOP was held constant, measured with a Tonopen (AVIA applanation tonometer, Reichert Inc, Depew, NY), and ONH was rescanned with OCT. In each OCT volume, BMO-MRW and area were calculated and compared across groups.

Results: The baseline MRW was significantly smaller in glaucomatous subjects ($174.3 \pm 54.3 \mu\text{m}$) compared to normal ($287.4 \pm 42.2 \mu\text{m}$, $P < 0.001$) and OHT subjects ($255.4 \pm 45.3 \mu\text{m}$, $P < 0.001$). For both IOP elevations, MRW was significantly smaller than that at baseline in glaucomatous subjects ($P < 0.001$) but not in normal and OHT subjects. Comparison of the changes in BMO-MRW to acute IOP elevation among the groups showed significant differences between the glaucoma group versus OHT and normal subjects ($P < 0.001$). No difference was seen across groups for BMO area ($P > 0.05$).

Conclusions: The differences in BMO-MRW thinning across eyes could reflect changes in neural tissue and/or connective tissue elasticity. The change in BMO-MRW due to acute IOP elevation could be a marker of ONH connective tissue susceptibility.

09:00 - 10:30

Venue: 310

Correlation of Lamina Cribrosa Thickness and Standard Automated Perimetry Findings in Glaucomatous and Non-Glaucomatous Eyes

First Author: Ian **DAGUMAN**

Purpose: To assess the correlation between lamina cribrosa depth, thickness, and prelaminar volume with visual field testing results in glaucomatous and

non-glaucomatous eyes.

Methods: Retrospective, comparative study. Twenty eyes from 10 glaucoma and 10 non-glaucoma patients were included. This was a single center, single observer, retrospective, cross-sectional study. Twenty eyes were categorized as glaucomatous or non-glaucomatous using the modified Hodapp-Anderson-Parish criteria. This study was approved by the Institutional Review Board of the Manila Doctors Hospital. The lamina cribrosa depth, thickness, and prelaminar volume were assessed using the Cirrus HD-OCT 5000 5-line HD raster with enhanced depth imaging and FastTrac mode. Correlations between the lamina cribrosa thickness and visual field test results of glaucoma and non-glaucoma patients were analyzed using Spearman correlation. Comparison of lamina cribrosa thickness between glaucoma and non-glaucoma groups were analyzed with independent t test. Comparison of lamina cribrosa thickness across glaucoma severities were analyzed using analysis of variance (ANOVA). A 5% level of significance was employed.

Results: There was a significant difference in the lamina cribrosa thickness between glaucomatous and non-glaucomatous eyes ($t = -2.655$, $P = 0.0156$). There was no strong correlation between the lamina cribrosa depth and thickness to the severity of visual field test results (LC depth, $r = -0.391$, $P = 0.07974$) (LC thickness, $r = 0.189$, $P = 0.556$).

Conclusions: Lamina cribrosa thickness can be used as an adjunctive index to support glaucoma as a diagnosis. However, it cannot be used as a gauge to qualify eyes into different glaucoma severities.

14:30 - 16:00

Venue: 301

Depression in Patients with Primary Open Angle Glaucoma Using Malay Version of Geriatric Depression Scale 14 Questionnaire

First Author: Sangeetha **THARMATHURAI**

Co-Author(s): Liza-Sharmini **AHAMD TAJUDIN**, Jemaima **CHE HAMZAH**, Fazilawati **QAMARRUDDIN**, Azhany **YAAKUB**

Purpose: To evaluate depression in patients with primary open angle glaucoma (POAG) using the Malay version of the Geriatric Depression Scale (mGDS 14) questionnaire.

Methods: A cross-sectional study was conducted between July 2014 and February 2016 in 2 tertiary hospitals in Malaysia. A total of 360 patients were randomly selected according to severity based on the Advanced Glaucoma Intervention Study (AGIS) score on Humphrey visual field (HVF) 24-2 analysis of the better seeing eye. The score was based on 2 consecu-



tive reliable HVF. Direct face-to-face interviews were conducted using the validated mGDS 14 questionnaire. Association between mGDS 14 scores and severity of POAG was performed using analysis of covariance.

Results: Malays constituted 45.6%, Chinese 38.1%, and Indians 16.4%. Based on AGIS score, a total of 64 (17.8%) were mild, 93 (25.8%) moderate, 115 (31.9%) severe, and 88 (24.4%) end-stage POAG. Majority of the recruited patients were not working (88.9%) and lived with their families (68.1%). A total of 213 (59.2%) had diabetes, 22 (6.1%) had cerebrovascular accident, and 176 (48.9%) had hypertension. A total of 59 (16%) were depressed based on mGDS 14 scoring. There was a significant association between mGDS score and severity of POAG ($P < 0.001$). There was a higher number of depressive POAG patients in the severe and end-stage of glaucoma.

Conclusions: Depression is more common in the severe stages of POAG. It is important to recognize the symptoms of depression among POAG patients to avoid psychosocial problems. Emotional and social support is important for elderly POAG patients.

09:00 - 10:30

Venue: 310

Determinants of Intraocular Pressure Fluctuations in Patients with Primary Angle-Closure Glaucoma

First Author: Ling LI

Co-Author(s): Nafees BAIG, Noel CHAN, Carol CHEUNG, Clement THAM

Purpose: To determine the ocular and systemic risk factors influencing long-term intraocular pressure (IOP) fluctuations in primary angle-closure glaucoma (PACG) eyes.

Methods: Chinese patients with PACG in 1 eye were recruited and followed up in the glaucoma clinics at Hong Kong Eye Hospital. IOP fluctuation was defined as the standard deviation of all the IOP measurements over 2 years. Baseline risk factors including demographics, medical/surgical treatment, ocular biometry, retinal nerve fiber layer thickness, and systemic factors (eg, hypertension, smoking) were evaluated. Generalized estimating equations adjusting for inter-eye correlation were used.

Results: We included 624 eyes from 315 patients in the final analysis. Eyes without glaucomatous visual field defect were further categorized into primary angle closure (PAC) ($n = 158$) and primary angle-closure suspects (PACS) ($n = 44$). Eyes with PACG had significantly higher IOP fluctuations than that of PAC ($P < 0.001$) and PACS ($P < 0.001$). In the multivariate analysis, we found that larger IOP fluctuation was associated with higher

baseline IOP ($P < 0.001$), greater number of IOP-lowering medications ($P < 0.001$), previous cataract surgery ($P = 0.002$), previous trabeculectomy ($P = 0.007$), and worse pattern standard deviation (PSD) of visual field ($P = 0.01$). Among eyes with PACG, higher baseline IOP ($P < 0.001$), greater number of IOP-lowering medications ($P < 0.001$), previous cataract surgery ($P = 0.01$), and shorter axial length ($P = 0.01$) were significantly associated with larger IOP fluctuation.

Conclusions: Baseline IOP, number of IOP-lowering medications, previous cataract surgery, previous trabeculectomy, PSD of visual field, and axial length influenced IOP fluctuation in eyes with angle closure. Systemic risk factors did not affect IOP fluctuations.

09:00 - 10:30

Venue: 310

Determinants of Three-Dimensional Morphometric Iris Analysis by Swept-Source Optical Coherence Tomography in a Singaporean Population

First Author: Tin TUN

Co-Author(s): Tin AUNG, Mani BASKARAN

Purpose: To characterize 3-dimensional (3D) morphology of the iris and its association with demographic and ocular parameters in a Singaporean population.

Methods: Right eyes from 1646 consecutive healthy subjects were recruited from a polyclinic in Singapore. All subjects underwent swept-source optical coherence tomography (SS-OCT; CASIA, Tomey Corporation, Nagoya, Japan) imaging and gonioscopy under dark-room conditions. For each eye, 8 frames (22.5 degrees apart) were selected from 128 frames volume for the analysis of iris volume and other anterior segment parameters. Associations of 3D iris parameters with demographic and clinical parameters were evaluated using linear regression analysis.

Results: The majority of the subjects were female (63.7%) with mean age of 61.28 ± 6.6 years. There were 128 closed angle eyes (7.8%) in this study. The mean iris volume was highly associated with sex ($\beta = -1.804$), anterior chamber depth ($\beta = 6.206$), lens vault ($\beta = 4.244$), and pupil size ($\beta = -0.834$) (all $P < 0.001$) after adjusting for the associated factors such as subject age, intraocular pressure, and angle status of the eye.

Conclusions: The 3D iris volume obtained with SS-OCT had strong associations with sex, anterior chamber depth, lens vault, and pupil size.



09:00 - 10:30

Venue: 310

Determination of Pattern and Rate of Visual Field Progression in Primary Angle Closure Glaucoma

First Author: Sushma VERMA

Co-Author(s): Eray ATALAY, Tin AUNG, Monisha NONG-PIUR, Xin WEI

Purpose: To determine the pattern and rate of visual field (VF) progression in primary angle closure glaucoma (PACG).

Methods: VF progression was assessed by pointwise linear regression (PLR, Progressor software version 3.7) defined by the presence of at least 2 adjacent testing points located within the same hemifield that showed progression with a change of ≥ 1 dB/y ($P < 0.01$) for inner points or ≥ 2 dB/y ($P < 0.01$) for edge points. We performed a logistic regression analysis to determine the variables associated with fast progression (defined as mean slope of progressing points ≥ 1.5 dB/y).

Results: Of the 1296 subjects who were assessed, 398 (30.7%) fulfilled the inclusion criteria of ≥ 5 VFs and ≥ 5 years of follow-up. The mean duration of follow-up was 11.3 ± 3.5 years. Visual field progression was observed in 63/398 (15.8%) eyes according to the PLR criteria. There were no significant differences in the age, gender distribution, follow-up duration, and the number of VFs between those that progressed and those that did not progress (all $P > 0.05$). The most common sector of VF progression was the superior arcuate area (65%). The mean slope of the progressing points was -1.80 ± 0.66 dB/y and 36 (57%) were fast progressors. Factors associated with fast progression were older age [odds ratio (OR) for 56-65 and >65 were 7.93 and 17.97, respectively, compared to reference ≤ 55 years] and higher vertical cup-disc ratio (VCDR) at presentation.

Conclusions: In eyes with PACG, the superior arcuate area was the most common sector of progression. Faster rate of progression was noted in those who presented at an older age and with a higher VCDR.

09:00 - 10:30

Venue: 310

Diagnostic Ability of Macular Ganglion Cell Asymmetry in Preperimetric Glaucoma

First Author: Mei-Ju CHEN

Co-Author(s): Yu-Fan CHANG, Yu-Chieh KO, Catherine LIU, Hsin-Yu YANG

Purpose: To evaluate the diagnostic ability of macular ganglion cell asymmetry for detection of preperimetric glaucoma patients using Cirrus spectral domain optical coherence tomography (OCT).

Methods: This prospective study included 67 patients with preperimetric glaucoma and 67 age- and refractive error-matched normal control subjects. Preperimetric glaucomatous eyes were defined as eyes with localized retinal nerve fiber layer (RNFL) defect corresponding to glaucomatous optic disc changes and a normal visual field test. OCT-measured circumpapillary RNFL (cpRNFL) thickness, macular ganglion cell-inner plexiform layer (GCIPL) thickness, and optic nerve head (ONH) parameters were recorded. Macular ganglion cell asymmetry between inferior and superior, temporal and nasal, and 6 sectors was expressed as absolute difference, ratio, and index (absolute value of \log_{10} ratio). Area under the receiver operating characteristics curve (AUROC) was analyzed and compared between groups.

Results: The best discriminating macular ganglion cell asymmetry parameters were inferotemporal to superonasal asymmetry index (0.734), inferotemporal to inferonasal asymmetry index (0.725), and absolute difference between inferotemporal and superonasal GCIPL thickness (0.715). Performance was comparable between the best measure of macular ganglion cell asymmetry analysis and that of cpRNFL (average RNFL thickness, $P = 0.398$), GCIPL (inferotemporal GCIPL thickness, $P = 0.277$), and ONH (average C/D, $P = 0.618$).

Conclusions: The diagnostic ability of GCIPL asymmetry measurements was comparable to that of cpRNFL, GCIPL, and ONH analysis for eyes with preperimetric glaucoma. The inferotemporal to inferonasal GCIPL asymmetry index could be a new parameter to detect early structural change in preperimetric glaucoma.

14:30 - 16:00

Venue: 301

Effect of Physical Activity on Severity of Primary Angle Closure Glaucoma in Malay Patients

First Author: Niven TEH

Co-Author(s): Liza Sharmini AHMAD TAJUDIN, Karunkar TIRMANDAS, Azhany YAAKUB

Purpose: To determine the association between physical activity and severity of primary angle closure glaucoma (PACG) in Malay patients residing in Malaysia.

Methods: A cross-sectional study was conducted involving 150 PACG patients between April 2014 and August 2016. Using the International Physical Activity Questionnaire (IPAQ), physical activity status was assessed and divided into 3 categories: mild, moderate, and heavy physical activity. The duration of physical activity and corresponding energy requirement (METs) was calculated. Body mass index (BMI) was also measured. Ocular examination was performed including Humphrey visual field (HVF) 24-2 assessment. Based on



2 consecutive reliable HVFs, the severity of glaucoma was scored according to the Advanced Glaucoma Intervention Study (AGIS) by 2 masked investigators and classified as mild (0-5 score), moderate (6-11 score), and severe (12-20 score). Correlation between physical activity and AGIS score was determined with multiple linear regression (MLR) analysis.

Results: There was an inverse relationship between physical activity by number of days and AGIS score after adjusting for age, weight, height, and BMI [B = -0.639; 95% confidence interval (CI), -113.982 to 236.818; P < 0.009]. Every increase in physical activity by day per week reduces the AGIS score by 0.639. Others factors such as age, weight, height, and BMI have no significant contribution toward AGIS scores.

Conclusions: Active lifestyle and increase in physical activity by day per week reduce the severity of PACG. Physical activity may reduce the chances of progression to more severe glaucoma in PACG patients.

09:00 - 10:30

Venue: 310

Factors Associated with Paracentral Visual Field Defects in Patients with Primary Open Angle Glaucoma

First Author: Raghavan **LAVANYA**

Co-Author(s): Tin **AUNG**, Mani **BASKARAN**, Hla Myint **HTOON**, Eranga **VITHANA**

Purpose: To investigate ocular and systemic risk factors associated with paracentral visual field defects (PCD) in Singaporean Chinese subjects with primary open angle glaucoma (POAG).

Methods: In this retrospective, observational, cross-sectional study, reliable visual fields (VF) of subjects with POAG at initial presentation (Humphrey visual field analyzer, Carl Zeiss Meditec, Dublin, CA) were analyzed. PCD was defined as a small VF abnormality (a cluster or single point defect) within 15 degrees of fixation in pattern deviation plot in either eye, with P < 0.5%, not contiguous with blind spot or nasal meridian, and no other VF abnormality. All other glaucomatous defects were grouped as non-paracentral defects. POAG was categorized as normal tension glaucoma [NTG; untreated diurnal intraocular pressure (IOP) ≤ 21 mm Hg] and high tension glaucoma (HTG; IOP > 21 mm Hg). The association of PCD with ocular and systemic risk factors was assessed using logistic regression models.

Results: Of the 887 subjects with POAG and reliable VF, 146 (16.45%) subjects had PCD at presentation. A total of 24.1% (n = 214) of subjects had a clinical diagnosis of NTG. Subjects with NTG were 2 times more likely to have PCD [odds ratio (OR), 2.02; confidence inter-

val (CI), 1.37-2.99; P = 0.001] as compared to those with HTG. On multivariate analysis, lower presenting IOP (OR, 0.95; CI, 0.92-0.98; P = 0.001), less severe VF mean deviation (MD) values (OR, 1.08; CI, 1.05-1.11; P < 0.001), and history of hypertension (OR, 1.52; CI, 1.03-2.25; P = 0.033) were associated with PCD.

Conclusions: PCD at initial presentation in POAG patients in Singapore was associated with a diagnosis of NTG, lower untreated IOP, less severe VF defects, and the presence of hypertension.

09:00 - 10:30

Venue: 310

Impact of Myopia on Corneal Biomechanics Between Glaucoma and Non-Glaucoma Patients

First Author: Rawiphan **PANPRUK**

Purpose: To compare corneal biomechanical properties between myopia and emmetropia in primary open angle glaucoma (POAG) patients and controls.

Methods: This study included 66 POAG eyes (33 myopia, 33 non-myopia) and 66 normal eyes (33 myopia, 33 non-myopia). Seven corneal biomechanics parameters, which included corneal deformation amplitude (CDA), inward/outward corneal applanation length (ICA, OCA), inward/outward corneal velocity (ICV, OCV), radius, and peak distance (PD), were measured by ultra-high-speed Scheimpflug camera. All parameters were compared using general linear models.

Results: The subjects comprised 65 males (49%) and 67 females (51%). Mean (SD) age of all subjects was 59 (9.82). Mean (SD) spherical equivalent was -7.78 (3.37) in myopia and +0.05 (0.96) in non-myopia. Only OCA and radius showed evidence that glaucoma modified the effect of myopia on corneal biomechanics [POAG: mean difference OCA, -0.18; 95% confidence interval (CI), -0.35 to -0.01; P < 0.05; non-POAG: mean difference OCA, -0.14; 95% CI, -0.30 to 0.02; P = 0.096; POAG: mean difference radius, 0.13; 95% CI, -0.57 to 0.83; P = 0.71; non-POAG: mean difference radius, -0.08; 95% CI, -0.78 to 0.62; P = 0.81]. Myopia significantly increased CDA and PD but significantly decreased OCA and OCV in the POAG group (P < 0.05). In the non-POAG group, a significant decrease in OCV and a significant increase in CDA and PD were found (P < 0.05). No effect of myopia on ICA, ICV, or radius was identified in both the POAG and non-POAG groups.

Conclusions: Both myopia and POAG have effects on corneal biomechanical properties. POAG can enhance the effect of myopia in particular corneal biomechanics parameters (eg, OCA and radius).



09:00 - 10:30

Venue: 310

Macula in Early Glaucoma: Study by OCT Angiography and Electrophysiological Testing

First Author: Kuryshva **NATALIA**

Co-Author(s): Ekaterina **MASLOVA**, Anna **TRUBILINA**

Purpose: To assess vascular density in the macular area and ganglion cell function in the early stage of primary open angle glaucoma (POAG).

Methods: Forty-eight eyes with POAG and 47 eyes of age-matched normal subjects were enrolled. Angio flow density (AFD) was measured using spectral domain optical coherence tomography (SD-OCT) with AngioVue function (OCT-A). AFD retina was measured in the macula: in the foveal area (circumference with a diameter of 1 mm) and parafovea (between the foveal border and a circumference 3 mm in diameter). The fovea and parafovea averaged value, AFD retina whole en face, was measured. Retrobulbar vessels, gray-scale ultrasound, and color Doppler image flow were studied using CDI. The electrophysiological study was done using Tomey EP-1000.

Results: All OCT-A, CDI, and EPS indicators were reduced in glaucoma compared to healthy eyes. The following indicators had the largest AUC and diagnostic value (z-value) to discriminate early glaucoma from normal eyes: PERG P50 (mV) [$z = 4.35$, $P < 0.0001$; AUC 0.93 (0.853-1.0)], PERG N95 (mV) [$z = 3.981$, $P < 0.0001$; AUC 0.893 (0.796-0.99)], AFD retina superficial whole en face [$z = 3.83$, $P < 0.0001$; AUC 0.8 (0.69-0.90)], VEP pattern P100 1° (mV) [$z = 3.57$, $P < 0.0001$; AUC 0.84 (0.72-0.96)], peripapillary vessel density [$z = 3.2$, $P = 0.001$; AUC 0.75 (0.63-0.87)], end-diastolic flow velocity in ophthalmic artery [$z = 3.03$, $P = 0.002$; AUC 0.74 (0.61-0.86)], and in TPCA [$z = 2.78$, $P = 0.005$; AUC 0.72 (0.58-0.86)].

Conclusions: The present study revealed the significance of OCT-A for the early diagnosis of glaucoma and the importance of investigating macular microcirculation. The combination of OCT-A and pattern ERG and VEP provide perspective in the early detection of glaucoma.

14:30 - 16:00

Venue: 301

Malay Version of Glaucoma Quality of Life 36 Questionnaire: Assessing Quality of Life in Patients with Primary Open Angle Glaucoma

First Author: Sangeetha **THARMATHURAI**

Co-Author(s): Jemaima **CHE HAMZAH**, Ahmad Tajudin **LIZA-SHARMINI**, Fazilawati **QAMARRUDDIN**, Azhany **YAAKUB**

Purpose: To evaluate the quality of life (QoL) in patients with primary open angle glaucoma (POAG) according to severity of glaucoma using the Malay version of the Glaucoma Quality of Life 36 (GlauQoL 36) questionnaire.

Methods: A cross-sectional study was conducted between July 2014 and February 2016. A total of 360 patients were randomly selected according to severity based on the Advanced Glaucoma Intervention Study (AGIS) score on Humphrey visual field (HVF) 24-2 analysis of the better seeing eye. A total of 64 mild, 93 moderate, 115 severe, and 88 end-stage POAG patients were recruited. Direct face-to-face interviews were conducted using a validated Malay version of the GlauQoL 36 questionnaire. Association of GlauQoL 36 scores among POAG patients according to severity was performed using multivariate analysis of covariance.

Results: Majority of recruited patients were between the ages of 60-67 (38.3%). Malays constituted 45.6%, Chinese 38.1%, and Indians 16.4%. Majority of the recruited patients were not working (88.9%) and lived with their families (68.1%). There was a statistically significant difference in all domains: daily living, driving, physiological well being, self image, anxiety, burden of treatment, and confidence in healthcare ($P < 0.001$) according to severity of POAG. Those with more severe stages of glaucoma have higher scores on the GlauQoL 36 questionnaire.

Conclusions: The Malay version of the GlauQoL 36 is a good tool to quantify QoL in the Malaysian population. QoL deteriorates as glaucoma progresses. Customizing the improvement of QoL according to the severity of glaucoma is important to enhance management of glaucoma.

09:00 - 10:30

Venue: 310

Relationship Between Glomerular Filtration Rate and Primary Open-Angle Glaucoma: The Singapore Chinese Eye Study

First Author: Yih-Chung **THAM**

Co-Author(s): Tin **AUNG**, Ching-Yu **CHENG**, Charumathi **SABANAYAGAM**, Tien **WONG**

Purpose: To investigate the relationship between es-



timated glomerular filtration rate (eGFR) and primary open-angle glaucoma (POAG) in an adult Chinese population.

Methods: Participants in the Singapore Chinese Eye Study (SCES) underwent standardized ocular and systemic examinations. eGFR was measured from serum creatinine and quantified in units of mL/min/1.73 m². POAG was diagnosed using the International Society of Geographic and Epidemiological Ophthalmology classification. The association between eGFR and POAG was evaluated using logistic regression models. Generalized estimating equation models were used to account for correlation between both eyes.

Results: A total of 3,191 Chinese adults aged 40 to 80 were included in this study. Of which, 55 subjects (78 eyes) had POAG. After adjusting for age, gender, hypertension, diabetes, body mass index, total cholesterol level, and intraocular pressure, lower eGFR (per 10 mL/min/1.73 m² decrease) was independently associated with POAG (odds ratio [OR], 1.18; 95% confidence interval [CI], 1.01 to 1.37; P = 0.033). Further stratification of eGFR levels showed that individuals with normal eGFR levels (≥ 90 mL/min/1.73 m²) were 4.97 times (95% CI, 1.49 to 16.59; P = 0.009) less likely to have POAG compared to those with low levels of eGFR levels (< 45 mL/min/1.73 m²). The significant association between lower eGFR and POAG was observed among diabetics (OR, 1.36; P = 0.001) but not in non-diabetic individuals (OR, 1.03; P = 0.772).

Conclusions: Our population-based study in Chinese adults showed that lower eGFR levels, which are indicative of poorer kidney function, were independently associated with POAG. This finding potentially suggests that targeted glaucoma screening among individuals with kidney disease is important.

09:00 - 10:30

Venue: 310

Trend-Based Analysis of Ganglion Cell-Inner Plexiform Layer Thickness Measured by Optical Coherence Tomography in Eyes with Localized Nerve Fiber Layer Defects

First Author: Won June **LEE**

Co-Author(s): Jin Wook **JEONG**, Young Kook **KIM**, Ki Ho **PARK**

Purpose: To evaluate the rate of thinning in ganglion cell-inner plexiform layer (GCIPL) thickness measured by optical coherence tomography in glaucomatous eyes with localized retinal nerve fiber layer defects and to evaluate, in a trend-based approach, the diagnostic ability of GCIPL thinning rate in the detection of glaucoma progression.

Methods: The study included 65 glaucomatous eyes.

The patients were divided into non-progressor (n = 38) and progressor (n = 27) on the basis of serial red-free photographs and/or visual field tests. The rates of GCIPL thinning were determined by linear regression and compared between groups. Areas under the receiver operating characteristic curve (AUROC) were calculated for each parameter. Additionally, the GCIPL thinning rates were compared between affected and unaffected hemifields.

Results: The GCIPL thinning rate was significantly faster in progressors than in non-progressors in the global area (P < 0.001); in the inferior hemifield (P = 0.001); and in the superotemporal, inferotemporal, and inferior sectors (P = 0.009, 0.003, and 0.022, respectively). The GCIPL thinning rate in the global area had the highest ability to discriminate between non-progressors and progressors (AUROC = 0.787). The GCIPL thinning rates were significantly faster in affected hemifields compared to that of unaffected hemifields.

Conclusions: The rate of GCIPL thinning was significantly faster in glaucoma patients termed progressors than in those who were non-progressors. The GCIPL thinning rate of affected hemifields was faster than that of unaffected hemifields. These results suggest that trend-based analysis of GCIPL thickness may be useful in glaucoma progression analysis and that glaucomatous damage may progress in a localized area rather than globally.

Mar 5, 2017 (Sun)

09:00 - 10:30

Venue: 300

Application of High Intensity Focused Ultrasound for Treatment of Primary Open Angle Glaucoma in Indian Patients

First Author: Nilanjana **DEB**

Purpose: To assess the efficacy of ultrasound ciliary-plasty (UCP) technique using high intensity focused ultrasound (HIFU) delivered by a miniaturized annular device (EyeOP1) in Indian patients with primary open angle glaucoma.

Methods: A prospective clinical study (CTR1/2014/10/007855) was conducted on 75 eyes of 75 patients with primary open angle glaucoma treated with the EyeOP1 device (Eye Tech Care, France) equipped with 6 miniaturized cylindrical piezoelectric transducers. Three treatment protocols of ultrasound delivery with variable combinations of intensity and exposure time were used. Complete ophthalmic examination, A-scan (axial length, white-to-white diameter), Orbscan, and anterior segment optical coherence tomography (OCT) were performed at entry and patients



were followed up at day 1, week 1, and months 1, 2, 3, and 6. Primary outcome measure was “successful” intraocular pressure (IOP) control defined as IOP reduction $\geq 20\%$ from baseline and IOP > 5 mm Hg at the last follow-up visit. Secondary outcomes were decrease in anti-glaucoma medication usage and occurrence of complications.

Results: In all 3 groups, the mean intraocular pressure reduced from 23.5 ± 3.0 mm Hg before treatment to 15.8 ± 3.5 mm Hg at last follow-up ($P < 0.05$). Successful IOP control after a single procedure was 77.9%. The mean IOP reduction achieved in responding patients was 39% (SD = 14%). Notwithstanding minor side effects such as transient pain, anterior chamber reaction, and refractive error changes, no major intra- or postoperative complications were observed.

Conclusions: UCP is a simple, non-invasive, and well-tolerated ambulatory procedure which can significantly reduce the intraocular pressure in patients with open angle glaucoma. Our results in Indian eyes corroborate findings in initial studies on Caucasian eyes.

09:00 - 10:30

Venue: 300

Citicoline Preserves Optic Nerve Integrity and Visuomotor Function Following Chronic Intraocular Pressure Elevation

First Author: Kevin CHAN

Co-Author(s): Ying CHAU, Christopher LEUNG, Joel SCHUMAN, Yu YU, Yolandi VAN DER MERWE

Purpose: Recent studies suggest the potential of citicoline, an intermediate in the generation of phosphatidylcholine from choline, to improve visual outcome in glaucoma patients, but its neuroprotective roles remain unclear. Here we examined the effects of oral citicoline treatment in a chronic intraocular pressure (IOP) elevation animal model.

Methods: Twenty-five Long Evans rats were intracamerally injected in the right eye with an optically clear cross-linking hydrogel that obstructed aqueous outflow. Eleven of the rats received daily citicoline treatment (500 mg/kg) via oral gavaging for 7 days prior to, and every 48 hours for 14 days after, hydrogel injection. IOP and visual acuity (VA) were measured with a TonoLab tonometer and OptoMotry virtual reality system, respectively, before and for 5 weeks after hydrogel injection. Diffusion tensor imaging was performed using a 9.4 Tesla MRI scanner to measure optic nerve (ON) integrity indicated by fractional anisotropy at 5 weeks following hydrogel injection.

Results: Hydrogel injection significantly elevated IOP for 5 weeks to similar extents in both citicoline-treated and untreated animals. VA of the left eye remained

unchanged over time, whereas VA deterioration in the right eye of untreated animals was significantly worse than citicoline-treated animals. The decrease in fractional anisotropy in ON was significantly smaller for citicoline-treated animals compared to untreated animals.

Conclusions: Chronic IOP elevation caused significant changes in the visuomotor behavior and optic nerve integrity, whereas citicoline treatment ameliorated the effects. Our results appear consistent with recent literature that suggests citicoline can act upon impaired brain tissues and improve functional outcomes in neurodegenerative diseases.

09:00 - 10:30

Venue: 300

Comparison of Mitomycin C Injection versus Mitomycin C Sponge Application During Phaco-Trabeculectomy

First Author: Vivek P

Purpose: To study the safety and efficacy of subconjunctival injection of mitomycin C (MMC) versus subconjunctival sponge application of MMC during 2-site phaco-trabeculectomy in patients from southern India.

Methods: Seventy-one prospectively randomized patients with primary open angle glaucoma and pseudoexfoliation glaucoma were administered either subconjunctival injection of MMC (0.1 mg/mL) or subconjunctival sponge application of MMC (0.4 mg/mL) for 2 minutes during 2-site phaco-trabeculectomy. Demographics, visual acuity, intraocular pressure (IOP), number of glaucoma medications, postoperative complications, and interventions were collected at baseline, postoperative day 1, and followed up for 6 months. Mean *t* test or chi-square tests were performed.

Results: Preoperative demographic characteristics were similar ($P > 0.005$) in both groups. Postoperatively the IOP (mean \pm standard deviation) reduced from 22.81 ± 7.02 to 13.28 ± 2.62 mm Hg ($P < 0.001$) in the injection group and 21.61 ± 5.89 to 16.44 ± 3.52 mm Hg ($P < 0.001$) in the sponge group. At 6 months postoperatively, the difference in IOP between the 2 groups approached statistical significance, with lower IOP in the injection group. Complete or qualified success (IOP ≤ 21 and > 5 mm Hg with 1 or fewer medications) was achieved in 91.8% of patients in the injection group and 77.8% of patients in the sponge group. Postoperative vision was similar in both groups, which improved from baseline ($P < 0.001$). Complications included 2 cases of hyphema and 1 case of endophthalmitis, which were all in the sponge group.

Conclusions: Subconjunctival injection of MMC during phaco-trabeculectomy is safe and more effective than

conventional sponge application of MMC with better control of IOP, need for fewer glaucoma medications, and enhanced surgical success.

09:00 - 10:30

Venue: 300

Efficacy of CO₂ Laser-Assisted Deep Sclerectomy in Chinese Primary Open Angle Glaucoma Patients: 12-Month Results

First Author: Gangwei **CHENG**

Purpose: To describe the intraocular pressure (IOP)-lowering effect after CO₂ laser-assisted deep sclerectomy (CLASS) until 12 months after surgery.

Methods: Twenty-one eyes of 19 consecutive Chinese primary open angle glaucoma (POAG) patients were recruited in a nonrandomized prospective pilot study. Average IOP pre-operation was 38.5 mm Hg on maximal medication treatment. A one-third thickness scleral flap of 5 × 5 mm in size was created during the procedure. The CO₂ laser system was used to achieve deep scleral ablation and unroofing of the Schlemm canal zone. IOP was measured and documented at baseline, 1 day, 1 week, 2 weeks, 4 weeks, 8 weeks, 6 months, and 12 months. UBM was applied to examine the scleral lake (reservoir) at each time point. Complete success was defined as IOP ranging from 5 to 21 mm Hg with no medication. Qualified success was defined as a similar IOP range with medication. Laser goniopuncture (LGP) was applied for chosen high IOP cases postoperatively.

Results: The preoperative IOP of 38.5 ± 11.7 mm Hg (mean ± SD) dropped to 7.6 ± 2.7 at 1 day and 14.7 ± 3.4 mm Hg at 12 months. A total of 9.5% (2/21) of eyes were converted to trabeculectomy due to iris incarceration postoperatively; 38.0% (8/21) of eyes underwent LGP. Scleral lake existed in 67% (14/21) of eyes at 12-month visit. Complete success rate at the endpoint was either 52.3% (11/21) without LGP or 76.2% with adjunctive LGP (16/21). Qualified success was 85.7% (18/21).

Conclusions: CLASS is currently an effective treatment for Chinese POAG patients and further modifications are necessary.

09:00 - 10:30

Venue: 300

Eyewatch: An Innovative Adjustable GDD for the Treatment of Glaucoma. Results from our First Clinical Cases with Seton Tubes

First Author: Jacopo **GUIDOTTI**

Co-Author(s): Andre **MERMOUD**

Purpose: To report the very first surgical cases of a con-

tinuously adjustable glaucoma drainage device (GDD) in glaucoma surgery with Seton tubes.

Methods: Prospective, monocentric, clinical study. After conventional placement of a Seton tube, the adjustable GDD was inserted under a scleral flap or under a scleral patch. It was implanted in the anterior chamber using a 25-gauge opening and after securing the device body onto the sclera, the device was connected to the drainage tube 5 mm back to the limbus. A magnet system allows for opening or closing the system, offering total regulation of intraocular pressure (IOP). During the entire postoperative follow-up, IOP can be managed by regulating the outflow, thus preventing early postoperative hypotony. The main outcomes were mean IOP, mean number of antiglaucoma medications, and postoperative complications.

Results: Fourteen patients were treated with a mean follow-up of 4 ± 3.5 months thus far. The mean baseline IOP was 26.9 ± 11.9 mm Hg. The mean postoperative pressure after a month was 12.7 ± 5.1 mm Hg and 12.3 ± 4.6 after 6 months. None of the patients have experienced complications so far.

Conclusions: The new adjustable GDD Eyewatch can be easily implanted during glaucoma surgery to better address the hypotony phase encountered after placement of a Seton tube. The system allows for opening or closing the tube with a “water tab” mechanism. The inner part of the tube is much smaller compared with the classic tube in the anterior chamber. This should prevent the late corneal decompensation often seen after tube implantation.

09:00 - 10:30

Venue: 300

Micropulse Transscleral Diode Laser Cyclophotocoagulation in the Treatment of Pediatric Glaucoma

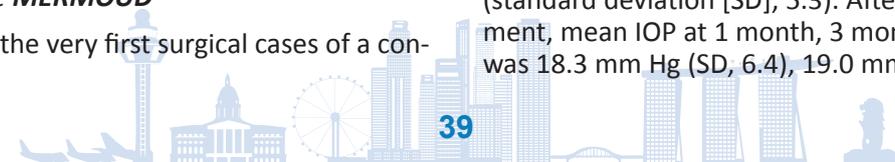
First Author: Marcus **TAN**

Co-Author(s): Jody **GOH**, Victor **KOH**, Cheryl **NGO**

Purpose: This study evaluates the efficacy and safety of micropulse transscleral diode laser cyclophotocoagulation (TSCPC) in the treatment of pediatric glaucoma.

Methods: Retrospective descriptive case series of 10 eyes in 5 patients with pediatric glaucoma treated with micropulse TSCPC or in combination with goniotomy/ glaucoma drainage device implantation. Outcome measures included intraocular pressure (IOP) reduction, reduction in number of medications, and postoperative complications.

Results: Mean pretreatment IOP was 22.0 mm Hg (standard deviation [SD], 5.3). After 1 session of treatment, mean IOP at 1 month, 3 months, and 6 months was 18.3 mm Hg (SD, 6.4), 19.0 mm Hg (SD, 4.0), and



21.1 mm Hg (SD, 6.3), respectively. The mean change from pretreatment IOP at post treatment month 1, 3, and 6 were -3.6 mm Hg (-16.5%), -3.0 mm Hg (-13.5%), and -0.9 mm Hg (-4.1%), respectively. There was a 100% response rate (defined as IOP lower than pretreatment IOP) in the first post treatment week, however this decreased to 70% at post treatment month 1, 62.5% at month 3, and 50% at post treatment month 6. The average number of antiglaucoma medications was 2.8 (SD, 0.9) pretreatment and at post treatment month 1, 3, and 6 were 2.4 (SD, 0.8), 2.5 (SD, 0.5), and 2.3 (SD, 1.0). MicroPulse TSCPC enabled discontinuation of systemic acetazolamide in 4 eyes (2 patients). None of the treated eyes had hypotony, pthisis, or retinal detachment.

Conclusions: Micropulse TSCPC is a non-invasive, safe, and effective adjunctive treatment for pediatric glaucoma and can be considered to reduce IOP before more definitive surgeries can be performed.

09:00 - 10:30

Venue: 300

Mitomycin-C Injections versus Sponges in Trabeculectomy: Which Is Better?

First Author: Yi Fang **LEE**

Co-Author(s): Monisha **NONGPIUR**, Shamira **PERERA**

Purpose: Reducing conjunctival scarring is important in ensuring good long-term outcomes after trabeculectomy. The use of mitomycin-C (MMC) sponges carries the risk of retained sponge material and results in dose variability if bleeding is present. Injections are quicker and safer for staff, as less MMC can evaporate into the air compared to sponges. This retrospective audit compared the visual outcomes, postoperative intraocular pressure (IOP), and adverse events in patients who underwent trabeculectomy with MMC sponges against those who received MMC injections.

Methods: We evaluated 120 eyes which had trabeculectomy or combined phacoemulsification and trabeculectomy. Sixty eyes received treatment with 0.4 mg/mL MMC sponges for 2 minutes and the other 60 eyes received 0.2 mL of 0.2 mg/mL subconjunctival MMC injections. Postoperative visual acuity and IOP at 1 year were compared. Adverse events occurring within the first year were also evaluated.

Results: Both groups had good visual outcomes at 1 year, where 73.3% of patients in each group achieved visual acuity of 6/12 or better ($P = 1$). Both groups also showed significant IOP reduction. Postoperatively, most patients in both groups achieved an IOP of 15 or less without medications (injection group, 88%; sponge group, 80%; $P = 0.19$). There were few postoperative events, including overfiltration, wound leak, and hyphema (injection group, 16.7%; sponge group, 13.4%;

$P = 0.12$).

Conclusions: MMC injections are equivalent to sponges during trabeculectomy in allowing good visual outcome and IOP reduction with a low risk of adverse events at 1 year. The use of MMC injections offers advantages to the assisting staff, patient, and doctor.

09:00 - 10:30

Venue: 300

Monocyte Chemoattractant Protein-1 Inhibition Prevents Scarring in Experimental Glaucoma Filtration Surgery

First Author: Rachel **CHONG**

Purpose: To determine the effect of monocyte chemoattractant protein-1 (MCP-1) inhibition on fibrosis following glaucoma filtration surgery (GFS).

Methods: A murine model of GFS was used to compare the effect of vehicle (veh, DMSO), 0.4 mg/mL MMC, or 2 μ g/mL MCP-1 inhibitor (MCPi; Sigma) on conjunctival tissues 7 days after surgery. Real time polymerase chain reaction (qPCR) was used to evaluate differences in gene expression of MCP-1, Arginase 1, iNOS 2, CD86, CD206, TGFB1, TGFB2, fibronectin, collagen 1a, and sparc corrected for reference gene 18S. In vivo imaging was performed using slit lamp biomicroscopy, anterior segment optical coherence tomography, and confocal microscopy. The effect of veh, MMC, or MCPi on conjunctival fibroblast viability as compared to untreated cells was also assessed using the xCELLigence system on dissociated primary cell cultures from human and mouse conjunctiva (ACEA Biosciences). One-way ANOVA with Dunnett correction for multiple comparisons was used for statistical analysis of qPCR. Area under the curve calculations were used to compare cell viability.

Results: QPCR showed that administration of both MMC and MCPi resulted in statistically significant ($P < 0.05$) decreases in the mean expression of collagen 1a and sparc associated with fibrosis in comparison with vehicle. Both treatments also resulted in better surgical outcome. Application of MMC and MCPi differentially altered the conjunctival inflammatory profile following surgery. Cell viability was better preserved in conjunctival fibroblasts that had been treated with MCP-1 inhibitor in comparison with MMC.

Conclusions: MCP-1 inhibition downregulates fibrosis and promotes surgical success in GFS with less toxicity than MMC.



09:00 - 10:30

Venue: 300

Oxidative Stress Level in Tears of Primary Open Angle Glaucoma and Primary Angle Closure Glaucoma Patients

First Author: Lai Chan **FHUN**

Co-Author(s): Che-Badariah **ABDUL AZIZ**, Mei Fong **CHONG**, Ahmad Tajudin **LIZA-SHARMINI**

Purpose: To compare the oxidative stress level in tears between primary glaucoma and age-matched controls.

Methods: A cross-sectional study was conducted between May 2014 and November 2015 involving 62 primary open angle glaucoma (POAG), 57 primary angle closure glaucoma (PACG), and 72 age-matched non-glaucoma patients. The detailed history and history of taking antioxidant supplements were obtained. Complete ophthalmic evaluations were conducted including Humphrey visual field analysis. Tear samples were collected using Schirmer paper. Laboratory analysis was performed to test the SOD, catalase, and MDA level of tears using commercially available immunological kits. Independent *t* test was used to compare the SOD, catalase, and MDA level in tears between primary glaucoma patients (POAG and PACG) and controls.

Results: Mean SOD and catalase level were slightly higher in glaucoma patients as compared to controls. Surprisingly, mean MDA level (43.60 μ M) was slightly lower in glaucoma patients compared with controls (43.76 μ M). However, there was no significant difference of SOD level ($P = 0.191$), catalase level ($P = 0.259$), and MDA level ($P = 0.309$) between glaucoma and controls based on independent *t* test. There was no significant difference in SOD, catalase, and MDA level between POAG and PACG patients.

Conclusions: Quantification of oxidative stress level in tears is noninvasive and easy but may be affected by ultra radiation, pollution, or topical pressure-lowering agents. SOD, catalase, and MDA may not a play role in oxidative stress in glaucoma. However, a prospective study will provide a better understanding of oxidative stress in the tears of glaucoma patients.

09:00 - 10:30

Venue: 300

Penetrating Canaloplasty on Medically Uncontrolled Primary Angle-Closure Glaucoma: A Pilot Study

First Author: Yuanbo **LIANG**

Co-Author(s): Cheng **HU**, Junhong **JIANG**, Jia **QU**, Yan-Qian **XIE**, Shaodan **ZHANG**

Purpose: To introduce a novel procedure of “penetrating canaloplasty,” combining conventional canaloplasty

and trabeculectomy but with tight suture of scleral flap, and its preliminary results in medically uncontrolled primary angle-closure glaucoma (PACG).

Methods: Prospective, noncomparative, interventional case series. Participants were 9 consecutive patients with medically uncontrolled PACG at the Eye Hospital of Wenzhou Medical University. Each patient received the novel surgery “penetrating canaloplasty” combining canaloplasty and trabeculectomy but with tight suture of scleral flap. All patients underwent a complete ophthalmic examination before surgery and at 1-day, 1-week, 1-month, 3-month, and 6-month follow-ups. Main outcome measures were intraocular pressure (IOP), bleb, complications, glaucoma medication usage, and adverse events.

Results: Nine eyes of 9 patients with medically uncontrolled PACG underwent the new procedure. The mean IOP reduced from 36.6 ± 9.3 mm Hg to 19.2 ± 14.7 mm Hg at 1 day, 16.7 ± 5.6 mm Hg at 1 month, and 14.7 ± 2.1 mm Hg at 6 months postoperatively. The number of medications used preoperatively and at the 6-month follow-up were 3.6 ± 0.9 and 0.1 ± 0.3 , respectively. Mild bleb was seen in 5 eyes, with no bleb in 4 eyes. The most frequent complications included hyphema in 2 eyes (22.2%), IOP spikes > 21 mm Hg in 1 case (11.1%), suture cheese-wiring through trabecular meshwork in 1 case (11.1%), and Descemet membrane detachment (DMD) with intracorneal hemorrhage in 1 case (11.1%). No other severe complications were encountered.

Conclusions: Through this preliminary study, penetrating canaloplasty seems to be a promising procedure in controlling intraocular pressure and avoiding bleb-dependent filtering surgery in PACG.

09:00 - 10:30

Venue: 300

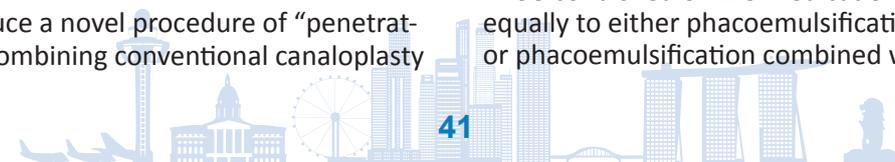
Phacoemulsification versus Phacoemulsification with iStent Microbypass Stent in Primary Angle Closure Glaucoma: Early Safety and Efficacy Results of a Randomized Controlled Trial

First Author: Jason **CHENG**

Co-Author(s): Tiakumzuk **SANGTAM**

Purpose: To determine the safety and efficacy of the iStent (Glaukos) in combination with cataract surgery in subjects with primary angle closure (PAC) and mild-moderate primary angle closure glaucoma (PACG) in the early postoperative period.

Methods: A prospective, randomized controlled trial. Thirty-two patients with cataract and either PAC or PACG controlled on 1-3 medications were randomized equally to either phacoemulsification (control group) or phacoemulsification combined with iStent (iStent



group). Patients were evaluated on intraocular pressure (IOP) and number of glaucoma medications before the operation and at postoperative month 1. Success was defined as IOP \leq 18 mm Hg without medications at 1 month.

Results: Preoperatively, the mean IOP was 18.0 ± 4.0 mm Hg and 17.5 ± 4.0 mm Hg ($P = 0.52$) and the mean number of medications was 2.1 ± 0.8 and 1.8 ± 0.9 ($P = 0.28$) in the control and iStent groups, respectively. At month 1, mean IOP was 19.5 ± 4.1 mm Hg and 15.5 ± 2.7 mm Hg ($P = 0.04$) and the mean number of glaucoma medications was 0.3 and 0.1 in the control and iStent groups, respectively. At 1 month, 7/16 patients were defined as success in the control group compared to 14/16 in the iStent group ($P = 0.01$). The most common complication was IOP spike (IOP $>$ 24 mm Hg) at day 1, with 4/16 in the control arm and none in the treatment arm. There were 4 iStents (25%) occluded by the iris at month 1, 2 of which required 1 glaucoma medication to control the IOP.

Conclusions: The use of iStent in PAC and PACG reduced IOP spikes but has a high rate of iris occlusion. There was a greater success rate and a lower mean IOP in the iStent group at 1 month.

09:00 - 10:30

Venue: 300

Prediction of Corneal Pressure with Scleral Pressure Using Pneumatometry

First Author: Ying **HAN**

Co-Author(s): Debbie **KUO**, Yvonne **OU**, Travis **PORCO**

Purpose: To evaluate the usefulness of scleral pneumatometry as an alternative for corneal measurements of intraocular pressure (IOP) over a broad range of IOPs.

Methods: The study was conducted in 33 adult patients receiving anti-vascular endothelial growth factor intravitreal injections, which transiently increase IOP. Corneal pachymetry and serial corneal and temporal scleral pneumatometry (baseline, immediately after, and 10, 20, and 30 minutes after injection) were collected. One-time baseline corneal and scleral pneumatometry readings were obtained in the noninjected eye. Correlation analysis and a Bland-Altman plot were used to evaluate reliability and agreement between scleral and corneal measurements of IOP. A linear mixed model was used to determine the relationship between measurements and to perform covariate analyses.

Results: Scleral and corneal pneumatometry showed nearly 1:1 linear correlation, although scleral pneumatometry was biased toward higher values ($r = 0.94$; $P < 0.001$). Scleral pneumatometry averaged 9.0 mm

Hg higher than corneal pneumatometry (95% limits of agreement, -1.5 to 19.5 mm Hg). A linear mixed model resulted in the following equation: corneal IOP = $1.04 \times$ scleral IOP - 10.37. Age, central corneal thickness, laterality, and glaucoma and lens status did not impact this relationship. The difference between corneal and scleral pneumatometry was correlated between the 2 eyes of individual patients ($r = 0.75$; $P < 0.001$).

Conclusions: Differences between serial scleral measurements reflect differences between serial corneal measurements. Scleral pneumatometry should be considered as an alternative to corneal pneumatometry for following patients in whom corneal measurements are unobtainable.

09:00 - 10:30

Venue: 300

Results of Surgical Treatment of Refractory Glaucoma by Angular-Uveal Drainage with Non-Absorbable Collagen Antiglaucomatous Device Xenoplast

First Author: Svetlana **ANISIMOVA**

Purpose: To analyze experimental and clinical results of the new collagen antiglaucomatous drainage device (DCA xenoplast) consisting of type 1 bone collagen. The biological material xenoplast is resistant to biodestruction and elastic.

Methods: In the experimental part of this work the implant was inserted into the rabbit eye, and after 1, 2, and 4 months the histological pictures were analyzed. We did not find any inflammatory reaction or capsule formation around the drainage. The clinical analysis was performed in 38 patients (39 eyes). The surgical technique included angular-uveal drainage method, when one DCA xenoplast part was implanted into the anterior chamber and the other part was fixed in deep sclera layers or on the surface of the ciliary body. Follow-up period was 1-4 years.

Results: The biological material xenoplast is resistant to biodestruction. We did not find any inflammatory reaction or capsule formation around the drainage in the experimental part. We did not observe any inflammatory reaction or perforation of the conjunctiva, even if the drainage was under the conjunctiva. The intraocular pressure (IOP) was lowered from 35.5-50.5 mm Hg preoperatively on 3-4 medications per day to 13.0-22.0 mm Hg postoperatively on 1-3 medications per day. After operations with xenoplast, in all cases filtering blebs were flat. There were no cases of cystic thin filtering blebs. In the long-term postoperative period during biomicroscopy the DCA xenoplast was visible in the anterior chamber.

Conclusions: Aniglucomatous operations are effective with new biological drainage xenoplast in different cases of refractory glaucoma.

09:00 - 10:30
Venue: 300

Selective Trans-Scleral Diode Laser Cycloablation in Eyes Having Visual Potential with Neovascular Glaucoma

First Author: Farah **AKHTAR**
Co-Author(s): Mahmood **ALI**, James **STANDEFER**

Purpose: Neovascular glaucoma is one of the difficult entities to treat because of multiple factors like uncontrolled intraocular pressure (IOP) and other co-morbidities. Satisfactory control of IOP is not achieved even with full medication. Due to high IOP, intravitreal anti-VEGF injections result in severe pain, while corneal edema limits the adequate view for panretinal photocoagulation (PRP). Moreover, presence of neovascularization delays surgical intervention. We are reporting the results of selective diode laser cycloablation (DLCA) combined with other modalities in partially seeing eyes with neovascular glaucoma.

Methods: Thirty-seven eyes were included with visual acuity ranging from counting fingers to 6/36. Treatment sequence included PRP or intravitreal bevacizumab followed by 2 quadrants of selective DLCA. The superior 2 quadrants were left untreated to prevent hypotony and subsequent use for filtration surgery if required.

Results: A significant drop in IOP was achieved in all except 2 cases. Pretreatment visual acuity was retained in 29 (78.37%) eyes, while 5 (13.51%) eyes showed improvement of visual acuity (most likely due to reduction of corneal edema and resolving vitreous hemorrhage). Required number of anti-glaucoma medications was also significantly reduced. Eight (21.62%) eyes required repeat DLCA in 1 quadrant; trabeculectomy was performed in 5 (13.51%) eyes, while 1 (2.7%) eye underwent Ahmed glaucoma valve implantation after neovascularization resolved.

Conclusions: Selective DLCA combined with other modalities is an effective method for the management of neovascular glaucoma in partially seeing eyes, as it gives a window of opportunity during which the neovascular process can be addressed effectively.

09:00 - 10:30
Venue: 300

Transplantation of iPSC-Derived TM Cells Rescues Glaucomatous Phenotypes in sGC^{-/-} Mice

First Author: Zhu **WEI**
Co-Author(s): Emmanuel **BUYS**, Markus **KUEHN**

Purpose: We previously demonstrated that transplantation of induced pluripotent stem cell-derived trabecular meshwork cells (iPSC-TM) can efficiently restore aqueous humor outflow in glaucomatous myocilin^{Y437H} transgenic mice. The goal of this study was to test the effects of iPSC-TM on another mouse model of primary open angle glaucoma (POAG) caused by the deficiency of soluble guanylate cyclase (sGC).

Methods: Mouse iPSCs were differentiated into iPSC-TM and characterized by immunohistochemistry study. Cells expressing SSEA-1 were depleted by magnetic separation. A total of 50,000 purified iPSC-TM cells were injected into the anterior chamber of 12-month-old sGC^{-/-} mice (n = 15). PBS recipients (n = 7) and wild-type mice (n = 8) were used as the vehicle and positive control. IOP was tracked by tonometry and TM cellularity was analyzed using H&E stain and immunohistochemistry.

Results: Differentiated iPSCs presented laminin and MGP strongly. Four weeks after transplantation IOP in recipient and control mice was still similar (13.98 mm Hg vs 14.42 mm Hg, P = 0.60). However, a significantly lower IOP in iPSC-TM recipients compared to vehicle control was observed 7 weeks after treatment (12.71 mm Hg vs 13.78 mm Hg, P = 0.046). Morphometric analysis suggests that iPSC-TM transplantation increases TM cellularity (22.34 TM/anterior segment) in 14-month-old sGC^{-/-} mice significantly over PBS recipients (16.42, P = 0.0059) and to similar levels as wild-type mice (24.97).

Conclusions: Transplantation of iPSC-TM may be an efficient treatment to reverse trabecular meshwork dysfunction due to a variety of damage mechanisms and also appears to be effective in very old individuals. This may be a viable therapeutic approach to treat a majority of POAG patients.



Intraocular Inflammation, Uveitis & Scleritis

Mar 2, 2017 (Thu)

11:00 - 12:30
Venue: 301

An Analysis of Late Dislocation of In-the-Bag Intraocular Lenses in Uveitic Eyes: Management and Complications

First Author: Sudha **GANESH**

Purpose: To analyze and report late in-the-bag dislocation of intraocular lenses (IOL) in uveitic eyes and study the surgical and non-surgical management and complications.

Methods: Retrospective case series of late in-the-bag IOL dislocations seen at a referral uveitis clinic between January 1997 and January 2015.

Results: Eleven eyes of 10 patients with late in-the-bag dislocation of IOL were included. All patients had chronic intermediate uveitis. Mean age at the time of onset of uveitis was 35.5 years. Mean age at the time of cataract surgery was 39.73 years. Mean age at the time of dislocation of PCIOL was 51 years. The mean duration from the time of cataract surgery to IOL dislocation was 11.24 years. Five eyes had pars plana vitrectomy (PPV) with IOL removal with 4-point sutured scleral fixated IOL (SFIOL). Two eyes had PPV with in-the-bag IOL re-fixation. Two eyes had PPV with IOL removal only. Two patients did not opt for surgery. Eight eyes had improved vision at last follow-up. Five eyes had secondary glaucoma and 2 eyes had chronic cystoid macular edema.

Conclusions: In-the-bag dislocation of IOL is a rare late complication in uveitic eyes. With tight perioperative inflammatory control with immunosuppression and steroids, SFIOL or IOL re-fixation are good options for restoring vision in these high risk eyes.

11:00 - 12:30
Venue: 301

Clinical Features and Outcomes of Scleritis Across the Asia-Pacific

First Author: Joshua **LANE**
Co-Author(s): Rupesh **AGRAWAL**, Lyndell **LIM**, Padmamalini **MAHENDRADAS**, Peter **MCCLUSKEY**

Purpose: Scleritis is a rare inflammatory eye disease, where there is limited opportunity to study the disease in large patient numbers. We performed a large retrospective study to examine the spectrum of scleritis in 4 tertiary institutions across Australia, Singapore, and India.

Methods: Clinical records were reviewed from tertiary centers in Sydney, Melbourne, Singapore, and India. A total of 354 patients were initially included; however, those with isolated episcleritis or uveitis or incomplete data were excluded (n = 24). Scleritis was classified using Watson classification.

Results: Indians were younger at presentation (41.7 ± 13.2 years) and had fewer female patients (49.2%) compared to Australia and Singapore (62.2%/56.7%). Diffuse anterior scleritis was the commonest form in each country, with the highest rate in Singapore (62.5%). India had the highest proportion of nodular anterior scleritis (36.7%), and Australia had nearly 3 times the amount of posterior scleritis (28.1%). Autoimmune and infectious causes made up similar numbers in Australia (31%/10.3%) and Singapore (27.5%/10.8%), with the reverse seen in India (8.3%/30%). Necrotizing scleritis was most frequently caused by infection (31.8%). In India, 75% of the infectious cases were due to tuberculosis. Posterior scleritis was most associated with complications (76.5%) and had the highest use of immunosuppressive agents per patient (0.98 ± 0.3 95% confidence interval).

Conclusions: Tuberculosis is a major cause of scleritis in endemic areas such as India. An infective cause for scleritis must always be considered in patients presenting with necrotizing scleritis. Posterior scleritis was disproportionately more common in Australian patients and was associated with more complications. Posterior scleritis remains a diagnostic and treatment challenge.

11:00 - 12:30
Venue: 301

Corticosteroid Tapering Success With Every-Other-Month Injections of Intravitreal Sirolimus in Subjects with Active Noninfectious Uveitis of the Posterior Segment Participating in SAKURA Study 1

First Author: Alay **BANKER**

Purpose: To examine vitreous haze (VH) outcomes and corticosteroid (CST) tapering success in subjects receiving intravitreal sirolimus for active noninfectious uveitis of the posterior segment (NIU-PS).

Methods: SAKURA Study 1 was a phase III, double-masked, multinational, multicenter trial in which 347 subjects with active NIU-PS were randomized 1:1:1 to receive intravitreal sirolimus 440 µg, 880 µg, or 44 µg (active control) every 2 months. Non-CST systemic immunosuppressants and topical CSTs were discontinued before baseline; subjects receiving systemic CSTs with overall prednisone-equivalent dose > 5 mg/d at baseline (intent-to-taper population) were tapered off. CST tapering success (overall prednisone-equivalent



dose ≤ 5 mg/d at month 5) was a prespecified secondary endpoint. Subjects receiving rescue therapy before month 5 were not considered tapering successes.

Results: Sixty-nine subjects (44 μ g, n = 22; 440 μ g, n = 26; 880 μ g, n = 21) were receiving CSTs > 5 mg/d at baseline. Tapering success was highest in the 440 μ g group: 76.9% (vs 63.6% in the 44 μ g group and 66.7% in the 880 μ g). Tapering success plus VH score of 0/0.5+ was achieved in 46.2%, 27.3%, and 33.3% of subjects, respectively. Differences among the 3 groups did not reach statistical significance due to small sample size.

Conclusions: In SAKURA Study 1, a majority of subjects taking oral CSTs (overall dose > 5 mg/d at baseline) were successfully tapered to ≤ 5 mg/d with every-other-month intravitreal sirolimus. Highest proportion of successes was observed with 440 μ g. Results support potential use of intravitreal sirolimus to help taper CSTs to below recommended maintenance doses.

11:00 - 12:30

Venue: 301

Intravitreal Injection of Neuroglobin in a Rodent Hypoxia Model

First Author: Sai Bo Bo **TUN**

Co-Author(s): Veluchamy A **BARATHI**, Anita S Y **CHAN**

Purpose: To determine the effects of intravitreal (IVT) exogenous neuroglobin (Ngb) injections in rodent retina.

Methods: Fifteen rats were used, of which 3 rats (6 globes) served as non-hypoxia controls. Remaining rats were subjected to 2 hours of hypoxia (7% oxygen) in a hypoxic chamber and allowed to recover in normoxic conditions. Hypoxic rats received 2.5 μ L Ngb IVT injections on day 0 (before hypoxia) and day 3 (after hypoxia) in the right eyes (12 globes, NGB-IVT hypoxia) while contralateral eyes received sham injections of balanced salt solution (12 globes, SHAM-IVT hypoxia). Nine rats were euthanized on day 7 and another 6 on day 30 post-hypoxia, and the globes were removed for histological and ELISA analysis for neuroglobin and inflammatory cytokines.

Results: IVT of Ngb did not result in endophthalmitis or uveitis. Day 7 post-hypoxia, Ngb levels in SHAM-IVT hypoxia retinas were reduced by 30% compared to non-hypoxia retinas ($P < 0.017$). Ngb levels in NGB-IVT hypoxia retinas on day 7 and day 30 were restored to almost normal levels of non-hypoxia controls (no statistical difference, $P = 0.67$). Post-hypoxia, IL-6 ($P = 0.03$) and RANTES ($P = 0.02$) were significantly decreased in Ngb-treated retinas in comparison to sham-injected retinas.

Conclusions: Restoration to normal Ngb levels post-hypoxia and reduced IL-6 and RANTES post-hypoxia were

seen post-IVT Ngb, suggesting an abrogation of the post-hypoxic inflammatory response. Our pilot data suggests a new potential role for Ngb in treating hypoxic retinal disorders.

11:00 - 12:30

Venue: 301

Microbiologic Spectrum and Susceptibility of Isolates in Endogenous Endophthalmitis

First Author: Bhavik **PANCHAL**

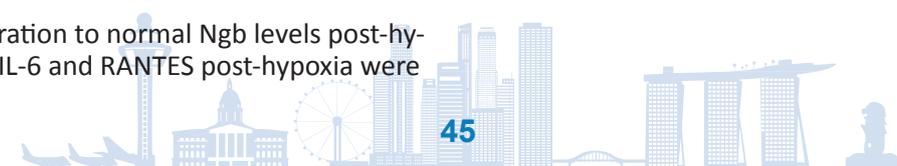
Co-Author(s): Vivek **DAVE**, Avinash **PATHENGAY**

Purpose: To evaluate the microbiological spectrum and antimicrobial susceptibility of isolates in endogenous endophthalmitis.

Methods: A retrospective review of 118 consecutive patients with culture-proven endogenous endophthalmitis was done from January 2006 to March 2013. The study was approved by the institutional review board and adhered to the guidelines of the Declaration of Helsinki. Vitreous samples from all patients had been investigated for bacteria and fungus using institutional protocol. Bacterial isolates were identified using Analytical Profile Index system until 2010 and Vitek-2 compact system (bioMérieux, Craponne, France) thereafter. The susceptibility was determined by the Kirby-Bauer disc diffusion method. Fungal species were identified based on their colony and microscopic characteristics.

Results: There were 96/118 (81.36%) bacterial and 22/118 (18.64%) fungal isolates. Gram-positive cocci (49/96, 51.04%) were more common than Gram-negative organisms (42/96, 43.75%). *Streptococcus pneumoniae* (30/49, 61.22%) was the most common isolate among the Gram-positive cocci and *Pseudomonas* (12/42, 28.57%) among the Gram-negative organism group. Gram-positive isolates were most susceptible to vancomycin (97.9%), chloramphenicol (93.8%), and cefazolin (91.8%), whereas Gram-negative isolates to ciprofloxacin (76.2%), chloramphenicol (66.6%), and amikacin (64.2%). Filamentous fungi were more common than yeast in cases of fungal endogenous endophthalmitis.

Conclusions: Our study demonstrated a higher incidence of virulent organisms like *Streptococcus*, *Pseudomonas*, and *Aspergillus* causing endogenous endophthalmitis, which is also known to be associated with poorer visual outcomes.



11:00 - 12:30

Venue: 301

Ocular Autoimmune Systemic Inflammatory Infectious Study (OASIS) Report 1: Epidemiology and Classification

First Author: Rupesh **AGRAWAL**

Co-Author(s): Elizabeth **CHEN**, Su Ling **HO**, Wee-Kiak **LIM**, Stephen **TEOH**

Purpose: To report the epidemiology and classification of ocular inflammation at a tertiary eye care center in Singapore.

Methods: Retrospective cohort study of the clinical records of consecutive new cases from the Ocular Autoimmune Systemic Inflammation Infection Study (OASIS) database from 2004–2015.

Results: A total of 2200 patients were studied from the OASIS database. The most common anatomical diagnoses were anterior uveitis (55.9%), posterior uveitis (17.5%), panuveitis (9.6%), and intermediate uveitis (4.7%). In addition, scleritis (6.1%), keratouveitis (2.8%), retinal vasculitis (2.2%), and episcleritis (1.2%) were observed. Etiology was established in 65.1% with 35.2% of patients associated with non-infectious etiologies. The most common etiologies found were presumed tuberculosis (7.2%), followed by cytomegalovirus infection (6.9%), herpetic infection (6.3%), HLA-B27 anterior uveitis (4.2%), and ankylosing spondylitis (3.8%).

Conclusions: The pattern of ocular inflammation in Singapore has similarities with both Western and Asian populations. Anterior uveitis was most common, with non-infectious etiologies being slightly more common than infectious etiologies.

11:00 - 12:30

Venue: 301

Ocular Autoimmune Systemic Inflammatory Infectious Study (OASIS) Report 3: Posterior and Panuveitis

First Author: Fang **MI**

Co-Author(s): Rupesh **AGRAWAL**, Su Ling **HO**, Joanne **LEE**, Stephen **TEOH**

Purpose: The study aims to report the etiological patterns, clinical characteristics, utility of diagnostic tests, and ocular complications in patients with posterior uveitis and panuveitis seen at a tertiary eye center in Singapore.

Methods: We conducted a retrospective analysis of 415 consecutive posterior uveitis and panuveitis cases from the Ocular Autoimmune Systemic Inflammation Infection Study (OASIS) database from 2004–2015. The etiologies were divided into infectious, non-infectious,

idiopathic, and masquerade syndrome.

Results: Infectious etiology was more common among younger patients (≤ 40 years) ($n = 94$, 51.6%), while non-infectious etiology was more common among older patients ($n = 73$, 54.1%) ($P = 0.000$). Of the 162 patients with infectious etiology, the commonest was dengue ($n = 53$, 32.7%). More patients with bilateral disease had a non-infectious etiology (49.4%) compared to the other etiologies ($P = 0.03$). There were 55 patients (16.0%) who were immunocompromised, and the majority of these patients had uveitis secondary to an infectious etiology ($n = 30$, 54.5%). The most common posterior segment sign was retinal vasculitis ($n = 113$, 32.8%), followed by vitritis ($n = 71$, 20.6%) and retinal detachment ($n = 52$, 15.4%). The most common complication was epiretinal membrane ($n = 20$, 12.3%) for the infectious group, cystoid macular edema ($n = 12$, 8.3%) for the non-infectious group, uveitic glaucoma ($n = 6$, 4.2%) for the idiopathic group, and phthisis in the masquerade syndrome group ($n = 2$, 20.0%).

Conclusions: The proportion of etiologies in our cohort varies from other studies, with the commonest being dengue in our population. The statistical significance between age and etiology categories could be attributed to genetic and environmental variations. Complications differ between the various etiologies.

11:00 - 12:30

Venue: 301

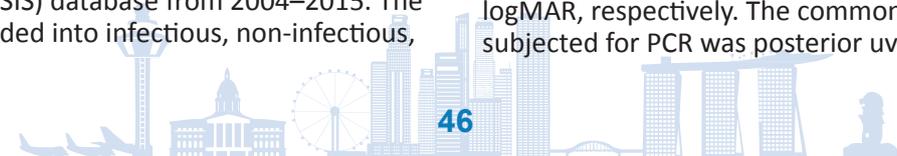
Polymerase Chain Reaction Analysis in 100 Cases of Suspected Infectious Uveitis in an Ophthalmic Tertiary Care Center in India

First Author: Jyotirmay **BISWAS**

Purpose: Polymerase chain reaction (PCR) analysis is an important tool in the diagnosis of infectious uveitis. We aimed to study the sensitivity and specificity of PCR in suspected infectious uveitis in an ophthalmic tertiary care center in South India.

Methods: A retrospective, interventional study of PCR analysis of ocular fluid in suspected infectious uveitis cases between January 2014 and July 2016 was performed for MTB, HSV1 and 2, VZV, CMV, *Toxoplasma gondii*, fungus, eubacterium, and *Propionibacterium acne*. Tuberculosis DNA detection was done using MPB64, IS6110, and real time MTB PCR. Analysis with SPSS14 was done.

Results: A total of 100 cases were included in the study. The mean age was 39.2 ± 15.4 years. Uveitis was unilateral in 82% and bilateral in 18%, granulomatous in 40% and non-granulomatous in 60%. Mean visual acuity at initial visit and final visit was 0.73 logMAR and 0.63 logMAR, respectively. The commonest type of uveitis subjected for PCR was posterior uveitis (38%). Among



100 eyes of 100 patients, PCR analysis confirmed the initial clinical diagnosis in 39% patients. The sensitivity and specificity of PCR analysis was found to be 90.20% and 93.88%. Positive predictive value was 93.88% and negative predictive value was 90.20%.

Conclusions: PCR assay is an accurate technique with high sensitivity and specificity to diagnose the DNA genome of suspected infectious uveitis.

11:00 - 12:30

Venue: 301

Severe Intraocular Inflammation Following Intravitreal Injection of Bevacizumab and Lucentis for Diabetic Macular Edema: A Comparative Study

First Author: Nilutpal **BORAH**

Purpose: A prospective, comparative study to identify (1) the incidence of severe intraocular inflammation (SII) following a single intravitreal injection of bevacizumab (IVB) and Lucentis (IVL) and (2) its management and outcome.

Methods: Study period was from April 1, 2013 to March 31, 2016. Pre- and post-treatment best corrected visual acuity (BCVA), intraocular pressure (IOP), anterior and posterior segment examinations, and investigations (FFA, OCT, USG) were done. Indication for IVB/IVL was diabetic macular edema (DME). IVB was prepared from a single vial (4 mL/100 mg) and used on the same day. IVL was prepared from a single-use vial (2.3 mg/0.23 mL). Injections were given in OT with aseptic technique. Follow-up was on the first and seventh day and at 1 month.

Results: A total of 2640 eyes (2640 patients) received IVB, and 806 eyes (806 patients) received IVL. In the IVB group 8 eyes (8 patients) had developed SII on the first postoperative day. Patients (n = 8) complained of dimness of vision, redness, and severe pain in the affected eye. Hypopyon (n = 2) and vitreous haze (n = 2) were seen. Cultures of aqueous fluid and remaining drug from the vial were negative. All eyes (n = 8) responded to intensive topical prednisolone, moxifloxacin, and cycloplegic eye drops. Following complete recovery at a mean of 15 days (10-30), mean VA improved from counting fingers at 1 foot to 6/12p. In the IVL group, no complications were noted (P = 0.250, CI 95%).

Conclusions: IVB prepared from a single vial caused severe sterile intraocular inflammation mimicking endophthalmitis (n = 8). SII (n = 8) responded to conservative management without surgery. Early detection, frequent follow-up, and prompt and intensive topical treatment could restore vision to baseline in our series. Bilateral same day intravitreal injections from a single vial of bevacizumab are not recommended. Individual

variations on clinical presentations to identical dose of IVB was noted. Monoclonal antibody or vehicle may be responsible.

11:00 - 12:30

Venue: 301

Typhoid Chain Reaction: *Salmonella typhi*-Induced Endogenous Endophthalmitis in a 28-Year-Old Immunocompetent Male

First Author: Suchit **DADIA**

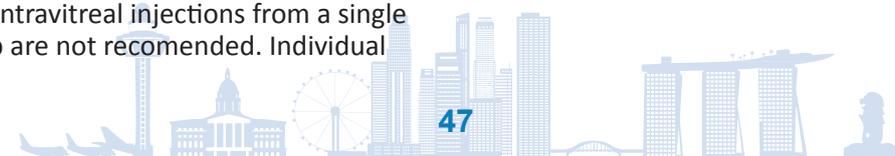
Co-Author(s): Rohit **MODI**, Akshay **NAIR**, Nayana **POTDAR**

Purpose: To report a case of *Salmonella typhi*-induced endogenous endophthalmitis in a 28-year-old immunocompetent male.

Methods: Retrospective case review. A 28-year-old male presented with a 3-day history of pain and diminished vision in the left eye. His best corrected visual acuity was 6/6 in the right eye. Vision in the left eye was PL + PR inaccurate. On slit lamp examination chemosis, corneal haze, and hypopyon were noted in the left eye and yellowish exudates were seen filling the vitreous cavity. Pupil was fully dilated, not reacting to light. Posterior segment was not visible. Detailed history revealed that the patient had been treated for typhoid fever 2 weeks earlier with high widal titers (1:400). Blood culture was positive for *S. typhi*. Vitreous biopsy revealed gram-negative bacilli, which were later identified as *S. typhi*.

Results: Despite intensive intravitreal and systemic antibiotic therapy, a vitrectomy was planned which had to be abandoned and the eye was eviscerated. In a literature search, this is the sixth documented case of post typhoid fever endophthalmitis in adults and the third in an immunocompetent adult.

Conclusions: Endogenous endophthalmitis is a rare but devastating complication of typhoid fever that requires a high degree of suspicion to diagnose. It is usually associated with poor visual outcomes. Visual outcome in most cases is blindness, and this has remained unchanged since the first report in 1979.



Miscellaneous

Mar 5, 2017 (Sun)

11:00 - 12:30
Venue: 301

Open Globe Injuries: A Prospective Study of Clinical Profile and Prognostic Factors Affecting Final Visual Outcomes

First Author: Deepika KAPOOR
Co-Author(s): Harsha BHATTACHARJEE, Kasturi BHATTACHARJEE, Nilutparna DEORI, Diva MISRA, Samir SERASIYA

Purpose: To evaluate the factors affecting final visual outcome in patients with open globe injury.

Methods: In this prospective study 50 consecutive patients with open globe injuries presenting to us for surgical repair were included. A detailed history of each patient was recorded including general and ophthalmic evaluation of the patient, visual acuity (VA) and pupillary reaction, slit-lamp examination of the anterior segment, and funduscopy. The injuries were graded according to Ocular Trauma Score (OTS) for comparison of the prognosis. Written informed consent was taken from each patient before surgical repair of the globe. Patients were followed up at 1 week, 1 month, 3 months, and 6 months postoperatively. The follow-up visual acuity was recorded. The results were analyzed using ANOVA, paired *t* test, and Spearman rank correlation test.

Results: The mean age was 24.28 years, with male preponderance. Presenting visual acuity was in the range of light perception to HMCF in 54% of cases. Final VA was good in 62%, impaired in 18%, and poor in 20%. The injuries in zone 1 were strongly associated with the final visual outcome ($P = 0.001$) and the surgical treatment in this zone significantly altered the outcome when compared to other zones ($P < 0.001$). Presenting VA and OTS were statistically significant.

Conclusions: The presenting visual acuity, zone of injury, and OTS affect final visual acuity. Higher OTS have better visual outcomes.

Neuro-Ophthalmology

Mar 4, 2017 (Sat)

14:30 - 16:00
Venue: 301

A Retrospective Review of the Clinical Characteristics and Visual Outcomes of Optic Neuritis Patients with Seropositive Compared with Seronegative Anti-Aquaporin-4 Autoantibody

First Author: Kong Yong GOH

Purpose: To compare the features of anti-aquaporin-4 autoantibody (AQP-4 Ab) seropositive and seronegative patients with optic neuritis in a tertiary general hospital.

Methods: We conducted a retrospective study on patients tested for AQP-4 Ab between 2012 and 2015. Those with visual complaints had their case notes traced. We compared the demographics, clinical features, and eventual visual outcome in both groups of patients.

Results: Sixty-eight patients were tested for AQP-4 Ab. Of these, 19 did not have visual complaints. Another 6 were excluded as their medical reports could not be traced. Of the remaining 43 patients, 11 tested positive for AQP-4 Ab while 32 tested negative. In the seropositive group, 9 had presenting visual acuity (VA) worse than 6/60 and only 1 was 6/12 to 6/60. Post-treatment 3 months later, 3 still had VA worse than 6/60, 5 had VA better than 6/12, and 3 were lost to follow-up. In the seronegative group, 12 had presenting VA worse than 6/60, 12 were 6/12 to 6/60, and 7 were better than 6/12. Post-treatment 3 months later, 2 still had VA worse than 6/60, 11 were 6/12 to 6/60, 16 were better than 6/12, and 2 were lost to follow-up. None of the patients had a worsening VA from presentation.

Conclusions: Poor presenting VA is more common among AQP-4 Ab positive patients. However it appears that most of them recover well with treatment.

14:30 - 16:00
Venue: 301

Clinical Features and Visual Outcomes of Optic Neuritis in Chinese Children

First Author: Huanfen ZHOU
Co-Author(s): Wei WANG, Shihui WEI, Junqing WANG, Shuo ZHAO

Purpose: The aim of this study was to evaluate the clinical features and visual outcomes of optic neuritis (ON) in Chinese children.



Methods: Patients with a first episode of ON at a tertiary neuroophthalmic center in China were assessed and followed up for at least 3 months. Visual outcomes and clinical, laboratory, and neuroimaging findings were reviewed.

Results: Seventy-six children (76 eyes) with a first episode of ON were included. The mean age was 11.8 years, 60.5% were females, and 48.7% had bilateral involvement. The children were followed up for an average of 18.5 months. Vision loss at presentation was severe, with visual acuity (VA) < 20/200 in 37 eyes (48.7%). At the final visit, 3 (3.9%) eyes had VA of at least 20/20, and 41 (53.9%) eyes had VA of at least 20/40. The final VA in 35 eyes (46.1%) was worse than 20/40. Children aged ≤ 10 years had better predicted visual outcomes when compared to children over 10 years (odds ratio = 2.73, 95% confidence interval: 1.05–7.07, $P = 0.039$). The other features of this cohort, such as sex, experienced bilateral attack, VA at presentation, presence of optic disc edema, systemic diseases, magnetic resonance imaging (MRI) findings, and aquaporin-4 (AQP-4) antibody status, were not significantly correlated with the final visual outcome.

Conclusions: The data revealed the clinical characteristics and visual outcomes of ON in Chinese children. ON in children was associated with severe vision loss and relatively good visual recovery. The age at onset could predict the final visual function.

14:30 - 16:00

Venue: 301

Features of Anti-Myelin Oligodendrocyte Glycoprotein-Positive Patients with Demyelinating Optic Neuritis

First Author: Ying **ZHAO**
Co-Author(s): Shihui **WEI**

Purpose: To evaluate clinical features among patients with myelin oligodendrocyte glycoprotein (MOG) antibody-associated optic neuritis (MOG-ON) and aquaporin-4 (AQP4) antibody-associated optic neuritis (AQP4-ON) retrospectively.

Methods: Patients with demyelinating ON were tested for anti-AQP4 and anti-MOG antibodies with cell-based assay. Clinical features including demographics, visual performance, serum autoantibody data, and magnetic resonance imaging (MRI) findings were compared.

Results: A total of 72 patients (32 anti-MOG-positive and 40 anti-AQP4-positive) diagnosed with demyelinating ON were selected. There was no overlap between MOG-ON and AQP4-ON. Compared with AQP4-ON, MOG-ON patients tended towards younger disease onset with a higher percentage of patients with pediatric (<18 years) disease onset (MOG+, AQP4+: 12/32, 3/40).

Unlike AQP4-ON that has a predilection for women, the distribution between men and women with MOG-ON was more even. Bilateral optic neuritis was more common in MOG-ON than in AQP4-ON. Onset episode severity did not differ between MOG-ON and AQP4-ON, but patients with MOG-ON had better outcomes from the onset episode. There were several cases that showed anti-SSA/SSB antibody and/or anti-ANA antibody positive combined with AQP4-ON, but there was no anti-SSA/SSB antibody and/or anti-ANA antibody positive combined with MOG-ON. Optic nerve head swelling was more common in MOG-ON. MRI showed MOG-ON affected the retrobulbar segment of the optic nerve more. Nevertheless, AQP4-ON involved the posterior portion of the optic nerve more.

Conclusions: The anti-MOG-positive patients with ON were suggested to be a distinct disease subgroup of neuromyelitis optica spectrum disorder (NMOSD). Anti-MOG antibodies should be tested in those patients.

14:30 - 16:00

Venue: 301

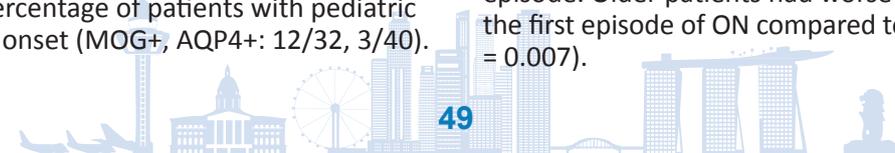
Optic Neuritis: A 5-Year Follow-Up Study of Chinese Patients Based on Aquaporin-4 Antibody Status and Age

First Author: Huanfen **ZHOU**
Co-Author(s): Shihui **WEI**, Junqing **WANG**, Shuo **ZHAO**

Purpose: To analyze the clinical features and long-term prognosis in Chinese patients with optic neuritis (ON) based on their aquaporin-4 antibody (AQP4-Ab) status and age, evaluate the risk factors, and associate them with clinical outcomes.

Methods: This was a retrospective analysis of medical records with 5-year follow-up in a cohort of Chinese ON patients according to AQP4-Ab status and age between early onset (18–44 years) and late onset (≥ 45 years) from January 2009 to December 2010.

Results: We identified 128 ON patients of whom 85 (66.4%) were female. AQP4-Ab occurred in 45 (35.2%) patients, with greater frequency in the female, bilateral, and recurrent ON groups (48.2%, 42.5%, and 53.6%, respectively). Seropositive AQP4-Ab ON patients had worse visual recovery compared to seronegative patients ($P = 0.033$). At 5-year follow-up, the ON recurrence rate was higher in seropositive AQP4-Ab patients (37/45, 82.3%) than in seronegative AQP4-Ab patients (35/83, 42.2%, $P < 0.001$). Among seropositive patients, 40% (18/45) developed neuromyelitis optica (NMO) compared to only 1.2% (1/83) of seronegative patients. Ocular pain and recurrence within 1 year were prognostic factors for transverse myelitis (TM) episode. Older patients had worse visual outcome after the first episode of ON compared to younger patients ($P = 0.007$).



Conclusions: This study confirms the higher frequency of AQP4-Ab and conversion rate of NMO in Chinese ON patients. We found 2 prognostic factors of TM episode: ocular pain and recurrence within 1 year in AQP4-Ab seropositive ON patients.

14:30 - 16:00

Venue: 301

Quantification of Myelin Density in Human Visual Cortex

First Author: Aditya **HERNOWO**

Purpose: To quantify the myelin density of the primary (V1) and extra-primary (V2, V3V, V4, and V5) visual cortices, as well as of the overall brain grey matter.

Methods: T1- and T2-weighted brain images were acquired and processed to obtain the brain myelin-enhanced (BRmy) images. The grey matter volumetric image (GM) was segmented from the T1 and was applied to the BRmy to obtain the myelin-enhanced grey matter volumetric image (GMmy). The grey matter myelin density (pmy) was defined as the ratio between GMmy and GM, the range of which is 0–1. Jülich probabilistic map of the visual cortices was used to extract the pmy (V1pmy, V2pmy, V3Vpmy, V4pmy, and V5pmy).

Results: Fifty healthy subjects (26 males, 24 females; age, 36.06 ± 12.10 years) were included. The pmy was 0.2690 ± 0.0384 , while the V1pmy, V2pmy, V3Vpmy, V4pmy, and V5pmy were 0.0154 ± 0.0024 , 0.0136 ± 0.0021 , 0.0068 ± 0.0011 , 0.0052 ± 0.0010 , and 0.0027 ± 0.0005 , respectively. ANOVA revealed $F = 600.28$ at $P < 0.0001$. Post-hoc test revealed significant difference for all possible combinations of comparison of the myelin density ($P < 0.0001$).

Conclusions: In the visual cortex, V1 and V2 have the highest myelin density, followed by V3V and V4, while the V5 has the least density. Our findings concurred with previous studies mapping higher myelin density on the primary sensory and motoric areas. The density gradation might be inversely correlated with the complexity of the intracortical circuitry.

14:30 - 16:00

Venue: 301

Structural and Functional Changes in Cases of Multiple Sclerosis and Optic Neuritis

First Author: Digvijay **SINGH**

Co-Author(s): Anita **GANGER**, Ganesh **PILLAY**, Rohit **SAXENA**

Purpose: To evaluate visual function and structural changes in cases of multiple sclerosis (MS) and optic neuritis (ON).

Methods: Forty-four cases of MS (24 with and 20 without ON), 29 cases of clinically isolated ON, and 20 age-matched controls were evaluated. Best corrected visual acuity (BCVA), contrast sensitivity, visual evoked responses (VER), optical coherence tomography (OCT) for retinal nerve fiber layer thickness (RNFLT) and ganglion cell layer thickness (GCL), and disease severity score (EDSS) were recorded at baseline and 6 months. Eyes were sub-grouped as affected eyes of MS cases with ON [MS+ON(AE)], fellow eyes of MS cases with ON [MS+ON(FE)], eyes of MS cases without ON [MS], affected eyes of isolated ON [ON(AE)], fellow eyes of isolated ON [ON(FE)], and controls [C].

Results: BCVA in all groups except ON(FE) was significantly worse than controls. Contrast sensitivity was reduced in MS+ON(FE) and ON(FE) ($P < 0.005$). VER amplitude was decreased in all groups ($P < 0.05$) except in MS while VER latency was prolonged in all ($P < 0.05$). RNFLT was reduced in MS+ON(AE), MS+ON(FE), and ON(AE) as compared to controls ($P < 0.05$). GCL was thinned in all groups ($P < 0.05$). RNFL and GCL loss over 6 months was similar for MS+ON(AE), MS+ON(FE), and ON but more than controls ($P < 0.005$). Significant correlation was found between BCVA and GCL thickness in MS and ON(AE). EDSS score was correlated with RNFL and GCL thickness in MS+ON(AE) patients ($P < 0.05$ and 0.005 , respectively).

Conclusions: Visual functional and structural parameters are affected in MS and ON. GCL thickness is a more sensitive structural marker than RNFL in MS and ON and correlates more strongly with visual functions and disease severity.

Ocular Imaging

Mar 2, 2017 (Thu)

11:00 - 12:30

Venue: 301

Optical Coherence Tomography Angiogram in Diabetes and Diabetic Retinopathy

First Author: Daniel **TING**

Purpose: To characterize the retinal microvasculature using optical coherence tomography angiogram (OCT-A) in patients with diabetes and the relationship of angiogram parameters with diabetic retinopathy (DR) and systemic risk factors.

Methods: We conducted a prospective, observational study of type 2 diabetes patients with and without DR ($n = 100$ eyes, 50 patients). We examined the retinal microvasculature with swept source OCT-A using angiography and a semi-automated software to measure the capillary density index (CDI) and fractal dimension (FD) at superficial and deep retinal vascular plexus.



We collected data on patients' glycated hemoglobin (HbA1c), hypertension, hyperlipidemia, smoking history, and renal impairment.

Results: The mean age and HbA1c of the patients were 59.5 ± 8.9 and 7.9 ± 1.7 , respectively; there were 19%, 17%, 21%, 22%, and 21% with no DR, mild nonproliferative DR (NPDR), moderate NPDR, severe NPDR, and proliferative DR, respectively. The mean CDI decreased from 35.8% to 33.8% in the superficial vascular plexus ($P < 0.001$) and from 36.1% to 34.5% in the deep vascular plexus ($P = 0.04$) in patients with no DR to PDR; the FD increased from 1.53 to 1.60 ($P < 0.01$) and 1.55 to 1.61 ($P = 0.02$) at the superficial and deep vascular plexus levels, respectively. For systemic risk factors, hyperlipidemia, smoking, and renal impairment were associated significantly with reduced CDI, while increased HbA1c ($>8\%$) and renal impairment were associated with increased FD.

Conclusions: OCT-A shows significant structural changes in the retinal microvasculature associated with DR severity and systemic risk factors in patients with diabetes. OCT-A is a new noninvasive tool to quantify the retinal capillary microvasculature to study diabetes, its complications, and outcomes.

11:00 - 12:30

Venue: 301

Posterior Eye Shape in Different Refractive Error Groups in Adult Singaporeans

First Author: Pavan **VERKICHARLA**

Co-Author(s): Ching-Yu **CHENG**, Saima **HILAL**, Anthony **KUO**, Shin Bin **LIM**, Seang Mei **SAW**

Purpose: The purpose of this study was to quantify the posterior eye shape using magnetic resonance imaging (MRI) and investigate how it changes in different refractive error groups in Singaporean adults.

Methods: Study subjects were enrolled from the Singapore Epidemiology of Eye Diseases study. Brain MRI T2-images were acquired as part of the Epidemiology of Dementia in Singapore study using a 32-channel head coil. After exclusions, there were 259 adults (113 Malay and 146 Chinese) consisting of 65 myopes [$SE \leq -0.75$ diopters (D)], 70 emmetropes, and 124 hyperopes ($SE \geq +0.75$) with SE ranging from +4.50 D to -10.75 D. Axial slices were created from the 1 mm isotropic volumes. The right eye in the MRI images was automatically segmented and fitted to the sphere to quantify the posterior eye shape in terms of the radius of curvature (Rc).

Results: The mean age of 259 subjects was 65.5 ± 6.5 years and 51% were females. Rc was significantly smaller in myopes compared to emmetropes (mean \pm SD: 9.83 ± 0.6 mm vs 10.58 ± 0.91 mm, $P < 0.001$) and hy-

peropes (9.83 ± 0.5 mm vs 10.63 ± 0.6 mm, $P < 0.001$). Posterior eye shape was not significantly different in hyperopes and emmetropes ($P = 0.69$). In linear regression, there was a tendency for the Rc to decrease with increasing degree of myopia at a rate of 0.13 mm/D ($P = 0.01$).

Conclusions: Steeper retinas were found in myopes than in emmetropes and hyperopes. Differences in the posterior shape of the eye between myopia and the other refractive error groups (with no differences in Rc between hyperopes and emmetropes) suggest a potential role of posterior eye shape in myopia.

11:00 - 12:30

Venue: 301

Simultaneous Wide Field of View Swept-Source OCT of the Anterior and Posterior Human Eye

First Author: Ryan **MCNABB**

Co-Author(s): Joseph **IZATT**, Anthony **KUO**, Robin **VANN**, Christian **VIEHLAND**

Purpose: Posterior eye shape is an important biomarker for eye development and myopia progression. However, posterior eye shape in optical coherence tomography (OCT) is influenced by the optics of the anterior eye, which are not imaged by current retinal OCT systems. We describe the development of a benchtop swept-source OCT (SS-OCT) system with simultaneous wide field of view imaging of both the anterior and posterior segments as well as biometric measurements from this whole eye system.

Methods: We developed our whole eye SS-OCT (200 kHz A scan rate, $\lambda = 1040 \pm 50$ nm) system using custom optics and optomechanics. We utilized a scan protocol resulting in 3D volumes ($2752 \times 800 \times 400$ voxels) that included the anterior and posterior segments simultaneously. Under an IRB approved protocol, we imaged 7 healthy (other than refractive error) volunteers, and 3 had partial coherence interferometry (PCI) for comparison with the OCT axial length measurement.

Results: We acquired volumes with full anterior chamber and 50-degree retinal fields of view on each subject (26-85 years). For subjects where biometry was performed, we measured a mean eye length of 24.00 mm with a mean repeatability of ± 47 μ m. For axial length, the mean difference between OCT and PCI was -68 μ m.

Conclusions: We demonstrated an SS-OCT system capable of imaging the eye with sufficient field of view to visualize the full anterior chamber, macula, optic nerve, and retina to the arcades within a single volume acquisition. Initial biometric measurements compare favorably with dedicated devices, and the influence of the anterior eye may be corrected to obtain true poste-



rior eye shape utilizing only OCT.

11:00 - 12:30

Venue: 301

Transpalpebral Near-Infrared Transillumination Imaging of Ciliary Body and Intraocular Tumors

First Author: Oleg **ZADOROZHNYI**

Co-Author(s): Andriy **KOROL**, Taras **KUSTRYN**, Alla **NEVSKA**, Nataliya **PASYECHNIKOVA**

Purpose: To study the possibilities of transpalpebral near-infrared light-emitting diode (LED) transillumination for anterior intraocular tumor imaging.

Methods: This study was conducted on 35 people (35 eyes) with intraocular tumors of the ciliary body and iris. In all cases a color photo of the anterior eye segment, transpalpebral near-infrared LED transillumination, and ultrasound examination were done. The device for near-infrared transillumination consists of a compact wireless infrared LED probe, monochrome camera able to capture video and images in the near-infrared range, slit lamp adaptor, and a computer with software for viewing and processing the received data. For transpalpebral transillumination we used near-infrared light sources with a wavelength of 940 nm. Examination was performed without local anesthesia.

Results: In all cases structures of the ciliary body were registered by transpalpebral near-infrared LED transillumination. Monochrome images of the ciliary body structures of good diagnostic quality were captured during the infrared transillumination of the eye in all cases. In patients with intraocular tumors transpalpebral near-infrared transillumination made it possible to visualize ciliary body structures and tumor shadows on sclera and to outline their borders. In all cases anteriorly located intraocular tumor shadow was detected and tumor localization in relation to the ciliary body structures was estimated.

Conclusions: Transpalpebral near-infrared LED transillumination provides imaging of the ciliary body and accurately estimates the projection of its structures to the sclera. Transpalpebral near-infrared transillumination helps to visualize intraocular tumors and determine their projection to the sclera and can be used for diagnostic purposes and during destruction of the tumor.

Ocular Oncology & Pathology

Mar 4, 2017 (Sat)

11:00 - 12:30

Venue: 310

A Case of Acute Exudative Paraneoplastic Polymorphous Vitelliform Maculopathy

First Author: Haruka **SEKIRYU**

Purpose: To present a patient with acute exudative paraneoplastic polymorphous vitelliform maculopathy (AEPPVM) secondary to genital melanoma.

Methods: Case report.

Results: A 37-year-old female with spondyloepiphyseal dysplasia congenita who had multiple systemic metastases secondary to genital melanoma diagnosed 2 years previously complained of central scotoma in the right eye (OD). She had failed surgical treatment and systemic chemotherapies for genital melanoma 3 years prior and was receiving dendritic cell immunotherapy. On examination, visual acuity was 20/20 OD and 20/16 in the left eye (OS). Ophthalmoscopy disclosed shallow multifocal serous retinal detachments with yellow-white subretinal deposits in the central macular area bilaterally. Optical coherence tomography (OCT) did not show choroidal thickening. Four months later the subretinal debris increased and fundus autofluorescence (FAF) demonstrated hyperfluorescence corresponding to subretinal deposits. Fluorescein angiography (FA) did not show dye leakage from the retinal vessels. Searching for anti-retinal autoantibodies to cause paraneoplastic syndrome, several autoantibodies for plural proteins including enolase to establish a diagnosis of AEPPVM were positive. Systemic steroid pulse therapy was performed. Subretinal fluid was slowly resorbed for 6 months. She died of lung metastasis 24 months after the onset of AEPPVM.

Conclusions: AEPPVM is a rare paraneoplastic retinopathy found in patients with metastatic melanoma or carcinoma. The most salient feature is reduced visual acuity from multifocal shallow retinal detachments. Enolase has been reported as being associated with AEPPVM. Multimodal retinal imaging in conjunction with detection of autoantibodies is necessary to establish the diagnosis of AEPPVM.



11:00 - 12:30

Venue: 310

Efficacy and Safety of Interferon α -2B in Treatment of Ocular Surface Squamous Neoplasia

First Author: Zahid **KAMAL**Co-Author(s): Muhammad **MOIN**

Purpose: To study the efficacy and safety of interferon (IFN) α -2B to treat ocular surface squamous neoplasia (OSSN) in the Pakistani population.

Methods: This was a multi-centred, prospective, non-comparative, interventional study conducted at tertiary care centers. Convenience purposive sampling was done. The period of study was between October 2010 and March 2016 (5.5 years). Both primary and recurrent cases were included. The cases with invasive and intra-epithelial neoplasia (CIN) were included. Only those cases who completed at least 6 months of follow-up were included.

Results: We included 88 eyes of 85 patients. Female-to-male ratio was 1:2.26. The median age was 52 years. Minimum follow-up was 6 months and median follow-up was 12 months (range, 6-60 months). There was a reduction in size of the lesion in 10 eyes where the IFN treatment was started 4-6 weeks before surgery. The histological examination showed carcinoma in situ (CIS) in 83.33% of the eyes, while others had moderately differentiated OSSN. The success rate of treatment was 91%. The mean period of resolution of lesions was 3 months. The median period of recurrence (9% of eyes) was 10 months. Different factors promoting recurrence were male gender (6), poor compliance to treatment (7), large lesion (2), and bilaterality (1). There were no systemic adverse effects of the therapy. Minor local complications encountered were filamentary keratitis (10), conjunctival hyperemia (5), pyogenic granuloma (4), and persistent corneal neovessels (2).

Conclusions: IFN α -2B is a safe and effective therapy for ocular surface squamous neoplasia. Long-term follow-up is indicated as there may be recurrence after several months.

11:00 - 12:30

Venue: 310

Intra-Arterial Chemotherapy for Retinoblastoma in Thailand: Seven-Year Experience

First Author: Rawi **BOONYAOPAS**Co-Author(s): Suradej **HONGENG**, Pawipon **NISARAT**, Duangnate **ROJANAPORN**, Sirintara **SINGHARA NA AYUDYA**, Tharikarn **SUJIRAKUL**

Purpose: To report the efficacy and safety of intra-arte-

rial chemotherapy (IAC) for intraocular retinoblastoma in Thailand.

Methods: Retrospective case series of 18 eyes from 17 retinoblastoma patients who received IAC from October 2009 to June 2016. IAC using melphalan and/or carboplatin and/or topotecan were given by direct cannulation into the ophthalmic artery (superselective IAC) or balloon occlusion of the internal carotid artery (selective IAC).

Results: Of 18 eyes, 22% (n = 4) had IAC as a primary treatment and 78% (n = 14) had IAC as a secondary treatment. The eyes were classified as International Classification of Retinoblastoma group B (n = 2, 11%), group C (n = 2, 11%), group D (n = 6, 33%), and group E (n = 8, 44%). IAC was successfully performed in all eyes. The mean number of IAC sessions in each eye was 3 sessions (range, 1-7). Additional treatment included systemic chemotherapy, intravitreal chemotherapy, and Ru-106 plaque brachytherapy. At the mean follow-up time of 40 months (range, 2-85), overall globe salvage rate was 39%, which was 100% in group B, 50% in group C, 67% in group D, and 0% in group E. Complications were facial skin hyperemia (24%), transient ophthalmic artery spasm (18%), transient carotid spasm (12%), intraretinal artery precipitation (6%), and transient ischemic attack with complete recovery (6%). The survival rate was 94% with 1 patient deceased from brain metastasis.

Conclusions: Intra-arterial chemotherapy is an alternative treatment modality for intraocular retinoblastoma, which can be used cautiously as primary or secondary treatment in various stages of intraocular retinoblastoma. More data and long-term follow-up is required.

11:00 - 12:30

Venue: 310

Isopropyl Alcohol-Based Excision Biopsy of Ocular Surface Squamous Neoplasia and Closing the Big Conjunctival Defect with a Small Autograft by a "Step Ladder Pattern" Securing and Suturing Technique

First Author: Anjum **MAZHARI**Co-Author(s): Purnendujee **CHAKARPANI**, Puneet **MAHAJAN**, Md **RAJA**, Ruchi **SHUKLA**

Purpose: To assess the safety and clinical outcomes in patients who underwent excision biopsies of ocular surface squamous neoplasia (OSSN) where the resultant large conjunctival defects were closed with small autograft by our innovative "step ladder pattern" securing and suturing technique.

Methods: Ten eyes with diffuse OSSN extending over 5 or more limbal clock hours or by extensive corneal spread were treated with isopropyl alcohol-based exci-



sion and cryotherapy. Closing big conjunctival defects was done with small (5-6 mm) autografts. The defects were pulled in a step ladder pattern to avoid restriction of eyeball movements postoperatively and secured with the autograft by 8-0 vicryl/10-0 nylon sutures. Two interrupted cycles of 0.04 % mitomycin C eyedrops were given. These cases were assessed for safety and efficacy of the procedure for 3 years during follow-up.

Results: The mean age at presentation of OSSN was 42 years. There were no recurrences of OSSN and its complications during the 3 years of follow-up, and there were no restrictions to eye movements in different gazes.

Conclusions: Diffuse OSSN is sometimes recalcitrant to initial treatment with chemotherapy alone and recurrences are also common. Combined excision biopsy and cycles of chemotherapy appears to be a safe approach for diffuse OSSN. Isopropyl alcohol-based excision helps in separation. The resultant big conjunctival defects can be closed effectively with a small autograft by “step ladder pattern” pulling of conjunctival margins and securing it with the autograft. AMG is the first choice for closing big conjunctival gaps, but in cases of limited resources, our technique is quite effective.

11:00 - 12:30

Venue: 310

Routine Fundus Screening of Parents and Siblings of Patients with Retinoblastoma: A Study of 100 Consecutive Families

First Author: Shweta **GUPTA**

Co-Author(s): Swathi **KALIKI**

Purpose: To discuss the importance of routine ophthalmic examination of parents and siblings of diagnosed retinoblastoma patients.

Methods: A prospective study of parents and siblings of 100 consecutive newly diagnosed patients of retinoblastoma.

Results: Routine ophthalmic examination of families (parents and siblings) of 100 consecutive newly diagnosed retinoblastoma cases, including 172 parents and 23 siblings, revealed spontaneously regressed retinoblastoma in at least 1 parent of 13 (13%) patients and active retinoblastoma in at least 1 sibling of 4 (4%) patients. Of the 13 parents with spontaneously regressed retinoblastoma, presentation was unilateral (n = 10; 77%) or bilateral (n = 3; 23%). The regression patterns were type 1 regression (n = 3; 19%), type 2 (n = 3; 19%), type 3 (n = 6; 38%), and spontaneous phthisis bulbi (n = 4; 25%). Sibling screening revealed active retinoblastoma in at least 1 sibling of 4 patients. Of these 4 siblings, 2 (50%) had unilateral and 2 (50%) had bilateral disease. At least 1 parent of all these 4

patients had spontaneously regressed retinoblastoma. The details of the 13 patients with affected parent and/or sibling included mean age at presentation of 34 months, unilateral disease (n = 4; 31%), bilateral disease (n = 9; 69%), ICIOR group A (n = 2; 15%), group B (n = 4; 31%), group C (n = 5; 39%), and international staging of retinoblastoma stage 3A (n = 2; 16%).

Conclusions: Routine ophthalmic examination is helpful in early detection of retinoblastoma in siblings. Detection of spontaneously regressed retinoblastoma in parents would be helpful in genetic counselling and to predict the inheritance patterns of retinoblastoma in genetic testing.

Ophthalmic Education

Mar 5, 2017 (Sun)

11:00 - 12:30

Venue: 301

Use of an Augmented Reality Simulator for Teaching Binocular Indirect Ophthalmoscopy to Novice Ophthalmology Residents

First Author: Wai-Ching **LAM**

Purpose: Teaching binocular indirect ophthalmoscopy (BIO) is an important skill for new ophthalmology residents to acquire, and it is difficult, time consuming, and often frustrating. We aim to compare the traditional teaching approach of BIO to the EyeSI augmented reality (AR) BIO simulator.

Methods: Residents were recruited at the Toronto Ophthalmology Residents Introductory Course (TORIC). Fifteen were randomized to conventional teaching (Group 1) and 13 to augmented reality simulator training (Group 2). Three vitreoretinal fellows were enrolled to serve as experts. Group 1 residents received traditional BIO didactic teaching and practice, then completed an evaluation. After that, Group 1 residents continued to complete the computer module training and did a second evaluation. Group 2 residents immediately started training on the AR simulator, then completed an evaluation. Three vitreoretinal fellows also completed the evaluation to serve as experts. Evaluations were completed on the simulator, and outcome measures were total raw score, total time elapsed, and performance.

Results: Following conventional training, Group 1 residents were outperformed by vitreoretinal fellows with respect to all 3 outcome measures. Following AR training, Group 2 residents demonstrated superior total scores and performance compared to Group 1 residents. Once the Group 1 residents also completed the AR BIO training, there was a significant improvement compared to their baseline scores, which were then on

par with Group 2 residents.

Conclusions: This study provides construct validity for the EyeSI AR BIO simulator and demonstrates that it may be superior to conventional BIO teaching for novice ophthalmology residents.

Ophthalmic Epidemiology

Mar 3, 2017 (Fri)

09:00 - 10:30

Venue: 301

6-Year Incidence of and Predictors for Cataract Surgery in Malay and Indian Populations from Singapore

First Author: Ava Grace TAN

Co-Author(s): Ching-Yu CHENG, Robert CUMMING, Paul MITCHELL, Jie Jin WANG, Tien WONG

Purpose: Epidemiology of cataract surgery is well documented in Western countries, but there are limited data in Asian populations. We report the 6-year incidence of cataract surgery in 2 Asian cohorts of Malays and Indians living in Singapore, as well as predictors of the need for cataract surgery.

Methods: From 2004-2009, 3280 Malays and 3400 Indians aged 40 years or older participated in the Singapore Malay and Indian Eye Studies. Six years later, 1901 (72.1% of eligible) Malays and 2200 (75.5% of eligible) Indians were re-examined. Detailed examinations, including slit-lamp biomicroscopy, were conducted at both visits. Logistic regression models were used to determine factors associated with cataract surgery after adjusting for age, sex, smoking status, hypertension, diabetes, education, occupation, socioeconomic status, and myopia.

Results: For the 2 cohorts combined, the 6-year incidence of cataract surgery was 10.4%, and it was strongly age-related (P for trend < 0.0001). After adjustment, factors associated with increased risk of cataract surgery include older age [odds ratio (OR), 1.11; 95% confidence interval (CI), 1.09-1.13], diabetes (OR, 2.14; 95% CI, 1.66-2.74), and myopia (OR, 2.30; 95% CI, 1.78-2.97). Among participants with incident cataract surgery, those with diabetes were significantly younger than those without in Malays (mean age, 69.4 vs 73.1 years; $P = 0.0066$) and those with myopia were significantly younger than those without in both Malays and Indians (mean age, 68.8 vs 70.9 years; $P = 0.0187$).

Conclusions: One in 10 Asian Malays and Indians aged 40 or older had cataract surgery over 6 years. Apart from age, diabetes and myopia are significant predictors of the need for cataract surgery.

09:00 - 10:30

Venue: 301

Adherence to Diabetic Eye Examination Guidelines in Australia: The National Eye Health Survey

First Author: Mohamed DIRANI

Co-Author(s): Joshua FOREMAN, Stuart KEEL, Hugh TAYLOR, Peter VAN WIJNGAARDEN

Purpose: To determine the adherence to diabetic eye examination guidelines in indigenous and non-indigenous Australians.

Methods: The National Eye Health Survey (NEHS) is a population-based cross-sectional study that examined 3098 non-indigenous Australians (aged 50-98 years) and 1738 indigenous Australians (aged 40-92 years) living in 30 randomly selected sites, stratified by remoteness. Details of the utilization of eye care services and history of diabetes, including age at diagnosis, were obtained using an interviewer administered questionnaire. National Health and Medical Research Council (NHMRC) diabetic eye examination guidelines were used to determine adherence.

Results: The age- and sampling-adjusted prevalence of self-reported diabetes for non-indigenous and indigenous Australians was 13.3% and 42.6%, respectively ($P < 0.001$). Non-indigenous Australians had a significantly higher adherence to screening recommendations (biennial screening) than indigenous Australians (annual screening) (77.5% vs 52.7%, $P < 0.001$). Factors associated with greater adherence were duration of diabetes in non-indigenous Australians [odds ratio (OR), 1.19 per 5 years; $P = 0.018$] and male gender (OR, 1.46; $P = 0.018$) and residing in inner regional geographic areas (OR, 1.66; $P = 0.007$) in indigenous Australians (OR, 0.44; $P = 0.018$).

Conclusions: More than three quarters of non-indigenous Australians and half of indigenous Australians with known diabetes adhere to the NHMRC examination guidelines. The discrepancy between adherence rates in indigenous and non-indigenous communities may point to a gap in the provision or uptake of screening services in indigenous communities or a lack of awareness of the recommendation for annual, as opposed to biennial, screening for indigenous Australians with diabetes.



09:00 - 10:30

Venue: 301

An Ecologic Study of Trends in the Prevalence of Myopia in Chinese Adults in Singapore Over the Past Few Decades

First Author: Sonoko **SENSAKI**

Co-Author(s): Audrey **CHIA**, Charumathi **SABANAYAG-AM**, Seang Mei **SAW**, Pavan **VERKICHARLA**

Purpose: To investigate secular trends in the prevalence of myopia over 6 decades (from the 1920s to 1980s) in Chinese adults in Singapore.

Methods: Parental myopia prevalence was estimated using a parent-completed questionnaire in pediatric cohorts that included 1) the Singapore Cohort of Risk Factors for Myopia (SCORM), 2) the Strabismus, Amblyopia, and Refractive Error in Singaporean Children (STARS), and 3) the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) participants. Published estimates for myopia prevalence from 4 adult studies in Singapore were reviewed. Secular trends in the prevalence of myopia were correlated with changes in the education system.

Results: The prevalence of parental myopia in SCORM (n = 2943), STARS (n = 4938), and GUSTO (n = 1072) was 47.8%, 53.4%, and 73.4%; corresponding calendar years these parents might have started schooling were 1966, 1973, and 1983 (born in 1960, 1967, and 1977), respectively. Mean age of the parents was 41.3, 40.1, and 33.4 years, respectively. Prevalence of myopia in adult studies in persons who started elementary school in 1928, 1938, 1942, 1948, 1952, 1958, 1962, 1972, 1982, and 1995 were 36.4%, 30.0%, 33.0%, 26.4%, 32.5%, 48.7%, 39.4%, 52.0%, 82.2%, and 85.9%, respectively.

Conclusions: During the past few decades, the prevalence of myopia increased rapidly, especially in persons who started elementary school after 1980 (born after 1970). The education system was expanded after Singapore's independence in 1965, and the New Education System was introduced in 1978. These changes, together with increasing intensive schooling, may have contributed to the increase in myopia prevalence.

09:00 - 10:30

Venue: 301

Analysis of Changes in Characteristics of Severe Retinopathy of Prematurity Patients After Screening Guidelines Were Issued in China

First Author: Jing **FENG**

Co-Author(s): Yi **CHEN**, Xiaoxin **LI**

Purpose: To describe changes in the characteristics of

infants treated for severe retinopathy of prematurity (ROP) in China after screening guidelines were issued in 2004 and to evaluate the effectiveness of the current criteria.

Methods: Information on consecutive infants referred to a single eye department for treatment of stage 3 (type 1 prethreshold and threshold disease), stage 4, and stage 5 ROP between January 2001 and May 2012 was retrieved from medical records.

Results: The mean gestational age (GA) was 29.98 ± 2.13 weeks (range, 26–34 weeks), and the mean birth weight (BW) was 1414.32 ± 343.18 g (range, 742–2087 g). The proportion of infants with stage 4 and stage 5 ROP decreased statistically significantly over time ($P = 0.026$ and $P < 0.001$, respectively) after screening guidelines for ROP were issued in 2004. The median postmenstrual age when patients first visited our hospital was 48.32 weeks (range, 30–602 weeks); later presentation was significantly associated with more advanced ROP ($P < 0.001$). In addition, the postmenstrual age of first presentation showed a significant decrease over time ($P < 0.001$) after the screening guidelines were issued. The current Chinese screening guidelines cover 99.63% of infants, while 9.07% of infants exceeded the UK screening criteria and 35.77% of infants exceeded the US criteria.

Conclusions: Big infants got severe ROP as before. However, the awareness of ROP increased, the proportion of infants with retinal detachment caused by ROP decreased, and the infants received more timely treatment. The current ROP screening criteria are very effective.

09:00 - 10:30

Venue: 301

Association Between Visual Status and Mental Health Status in Thai Elderly: A Community-Based Study

First Author: Nopphawan **URAMPORN**

Co-Author(s): Nuchanad **HOUNNAKLANG**, Pear **PONG-SACHAREONNONT**

Purpose: The main objective was to assess the association of visual impairment (VI) with mental health and social engagement in Thai elderly. The secondary objective was to identify sociodemographic characteristics associated with VI.

Methods: This cross-sectional study was conducted using the database from a community survey in Saraburi Province, Thailand in November 2015. A total of 327 participants aged 50 or older were enrolled. VI was assessed using presenting distance visual acuity. Mental health and social engagement were evaluated by face-to-face interviews with validated questionnaires.



Prevalence of VI was analyzed. Sociodemographic and behavioral factors related to VI were identified. The impact of VI on mental health and social engagement was determined by multivariate regression analysis.

Results: Prevalence of VI among participants (mean age, 72.32 years) was 18.3%. In crude analysis, older age; unemployment; being widowed, divorced, or separated; current smoking; and disability in ADL were associated with VI compared with the control group ($P < 0.05$). Having an eye screening at least once a year ($P = 0.029$) and being obese ($P = 0.005$) had protective effects against VI. VI was significantly associated with low social engagement [adjusted odds ratio (OR), 4.131; confidence interval (CI), 1.47-11.59] but not associated with poor mental health (adjusted OR, 1.68; CI, 0.72-3.91).

Conclusions: Visually impaired elderly had less participation in social activities. No significant association was found between VI and poor mental health. Having an eye examination at least once a year may prevent VI in elderly. Special concern in employment and anti-smoking campaigns should be emphasized for elderly with VI.

09:00 - 10:30

Venue: 301

Epidemiology and Visual Outcome of Ocular Trauma and Visual Prognostic Value of Ocular Trauma Score

First Author: Laxman Singh **JHALA**

Purpose: To evaluate the causes, epidemiology, and visual outcome of ocular trauma and to investigate the visual prognostic value of the ocular trauma score (OTS).

Methods: An observational study was conducted on 281 cases of ocular trauma from July 2014 to September 2015. All patients were examined according to the standardized protocol and data was recorded as per study proforma developed for the purpose. Relevant investigations were done as necessary. Ocular trauma score was used to predict the final visual outcome.

Results: A total of 214 (76.2%) were males and the commonest age group affected was 21-30 years. Bilateral involvement was seen in 2.8%. Ninety-one cases (32.4%) presented within 12 hours of injury. Commonest source of injury was wooden stick affecting 36 cases (12.3%). Among mechanical injuries, closed globe injuries were more common (70.5%) than open globe injuries (22.1%). Most common type of injury was superficial corneal foreign body (19.9%). Presenting visual acuity better than 6/12 was noted in 47%, whereas no perception of light was seen in 3.9%. Best corrected visual acuity (BCVA) $> 6/12$ was achieved in

72.8% at 3 months. Among open globe injuries, penetrating injuries showed the best visual prognosis ($P = 0.000$). Injuries leading to globe rupture showed very poor prognosis ($P = 0.000$). Most cases were managed conservatively with medical treatment (48%). The likelihood of the final visual acuities in all OTS categories in our study group were similar to those in the OTS study group.

Conclusions: Early recognition of severity, adequate evaluation, and appropriate management can lead to a better visual outcome in cases of ocular trauma.

09:00 - 10:30

Venue: 301

Impact of Diabetic Retinopathy on Vision-Related Quality of Life in a Chinese Singaporean Population

First Author: Eva **FENWICK**

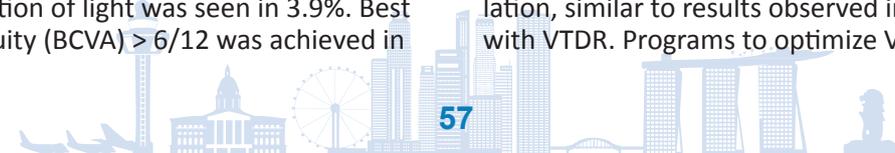
Co-Author(s): Ching-Yu **CHENG**, Ecosse **LAMOUREUX**, Ryan **MAN**, Tien **WONG**

Purpose: To assess the impact of diabetic retinopathy (DR) on vision-related quality of life (VRQoL) in a Chinese population and to compare the findings with a Malay population.

Methods: We included 292 adults with diabetes from the Singapore Chinese Eye Study ($N = 3353$; 2009-2011). DR was categorized using the better eye as mild-moderate DR and vision-threatening DR (VTDR; severe non-proliferative DR; proliferative DR; and clinically significant macular edema). VRQoL was measured using the Reading, Mobility, and Emotional scales of the Impact of Vision Impairment questionnaire. The relationship between DR and VRQoL was assessed using multiple linear regression, adjusting for traditional covariates.

Results: Of the 292 individuals (66% aged 50-69; 56% male), 91 (31%), 41 (14%), and 27 (9%) had any DR, mild-moderate DR, and VTDR, respectively. In adjusted models, any DR and VTDR were independently associated with 7% and 11% reductions in reading ($\beta = -0.46$; 95% confidence interval [CI], -0.87 to -0.04 and $\beta = -0.65$; 95% CI, -1.31 to -0.06 , respectively); 7% and 16% reductions in emotional ($\beta = -0.50$; 95% CI, -0.96 to -0.23 and $\beta = -1.14$; 95% CI, -1.86 to -0.42 , respectively). Associations between DR and mobility were not statistically significant. Correspondingly, Malays with VTDR had an 11% reduction in vision-specific functioning ($\beta = -0.37$; 95% CI, -0.66 to -0.08) measured using the VF-11.

Conclusions: VTDR was associated with restrictions in reading and emotional well-being in this Chinese population, similar to results observed in a Malay population with VTDR. Programs to optimize VRQoL for people liv-



ing with late-stage DR and coordinated eye screenings to prevent DR and slow progression are warranted.

09:00 - 10:30

Venue: 301

Incidence and Risk Factors of Symptomatic Dry Eye Disease in Malays from the Singapore Malay Eye Study

First Author: Ryan **MAN**

Co-Author(s): Ching-Yu **CHENG**, Eva **FENWICK**, Ecosse **LAMOUREUX**, Louis **TONG**

Purpose: To evaluate the incidence of symptomatic dry eye disease (SDED) and associated risk factors in a well-characterized cohort of ethnic Malays in Singapore.

Methods: We included 1682 participants [mean age (SD), 56.9 (10.0) years; 55.4% female] without SDED at the baseline visit (2004-2006) and who were re-examined at the second visit (2010-2013) as part of the Singapore Malay Eye Study (SiMES), a population-based longitudinal study. SDED was considered present if a participant answered "often" or "all the time" to any of the 6 questions from a valid dry eye questionnaire. Age-standardized incidence of SDED was calculated as the crude 6-year cumulative incidence standardized to Singapore's population census. Gender-stratified multivariable log-binomial regression models were utilized to determine the independent risk factors of incident SDED.

Results: Over 6 years, 86 of 1682 participants developed SDED, which was equivalent to an age-standardized 6-year incidence of 5.1% [95% confidence interval (CI), 4.1-6.4%], with similar incidence between men and women ($P = 0.9$). Multivariable models revealed that glaucoma and poorer self-rated health were independently associated with incident SDED in men ($P = 0.003$ and 0.03 , respectively), while contact lens wear ($P = 0.002$), history of thyroid disease ($P = 0.03$), and having had cataract surgery ($P = 0.02$) were predictive of incident SDED in women.

Conclusions: One in 20 adult Malays developed SDED over a 6-year period. Future studies should explore why risk factors for SDED differ for men and women, and public health interventions to prevent SDED should take these gender differences into account.

09:00 - 10:30

Venue: 301

Overview of Ocular Injury in Southern Bangladesh: A Hospital-Based Study of 406 Cases

First Author: Md Shafiqul **ISLAM**

Purpose: To find out the magnitude, pattern, extent, severity, and causes of ocular injury as well as the impact on vision in a tertiary hospital in the southern part of Bangladesh.

Methods: This cross-sectional study was done at the eye department of Sher-E-Bangla Medical College Hospital, Barisal over a period of 2 years. All patients admitted with eye injury through the outpatient or emergency routes were included in the study. They were examined to note the areas injured, type and extent of injury, and impact on vision.

Results: Ocular injuries were 18.5% of total admitted patients and 16.3% of all operative cases. Out of a total 406 cases, 74.3% were male and 25.6% were female. The average age was 26.3 years. Pediatric eye trauma constituted 29.8% of total cases, which mostly occurred while playing. A total of 71.4% of cases arrived to our center within 24 hours and 28.5% presented after 24 hours. The majority of the cases comprised monocular trauma: 93.8%. Blunt injuries constituted about 59.1%, while 19.7% had sharp injuries. Open globe injuries were 23.8%. More than one third of the patients had visual acuity worse than 3/60 at presentation and 5.4% cases had no perception of light (NPL).

Conclusions: Ocular injuries are a significant cause of morbidity in terms of visual loss or impairment and diminished quality of life. A preventive and educational strategy among the population is necessary to reduce the eye injury burden.

09:00 - 10:30

Venue: 301

Prevalence and Risk Factors for Choroidal Nevi: The Singapore Epidemiology of Eye Disease Study

First Author: Si Rui **NG**

Co-Author(s): Ching-Yu **CHENG**, Ning **CHEUNG**, Tien **WONG**, Wanting **ZHAO**

Purpose: To examine prevalence and risk factors of choroidal nevi in a large, contemporary, multi-ethnic Asian population.

Methods: Combined analysis of 3 population-based studies of eye diseases, with a total of 9799 Chinese, Malays, and Indians residing in Singapore. A comprehensive ophthalmic examination, interviews, and labo-



ratory blood tests were performed to assess potential risk factors. Digital retinal photographs were used to assess for choroidal nevi.

Results: The age- and ethnicity-standardized prevalence of choroidal nevus was overall 2.1%, 2.5% in males, and 1.4% in females. Prevalence was highest among Chinese (2.4%), compared to Indians (2.2%) or Malays (1.7%). In multivariate analysis, significant factors associated with choroidal nevi were male gender [odds ratio (OR) 1.82, confidence interval (CI) 1.34–2.48], cataract (OR 0.49, CI 0.32–0.75), and Chinese ethnicity (OR 1.57 compared to Malays, CI 1.09–2.25).

Conclusions: Choroidal nevus is not uncommon among Asians and is most frequently seen in Chinese. Males were more likely to have nevus than females.

09:00 - 10:30

Venue: 301

Prevalence and Risk Factors of Diabetic Retinopathy Among Diabetic Patients Attending Different Tertiary Level Hospitals in Bangladesh

First Author: Dipak **NAG**

Co-Author(s): Ava **HOSSAIN**, Enayet **HUSSAIN**, Aliya **NAHEED**, Rinku **PAUL**, Pankaj **ROY**

Purpose: To assess the burden and risk factors of diabetic retinopathy (DR) among diabetes mellitus (DM) patients who attended tertiary level hospitals in Bangladesh.

Methods: A cross-sectional survey for prevalence of DR and a case-control study for risk factors were carried out on 450 diabetic patients aged ≥ 18 years who attended the outpatient department (OPD) at 3 tertiary level hospitals. All patients underwent Optomed hand-held M5 EY3 non-mydratic fundus photography. Data on socio-demographic, behavioral, clinical, and metabolic factors were recorded.

Results: Mean age of the sample was 49.36 (SD \pm 11) years. The number of females was higher ($n = 268$, 58%). Mean duration of DM was 6 (SD \pm 6) years. Sixty-nine percent had good vision ($\geq 6/18$) and only 14% had eye-related complaints. DR was present in 28% of patients [mild to moderate nonproliferative DR (NPDR), 93%; severe NPDR, 2%; PDR, 5%]. In bivariate analysis, middle-class people [odds ratio (OR), 2.40; 95% confidence interval (CI), 1.23-4.70], duration of DM ≥ 5 years (OR, 2.89; 95% CI, 1.87-4.87), having neuropathy (OR, 2.40; 95% CI, 1.27-4.56), HbA1C $\geq 6.5\%$ (OR, 1.85; 95% CI, 1.05-3.25), total cholesterol ≥ 200 mg (OR, 2.37; 95% CI, 1.23-4.56), and LDL ≥ 160 mg (OR, 2.03; 95% CI, 1.18-3.47) were found to be significant risk factors. After taking these into account in the logistic regression model, it was observed that the odds of having DR

in middle-class people (OR, 3.43; 95% CI, 1.62-7.3; $P = 0.001$) and duration of DM ≥ 5 years (OR, 3.21; 95% CI, 1.91-5.43; $P = 0.00$) remained statistically significant.

Conclusions: The burden of DR has been found substantial in Bangladeshi hospitals. Routine eye screening in tertiary level hospitals among diabetic patients can facilitate early detection of DR.

09:00 - 10:30

Venue: 301

Prevalence and Risk Factors of Diabetic Retinopathy and Its Impact on Vision in the Indonesian Population: The Jogjakarta Eye Diabetic Study in the Community

First Author: Muhammad **SASONGKO**

Co-Author(s): Angela **AGNI**, Supanji **SUPANJI**, Firman **WARDHANA**, Tri Wahyu **WIDAYANTI**

Purpose: To report the prevalence and risk factors of diabetic retinopathy (DR) and its impact on vision in the Indonesian population with type 2 diabetes.

Methods: A population-based cross-sectional study. We recruited 1184 people aged older than 30 years with confirmed type 2 diabetes residing in Jogjakarta, Indonesia. Multistage, clustered random sampling based on regencies and districts in Jogjakarta was used. Detailed interviews and general and eye examinations were performed. Disc and macula-centered retinal photographs were taken to assess DR. DR was categorized into mild, moderate, and severe non-proliferative diabetic retinopathy (NPDR); diabetic macular edema (DME); and the combined endpoint of vision-threatening DR (VTDR). Blindness was defined as presenting visual acuity $< 20/400$ in the better eye.

Results: Of 1138 participants with gradable images, the prevalence of any DR was 43.1% (95% confidence interval [CI], 39.6–46.6). The prevalence of mild and moderate NPDR and VTDR were 9.41% (95% CI, 7.35–11.4), 7.46% (95% CI, 5.59–9.33), and 26.3% (95% CI, 23.1–29.5), respectively. Longer duration of diabetes, higher fasting glucose level, presence of hypertension, and foot ulcers/gangrene were significantly associated with the presence of DR and VTDR. The prevalence of blindness was 12.4 and 20.7 in persons with DR and VTDR, respectively.

Conclusions: We report a high prevalence of any DR and VTDR among Indonesian adults with type 2 diabetes. Our data show that approximately 1 in 4 adults with type 2 diabetes are potentially blind, suggesting the need for appropriate screening and management of DR among the Indonesian population.



09:00 - 10:30

Venue: 301

Prevalence and Risk Factors of Retinal Arteriolar Emboli in a Multi-Ethnic Asian Population

First Author: Kelvin **TEO**

Co-Author(s): Ching-Yu **CHENG**, Ning **CHEUNG**, Shu Pei **TAN**, Tien **WONG**

Purpose: To describe the prevalence and risk factors of retinal arteriolar emboli (RAE) in a large, multi-ethnic Asian population.

Methods: A total of 9799 Chinese, Malays, and Indians residing in Singapore who were participants in the Singapore Epidemiology of Eye Diseases (SEED) Study underwent comprehensive ophthalmic examination and digital retinal photographs. These digital retinal photographs were used to assess RAE according to a standardized protocol. Systemic risk factors, especially those related to cardiovascular disease, were correlated to presence of RAE.

Results: The overall prevalence of retinal arteriolar emboli in the SEED study was 0.75% (confidence interval, 0.60 to 0.95). The age-standardized prevalence rates of retinal emboli were 0.73% among Chinese, 0.44% among Malays, and 0.98% among Indians ($P = 0.03$). In multivariate analysis, retinal emboli were significantly associated with Indian ethnicity, glomerular filtration rate, and history of stroke.

Conclusions: Among the 3 major Asian ethnic populations examined in this study, retinal arteriolar emboli were most commonly seen in Indians and associated with renal function and history of stroke.

09:00 - 10:30

Venue: 301

Profile of Optic Disc Hemorrhage: A Prospective Case Series

First Author: Aanal **SHAH**

Purpose: This prospective study aimed to evaluate the profile of disc hemorrhages including causes, presentation, regression pattern, and outcome.

Methods: All patients with optic disc hemorrhages who presented at our hospital from January 2016 to July 2016 were included. Detailed history, ocular and systemic examination, fundus examination, fundus fluorescein angiography, perimetry, gonioscopy, and so on were carried out. Cause-specific medical and/or surgical treatments were given. Patients were called for follow-up at the end of 1 week, 2 weeks, and 6 weeks. The results were noted in a stipulated format and analysis was done.

Results: Disc hemorrhages were found in 71 eyes of 69 patients (2 bilateral). A total of 51% of patients had primary open angle glaucoma (including normal tension glaucoma), 3% had ocular hypertension, 18% had associated diabetic retinopathy, and other causes were rare. A total of 54% of patients had normal intraocular pressure (IOP). Seventy-three percent of patients had single disc hemorrhage out of which 24% were at the 7 o'clock temporal position. Eighteen percent of single disc hemorrhages resolved in 2 weeks of treatment and 56% resolved at the end of 6 weeks of treatment. Seventy-five percent of multiple disc hemorrhages were not resolved at the end of 6 weeks of treatment. The 83% of patients resolving in 2 weeks had normal tension glaucoma.

Conclusions: From our study glaucoma was the most common cause of optic disc hemorrhage followed by diabetes. Seven o'clock temporal was commonest site of single disc hemorrhage. Most of the patients had normal IOP. More than half of single disc hemorrhage patients resolved within 6 weeks, whereas most multiple hemorrhages did not resolve at the end of 6 weeks with aggressive treatment. Early resolution was found in patients with normal tension glaucoma.

09:00 - 10:30

Venue: 301

Profile of Secondary Glaucoma at a Teaching Hospital in Surabaya

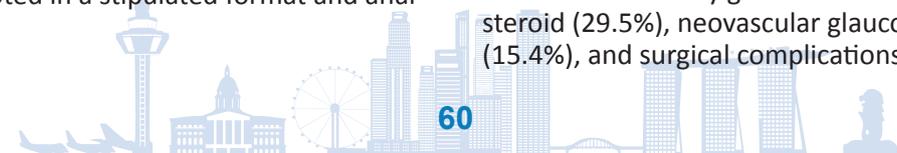
First Author: Evelyn **KOMARATIH**

Co-Author(s): Yulia **PRIMITASARI**, Yuyun **RINDIASTUTI**

Purpose: To study the profile of secondary glaucoma at a teaching hospital in Surabaya.

Methods: Medical records of first-visit glaucoma patients at the outpatient ophthalmology clinic from January 2014 to April 2016 were recorded. Evaluation of all cases was done on the basis of a detailed history and recorded examination including vision, intraocular pressure (IOP), anterior segment examination, gonioscopy, and fundus evaluation by glaucoma specialists. Demographic data, etiology of secondary glaucoma, and any other significant findings were noted.

Results: Of 363 first-visit glaucoma patients, 66 patients (18.18%) had secondary glaucoma with a mean age of 51.21 ± 16.58 years. Of all 66 patients consisting of 37 males and 29 females, 21 (42%) were referred patients. Of the total 78 eyes from 66 patients mean intraocular pressure (IOP) was 28.48 ± 11.02 mm Hg and mean best corrected visual acuity (BCVA) was 0.10 ± 0.09 . Mean vision ≤ 0.10 was present in 72.5% of eyes and 42.6% of eyes had baseline IOP > 30 mm Hg. Frequent causes of secondary glaucoma were lens factor (30.8%), steroid (29.5%), neovascular glaucoma (20.5%), uveitis (15.4%), and surgical complications (3.8%). A total of



21 patients had been on a single glaucoma medication (28.5%), whereas 61.9% and 9.5% were on a combination of 2 and 3 glaucoma medications, respectively.

Conclusions: Frequent causes of secondary glaucoma were lens factor, steroid, neovascular, uveitis, and surgical complications. Most patients with secondary glaucoma had poor vision (≤ 0.10) with high baseline IOP. Assessment of the underlying cause is the key guide to treatment strategy.

09:00 - 10:30

Venue: 301

Six-Year Changes in Refractive Error: Singapore Malay Eye Study

First Author: Pavan **VERKICHARLA**

Co-Author(s): Ching-Yu **CHENG**, Wenfei **CHU**, Charumathi **SABANAYAGAM**, Seang Mei **SAW**, Tien **WONG**

Purpose: To investigate the 6-year changes in refractive error and incidence of myopia in Malay adults in Singapore.

Methods: The Singapore Malay Eye Study is a population-based cohort study that recruited adults of Malay ethnicity living in Singapore, aged 40-80 years at baseline (2004-2006). The 6-year follow-up study conducted in 2011-2013 re-examined 1901 surviving cohort members (response rate = 72.1%). Refraction data obtained from phakic right eyes of 1550 participants were analyzed. Change in SE was calculated as SE at follow-up - baseline. Myopia was defined as SE < -0.5 diopters (D), hyperopia as SE > +0.5 D, and astigmatism as cylinder < -0.5 D. The incidence of myopia was estimated based on eyes without myopia at baseline (N = 1150).

Results: Over a 6-year period, there was a slight overall hyperopic shift of +0.07 D [95% confidence interval (CI): 0.01 to 0.13, P = 0.12]. The majority of participants (51.9%) had only minimal or no change in refraction (-0.5 to +0.5 D), whereas 16.5% and 31.6% showed myopic and hyperopic shifts. The mean 6-year SE changes in adults aged 40-49, 50-59, 60-69, and >70 years were +0.26 D, +0.13 D, -0.32 D, and -0.10 D, respectively (P < 0.001). Corresponding mean changes in cylinder power were -0.34 D, -0.43 D, -0.57 D, and -0.57 D (P < 0.001). The 6-year incidence of myopia was 9.8% in all participants and 4.0% in adults without cataract.

Conclusions: This study documented refractive error changes in the middle-aged and older Malay population and indicated trends of a hyperopic shift before age 60 years and a myopic shift in adults over 60 years. The incidence of myopia was lower when participants with cataract were excluded, suggesting increased risk of adult-onset myopia with cataract development.

Orbital and Oculoplastic Surgery

Mar 4, 2017 (Sat)

11:00 - 12:30

Venue: 310

Analysis of Contrast Sensitivity, Visual Field, Visual Aberrations, and Corneal Topography Before and After Upper Eyelid Blepharoplasty

First Author: Diva **MISRA**

Co-Author(s): Kasturi **BHATTACHARJEE**, Nilutparna **DEORI**, Shriya **DHAR**, Prabhjot Kaur **MULTANI**, Richa **SHRIVASTAVA**

Purpose: To detect and evaluate the changes in functional quality of vision before and after upper eyelid blepharoplasty for dermatochalasis.

Methods: A prospective study on 60 eyes undergoing upper lid blepharoplasty treated between April 1, 2015, and March 31, 2016, was conducted. Visual field testing, contrast sensitivity measurements, corneal topography values, and higher order aberrations (HOA) were documented preoperatively and 3 months postoperatively. Paired *t* test was applied for testing the significant differences utilizing SPSS 15.0 and SAS 9.3 jmp software.

Results: There were statistically significant improvements in the superior peripheral visual fields. The mean preoperative contrast sensitivity was 1.34 ± 0.13 and 3-month postoperative contrast sensitivity was 1.53 ± 0.11 , which was statistically significant. Corneal topography revealed significant differences between preoperative cylinder (mean, 0.67 diopters [D]; SD, ± 0.27) and 3-month postoperative cylinder (mean, 0.48 D; SD, ± 0.25). Mean change in the cylinder was 0.19 D. The study revealed statistically significant differences in ocular aberrations at 4 mm and 6 mm pupil size. The values of total HOA, third order, fourth order, and coma decreased substantially postoperatively.

Conclusions: A significant improvement was seen in the superior visual fields and contrast sensitivity in patients undergoing upper lid blepharoplasty. The improvement in contrast sensitivity can be attributed to the reduction in ocular higher order aberrations and corneal topographic measurements. Therefore, it has twofold implications of betterment in functional quality of vision in terms of improvement in peripheral visual field and contrast sensitivity, along with an overall aesthetically improved outcome.



11:00 - 12:30

Venue: 310

Combined Approach with Onyx Embolization for Posterior Vascular Malformation of the Orbit

First Author: Vivian **YIN**

Co-Author(s): Manraj **HERAN**

Purpose: Orbital vascular malformations are divided into high- and low-flow lesions based on their hemodynamic categories. Even low-flow lesions such as venous malformation, lymphatic malformation, and combined lymphaticovenous malformation are difficult in surgical excision due to the thinned walled nature and confined space of the orbit. Intralesional injection with cyanoacrylate has been described to facilitate excision of posterior orbital low-flow vascular malformations. Onyx is a non-adhesive liquid embolic agent made of ethylene vinyl alcohol (EVOH) copolymer dissolved in dimethyl sulfoxide (DMSO) and suspended in micronized tantalum powder for contrast visualization under fluoroscopy. It has an advantage over cyanoacrylate in that it travels more distally within the lesion as it solidifies from the outside to the inside.

Methods: We describe the use of combined intralesional embolization with Onyx with surgical excision of difficult posterior orbital low-flow vascular malformation. The safety and increased ease in surgical excision is described.

Results: Four patients, 2 venous malformations and 2 lymphaticovenous malformations, were treated with intraoperative direct embolization with Onyx after surgical exposure of the anterior face of the lesion. All patients had successful excision of the lesion without issues with intraoperative hemorrhage. No significant orbital inflammation was noted in cases with residual Onyx in the orbit.

Conclusions: The use of Onyx embolization for posterior orbital vascular malformation allows for safe surgical excision of otherwise difficult to approach lesions.

11:00 - 12:30

Venue: 310

Comparing the Effect of Levator Advancement and Conjunctival Mullerectomy Ptosis Surgery on Tear Production and Dry Eye Symptoms

First Author: Vivian **YIN**

Co-Author(s): Peter **DOLMAN**, Grace **QIAO**, David **ROSSMAN**

Purpose: Ptosis repair by conjunctival mullerectomy (CMR) has been shown to be effective for mild to moderate ptosis, with patients who respond positively to

phenylephrine test showing greater response. However, there was concern for dry eye with CMR from removal of goblet cells and accessory lacrimal glands (ALG). Retrospective studies have shown conflicting results in changes in Schirmer or subjective symptoms. We aim to prospectively compare tear production and dry eye symptoms between patients undergoing levator advancement (LA) and CMR.

Methods: A prospective multicenter non-randomized trial comparing change in Schirmer basal tear production (BT) and dry eye symptoms by Ocular Surface Disease Index (OSDI) between patients undergoing ptosis correction by LA and CMR. Baseline measurements included MRD1, palpebral fissure (PF), levator excursion, response to 2.5% phenylephrine, and Schirmer test with anesthesia at 5 minutes.

Results: Fifty patients with involutional ptosis were recruited. Twenty-six (52%) had conjunctival mullerectomy based on surgeon's discretion. The mean age was 59 years (range: 35-87) with baseline MRD1 of 0.75 mm (range: -0.5 to 2). There was no significant difference in change of BTS ($P < 0.001$) or OSDI ($P < 0.001$) between the 2 groups. Multivariate analysis for MRD1, PF, baseline BTS, and OSDI did not show any significance. Histopathological analysis showed presence of ALG in 4/10 specimens.

Conclusions: Conjunctival mullerectomy does not result in significant changes in tear production or dry eye symptoms.

11:00 - 12:30

Venue: 310

Ethnic Variation in Deep Lateral Orbital Anatomy and its Implications in Decompression Surgery

First Author: Amy **CHAN**

Co-Author(s): Arjunan **KUMARAN**, Sunny **SHEN**, Kailing **YONG**

Purpose: To describe differences in the deep lateral orbital wall (specifically, trigone) between Chinese, Malay, Indian, and Caucasian subjects.

Methods: Single-center retrospective computed tomogram (CT)-based study. Twenty subjects of each ethnicity were used from existing databases, matched for gender, average age, and laterality. Subjects below 16 years of age were excluded. DICOM image viewing software CARESTREAM Vue PACS (Carestream Health Inc, USA) and OsiriX version 7.5 (Pixmeo, Switzerland) were used to measure deep lateral wall length, thickness, and volume and orbital depth. Statistical analyses were performed using Statistical Package for Social Sciences version 21 (IBM, USA).

Results: In each group, there were 12 males (60%)



and average age was not significantly different ($P = 0.682-0.987$). Using Chinese subjects as a reference, in Chinese, Malay, Indian, and Caucasian subjects, mean trigone thickness was 13.68, 14.02, 11.60 ($P < 0.001$), and 13.80 mm; curved total wall length was 45.23, 42.29 ($P = 0.048$), 41.91 ($P = 0.020$), and 45.00 mm; curved trigone length was 23.03, 22.61, 17.19 ($P = 0.011$), and 18.76 mm ($P = 0.030$); and trigone volume was 3120.97, 3221.01, 1613.66 ($P < 0.001$), and 2498.46 mm³ ($P = 0.059$), respectively. Similarly, perpendicular orbital depth was 27.54, 24.97, 22.12 ($P = 0.001$), and 25.93 mm and diagonal orbital depth was 34.19, 33.27, 29.48 ($P = 0.01$), and 34.63 mm, respectively.

Conclusions: Indians, and to a lesser extent, Caucasian subjects have smaller trigones compared to their Chinese and Malay counterparts. Indian subjects also have shallower orbits and due care should be taken during decompression surgery.

11:00 - 12:30

Venue: 310

Factors Associated with Rhinostomy Shape After Endoscopic Dacryocystorhinostomy

First Author: Hyun Jin **SHIN**

Purpose: To determine the factors associated with rhinostomy shape after endoscopic dacryocystorhinostomy (DCR) in patients with primary acquired nasolacrimal duct obstruction.

Methods: A retrospective evaluation of 102 cases in 70 patients was performed. All cases were classified into 3 groups according to the healed appearance of the rhinostomy: flat, ladle, and ice scoop type. Anatomic success was defined as patency with syringing and endoscopic evidence of ostial patency. Functional success was defined as visualization of fluorescein dye at the ostium and relief of epiphora. Clinical information and intra- and postoperative endoscopic video findings were compared between the 3 groups.

Results: Of the 102 cases, 19 flat, 37 ladle, and 46 ice scoop type rhinostomies were categorized. Among the variables, patient demographics and rhinostomy size and location were not different between the 3 groups. However, intraoperative lacrimal sac findings (size, wall thickness, and mobility), postoperative ostial shrinkage, and rhinostomy movement were associated with rhinostomy shape (all $P < 0.05$). With regard to surgical outcomes, there were no differences in anatomical patency between the 3 groups. However, the flat group had a poorer functional success rate (73.7%) than the ladle (91.9%) and ice scoop (97.8%) groups ($P = 0.008$). A higher degree of ostial shrinkage and poor rhinostomy movement occurred in the flat shape, which had a small, thick, and poorly mobile lacrimal sac.

Conclusions: Lacrimal sac characteristics play a prominent role in determining rhinostomy shape after endoscopic DCR. The rhinostomy shape along with the degree of ostial shrinkage and rhinostomy movement is predictive of functional success after endoscopic DCR.

11:00 - 12:30

Venue: 310

Frequency of Simultaneous Nasal Procedures While Performing Endoscopic Endonasal Dacryocystorhinostomy

First Author: Akshay **NAIR**

Co-Author(s): Bruce **MOSKOWITZ**

Purpose: To assess the frequency of concurrent endoscopic nasal surgeries performed during endoscopic endonasal dacryocystorhinostomy (DCR).

Methods: An analysis of all endoscopic endonasal DCRs performed by a single fellowship-trained oculoplastic surgeon from 2012-2015 at a single tertiary eye care center was performed.

Results: Endoscopic endonasal DCRs were performed on 198 eyes of 193 patients. The mean age of the patients was 65.1 years (range: 20-94 years). Females outnumbered male patients by a ratio of 2:1. Out of 198 surgeries, 178 surgeries were simple endo-DCRs, while in 10.1% (20/198) of the cases adjunctive endoscopic nasal procedures had to be performed. Eight percent (16/198) required a septoplasty. Two percent (4/198) underwent turbinectomies, of which 1 patient underwent a combined turbinectomy and polypectomy (0.5%). At a mean follow-up period of 15 months, the overall success rate was 92.4% and the success rate among those who underwent adjunctive procedures was 90% (18/20). One patient had cicatricial scarring at the ostium and subsequently underwent a repeat endoscopic DCR which was successful. The other failure was found to have synechiae around the ostium but declined any further intervention. Therefore, the final success rate in the adjunctive procedure group was 95% (19/20). The difference between the success rates for the simple endo-DCR vs DCR + adjunctive procedure groups was not statistically significant.

Conclusions: Concurrent surgical intervention for nasal pathology can be addressed at the time of performing endo-DCR with acceptable success rates. It may be prudent for oculoplastic surgeons to be surgically adept at basic nasal procedures, namely septoplasty and turbinectomy.



11:00 - 12:30

Venue: 310

Orbital Implants in Reconstruction of Orbital Fractures: A Ten-Year Series

First Author: Stephanie **YOUNG**

Co-Author(s): Shantha **AMRITH**, Gangadhara **SUNDAR**

Purpose: We aim to describe the indications for repair, types of orbital implants, outcomes, and implant-related complications of all orbital fractures treated in a single institution over a 10-year period.

Methods: Retrospective review of patients between 2005 and 2014 who had undergone orbital fracture repair and reconstruction for craniofacial trauma in a tertiary eye hospital.

Results: A total of 308 orbits of 279 patients were included in the study. Mean age was 35.6 ± 13.6 years; gender: 239 males (85.7%). Types of fracture included floor ($n = 86, 28.0\%$), medial wall ($n = 8, 2.6\%$), floor and medial wall ($n = 85, 27.6\%$), zygomaticomaxillary complex ($n = 78, 25.4\%$), and others ($n = 51, 16.6\%$). Orbital implants included bioresorbable ($n = 65, 21.1\%$), purple prefabricated titanium orbital plate ($n = 89, 28.9\%$), gold prefabricated titanium orbital plate ($n = 97, 31.5\%$), titanium mesh ($n = 21, 6.8\%$), and others, eg, MEDPOR and Titan implants ($n = 36, 11.7\%$). A total of 15.4% of cases were done using a navigation system. Most patients had good position and functional outcome postoperatively, with significant improvement in diplopia, ocular motility restriction, and enophthalmos ($P < 0.01$). Complications included canthal malposition ($n = 6, 1.9\%$), malpositioned implants requiring repositioning ($n = 6, 1.9\%$), and implant exposure ($n = 2, 0.6\%$).

Conclusions: The ultimate goal for orbitofacial fracture repair is to restore form and function in the safest possible setting. Two main options for volume augmentation are autologous grafts and alloplastic implants. Every implant has its own set of advantages and disadvantages. The indication for implant type depends on the type of fracture, patient factors, and surgeon comfort.

11:00 - 12:30

Venue: 310

Use of a Compressive Conformer in Contracted Fornix Reconstruction: A Novel Technique

First Author: Supapan **CHATTINAKORN**

Co-Author(s): Preamjit **SAONANON**

Purpose: Sufficient deepening of the fornix in an anophthalmic socket is necessary for fitting an ocular prosthesis. Severely contracted lower fornix remains a

challenging problem to surgeons today, despite current surgical techniques and postoperative wound care. Our surgical results in inferior fornix reconstruction improved with the advent of a customized compressive conformer.

Methods: This retrospective case series included 5 contracted socket patients who underwent lower fornix reconstruction surgery with a customized compressive conformer. After fornix reconstruction with autogenic/allogenic graft implantation, the socket was fitted with a temporary compressive conformer. The temporary compressive conformer was assembled intraoperatively using stock conformer, acrylic rod, gauze, and adhesive tape. Continuous downward pressure was placed on the lower fornix to help maintain depth during the wound healing process. Two weeks after the operation, the temporary compressive conformer was replaced with the customized one.

Results: Of 5 cases, 4 patients had severely traumatized sockets while 1 patient was born with congenital blindness. All patients had a shortened lower fornix and had undergone multiple fornix reconstructive surgeries previously. Mean surgical correction excluding primary eye removal was 3.75 surgeries per patient. Mean follow-up time after initiating compressive conformer was 4.75 months. After reconstruction with the temporary compressive conformer, all patients had a deepened lower fornix. Three months postoperatively, all patients were successfully fitted and wearing ocular prosthesis currently. One patient alternates between the compressive conformer at night and the ocular prosthesis during the day to maintain his fornix depth.

Conclusions: Use of a customized compressive conformer shows promising results in assisting lower fornix reconstruction.

11:00 - 12:30

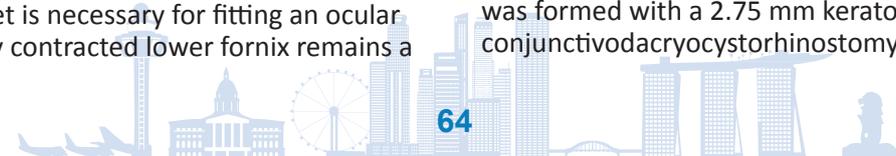
Venue: 310

Use of a Conjunctiva-Wrapped Jones Tube to Prevent Post-Surgical Complications of Conjunctivodacryocystorhinostomy

First Author: Vincent **WONG**

Purpose: To describe the patient experience and success of using a Jones tube wrapped with conjunctiva to alleviate tearing.

Methods: Retrospective case series of 5 patients who underwent dacryocystorhinostomy with insertion of a conjunctiva-wrapped Jones tube. All patients had had previous dacryocystorhinostomies which had failed. Conjunctiva was measured and harvested from the superior conjunctiva of the eye with epiphora. A tract was formed with a 2.75 mm keratome as per routine conjunctivodacryocystorhinostomy (CDCR), followed by



insertion of the conjunctiva-wrapped Jones tube. The conjunctival raw surface faced outward and the epithelial surface faced the Jones tube. The conjunctiva was sutured around the Jones tube with 6.0 vicryl to create a sleeve. Once in proper position, the conjunctiva was secured to the tissue in the tract with Tisseel glue. The Jones tube neck was sutured in position for 2 weeks with 6.0 prolene and tied through a bolster on the skin. Patients were followed at 1 week, 3 months, and yearly, with some patients as long as 6 years.

Results: None of the patients suffered from epiphora after the CDCR surgery with conjunctival wrap; the Jones tube stayed in position in 3 of the 5 patients. In 2 patients, over time, the Jones tube fell out, but the tract still remained patent presumably due to the conjunctiva creating an open, epithelial-lined fistula.

Conclusions: Conjunctiva-wrapped Jones tubes provide a successful way to alleviate tearing and to avoid complications with Jones tubes (such as closure of the fistula after inadvertent extrusion of the Jones tube).

Pediatric Ophthalmology & Strabismus

Mar 5, 2017 (Sun)

11:00 - 12:30

Venue: 303

Antenatal Steroid Protects Preterm Infants Against Retinopathy of Prematurity: A Systematic Review and Meta-Analysis

First Author: Cheuk Ling **YIM**

Co-Author(s): Lilian **CHAN**, Matthew **TAM**, Shumin **TANG**, Jason **YAM**

Purpose: To determine the association of antenatal steroid with retinopathy of prematurity (ROP).

Methods: Potentially eligible studies published from the starting date to May 24, 2016, were identified from MEDLINE and EMBASE online databases. All studies reporting the outcomes, such as odds ratio (OR) and their confidence intervals (CIs), or numerical counts that allowed the calculation of the aforementioned outcomes were included. Study-specific odds ratios (ORs) were combined using the random-effects model when $P < 0.1$ in the test for heterogeneity, or otherwise the fixed-effects model was used. Sensitivity analysis and evaluation of potential bias by Egger test was undertaken.

Results: Four hundred forty-three relevant studies were identified in the literature search. Among them, 28 studies were identified as eligible for the meta-analysis, including a total of 20,731 neonates with 4202 cases of ROP. Both unadjusted and adjusted data showed a protective association between antenatal steroid exposure and ROP (unadjusted OR, 0.82; 95% CI, 0.68-0.98; $I^2 =$

58; $P = 0.03$; adjusted OR, 0.64; 95% CI, 0.44-0.94; $I^2 = 63\%$; $P = 0.02$). Subgroup analysis also demonstrated a protective association between antenatal steroid exposure and severe ROP development (unadjusted OR, 0.75; 95% CI, 0.62-0.91; $I^2 = 55\%$; $P = 0.003$). Sensitivity analysis indicated our results were robust.

Conclusions: The result of this meta-analysis confirmed that antenatal steroid was associated with a reduced risk of ROP development, as well as prevention against severe ROP.

11:00 - 12:30

Venue: 303

Anti-VEGF Monotherapy in the Management of Aggressive Posterior Retinopathy of Prematurity in Selected Cases

First Author: Tariq **ALI**

Co-Author(s): Nuzhat **CHOUDHURY**, Md Showkat **KABIR**

Purpose: To report the outcomes of aggressive posterior retinopathy of prematurity (APROP) treated with anti-vascular endothelial growth factor (anti-VEGF) monotherapy followed by as needed (PRN) rescue laser.

Methods: Retrospective review of data of 43 consecutive APROP babies from May 2012 to May 2015 was performed. Intravitreal injection of anti-VEGF (Avastin) was performed in both eyes with all aseptic precautions on the day of diagnosis. The babies were followed up on the next day and after 3 and 7 days. Rescue laser was performed to the avascular retina after 7 days if there was no change in the status of APROP. All the peripheral ischemic retina was ablated with diode indirect laser in single or multiple sessions. Examination under anesthesia (EUA) was performed in every baby at 6 month intervals up to 2 years of age.

Results: Nine cases did not need additional laser in whom blood vessels grew up to periphery and vascular tortuosity decreased. The APROP regressed in the remaining 34 cases in whom laser was required. All babies were followed up for at least 2 years. Cycloplegic refraction was done in all 43 babies. Among the 9 babies who underwent only injection, 2 developed low myopia and 7 were emmetropic. Out of 34 babies who underwent laser, 23 babies needed spectacle correction and the mean spherical correction was -4.5 diopters. All the babies showed regression of ROP.

Conclusions: Intravitreal injection of Avastin is a good treatment choice in APROP. Not all cases need laser and favorable cases can be followed up. However, in our series, a substantial number of babies needed rescue laser.



11:00 - 12:30

Venue: 303

Clinical Observation of Modified Posterior Scleral Reinforcement Surgery to Treat Childhood Progressive High Myopia

First Author: Qi **LIN**

Purpose: To assess the safety and effectiveness of modified Nurmamedov NN scleral reinforcement surgery for childhood progressive high myopia.

Methods: Retrospective case series. Twenty-eight children (56 eyes) with high myopia (mean age, 8.38 ± 3.12 years) were treated with modified Nurmamedov NN posterior scleral reinforcement surgery and were followed up for 18 months after the operation. The best corrected visual acuity, refractive status, and axial lengths were observed.

Results: The preoperative mean refraction was -9.69 ± 2.57 D; the postoperative mean refraction at 1 month, 6 months, 12 months, and 18 months increased by -0.17 ± 0.22 D, -0.27 ± 0.32 D, -0.38 ± 0.42 D, and -0.63 ± 0.54 D, respectively. The preoperative mean axial length was 26.43 ± 1.31 mm; the postoperative axial length at 1 month, 6 months, 12 months, and 18 months increased by 0.04 ± 0.17 mm, 0.14 ± 0.12 mm, 0.39 ± 0.33 mm, and 0.52 ± 0.47 mm, respectively. Before and after the surgery, spherical equivalent and axial length mildly increased, but they were not statistically significant ($P > 0.05$). The preoperative best corrected visual acuity (BCVA) was 0.60 ± 0.28 ; the postoperative BCVA improved by 0.06 ± 0.33 , 0.09 ± 0.27 , 0.12 ± 0.22 , and 0.15 ± 0.24 at 1 month, 6 months, 12 months, and 18 months, respectively. The postoperative BCVA was better than the preoperative BCVA at 12 months and 18 months with statistical significance ($P < 0.05$). No serious postoperative complications were observed after surgery, such as retinal detachment, vitreous hemorrhage, or implant displacement.

Conclusions: Modified Nurmamedov NN scleral reinforcement surgery was effective and safe to stabilize the progression of childhood high myopia.

11:00 - 12:30

Venue: 303

Frosted Angiitis Mimicking Central Retinal Vein Occlusion in a 13-Year-Old Boy: A Case Report

First Author: Pei-Chen **WU**

Co-Author(s): Ching-Lung **CHEN**, Chien-Neng **KUO**, Hsi-Kung **KUO**, Chien-Hsiung **LAI**

Purpose: To emphasize a rare vasculitis and the need for differentiation of this entity and other retinal diseases it can mimic; and to be familiar with ocular mani-

festations in frosted angiitis.

Methods: We describe the clinical course of frosted angiitis in a 13-year-old boy with painless decreased corrected visual acuity in his right eye (20/200). Fundus examination showed flame-shaped hemorrhage and exudative retinal detachment. He was diagnosed with frosted angiitis (CRVO) initially. Fluorescein angiography revealed staining of the involved vessels, late leakage of sheathed retinal venules and disc, and late pooling in the area of exudative retinal detachment. There was no systemic abnormality noted after a very extensive medical work-up. This patient had partial improvement with systemic steroid within 3 months, then responded well to a combination of steroid and azathioprine therapy. He experienced restoration of functional and anatomical changes in the next 4 months.

Results: The diagnosis of frosted angiitis was based on the special features on fluorescein angiography. CRVO rarely involves children and rarely causes exudative retinal detachment. Further survey should be considered in patients with atypical presentation.

Conclusions: Frosted angiitis is a rare entity of retinitis. Being familiar with differential diagnosis of frosted angiitis is important for appropriate causal treatment initialization. Azathioprine may be added as an adjuvant therapy if patients do not respond well to corticosteroids.

11:00 - 12:30

Venue: 303

Outcomes in Surgical Management of Monocular Elevation Deficit: A Retrospective, Interventional Case Series

First Author: Supraja **KASTURIRANGAN**

Co-Author(s): Mohammed **ALAM**, Meenakshi **GOPALAKRISHNAN**, Srikanth **RAMASUBRAMANIAN**

Purpose: Monocular elevation deficiency (MED) is an unilateral defect in elevation caused by paretic, restrictive, or combined etiology. This study analyzes different surgical procedures in patients of MED and evaluates their outcome based on ocular alignment and ptosis correction.

Methods: All 79 patients included in the study had significant vertical deviation; 37 patients also had horizontal deviation. Sixty-seven patients had severe ptosis, 12 patients had mild-moderate ptosis. Decision on type of squint surgery was based on the forced duction test (FDT). Forty-three FDT positive patients underwent an inferior rectus recession and 17 FDT negative patients underwent Knapp procedure. Type of ptosis surgery depended on LPS action and presence of Marcus Gunn jaw winking phenomenon. Thirty-five patients underwent frontalis sling alone, 23 patients underwent fron-



talis sling with LPS excision, and the rest underwent other procedures. Ptosis surgery was planned after 6 weeks of squint surgery. Sixty-nine patients underwent both ptosis and squint surgery, 6 patients only ptosis surgery, and 4 patients only squint surgery.

Results: FDT was positive in 54% of patients. Strabismus was corrected with a single procedure in 81% and ptosis was corrected with a single procedure in 84% of the patients.

Conclusions: Satisfactory correction of MED can be achieved with a single ptosis and strabismus surgery.

11:00 - 12:30

Venue: 303

Sensory Status and Motor Control in Intermittent Divergent Squint

First Author: Chirakshi **DHULL**

Co-Author(s): Swati **PHULJHELE**, Rohit **SAXENA**, Pradeep **SHARMA**, Radhika **TANDON**

Purpose: To correlate sensory status and motor control in cases of intermittent divergent squint (IDS).

Methods: Thirty-one consecutive patients of IDS scheduled for surgery and 31 age-matched controls underwent complete ophthalmic and orthoptic examination. Stereoacuity was measured using The Netherland Organization (TNO) and Near Randot (NR) stereotest for near and Frisby–Davis Distance (FD2) and Distance Randot (DR) stereotest for distance. Fusional vergences for distance and near fixation for both convergence and divergence were measured after neutralization of deviation. Newcastle Control Score (NCS) was used to assess motor control. Subjects were examined at 1 week and months 1, 3, and 6 after surgery.

Results: Median near stereoacuity improved from 120 arcsec to 60 arcsec with TNO ($P < 0.001$) and from 50 arcsec to 40 arcsec with NR ($P < 0.001$) postoperatively. Median distance stereoacuity improved from 200 arcsec to 100 arcsec with DR ($P < 0.001$) and from 100 arcsec to 60 arcsec with FD2 ($P < 0.001$) postoperatively. Stereoacuity remained significantly lower than controls for TNO (30 arcsec), NR (20 arcsec), DR (100 arcsec), and FD2 (15 arcsec) ($P < 0.001$ each). The preoperative median for NCS was 4, showing excellent recovery to 0 at 6 months postoperatively. NCS showed a good correlation with TNO and NR [Spearman coefficient (r_s) = 0.72, $P < 0.001$; r_s = 0.83, $P < 0.001$, respectively] and also with DR and FD2 (r_s = 0.59, $P < 0.001$; r_s = 0.86, $P < 0.001$, respectively), though fusional vergences showed insignificant correlation with sensory tests.

Conclusions: Sensory and motor control improves significantly after surgery. NCS shows good correlation with sensory status and should be used for evaluating

patients of IDS.

11:00 - 12:30

Venue: 303

Sleep Duration and Myopia Among Singaporean Infants

First Author: Sonoko **SENSAKI**

Co-Author(s): Yap Seng **CHONG**, Wenfei **CHU**, Sharon **CHUA**, Cheryl **NGO**, Seang Mei **SAW**

Purpose: To investigate the associations between sleep duration and early-onset myopia in Singaporean infants.

Methods: Pregnant women who attended their first trimester clinic at 2 major maternity units were recruited for the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) birth cohort ($n = 1236$). Parents completed questionnaires about children's sleep duration and sleep disorders (A Brief Screening Questionnaire for Infant Sleep Problems [BISQ]) when the child was 6 months of age ($n = 590$). Cycloplegic autorefractometry and axial length (AL) were obtained in 3-year-old children ($n = 347$). Detailed questionnaires on parental myopia, maternal education level, outdoor time, and near work were collected when the child was 2 years of age. Height was measured in the children when the child was 3 years of age.

Results: Total sleep duration, night sleep duration, and number of night waking were not associated with spherical equivalent (SE), AL, and myopia. In multivariable regression models adjusting for potential confounders (age, sex, ethnicity, maternal education level, parental myopia, height, near work, and outdoor time), children with longer daytime sleep duration were found to have shorter AL (regression coefficient, -0.18; 95% confidence interval [CI], -0.33 to -0.02; $P = 0.02$), but there were no associations with SE and myopia.

Conclusions: There was no consistent evidence for an association between sleep duration and myopia. Daytime sleep duration might contribute to early-onset myopia development.

Prevention of Blindness

Mar 5, 2017 (Sun)

11:00 - 12:30
Venue: 301

Low-Cost Fundus Imaging for Saving Eyesight: Foresight

First Author: Gaurav MATHUR
Co-Author(s): Ajay SHARMA, Deependra V SINGH, Davinder TYAGI

Purpose: To determine the profile and prevalence of macular diseases among self-reporting subjects at rural eye centers across North India using low-cost fundus imaging. This study also evaluated the efficacy of trained optometrists in identifying macular abnormality through fundus imaging.

Methods: All subjects coming to 5 rural eye centers with age above 30 years were included in the study and data analyzed retrospectively. Fundus images were taken by trained technicians/optometrist at primary centers and sent for analysis by a specialist on a daily basis. Of the total data collected, a subset of patients were graded by the optometrist and specialist separately and fundus images were diagnosed as normal or abnormal. Percent agreeability between the optometrist and specialist on the same subset of subjects was calculated using Cohen kappa.

Results: Of the total 4800 eyes imaged 89.27% were gradable. Of the gradable eyes 8.85% had macular abnormalities. The major causes of macular abnormalities were age-related macular degeneration and diabetic retinopathy. A total of 2300 eyes were analyzed both by a single retina specialist and optometrist. Comparing the results 13.6% of fundus images were over-diagnosed by optometrists, 0.82% of cases were under-diagnosed, and 83.15% were correctly identified as normal or abnormal.

Conclusions: Low-cost fundus imaging is an effective telescreening tool. Teaching and training optometrists can become an effective way of early diagnosis of retinal diseases in rural areas and timely referral of selected retinal problems can be done at higher centers. The chance of an optometrist missing a positive case was <1%.

Refractive Surgery

Mar 1, 2017 (Wed)

16:30 - 18:00
Venue: 300

Changes in Morphology of Anterior Chamber and Corneal Endothelium Following LASIK in Myopic Eyes

First Author: Shriya DHAR
Co-Author(s): Kasturi BHATTACHARJEE, Kalyan DAS, Nilutparna DEORI, Diva MISRA, Uppapalli SHALOMITH

Purpose: To study laser-assisted in situ keratomileusis (LASIK)-induced changes in anterior chamber morphology and corneal endothelium with respect to different grades of myopia.

Methods: In this prospective, interventional study of 1 year's duration, we studied 263 eyes of 135 patients undergoing uncomplicated LASIK and grouped them based on spherical equivalent (SE) as mild (≤ -3.00 DS), moderate (-3.12 to -6.00 DS), and severe (≥ -6.12 DS) myopia. The preoperative and 6 months postoperative parameters were compared using analysis of variance (ANOVA) test and Tukey honestly significant difference (HSD) test.

Results: Comparison of preoperative and postoperative values in regard to anterior chamber angle (ACA) (39.03 ± 9.14 degrees and 35.21 ± 8.42 degrees, respectively), endothelial cell density (2654 ± 281.14 cells/mm² and 2588 ± 281.57 cells/mm², respectively), and percentage hexagonality of endothelial cells ($58.89 \pm 13.68\%$ and $52.99 \pm 11.29\%$, respectively) revealed a statistically significant ($P < 0.05$) decrease in all parameters with maximum reduction seen in severely myopic eyes.

Conclusions: ACA, corneal endothelial cell density, and its percentage hexagonality show a decrease after LASIK that corresponds to the severity of myopia (decrease in the parameters is directly proportional to the increasing value of SE).

16:30 - 18:00
Venue: 300

Comparative Analysis of Efficacy of Combining Photorefractive Keratectomy with Cross Linking versus Standard PRK

First Author: Gitansha SACHDEV
Co-Author(s): Shreyas RAMAMURTHY

Purpose: To compare the efficacy, refractive accuracy, and safety of combining photorefractive keratectomy (PRK) and cross linking (CXL) to standard PRK.

Methods: Retrospective comparative interventional



study. For PRK with CXL (group A), eyes with borderline suspicious tomography or low pachymetry ($<470 \mu\text{m}$) were included. Age- and spherical equivalent-matched eyes with normal tomography and pachymetry were taken for standard PRK (group B). Group A underwent accelerated CXL of 30 mW/cm^2 for 90 seconds. Minimum follow-up was 6 months.

Results: A total of 150 eyes were included, with 75 eyes in each group. The mean spherical equivalent was -3.57 in group A and -3.42 in group B. Group A had significantly more eyes with low pachymetry ($P < 0.01$). A total of 100% in group A and 98% in group B maintained best corrected visual acuity (BCVA). The mean residual spherical equivalent was 0.62 diopters (D) and 0.35 D, respectively. No difference in significant haze or contrast sensitivity was noticed.

Conclusions: Combining cross linking with surface ablation in suspicious tomographies promises safe and predictable outcomes.

16:30 - 18:00
Venue: 300

Corneal Epithelial Remodeling and Related Factors After TransPRK in Treatment of Myopia

First Author: Jie **HOU**

Purpose: To evaluate the changes in epithelial thickness profile and related factors following transepithelial photorefractive keratectomy (TransPRK) for myopia.

Methods: In this prospective controlled study, 43 patients (43 eyes) who underwent TransPRK with spherical equivalent (SE) refraction of -1.25 to 6.25 diopters (D) were included. Epithelial thickness was measured using optical coherence tomography at different corneal zones (central, 2 mm; paracentral, 2-5 mm; and mid-peripheral, 5-6 mm) preoperatively and at 1 week and 1, 3, and 6 months postoperatively. Correlations between epithelial thickness changes and the amount of correction, optical zone, and Q-value changes (ΔQ) were analyzed 6 months postoperatively.

Results: The mean epithelial thicknesses in the central zone were 52.37 ± 3.42 , 53.97 ± 4.33 , 51.03 ± 4.12 , 55.14 ± 5.52 , and $56.68 \pm 5.06 \mu\text{m}$ at 5 days, 1 month, 3 months, and 6 months after surgery, respectively. The epithelium was thicker at 3 and 6 months after surgery compared to preoperative measurements ($P < 0.05$). Compared to preoperative values, the epithelial thickness was 3.69 ± 4.23 , 5.19 ± 3.88 , and $6.23 \pm 3.91 \mu\text{m}$ thicker at the center, paracenter, and mid-periphery, respectively, at 6 months postoperatively ($P < 0.01$). A significant positive relationship was observed between epithelial thickening and programmed SE correction and between epithelial thickening and ΔQ . A significant

negative relationship was observed between epithelial thickening and optical zone. No correlation between epithelial thickness change and ablation depth was detected.

Conclusions: Significant epithelial thickening was observed after TransPRK and showed a lenticular change with more thickening mid-peripherally, which results in increased oblateness postoperatively. Epithelial remodeling may modify the profile after surface ablation.

16:30 - 18:00
Venue: 300

Efficacy and Outcomes of Combined Topography Guided with Wavefront Optimized Profile for Correction of Myopia

First Author: Chitra **RAMAMURTHY**

Co-Author(s): Ramamurthy **DANDAPANI**, Shreyas **RAMAMURTHY**

Purpose: To evaluate outcomes of topography guided combined with wavefront optimized profile for refractive correction.

Methods: Prospective interventional case series conducted between January and September 2016 at a tertiary eye institute. Patients undergoing myopic ablative refractive surgery older than 18 years of age with spherical equivalent less than -9 diopters (D) and cylinder up to -3 D were included in the study. Eyes with tomographic abnormalities were excluded. Treatment was performed using a combined topography guided and wavefront optimized profile (Contoura Vision) using the Wavelight EX 500 laser system. The primary outcome parameter was uncorrected visual acuity (UCVA) at 6 months.

Results: Two hundred eyes of 114 patients were included in the study with a mean spherical equivalent of -4.21 D. At 6 months 97.6% had UCVA of 6/6, of which 41.2% of patients had UCVA better than 6/6. No patient lost lines of BCVA. Two patients had a residual error of -0.75 D at 6 months. A statistically significant decrease in total higher order aberrations was observed ($P < 0.05$). On the subjective questionnaire 98.4% expressed a high degree of satisfaction with no photic phenomena. A total of 11.2% of patients reported a decrease in light sensitivity and 9.5% had improvement in night driving as compared to the preoperative period. Dry eye was the only reported complication after surgery.

Conclusions: Combined topoguided and wavefront optimized treatment profile showed excellent visual outcomes with a significant number of patients showing improvement in visual acuity better than preoperative levels and a high degree of subjective satisfaction.



16:30 - 18:00

Venue: 300

Epithelium-On Photorefractive Intrastromal Cross-Linking for Correction of Low Myopia in Asian Eyes

First Author: Wee-Kiak LIM

Purpose: To report the 12-month results of epithelium-on photorefractive intrastromal cross-linking (PiXL) in correcting low myopia in Asian subjects.

Methods: All PiXL treatments were customized to deliver specific patterns and intensities of UVA light based on individual corneal topography and refractive error. Clinical evaluation included safety (BCVA, ECC, anterior ocular health) and efficacy (UCVA, manifest refraction, keratometric parameters) checks. In addition, a survey was conducted at 9 months post-procedure to evaluate patients' subjective experience with the procedure.

Results: Fourteen myopic eyes (mean MRSE, -1.62 ± 0.6 D; range -0.75 to -2.65 D) of 8 subjects (mean age, 30 years old; range, 24 to 51 years old) were assessed. Our 9-month results revealed a mean MRSE reduction of -0.75 ± 0.42 D with a corresponding gain in UCVA of 0.34 log unit (3.5 Snellen lines) and mean keratometry flattening of 0.42 ± 0.32 D. There were no clinically significant changes to ECC and CCT and there was no loss in BCVA, no cases of infection, or permanent corneal haze. Subjectively, 62.5% of patients graded 7 and above on an ordinal scale for overall satisfaction; 62.5% of patients did not feel the need for spectacle correction; 62.5% of patients did not experience dysphotopsia; and 50% of patients experienced moderate to severe dry eyes.

Conclusions: Early results of this novel application of collagen cross-linking are encouraging but long-term data in larger studies are still required.

16:30 - 18:00

Venue: 300

Outcomes of Presbyopic Correction Using Monocular Bi-Aspheric Ablation Profile (PresbyMAX) in Hyperopic Eyes

First Author: Tommy CHAN

Co-Author(s): Vishal JHANJI, Sek KWOK, Alex Lap Ki NG, Victor WOO

Purpose: To present the 1-year outcomes of combining monocular bi-aspheric ablation profile and contralateral monofocal laser in situ keratomileusis (LASIK) in hyperopic patients with presbyopia.

Methods: Thirty-six consecutive patients (72 eyes) who underwent simultaneous bi-aspheric ablation (PresbyMAX: SCHWIND Eye-Tech-Solutions GmbH and Co KG,

Kleinostheim, Germany) in the non-dominant eye and monofocal regular LASIK in the dominant eye for correction of hyperopia and presbyopia were retrospective reviewed for 1 year. Binocular uncorrected distance visual acuity (UDVA) and near visual acuity (UNVA), corrected distance visual acuity (CDVA), distance corrected near visual acuity (DCNVA), and manifest refraction were analyzed postoperatively.

Results: At 1 year, the mean binocular UDVA improved significantly from 0.26 ± 0.25 logMAR to 0.039 ± 0.088 logMAR ($P < 0.001$). Binocular UNVA also improved from 0.73 ± 0.30 logRAD to 0.10 ± 0.22 logRAD ($P < 0.001$). Ninety-four percent of patients achieved UDVA $\geq 20/25$ and 90% had UNVA $\leq J3$. Simultaneous binocular distance and near vision of 20/25 and J2 or better was achieved in 70%. Only 17% of patients had a binocular DCNVA of $\leq J2$. No patient suffered from a loss of 2 lines of CDVA. Refractive stability was achieved for both eyes from 1 month postoperatively. Retreatment rate was 14% for improvement of near vision within 6 months to 1 year.

Conclusions: Presbyopic correction using monocular PresbyMAX combined with monofocal regular LASIK in the fellow eye is safe and acceptable in hyperopic patients.

16:30 - 18:00

Venue: 300

Safety and Efficacy of Accelerated Corneal Crosslinking with Laser in Situ Keratomileusis (3 Years)

First Author: Jing ZHANG

Co-Author(s): Changbin ZHAI, Yuehua ZHOU

Purpose: To evaluate the safety and efficacy of corneal collagen crosslinking (CXL) with laser in situ keratomileusis (LASIK) after 3 years.

Methods: Fifty patients (100 eyes) who received CXL-LASIK and 50 patients (100 eyes) who received LASIK to treat myopia or myopic astigmatism were compared. The follow-up was 3 years. Patients were evaluated for uncorrected distance visual acuity (UDVA), best corrected visual acuity (BCVA), spherical equivalent (SE), corneal topography, endothelial cell count, and corneal biomechanics at baseline and at 1 month, 6 months, 12 months, and 3 years after surgery.

Results: The SE were -6.83 diopters (D) before surgery, -0.31 D 1 month after surgery, -0.39 D 1 year after surgery, and -0.41 D 3 years after surgery in the CXL-LASIK group but -6.75 D, -0.35 D, -0.38 D, and -0.45 D in the LASIK group, respectively. There was no significant difference of SE between the 2 groups 3 years after surgery ($P > 0.05$). No significant decrease was observed in mean endothelial count in both groups ($P > 0.05$). The



changes of corneal hysteresis and corneal resistance factor were not significant in both groups ($P > 0.05$). The mean average keratometry value was significantly smaller in the CXL-LASIK group than that in the LASIK group 3 years after surgery ($P = 0.012$).

Conclusions: CXL with LASIK was safe and effective for 3 years. It can not only effectively correct myopia but also maintain stability of corneal curvature. CXL with LASIK can prevent the occurrence of myopia regression.

16:30 - 18:00

Venue: 300

Short-Term Safety and Efficacy of Combined Laser-Assisted Subepithelial Keratomileusis and Accelerated Corneal Crosslinking for Myopia

First Author: Kook Young **KIM**

Co-Author(s): Jae Lim **CHUNG**, Byoung-Yeop **KIM**, Kyung Min **KOH**, Young A **KWON**, Sang Wroul **SONG**

Purpose: To evaluate the short-term safety and efficacy of LASEK-Xtra, a technique combining laser-assisted subepithelial keratomileusis (LASEK) and accelerated corneal crosslinking (CXL), for myopia compared with the outcomes of standard LASEK.

Methods: One hundred thirty-six myopic eyes undergoing LASEK-Xtra from July 2015 to January 2016 and a control group of 102 myopic eyes undergoing LASEK from January 2015 to December 2015 were retrospectively analyzed. Manifest refractive spherical equivalent (MRSE), corneal keratometry (K), uncorrected (UDVA) and corrected (CDVA) distance visual acuities, and complications were analyzed both preoperatively and postoperatively for 6 months.

Results: The mean preoperative MRSE was significant: -6.23 ± 0.18 diopters (D) (range, -10.75 to -1.00 D) in the LASEK-Xtra eyes and -4.55 ± 0.17 D (range, -8.50 to -1.50 D) in the LASEK eyes. The differences between the 2 groups were statistically significant ($P < 0.05$). Postoperative UDVA and MRSE at 6 months were not significantly different statistically between the 2 groups (LASEK-Xtra: 0.06 ± 0.003 logMAR, -0.005 ± 0.03 D; LASEK: 0.01 ± 0.003 logMAR, -0.02 ± 0.03 D). Linear regression of the scatterplot of attempted versus achieved correction reveals a coefficient of determination of $R^2 = 0.977$ ($P < 0.05$) in the LASEK-Xtra group versus $R^2 = 0.978$ ($P < 0.05$) in the LASEK group.

Conclusions: Combined LASEK and accelerated corneal crosslinking does not reduce the accuracy of postoperative visual acuity and refraction in myopic subjects with higher diopters compared to LASEK surgery. In terms of the predictability of refractive outcomes, LASEK-Xtra is considered as an effective and safe surgical procedure

in comparison with LASEK surgery.

16:30 - 18:00

Venue: 300

Sub-SMILE Enhancement: A New Retreatment Option

First Author: Moones **ABDALLA**

Purpose: To assess clinical results of re-SMILE in a deeper level as retreatment after small incision lenticule extraction (SMILE) corneal refractive surgery.

Methods: The time between primary surgery and re-treatment had to be at least 3 months. A 160-um deep new cap was created with a different position for the incision.

Results: Three eyes of 3 patients were retreated using a second SMILE procedure. Spherical equivalent preoperatively was -3.79 , while postoperatively it was -0.47 diopters (D). There was no loss of 2 or more lines. Regression was insignificant.

Conclusions: Preliminary results of sub-SMILE enhancement show good safety and efficacy.

16:30 - 18:00

Venue: 300

Tear Fluid MMP-8 Concentration Predicts Inflammation After Photorefractive Keratectomy

First Author: Agung **NUGROHO**

Purpose: To compare tear fluid MMP-8 concentration of eyes with mild inflammation and severe inflammation after photorefractive keratectomy (PRK).

Methods: A cross-sectional study of 36 patients (55 eyes) who underwent PRK. Data including patient characteristics, inflammation parameters (pain, blepharospasm, lacrimation, limbal hyperemia, and corneal haze), and tear fluid MMP-8 concentration were collected before and after surgery. Tear fluid MMP-8 concentration was examined using ELISA. Patients within the 33rd percentile were included in the mild inflammation group, while those more than the 66th percentile were in the severe inflammation group.

Results: Both groups showed similar distribution in age, gender, refractive error, Schirmer test, retinometry, preoperative thickness, residual thickness, surgery time, ablation thickness, pulse, preoperative inflammation score, intraocular pressure (IOP), and MMP-8 concentration. After PRK, MMP-8 concentration was significantly increased in both the mild ($P = 0.025$) and severe inflammation ($P = 0.005$) groups. The severe inflammation group had a higher concentration of MMP-



8 than the mild inflammation group ($P = 0.006$).

Conclusions: This study demonstrated that after PRK, MMP-8 concentration was higher in the severe inflammation than in the mild inflammation group. This suggests that tear fluid MMP-8 concentration may predict inflammation after photorefractive keratectomy.

Mar 5, 2017 (Sun)

09:00 - 10:30

Venue: 301

A Comparative Study of Manual and Femtosecond Laser-Assisted Big Bubble Generation for Deep Anterior Lamellar Keratoplasty: A Laboratory Study

First Author: Millicent **BORE**

Co-Author(s): Pratik **GOGRI**, Pravin **KRISHNA**

Purpose: To compare manual big bubble creation and femtosecond laser-assisted creation of a stromal channel as a pre-treatment for creating a big bubble for deep anterior lamellar keratoplasty (DALK) surgery.

Methods: Creation of a big bubble was done on 10 donor pairs of cadaveric corneoscleral buttons. The 20 buttons were split into 2 groups; group A was the femtosecond laser pre-treatment group and group B the conventional deep lamellar technique. Laser pre-treatment was performed using the VisuMax Femtosecond System to create a stromal channel using the intracorneal ring treatment method for direct insertion of the 27-gauge air cannula for pneumo-dissection at pre-determined depth.

Results: The big bubble was achieved in 9 out of 10 group A corneoscleral buttons, while it was achieved in 7 corneoscleral buttons of group B. One button from group A had a combined type 1 and 2 bubble, while 1 did not achieve a big bubble nor did it perforate.

Conclusions: Preliminary results from this laboratory study show that intrastromal channel creation using femtosecond laser (INTACS module, Visumax platform) at pre-determined depth seems to be a promising option as a pre-treatment method for generation of a big bubble as compared to conventional deep lamellar technique.

09:00 - 10:30

Venue: 301

Bioptics: The Best Choice for High Ametropia Correction

First Author: Merab **DVALI**

Co-Author(s): Lia **JORJIKASHVILI**, Nino **SHARAZADASHVILI**, Bella **SIRBILADZE**, Nana **TSINTSADZE**

Purpose: To evaluate the efficacy, safety, and predictability of high myopia and hyperopia correction with the bioptics method, when target emmetropia cannot be achieved with only phakic intraocular lens (IOL) implantation or laser in situ keratomileusis (LASIK). It allows the surgeon to use a thinner phakic IOL to prevent contact between the phakic IOL and natural lens.

Methods: This retrospective study comprised more than 110 eyes with different types of bioptics treatments. Patient age ranged from 18-37 years. Spherical implantable collamer lens (ICL) was implanted through the first procedure (followed by LASIK) to correct high refractive errors. Toric ICL was implanted after penetrating keratoplasty (PK), radial keratotomy (RK), or intrastromal corneal ring (ISCR) implantation to correct residual refractive errors. Refraction, corneal topography, aberrometry, uncorrected visual acuity (UCVA), and best corrected visual acuity (BCVA) were assessed preoperatively and 1 week, 1 month, 6 months, and 1 year postoperatively.

Results: The UCVA of 81% of eyes was 20/25 or better. All eyes were within 1.25 diopters (D) of the target refraction, with 76% within ± 0.75 D. Four eyes (1.48%) developed increased intraocular pressure (IOP) for the first few days after surgery. Five eyes (1.85%) had moderate pigmentary dispersion after ICL implantation. Follow-up period was from 1 month to 12 years.

Conclusions: Bioptics is an effective, safe, and predictable procedure and its results are absolutely comparable. Bioptics is a good solution for patients with refractive errors when target emmetropia cannot be achieved with only 1 procedure, as well as due to individual restrictions (relatively thin cornea and/or abnormalities shown by corneal topography).

09:00 - 10:30

Venue: 301

Comparison of Implantable Collamer Lens Sizing Using White to White Measurements from Different Devices

First Author: Ganesan **VAITHEESWARAN**

Co-Author(s): Hema Malini **M S**, Mathew **KURIAN**, Rohit **SHETTY**

Purpose: To compare the implantable collamer lens (ICL) sizing obtained using white to white (WTW) mea-



surements from Orbscan with that of Lenstar, Nidek OPD Scan III, and Galilei and correlate them with the actual obtained vault.

Methods: The ICL size was calculated using the WTW from Orbscan (Bausch & Lomb) and anterior chamber depth (ACD) from Pentacam. The predicted vault was calculated from the UBM (Quantel Medical) machine and achieved vault measured by anterior segment optical coherence tomography (ASOCT). ICL size was calculated for 57 eyes of 57 patients with normal predicted and achieved vault after ICL implantation using WTW from the Lenstar, Nidek OPD Scan III, and Galilei with the standard ACD from Pentacam.

Results: Fifty-seven eyes (31 right, 26 left) of 57 patients underwent uneventful ICL implantation using WTW from Orbscan (mean, 11.56 mm; SD, 0.35 mm) and ACD from Pentacam (mean, 3.27 mm; SD, 0.19 mm). They had a mean preoperative predicted vault of 0.55 mm with 0.12 mm SD and mean postoperative attained vault of 0.53 mm with 0.14 mm SD. The mean WTW calculated using Lenstar, Galilei, and Nidek OPD Scan III were 12.16 ± 0.47 mm, 12.02 ± 0.35 mm, and 12.32 ± 0.44 mm, respectively, all higher than mean WTW with Orbscan. ICL sizes predicted by these methods were significantly oversized compared to the sizes with normal postoperative vaulting.

Conclusions: WTW is overestimated by the other machines compared to Orbscan and as a consequence phakic IOL patients risk high vaults unless adjustments are made in the calculations to compensate for the WTW overestimation.

09:00 - 10:30

Venue: 301

Customized Ablation in Keratoconus for a Targeted Corneal Asphericity: Q Protocol

First Author: Shruti KOCHAR

Co-Author(s): Tushar GROVER, Rohit SHETTY, Maithil THAKKAR

Purpose: To evaluate the outcomes of corneal laser ablation with Q factor modification for vision correction in patients with progressive keratoconus.

Methods: In this prospective study, 50 eyes of 50 patients were divided into 2 groups based on Q (>-1 in Group I and ≤ -1 in Group II). All patients underwent a detailed ophthalmic examination including uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), subjective acceptance, and corneal topography using the Pentacam. The Topolyzer was used to measure corneal asphericity (Q). Ablation was performed based on the preoperative Q values and thinnest pachymetry to obtain a target of near normal Q. This was followed by corneal collagen crosslinking to

stabilize the progression.

Results: Statistically significant improvement ($P \leq 0.05$) was noticed in refractive, topographic, and Q values post treatment in both groups. The improvements in higher-order aberrations and total aberrations were statistically significant in both groups; however, the spherical aberration showed statistically significant improvement only in Group II.

Conclusions: Ablation based on the preoperative Q and pachymetry for a near normal postoperative Q value appears to be an effective method to improve visual acuity and quality in patients with keratoconus.

09:00 - 10:30

Venue: 301

Evaluation of Age-Related Changes in Ocular Accommodation Biomechanics Using High-Frequency Ultrasound Biomicroscopy

First Author: Annmarie HIPSLEY

Co-Author(s): Dan GOLDBERG, Enrique PFEIFFER

Purpose: To measure accommodation in phakic young/healthy adult eyes compared with old/presbyopic eyes to explore changes in anterior segment anatomy by ultrasound biomicroscopy (UBM) imaging.

Methods: Twenty eyes (10 patients) were enrolled: group 1 (young/healthy aged 27-32); group 2 (old/presbyopic aged 45-55). Preoperative best corrected visual acuity was 20/25 or better. Dynamic accommodative response (AR) was stimulated utilizing a laser pointer as the far target and an ETDRS card fixed at 40 cm as a near target. Biometric changes of AR in the anterior segment were measured by UBM in an accommodation-solicited condition and in a relaxation state: a) scleral-ciliary angle structures; b) anterior and posterior (AP) lens surfaces; c) lens thickness. Individual UBM images and raw data of video loops were analyzed.

Results: Intraocular distances were evaluated based on a literature review of age-related anatomical changes. We observed a decrease in the distance between the ora serrata or insertion zone identified by Croft et al as the "posterior insertion zone of the vitreous zonule" and (a) scleral spur, (b) ciliary muscle apex, and (c) circumferential space and decrease in relative AP movements of the lens surfaces in all subjects in group 2 upon solicited accommodation.

Conclusions: Biometric changes in the scleral ciliary angle and AP lens surfaces can be quantified with UBM by observing and identifying specific anatomical relationships affected by age. Almost all anatomical structures appear to be affected by age and contribute to loss of accommodation. UBM appears to reliably measure these changes and evaluate the mechanisms that contribute to age-related biomechanical dysfunction in



the accommodative system.

09:00 - 10:30

Venue: 301

Evaluation of Changes in Dysfunctional Lens Syndrome Using Ray Tracing Wavefront Analysis After Laser Anterior Ciliary Excision in Presbyopic Eyes

First Author: Sheri **ROWEN**

Co-Author(s): Dan **GOLDBERG**, Annmarie **HIPSLEY**, David **MA**, Karolinne **ROCHA**

Purpose: To evaluate the effects of the laser anterior ciliary excision (LaserACE) procedure on dysfunctional lens syndrome (DLS).

Methods: Twenty-four patients (48 eyes) over 40 years of age demonstrating loss of accommodative function underwent bilateral LaserACE. An Er:YAG laser was used in 4 quadrants on the sclera to improve pliability and biomechanical efficiency of the ciliary muscles in 3 critical zones. Visual acuities were assessed using the Early Diabetic Retinopathy Study (EDTRS) logMAR charts at 1, 3, 6, 12, and 24 months and after 10 years.

Results: The accommodative range increased 1.25-1.5 diopters (D) ($P < 0.034$) after LaserACE treatment. Changes in SA, coma, trefoil, defocus, and accommodation were noted. LaserACE showed a positive effect on DLI and MTF of the internal optics.

Conclusions: Ray-tracing technology can objectively measure dynamic accommodation as well as specific lens behavior. Changes after the LaserACE procedure were seen in both spherical aberration and depth of focus. Pseudoaccommodation from changes in spherical aberration and increased depth of focus may contribute to near vision functionality. LaserACE may prove a valuable therapy for patients who have dysfunctional lens syndrome. Further, ray-tracing wavefront analysis changes after the LaserACE procedure may explain some of the effects of the procedure.

09:00 - 10:30

Venue: 301

Functional Outcomes of the New Precision Presbyopic Multifocal Intraocular Lens

First Author: Mike **HOLZER**

Purpose: To evaluate the ability of the Precision Presbyopic Multifocal Intraocular Lens (MIOL; Ophtec, Groningen, The Netherlands) to provide near, intermediate, and distance vision in patients undergoing cataract extraction or refractive lens exchange (RLE) in a multicenter clinical trial.

Methods: Prospective, open label, single-arm, mul-

ticenter clinical trial with ethics committee approval. Follow-up exams were performed 1 day, 1 week, 1 and 3 months postoperatively. The main outcome parameters were logMAR corrected/uncorrected visual acuity scores at distance (uncorrected distance visual acuity, UDVA 4 m), intermediate (uncorrected intermediate visual acuity, UIVA 80 cm), and near (uncorrected near visual acuity, UNVA 40 cm); manifest refraction spherical equivalent (MRSE); and defocus curve. Lenses were available in powers ranging from +10.0 diopters (D) to +30.0 D in 0.5 D increments, with add-on power of +2.75 D.

Results: Three-month postoperative analysis after bilateral implantation of the MIOL in 24 patients. Mean uncorrected bilateral VA scores were UDVA 0.02 ± 0.10 , UIVA 0.09 ± 0.14 , and UNVA 0.15 ± 0.15 . Distance corrected VA scores were CDVA -0.01 ± 0.09 , DCIVA 0.11 ± 0.15 , and DCNVA 0.17 ± 0.15 . CNVA was 0.09 ± 0.11 . The mean spherical equivalent was -0.12 ± 0.38 . The mean sphere was -0.01 ± 0.36 and the mean refractive cylinder was -0.23 ± 0.39 . The defocus curve showed 2 peaks (~ 0.0 logMAR) at distance and 50 cm (defocus -2.0) with a minor drop for intermediate vision.

Conclusions: Bilateral Precision Presbyopic MIOL implantation was uneventful and effectively provides presbyopic patients with satisfying uncorrected near, intermediate, and distance visual acuity.

09:00 - 10:30

Venue: 301

Linking Temporal Changes in Corneal Biomechanics with Proteomic Changes in Tears and Bowman Layer Microdistortions After Contralateral SMILE and LASIK

First Author: Rushad **SHROFF**

Co-Author(s): Rashmi **DESHMUKH**, Tushar **GROVER**, Abhijit **SINHA ROY**, Rohit **SHETTY**

Purpose: To compare the biomechanical changes and proteomic profile of wound healing after small incision lenticule extraction (SMILE) and laser in situ keratomileusis (LASIK) in contralateral eyes.

Methods: This prospective study included 80 eyes of 40 patients who underwent SMILE (Carl Zeiss, Germany) in 1 eye and LASIK (Wavelight, USA) in the fellow eye. Tomography and corneal biomechanics were measured using Pentacam and Corvis ST, respectively (OCULUS Optikgerate, Germany). Bowman layer was imaged and quantified using high resolution spectral domain optical coherence tomography (OCT; Bioptigen Inc, USA). Tears were collected before and after surgery for quantitative proteomic (ABSciex, USA) analyses.

Results: Both SMILE and LASIK caused microdistortions in Bowman layer but resolution of distortions took



longer in LASIK eyes ($P < 0.05$). Corneal deformation reduced but was stable between 1 and 3 months after surgery followed by significant improvement (~27%) up to 6 months ($P < 0.05$). In LASIK eyes, there was continued degradation of deformation from 1 to 3 months followed by slight improvement up to 6 (~9%) months. Wound healing tear markers indicated delayed healing in LASIK eyes compared to SMILE eyes.

Conclusions: Temporal change in corneal deformation indicated greater biomechanical stability after SMILE than after LASIK. This was supported by faster reduction in microdistortions in the Bowman layer and tear biomarker expression after SMILE.

09:00 - 10:30

Venue: 301

Long-Term Outcomes of Femtosecond Intrastromal Lenticule Implantation for Correction of Moderate to High Hyperopia

First Author: Sanjana **SRIVATSA**

Co-Author(s): Sheetal **BRAR**, Sri **GANESH**

Purpose: To evaluate the visual and refractive outcomes, along with changes in keratometry, pachymetry, higher order aberrations, and asphericity following a tissue addition technique in moderate to high hyperopia.

Methods: This study included 30 eyes of 17 patients (mean age, 27 years) with unilateral or bilateral hyperopia. Femtosecond laser was used to create a pocket in the patient's cornea into which a fresh/cryopreserved lenticule, obtained from myopic patients undergoing ReLEx SMILE and matched for refractive error, was implanted. Mean follow-up was 14 months (range, 8-24 months).

Results: Based on values before and 1 year after the procedure, clinical improvement was noted in best corrected visual acuity (0.19 ± 0.22 vs 0.15 ± 0.11 logMAR), manifest spherical equivalent (4.73 ± 1.65 vs $+0.65 \pm 0.59$ D), and mean CCT (551.23 ± 43.00 vs 600.87 ± 46.54 μ m). Mean keratometry increased from 44.3 ± 2.51 D to 46.7 ± 2.11 D. Asphericity changed from -0.37 ± 0.33 to -0.96 ± 0.19 . Preoperative and postoperative higher order aberrations were 0.2 μ m and 0.32 μ m, respectively. One patient developed bilateral interface haze, for which the lenticules were explanted followed by reimplantation of fresh lenticules. Both eyes of another patient with high hyperopia of +9.0 DS had a residue of +2.5 DS, for which Bowman membrane relaxation was done using a Barren trephine.

Conclusions: At 1 year, the tissue addition technique was found to be safe and effective to treat moderate to high hyperopia. Potential advantages are less chances of regression, less induced aberrations, no flap compli-

cations, reversibility, and any residual refractive error can be managed effectively.

09:00 - 10:30

Venue: 301

Long-Term Visual Outcomes and Stability After Laser Anterior Ciliary Excision

First Author: David **MA**

Co-Author(s): Annmarie **HIPSLEY**, Jod **MEHTA**, Sheri **ROWEN**, Chi-Chin **SUN**

Purpose: To evaluate the long-term visual outcomes after bilateral laser anterior excision (LaserACE) for restoring dynamic near and intermediate vision.

Methods: Twenty-four patients (48 eyes) over 40 years of age demonstrating loss of accommodative function underwent bilateral LaserACE. An Er:YAG laser was used in 4 quadrants on the sclera to improve pliability and biomechanical efficiency of the ciliary muscles in 3 critical zones. Visual acuities were assessed using the Early Diabetic Retinopathy Study (EDTRS) logMAR charts at 1, 3, 6, 12, and 24 months and after 10 years.

Results: All patients achieved improvement in their visual acuities. At 24 months postoperatively, DCIVA was 20/30 or better in 100% of subjects, 89% with 20/25 and 78% with 20/20. DCNVA was 20/30 or better in 83% of subjects, 67% with 20/25 and 50% with 20/20. UIVA was 20/30 or better in 89% of subjects, 72% with 20/25 and 72% with 20/20. UNVA was 20/30 or better in 83% of subjects, 78% with 20/25 and 33% with 20/20. There was no statistical change in DCVA or UDVA. Mean stereopsis improved from 75.77" to 60".

Conclusions: LaserACE performed using the VisioLite Er:Yag laser appears to be a safe and effective procedure for restoring range of visual performance for near and intermediate visual tasks without compromising UDVA, CDVA, or binocularity. Stereopsis was not only preserved but improved over time. Patient visual performance was improved following LaserACE and was sustained over 24 months and up to 10 years.

09:00 - 10:30

Venue: 301

Pattern of Increasing Intraocular Pressure After Phakic Anterior Chamber Intraocular Lens Implantation

First Author: Puty **LESTARI**

Purpose: Phakic intraocular lenses (IOLs) are being used to correct refractive errors. We studied the pattern of increasing intraocular pressure (IOP) after phakic anterior chamber intraocular lens implantation as a risk after surgery.



Methods: Sixty-two eyes of 31 patients were enrolled. All eyes underwent the same protocol with IOP examination before the surgical procedure and during follow-up (1 day, 2 weeks, 1 month, 2 months, and 3 months) after implantation of the phakic anterior chamber IOL. All results were analyzed statistically using SPSS 16 statistics software. Correlation between parameters were analyzed using the Wilcoxon test.

Results: Median IOP before surgery was 14.00 mm Hg (IOP) and during follow-up was 17.00 mm Hg (IOP I), 16.00 mm Hg (IOP II), 17.00 mm Hg (IOP III), 15.00 mm Hg (IOP IV), and 15.00 mm Hg (IOP V). The increase in IOP from before surgery to day 1 follow-up was found to correlate significantly ($P = 0.03$). There were increases of IOP after 2 weeks, 1 month, 2 months, and 3 months but they were not significantly different.

Conclusions: There was a significant increase in IOP before surgery compared to 1 day after surgery; then the pattern of increasing IOP tended to be stable. There were no significant increases of IOP during 3 months of follow-up.

09:00 - 10:30

Venue: 301

Predictive Analysis of Accommodation Mechanics for Various Technology Applications Using a Virtual 3D Finite Element Model

First Author: Annmarie HIPSLEY

Co-Author(s): Silvia BLEMKER, Dan GOLDBERG, Katie KNAUS

Purpose: To develop a multi-component 3-dimensional (3D) finite element (FE) model of the accommodative mechanism that includes the ciliary muscle, lens, zonules, sclera, and choroid.

Methods: Representative 3D models of the ocular structures were developed based on extensive review of literature defining the anatomical geometry and material properties of the young and old resting human eye. Geometric meshing and FE analysis were performed using AMPS technology with simulated zonular pre-tensioning of the lens to the unaccommodated state and ciliary muscle contraction to the accommodated state. Ciliary muscle fiber groups were activated in isolation to quantify each's contribution to accommodative action. Model predictions for surgical intervention and therapies were analyzed including scleral treatments and accommodating intraocular lenses.

Results: The FE models demonstrated contractile forces of the ciliary muscle and the resultant changes to the ocular structures during accommodation. The model predicted lens deformations and displacements related to accommodative amplitude changes that

were consistent with experimental observations from the literature. The model revealed specific contributions of ciliary fiber groups to lens changes, with radial fibers contributing most to anterior displacement and circular fibers contributing most to circumferential deformation. Sensitivity analysis of the differences in accommodation between the "young/healthy" and "old/presbyopic" eye identified the age-related changes that contribute most to symptoms of presbyopia.

Conclusions: This computational 3D FE model provides novel insight into the interactions of the components of the accommodative mechanism through incorporation of decades of previous research. The model results were effectively validated with existing data.

09:00 - 10:30

Venue: 301

Results of Intraoperative Manual Cyclotorsion Compensation for Myopic Astigmatism in Patients Undergoing Small Incision Lenticule Extraction

First Author: Sheetal BRAR

Co-Author(s): Sri GANESH

Purpose: To study the safety, efficacy, and outcomes of manual cyclotorsion compensation in small incision lenticule extraction (SMILE) for myopic astigmatism.

Methods: Eligible patients with myopia from -1 to -10 diopters (D) spherical equivalent (SE) with a minimum astigmatism of -0.75 D undergoing SMILE were included. Intraoperative cyclotorsion compensation was performed by gently rotating the cone and aligning the 0-180 degree limbal marks with the horizontal axis of the reticule of the right eye piece of the femtosecond laser after activating the suction.

Results: Eighty-one left eyes from 81 patients were analyzed for vector analysis of astigmatism. The mean cyclotorsion was 5.64 ± 2.55 (range, 2-12) degrees. No significant differences were found for surgically induced astigmatism (SIA), difference vector (DV), angle of error (AE), correction index (CI), magnitude of error (ME), index of success (IOS), and flattening index (FI) between 2 weeks and 3 months ($P > 0.05$). The eyes were categorized into low (≤ -1.5 D, $n = 37$) and high (> -1.51 D, $n = 44$) cylinder groups. At 3 months, inter-group analysis showed a comparable CI of 0.97 for low and 0.93 for the high cylinder group, suggesting a slight undercorrection of 3% and 7%, respectively ($P = 0.14$). However, the AE and IOS was significantly lower in the high compared to the low cylinder group ($P = 0.032$, $P = 0.024$ for AE and IOS respectively), suggesting better alignment of the treatment in the high cylinder group. However, the mean uncorrected visual acuity (UCVA) of both groups was comparable ($P = 0.21$), suggesting

good visual outcomes in the low cylinder group despite a less favorable IOS.

Conclusions: Manual compensation may be a safe, feasible, and effective approach to refine the results of astigmatism with SMILE, especially in higher degrees of cylinders.

09:00 - 10:30

Venue: 301

SAVER Study: Simulation by Adaptive Optics for Vision Experiment and Treatment in Presbyopia

First Author: Shruti **KOCHAR**

Co-Author(s): Tushar **GROVER**, Rohit **SHETTY**, Abhijit **SINHA ROY**

Purpose: To evaluate distance and near vision in presbyopic patients by modifying spherical aberration (SA) with an adaptive optics (AO) simulator.

Methods: Visual AO (VAO) aberrometer (VOptica Inc, Spain) was used to measure ocular wavefront aberrations in presbyopic patients ($n = 100$). VAO also has an inbuilt liquid crystal sensor to modify the ocular aberrations virtually and perform functional vision test on presbyopic eyes. By changing SA over the natural aberrations of the eye, the change in uncorrected distance, intermediate (80 cm), and near (40 cm) visual acuity (VA) was noted in decimals. Refractive error was also measured with VAO. Induced change in SA was converted to required myopic ablation in terms of myopic spherical correction for possible surgical modification.

Results: In presbyopic eyes, induction of added negative SA resulted in improvement of near and intermediate VA but distance VA reduced simultaneously. Median VA improved by 0.1 decimal in intermediate and near vision while distance VA reduced by -0.15 decimal ($P < 0.0002$). Desired change in SA was selected by optimizing the improvement in near and intermediate vision while maintaining distance VA. Nearly half of the eyes required a myopic spherical correction of 1 diopter (D) or more to improve near and intermediate vision. The remaining needed a correction of 1 D or less. Overall, each eye was unique.

Conclusions: VAO provided patient-specific measurements of aberrations and subsequent modification to improve near and intermediate VA. This methodology can help in customizing presbyopia treatment with laser ablation.

Retina (Medical)

Mar 3, 2017 (Fri)

16:30 - 18:00

Venue: 302

A Nationwide Cohort Study of Cigarette Smoking and Risk of Neovascular Age-Related Macular Degeneration in Men

First Author: Tyler Hyungtaek **RIM**

Co-Author(s): Ching-Yu **CHENG**, Sung Soo **KIM**, Tien **WONG**

Purpose: Smoking is associated with prevalent age-related macular degeneration (AMD). However, the incidence of neovascular AMD among smokers has not been longitudinally well-evaluated because of the rarity of this disease. This study aimed to evaluate the association between cigarette smoking and neovascular AMD.

Methods: We conducted a nationwide historical cohort study involving Korean men aged 45–79 years included in the Korea National Health Insurance Service database from 2002 through 2013. Incident cases of neovascular AMD were identified from the database. We compared hazard ratios (HR) for neovascular AMD between 64,974 current/past smokers and 64,974 nonsmokers by 1:1 propensity-matched analysis, and 85,288 current/past smokers and 72,406 nonsmokers by unmatched cohort and propensity-adjusted analysis.

Results: The risk of neovascular AMD in current/past smokers was higher than in nonsmokers (propensity-adjusted whole cohort analysis: HR, 1.50; 95% confidence interval [CI], 1.24–1.82; propensity-matched analysis: HR, 1.56; 95% CI, 1.28–1.91). This risk was more pronounced in current than past smokers (propensity-adjusted whole cohort analysis for current smokers: HR, 1.68; 95% CI, 1.36–2.06; for past smokers: HR, 1.18; 95% CI, 0.89–1.56; propensity-matched analysis for current smokers: HR, 1.66; 95% CI, 1.34–2.06; and for past smokers: HR, 1.36; 95% CI, 1.02–1.80). Longer duration of smoking and higher amounts of cigarette consumption were associated with a higher incidence of neovascular AMD in a dose-dependent manner ($P < 0.001$).

Conclusions: There is a strong risk of neovascular AMD associated with smoking, with the risk higher among current smokers than past smokers.



14:30 - 16:00

Venue: 300

Analysis of Comorbidities for Development of Diabetic Macular Edema Among Japanese Patients with Diabetes Mellitus-Related Ocular Complications

First Author: Atsuki **KUME**

Co-Author(s): Kenji **KASHIWAGI**, Tomohiro **OHSHIRO**

Purpose: To investigate ocular and systemic comorbidities related to the development of diabetic macular edema (DME) among Japanese patients with any diabetes mellitus (DM)-related ocular complications using health insurance claims.

Methods: The total number of analyzed subjects were 3.11 million Japanese who were registered in a database from Japan Medical Data Center from 2005 to 2014. Subjects with DM were defined as those who had been prescribed any therapeutic medications for DM, and analysis of comorbidity was performed based on the International Classification of Diseases version 10 (ICD 10). Periods for the analysis were 1 year before development of DME among DME patients and 1 year before the last visit to ophthalmic clinics among non-DME patients.

Results: The total number of patients with DM-related ocular complications was 21,463, and 17,403 (55.7 ± 10.8 years) patients met the entry criteria. Of these, a total of 420 (55.2 ± 10.0 years) patients developed DME. Many comorbidities were determined as significantly related factors for DME development by Fisher exact test ($P < 0.05$). Significantly frequent comorbidities were mainly cataract, proliferative diabetic retinopathy, uveitis, hypertension, heart failure, nephropathy, peripheral neuropathy, skin necrosis or ulcer, dysmenorrhea, and abnormalities in pregnancy. In contrast, significantly less frequent comorbidities were mainly ureteral stone, pollinosis, hepatic steatosis, and insomnia.

Conclusions: Various kinds of comorbidities were involved in the development of DME. Comorbidities which deeply related to 3 major complications related to DM increased the possibility of developing DME, while some comorbidities decreased it.

14:30 - 16:00

Venue: 300

Association Between Retinal Neurodegeneration and Foveal Avascular Zone Measured by OCT Angiography in Diabetic Eyes

First Author: Kiyoungh **KIM**

Co-Author(s): Eung-Suk **KIM**, Seung Young **YU**

Purpose: To evaluate the correlation of ganglion cell-inner plexiform (GC-IPL) thickness with foveal avascular zone (FAZ) area using optical coherence tomography angiography (OCTA; Angioplex, Carl Zeiss) in diabetic eyes.

Methods: Medical records of diabetic patients without retinopathy ($n = 40$), diabetic patients with mild to moderate nonproliferative diabetic retinopathy (NPDR; $n = 55$), and healthy eyes ($n = 40$) were reviewed. The mean parafoveal GC-IPL thickness was measured using Cirrus HD-OCT (Carl Zeiss). The FAZ area in the superficial and deep plexus layers were measured and evaluated using OCTA.

Results: The FAZ area in the superficial and deep layer was $0.28 \pm 0.09 \text{ mm}^2$ and $0.36 \pm 0.11 \text{ mm}^2$ in healthy eyes, $0.4 \pm 0.16 \text{ mm}^2$ and $0.47 \pm 0.16 \text{ mm}^2$ in diabetic eyes without retinopathy, and $0.39 \pm 0.12 \text{ mm}^2$ and $0.46 \pm 0.12 \text{ mm}^2$ in eyes with diabetic retinopathy. Diabetic eyes showed statistically significant FAZ enlargement compared with healthy eyes. The FAZ area and GC-IPL thickness were significantly correlated in both diabetic groups ($P = 0.03$, $P < 0.001$), whereas they were not significant in controls ($P = 0.894$).

Conclusions: Both enlargement of FAZ and retinal neurodegeneration occur in early diabetic retinopathy regardless of the presence of retinopathy. Additionally, FAZ area and GC-IPL thickness were numerically correlated in diabetic eyes.

14:30 - 16:00

Venue: 300

Association of Structural and Refractive Ocular Components with the Development of Diabetic Retinopathy and Its Severity

First Author: Prabhjot Kaur **MULTANI**

Co-Author(s): Harsha **BHATTACHARJEE**, Kasturi **BHATTACHARJEE**, Deepika **KAPOOR**, Diva **MISRA**, Samir **SERASIYA**

Purpose: To study the effect of structural components including axial length (AL), average spherical equivalent (average K), anterior chamber depth (ACD), and lens biometry as well as cycloplegic refractive error (RE) on diabetic retinopathy (DR) and its severity.



Methods: A total of 1300 eyes of 650 diabetic patients underwent examination with a 90 diopter (D) lens and indirect ophthalmoscopy to diagnose diabetic retinopathy, if present. Structural components were assessed using biometry technique. Cycloplegic refraction was done. The DR group and no DR group were formed. The former was further classified into non-proliferative DR (NPDR), NPDR with clinically significant macular edema (CSME), and proliferative DR (PDR).

Results: Based on the RE, subjects were 62.89% and 54.42% hyperopic, 13.40% and 16.02% emmetropic, and 23.71% and 29.56% myopic in the DR and no DR groups, respectively. Mean AL in the DR group was 22.89 ± 0.87 mm and in the no DR group was 23.33 ± 1.14 mm ($P < 0.0001$). Mean ACD in the DR group was 3.31 ± 0.59 mm and in the no DR group was 3.40 ± 0.62 mm ($P = 0.025$). Mean K value in the DR group was 44.44 ± 1.53 D and in the no DR group was 44.10 ± 1.43 D ($P < 0.0001$). Statistically significant difference was obtained in the lens biometry between the 2 groups. ANOVA showed no significant difference among the NPDR, NPDR-CSME, and PDR groups.

Conclusions: This study indicates that all the structural components have a strong association with the development of diabetic retinopathy. However, there is no association of these components among the different clinical forms of diabetic retinopathy.

14:30 - 16:00
Venue: 300

Associations Between Perceived Barriers to Diabetes Self-Care and Diabetic Retinopathy in Singaporean Patients with Type 2 Diabetes

First Author: Amudha ARAVINDHAN
Co-Author(s): Eva FENWICK, Ecosse LAMOUREUX, Ryan MAN, Gavin TAN

Purpose: We examined the associations between barriers to diabetes self-care and the presence and severity of diabetic retinopathy (DR) in a sample of Singaporeans with type 2 diabetes.

Methods: Consenting patients with diabetes attending the retinal clinics at a tertiary eye center were recruited. DR was graded from 2-field retinal images using the Modified Airlie House Classification system. Barriers to diabetes self-care were measured using a 23-item questionnaire comprising items about knowledge of diabetes management, access to diabetes care, and confidence in healthcare professionals. Rasch analysis was used to transform questionnaire data into an interval level composite score, with lower scores indicating a higher degree of self-perceived barriers. Multivariable logistic regression models were utilized to assess the relationship between barriers to diabetes self-care

and DR (worse-affected eye).

Results: We included 436 eligible patients (mean age [SD], 57.8 [7.6] years; 68% males). Of these, 193, 125, and 118 had none, mild-moderate, and severe (severe non-proliferative and proliferative stages) DR, respectively. Greater perceived barriers to diabetes self-care were independently associated with higher odds of having any (odds ratio [OR], 95% confidence interval [CI]: 1.28; 1.04-1.57), mild-moderate (1.28; 1.01-1.63), and severe DR (1.31; 1.02-1.69). This relationship was independent of socio-demographic factors, diabetes control parameters (HbA1c, blood pressure, and lipids), and presenting visual acuity.

Conclusions: Perceived barriers to diabetes self-care are independently associated with DR severity. While a longitudinal study is needed to confirm our cross-sectional findings, our data suggest that evidence-based interventions to improve barriers to diabetes care may prevent the development and progression of DR.

14:30 - 16:00
Venue: 300

Awareness of Diabetic Retinopathy Among Diabetic Patients Attending the Outpatient Department of Various Tertiary Care Hospitals in Pakistan

First Author: Muhammad Khizar NIAZI
Co-Author(s): Akhtar ALI, Abdur Rehman Azeem DAR, M Irshad HUSSAIN

Purpose: According to the International Diabetes Federation, over 6.9 million people have diabetes in Pakistan. Among its complications, retinopathy is most severe and can cause blindness if left untreated. The only way to avoid it is early detection and control of risk factors. This study aims to assess the awareness of diabetic retinopathy among diabetic patients attending eye outpatient departments (OPD) at various tertiary care hospitals in Pakistan.

Methods: This observational cross-sectional study was conducted between January 2014 and December 2015 in the OPD of Quetta Institute of Medical Sciences, Quetta; Armed Forces Institute of Ophthalmology, Rawalpindi; and Sheikh Khalifa Hospital Rawalakot; all are tertiary care hospitals in different provinces of Pakistan. A total of 477 cases were included in the study after confirming their positive history for diabetes and no previous eye exam. Data was collected via questionnaires containing 10 closed-ended questions. Demographic details and other co-variables like age, level of education, socioeconomic status, and duration of diabetes were also included.

Results: Only 41.6% ($P < 0.001$) of patients were aware of diabetic retinopathy, out of which 82.6% ($P < 0.001$)



were aware that it could cause permanent blindness. A total of 65.2% and 34.8% of patients from urban and rural areas, respectively, were aware of diabetic retinopathy.

Conclusions: Irrespective of the large population suffering from diabetes, few were aware of its adverse effects on vision. There is an immediate need for the development of national policy, which should promote awareness campaigns and screening programs for diabetic retinopathy.

16:30 - 18:00

Venue: 302

Classification of Exudative Age-Related Macular Degeneration with Pachyvessels on En Face Swept Source Optical Coherence Tomography

First Author: Danny **NG**

Co-Author(s): Malini **BAKTHAVATSALAM**, Marten **BRELEN**, Carol **CHEUNG**, Timothy **LAI**, Chi-Wai **TSANG**

Purpose: To classify exudative age-related macular degeneration (AMD) by the presence of pachyvessels on en face swept-source optical coherence tomography (SS OCT).

Methods: Consecutive patients with signs of exudative AMD underwent SS OCT, fluorescein and indocyanine green angiography (ICGA), fundus photography, and fundus autofluorescence examinations. Images were analyzed in a masked fashion by 2 sets of 4 examiners in different sessions: 1) the presence of pachyvessels in en face OCT and 2) features of exudative AMD in conventional imaging modalities. Quantitative data evaluated included subfoveal choroidal thickness (SFCT) and choroidal vascularity index (CVI), which was the ratio of choroidal vessel lumen area to a specified choroidal area from binarized cross-sectional OCT scans.

Results: Pachyvessels was observed in 38 (52.1%) of 73 eyes with exudative AMD. The pachyvessel group was significantly younger: 69.1 vs 73.7 years old ($P = 0.04$). The presence of polyps, absence of drusen, increased SFCT, and CVI were significantly associated with pachyvessels by univariate analysis ($P = 0.02, 0.01, < 0.01$, and 0.01 , respectively). In multiple logistic regression, CVI significantly correlated with pachyvessels ($P = 0.04$). Correlation analysis for pachyvessels, SFCT, and CVI found a high agreement between study eyes and their asymptomatic fellow eyes (coefficient of kappa = 0.698, Pearson correlation coefficient = 0.681 and 0.692, respectively).

Conclusions: Exudative AMD could be classified based on differences in choroidal vasculature morphology. Current results implicated that choroidal hemodynamics may be relevant to variable natural history and

treatment response in various types of exudative AMD.

14:30 - 16:00

Venue: 300

Cloud-Based Automated Software for Diabetic Retinopathy Screening and Monitoring in a National Screening Program

First Author: Daniel **TING**

Purpose: Several automated diabetic retinopathy (DR) grading software programs have been developed and tested, but few have been used in “real-life” settings in screening programs. We evaluated the diagnostic performance of cloud-based automated software for DR in a national Singapore screening program.

Methods: We developed “cloud-based” DR screening software (the Singapore Eye LESion Analyzer, SELENA) that utilizes deep learning technology, a machine-learning technology based on learning representations of data, and applied this to images captured from the Singapore Integrated Diabetic Retinopathy Screening Programme (SiDRP), a national telemedicine screening program for DR in Singapore. We trained SELENA on a total of 104,467 retina images captured from all patients with diabetes over a 3-year period from SiDRP. We calculated the sensitivity, specificity, and repeatability (same image analyzed twice) of SELENA in detection of referable DR (moderate NPDR and above, including “ungradable” images) and vision-threatening DR (severe NPDR and PDR), with reference to the retinal specialists’ grading.

Results: Among the 104,467 retinal images, 92,970 (89.0%) had no DR, 8761 (8.4%) had mild nonproliferative DR (NPDR), 1799 (1.7%) had moderate NPDR, 740 (0.7%) had severe NPDR, and 197 (0.2%) had PDR. For the detection of referable DR ($n = 2736$), the sensitivity and specificity were 95% and 95%, respectively. For vision-threatening DR, the sensitivity increased to 97% with a specificity of 94%. The repeatability of SELENA ($n = 104,467$) was 100%.

Conclusions: We tested and validated the performance of an automated DR screening software using retinal photographs from a national telemedicine DR screening program in the primary care setting in Singapore.

14:30 - 16:00

Venue: 300

Comparative Study of RNFL Thickness in Diabetic Patients by SD-OCT

First Author: Jyoti **GARHWAL**

Co-Author(s): Anju **KOCHAR**, Lokesh **MAURYA**

Purpose: A comparative study of retinal nerve fiber



layer (RNFL) thickness between diabetic retinopathy patients, diabetic patients without retinopathy, and healthy subjects to establish the role of optical coherence tomography (OCT) in detecting early diabetic RNFL changes in diabetes mellitus patients before diabetic retinopathy becomes clinically evident using spectral domain OCT (SD-OCT).

Methods: A prospective study was done in 150 eyes of 75 patients of defined study groups. Group A included patients with type 2 diabetes mellitus without diabetic retinopathy (NDR). Group B included patients with type 2 diabetes mellitus and non-proliferative diabetic retinopathy (DR). Group C comprised normal subjects without diabetes mellitus (control).

Results: Average RNFL thickness in normal subjects was 105.40 ± 7.69 , in the NDR group was 98.80 ± 10.432 , and in the DR group was 99.52 ± 12.01 . Mean RNFL thickness in the superotemporal, superonasal, inferotemporal, inferonasal, inferior, superior, nasal, and temporal quadrants were noted. Statistically significant differences were present in the inferotemporal, inferonasal, nasal, and inferior quadrants and for overall average ($P < 0.05$) between normal subjects and the NDR group and between normal subjects and diabetic retinopathy patients.

Conclusions: RNFL thickness was significantly decreased in both diabetic retinopathy patients and diabetic patients who had not developed retinopathy as compared to normal subjects, indicating that not only vascular abnormalities but also neuronal abnormalities accompany the pathogenic changes at the early stage of DR. RNFL thickness measurement has a significant role in detecting retinal pathology in the preclinical stage before ophthalmoscopic changes appear. However, larger studies with long-term follow-up are required to establish a definitive role of OCT to detect damage and progression of RNFL damage.

16:30 - 18:00

Venue: 302

Comparison of Lipoprotein Profile in Typical Age-Related Macular Degeneration and Polypoidal Choroidal Vasculopathy

First Author: Kelvin **TEO**

Co-Author(s): Miao Ling **CHEE**, Gemmy **CHEUNG**, Chiea Chuen **KHOR**, Ian **YEO**

Purpose: Polypoidal choroidal vasculopathy (PCV) is a well-recognized subtype of age-related macular degeneration (AMD). Dysfunctional lipid metabolism may be involved in the pathogenesis of AMD and PCV. In a genome-wide association study in Asian AMD, our group identified a missense mutation (D442G) in the cholesteryl ester transfer protein (CETP) gene that is

associated with elevated HDL-C and increased risk of AMD. CETP deficiency is thought to affect the transfer of cholesteryl ester from HDL to LDL. We previously reported a significantly different lipoprotein profile in Asian AMD compared to controls. This study aims to report the lipoprotein profile in PCV, which is more common in Asians.

Methods: This is a case-controlled study using serum samples of patients with PCV, typical (non-PCV) AMD (tAMD), and age/gender-matched controls. tAMD and PCV were diagnosed with standardized clinical and baseline fluorescein and indocyanine green angiography. In-depth lipoprotein profiles were performed using nuclear magnetic resonance spectroscopy.

Results: Lipoprotein profiles of tAMD and PCV showed marked differences compared to controls in many parameters, including higher HDL particle concentration (tAMD = $37.3 \mu\text{mol/L}$, PCV = $37.2 \mu\text{mol/L}$ vs control = $35.3 \mu\text{mol/L}$), higher IDL particle concentration (tAMD = 168.9 nmol/L , PCV = 143.5 nmol/L vs control = 110.7 nmol/L), lower VLDL and chylomicron particle concentration (tAMD = 61.3 nmol/L , PCV = 60.0 nmol/L vs control = 73.2 nmol/L), and lower ApoA1 (tAMD = 150.9 mg/dL , PCV = 140.2 mg/dL vs control = 155.8 mg/dL). Patients with PCV also had significantly lower CETP concentrations than controls.

Conclusions: Lipoprotein profiles in PCV and tAMD patients were significantly different from controls, suggesting lipid metabolism pathway may be involved the pathogenesis of both subtypes.

14:30 - 16:00

Venue: 300

Comparison of Ranibizumab and Aflibercept for Myopic Choroidal Neovascularization

First Author: Taras **KUSTRYN**

Co-Author(s): Oksana **BLAVATSKA**, Andrii **KOROL**, Alla **NEVSKA**, Illia **NASINNYK**

Purpose: To assess the efficacy of ranibizumab compared to aflibercept in patients with myopic choroidal neovascularization (CNV) at 1 year.

Methods: Ninety-six eyes (94 patients) with choroidal neovascularization associated with pathologic myopia (PM) were observed. Patients underwent visometry, tonometry, fluorescein angiography (FA), and optical coherence tomography (OCT). Schedule of injections was as needed (PRN) with 2 loading doses following as needed administration. The primary endpoint was change in best-corrected visual acuity (BCVA) at month 12, while central retinal thickness (CRT) on OCT, neovascularization activity on FA, and the number of ranibizumab and aflibercept injections administered were examined as secondary endpoints.



Results: Sixty-five eyes received 0.5 mg intravitreal ranibizumab, and 31 eyes received 2.0 mg intravitreal aflibercept. The mean decimal BCVA at baseline in the ranibizumab and aflibercept groups was 0.2 (0.1) in each group ($P = 0.6$). At month 12, the mean BCVA was 0.4 (0.2) ($P = 0.001$) in the ranibizumab group and 0.38 (0.2) ($P = 0.001$) in the aflibercept group. The baseline mean CRT with ranibizumab was 314 (79) mcm and in the aflibercept group was 285 (62) mcm ($P = 0.01$). At month 12, the mean CRT were 243 (31) mcm in the ranibizumab group ($P = 0.001$) and 227 (39) mcm in the aflibercept group ($P = 0.01$). The mean numbers of ranibizumab and aflibercept injections were 2.3 (0.9) and 2.6 (1.0), respectively ($P = 0.15$). No cases of endophthalmitis, uveitis, stroke, or retinal detachment were noted.

Conclusions: This study demonstrated similar significant gain in visual acuity in eyes with CNV associated with PM treated with either ranibizumab or aflibercept, with no significant difference in quantity of intravitreal injections.

14:30 - 16:00

Venue: 300

Correlations Between Clinical, Anatomical, and Angiographic Findings in Patients with Macular Edema Secondary to Branch Retinal Vein Occlusion: The COBALT Study

First Author: Joo Yong **LEE**

Co-Author(s): Dj **CHANG**, Jong Woo **KIM**, Susan **SIMONYI**, Young Hee **YOON**

Purpose: To determine correlations between clinical, anatomical, and angiographic data in patients with macular edema (ME) secondary to branch retinal vein occlusion (BRVO) treated with dexamethasone intravitreal implant 0.7 mg (DEX; Ozurdex, Allergan).

Methods: Seventy-one patients with ME < 3 months and best-corrected visual acuity (BCVA) 19–73 letters were enrolled (7 sites, Korea). DEX retreatment was allowed at 4 months. BCVA (according to presence of intraretinal and subretinal fluid [SRF], subretinal hyperreflective material [SHRM], vitreomacular traction, epiretinal membrane, and macular nonperfusion) and central retinal thickness (CRT) were analyzed.

Results: Mean CRT decreased significantly from baseline (BL) at 6 ($246.82 \pm 150.74 \mu\text{m}$) and 12 months ($196.90 \pm 164.07 \mu\text{m}$; $P < 0.0001$ for both). CRT change was unaffected by SRF or SHRM. SHRM subsided in 96% of patients. Macular nonperfusion at 6 months was related to CRT reduction at 12 months ($P = 0.0090$). Twenty-one percent and 79% ($P = 0.0115$) of those with and without macular nonperfusion at 6 months had a ≥ 15 -letter BCVA increase at 12 months. The area

of nonperfusion correlated with change in BCVA from BL at 5 ($P = 0.0113$) and 11 months ($P = 0.0317$).

Conclusions: Change in CRT with DEX was more closely related to BCVA than ME type in patients with BRVO. Nonperfusion of the macula and the area of nonperfusion may be used as prognostic factors.

14:30 - 16:00

Venue: 300

Diabetic Retinopathy and Retinal Thickness Profile

First Author: Wei **DAI**

Co-Author(s): Ching-Yu **CHENG**, Ning **CHEUNG**, Yih-Chung **THAM**, Tien **WONG**

Purpose: To examine the associations between diabetic retinopathy (DR) and retinal thickness profile on optical coherence tomography (OCT) among diabetic individuals.

Methods: Subjects were recruited from the Singapore Chinese Eye Study and Singapore Malay Eye Study 2. Average thickness of the macula, ganglion cell-inner plexiform layer (GC-IPL), and outer retina layer were measured using Cirrus High Definition OCT. Presence of DR and DR severity were graded according to the Early Treatment Diabetic Retinopathy Study classification. Multiple linear regression analysis was performed to examine the association between DR and retinal thickness.

Results: This analysis included 924 eyes from 549 diabetic subjects. Of these, 715 eyes had no DR, 141 eyes had minimal or mild DR, and 68 eyes had moderate, severe, or proliferative DR. Compared to eyes without DR, eyes with DR had thicker full macular thickness ($243.24 \mu\text{m}$ vs $247.03 \mu\text{m}$, $P = 0.043$) and outer retinal thickness ($120.87 \mu\text{m}$ vs $123.06 \mu\text{m}$, $P = 0.032$) after adjusting for covariates. There was no significant difference in GC-IPL thickness between eyes with and without DR ($P = 0.983$). Further stratified by DR severity, eyes with moderate to proliferative DR had thicker full macular thickness ($243.17 \mu\text{m}$ vs $251.98 \mu\text{m}$, $P = 0.039$) and outer retinal thickness ($120.82 \mu\text{m}$ vs $125.54 \mu\text{m}$, $P = 0.009$) compared with eyes without DR. The retinal thickness parameters were similar between eyes without DR and with minimal or mild DR ($P = 0.242$, $P = 0.222$, respectively).

Conclusions: Retinal layers are generally thicker in eyes with DR, particularly in those with more severe DR, compared to eyes without DR. These findings may warrant further investigation into their pathophysiological and clinical relevance in future studies.



16:30 - 18:00

Venue: 302

Efficacy and Safety of Ranibizumab 0.5 mg Treat and Extend versus Monthly Treatment in Patients with Neovascular Age-Related Macular Degeneration: TREND Study Results

First Author: Rufino **SILVA**Co-Author(s): Chrystal **FELLER**

Purpose: To assess if ranibizumab treat and extend (T&E) would result in comparable visual outcomes compared with monthly treatment with fewer injections and monitoring visits in patients with neovascular age-related macular degeneration (nAMD).

Methods: TREND (NCT01948830) was a 12-month, phase IIIb, visual acuity (VA) assessor-masked, multi-center, interventional study. Treatment-naïve patients (N = 650) aged ≥ 50 years were randomized 1:1 to ranibizumab T&E (n = 323) or monthly (n = 327) treatment. The study objectives were to demonstrate non-inferiority of ranibizumab T&E to monthly treatment as assessed by change in best-corrected VA (BCVA) from baseline to end of study (primary objective), change in central subfield retinal thickness (CSFT) from baseline to end of study, treatment exposure, and safety.

Results: Overall, 89.8% (T&E) and 90.2% (monthly) of patients completed the study. In the T&E/monthly groups, mean age of patients was 75.3/75.2 years, 55.4% (both groups) were female, 91.6%/92.0% were Caucasian, baseline BCVA was 59.5/60.6 letters, and CSFT was 504.0/497.7 μm . At the end of the study, T&E regimen was non-inferior ($P < 0.001$) to monthly dosing with a least squares mean BCVA change from baseline of 6.2 versus 8.1 letters, respectively. The mean change in CSFT from baseline was $-172.1 \mu\text{m}$ (T&E; n = 289) and $-173.3 \mu\text{m}$ (monthly; n = 287). Fewer injections were required in patients receiving T&E (8.7) versus monthly (11.0) treatment. Ocular serious adverse events were similar between the treatment groups (1.2% each).

Conclusions: Ranibizumab 0.5 mg administered as T&E regimen was statistically non-inferior and clinically comparable to the monthly regimen in improving VA in nAMD patients with no new safety signals identified.

16:30 - 18:00

Venue: 302

Evaluation of Choroidal Neovascularization Before and After Anti-VEGF Therapy Using OCT Angiography

First Author: Bhuvan **CHANANA**Co-Author(s): Sudhank **BHARTI**

Purpose: To analyze choroidal neovascularization (CNV)

using optical coherence tomography (OCT) angiography, and to study structural features of CNV sequentially after anti-vascular endothelial growth factor (VEGF) therapy.

Methods: Macular OCT angiography images were acquired using the RTVue XR Avanti with AngioVue. Distinct morphologic patterns and quantifiable features of neovascular membranes were studied at baseline and follow-up.

Results: Twenty-one eyes of 21 patients were included. Fifteen eyes (71%) were identified as type I CNV, 5 eyes as type 2 CNV, and 1 eye as type 3 CNV. In 17 eyes, a highly organized vascular complex could be identified. A large main central vessel trunk/feeder vessel could be seen in 76% (13 eyes) of these eyes, with vessels radiating in a branching pattern either in all directions from the center of the lesion ("medusa" pattern) or from one side of the lesion ("seafan" pattern). Nineteen percent (4 eyes) had an "indistinct" vascular pattern. Of the 15 eyes with follow-up OCT angiography, the lesion area changed marginally, but vessel density decreased after anti-VEGF therapy, indicating a more mature long-standing neovascular complex resistant to anti-VEGF therapy.

Conclusions: OCT angiography is a noninvasive imaging modality which provides a unique opportunity to study the morphology of neovascular membranes and allows precise structural and vascular assessment. We identified a large mature neovascular complex in approximately 81% of eyes. OCT angiography may help to define a correlation between a particular vascular pattern and response to treatment and may contribute to the development of improved therapies.

16:30 - 18:00

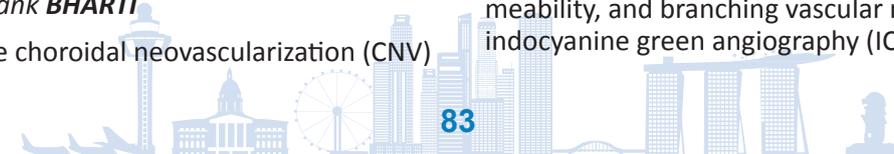
Venue: 302

Five-Year Outcomes of Polypoidal Choroidal Vasculopathy in Unaffected Fellow Eyes

First Author: Eung-Suk **KIM**Co-Author(s): Seung Young **YU**

Purpose: To assess longitudinal 5-year changes in the fellow eyes of patients with unilateral polypoidal choroidal vasculopathy (PCV).

Methods: We retrospectively reviewed the medical records of 49 patients with unilateral PCV, all of whom had completed at least 60 months of follow-up. All patients underwent complete ophthalmologic examination, fundus photography, and optical coherence tomography. The angiographic features were evaluated including the development of active PCV over time, choroidal vessel dilation, choroidal vascular hyperpermeability, and branching vascular network (BVN) on indocyanine green angiography (ICGA).



Results: The mean follow-up period was 74.04 ± 14.64 months. Among 49 fellow eyes, 10 (20.4%) had drusen, 20 (40.8%) had choroidal thickness $> 200 \mu\text{m}$, 18 (36.7%) had retinal pigment epitheliopathy, 17 (34.7%) had choroidal vascular dilation, 16 (32.7%) had choroidal vascular hyperpermeability, and 10 (20.4%) had BVN. The development of active PCV and CNV was noted in 9 fellow eyes (18.4%). The presence of choroidal thickness $> 200 \mu\text{m}$ ($P = 0.002$), retinal pigment epitheliopathy ($P < 0.001$), choroidal vascular dilation ($P < 0.001$), choroidal vascular hyperpermeability ($P < 0.001$), and BVN ($P < 0.001$) in the fellow eye had statistically significant correlation with development of PCV (examined with Fisher exact test).

Conclusions: The presence of choroidal thickness $> 200 \mu\text{m}$, retinal pigment epitheliopathy, choroidal vascular dilation, choroidal vascular hyperpermeability, and BVN in the fellow eye appears to be a significant risk factor for the development of active PCV and may constitute the diagnosis of preclinical PCV.

16:30 - 18:00

Venue: 302

Genome-Wide Association Study Identifies a New Genetic Locus at 2q36.3 for Polypoidal Choroidal Vasculopathy in East Asians: The GAMA Consortium

First Author: Masayuki **YASUDA**

Co-Author(s): Ching-Yu **CHENG**, Qiao **FAN**, Chiea Chuen **KHOR**, Tien **WONG**, The Gama Consortium

Purpose: Polypoidal choroidal vasculopathy (PCV) is the most frequent subtype of age-related macular degeneration (AMD) in East Asians. Genome-wide association studies (GWAS) have identified at least 30 genetic variants associated with AMD. However, unique genetic variants for PCV remain unclear. In this study, we aim to identify the unique susceptibility loci for PCV.

Methods: We conducted a GWAS of 1062 PCV cases and 1152 typical AMD (tAMD) cases versus 5275 non-AMD controls, all of East Asian ancestry recruited in the Genetics of AMD in Asians (GAMA) Consortium. Genetic variants were genotyped using the Illumina HumanOmniExpress bead chips and imputed with 1000 genome reference panels. For the replication, we genotyped an additional 895 PCV cases and 721 tAMD cases versus 5734 non-AMD controls from 3 independent sample collections.

Results: At the discovery stage, 4 loci showed genome-wide significance ($P < 5.0 \times 10^{-8}$) for PCV. Among them, we identified a novel genetic variant at 2q36.3 [odds ratio (OR), 1.45; $P = 2.88 \times 10^{-8}$], which was replicated in the independent cohorts (OR, 1.26; $P = 3.35 \times 10^{-4}$; Poverall = 1.18×10^{-10}). Although the new vari-

ant also showed a significant association with tAMD (Poverall = 1.02×10^{-3}), the OR for PCV is significantly higher than that of tAMD ($P = 0.048$). The new genetic locus is involved in the structure of the basement membrane in RPE and choriocapillaris.

Conclusions: We found a new genetic locus associated with the risk of PCV. Our data suggest that the new genetic locus at 2q36.3 is more closely involved in the pathogenesis of PCV than that of tAMD.

14:30 - 16:00

Venue: 300

Influence of Myopic Macular Degeneration Severity on Treatment Outcomes of Myopic Choroidal Neovascularization in the MYRROR Study

First Author: Kyoko **OHNO-MATSUI**

Co-Author(s): Friedrich **ASMUS**, Gemmy **CHEUNG**, Sergio **LEAL**, Tummy **LI**, Tien **WONG**

Purpose: To determine the influence of baseline myopic macular degeneration (MMD) severity on outcomes of myopic choroidal neovascularization (mCNV) treated with intravitreal aflibercept (IVT-AFL) injection.

Methods: MYRROR was a randomized, double-masked study in patients with mCNV treated with IVT-AFL or sham over 48 weeks. Baseline/week 48 color fundus and fluorescein angiography images were retrospectively graded for MMD in 4 categories of increasing severity using the META-PM grading scheme.

Results: Eyes were analyzed at baseline ($n = 115$) and week 48 [IVT-AFL ($n = 78$)/sham ($n = 21$)]. Severity of baseline MMD was distributed as follows: category 1: 17%; 2: 58%; 3: 19%; 4: 6%. Higher MMD category was associated with older age ($P = 0.007$), longer axial length ($P = 0.025$), and lower baseline central retinal thickness ($P = 0.033$). Best-corrected visual acuity improved by 13.5 letters from baseline to week 48 when considering all patients in the IVT-AFL arm. MMD severity did not significantly affect visual/anatomical outcomes or number of treatments. Visual function questionnaire (VFQ)-25 scores improved more in mild (+5.6) vs severe (+0.4) MMD ($P = 0.03$). There were no new safety events. Seven (5.7%) patients had a serious AE (all IVT-AFL). Only 1 serious ocular AE occurred (macular hole).

Conclusions: Visual acuity gains, morphological outcomes, and dosing frequency were not affected by baseline MMD severity in patients treated with IVT-AFL. Severe MMD was associated with smaller gains in VFQ-25.



14:30 - 16:00

Venue: 300

Is Diabetic Retinopathy Associated with Radiological Markers of Brain Abnormalities?

First Author: Ning **CHEUNG**

Co-Author(s): Ching-Yu **CHENG**, Alfred Tau Liang **GAN**, Yuan **SHI**, Tien **WONG**

Purpose: To examine the relationships between diabetic retinopathy and brain changes on magnetic resonance imaging (MRI).

Methods: This is a cross-sectional, sub-study of the Singapore Epidemiology Eye Disease (SEED) study that consisted of 900 participants, aged 60 years or older. All participants underwent MRI brain scan to identify cerebral abnormalities according to a standardized protocol. Diabetic retinopathy (DR) was ascertained from digital retinal photographs according to a modified Airlie House classification.

Results: After adjusting for age, gender, and ethnicity, presence of DR was associated with presence of lacunar infarct [odds ratio (OR) 22.56, $P = 0.02$], cortical stroke (OR 44.77, $P = 0.03$), and medial temporal atrophy (OR 8.76, $P = 0.02$) on MRI. In multivariate analysis with further adjustments for cardiovascular risk factors, these associations remained significant.

Conclusions: Presence of DR is associated with ischemic and neuro-degenerative changes in the brain. Additional studies may be warranted to assess the implications of these findings, especially in the era of increasing use of ocular anti-angiogenic therapy for DR.

16:30 - 18:00

Venue: 302

Morphological Patterns of Indirect Choroidal Rupture by Optical Coherence Tomography and Its Relation to Choroidal Neovascularization

First Author: Sunil **GANEKAL**

Co-Author(s): Ramachandran **NAIR**

Purpose: To evaluate the morphological types of indirect choroidal rupture (ICR) using spectral domain optical coherence tomography (SD-OCT) and their relation to the risk of choroidal neovascular membrane (CNVM).

Methods: Twenty-four eyes of 24 patients presented with blunt ocular trauma causing choroidal rupture. All had detailed evaluation and SD-OCT examination.

Results: Three types of choroidal ruptures were seen on SD-OCT. The first type (Type 1 ICR) is a forward protrusion of the retinal pigment epithelium (RPE)-choriocapillaris (CC) with a small loss of continuity of the RPE layer and significant subretinal hemorrhage. The

second type (Type 2 ICR) is a larger area of disruption of the RPE-CC, photoreceptor ISOS junction, and ELM with a posteriorly directed concave contour depression at that area and downward sliding of overlying tissues into the defect. Type 3 ICR is combination of type 1 and 2. Ten eyes had type 1 ICR, 8 eyes had type 2 ICR, and 6 eyes had type 3 ICR. Of these, 5 developed CNV (20.8%): 1 eye belonged to type 1 ICR, 2 eyes belonged to type 2 ICR, and 2 eyes in type 3 ICR.

Conclusions: Three distinct patterns of choroidal ruptures were identified on SD-OCT. There are differences in clinical and morphometric appearances, and types 2 and 3 carry increased risk of CNVM.

14:30 - 16:00

Venue: 300

Prospective Natural History Study of Retinitis Pigmentosa GTPase Regulator Gene-Associated Retinopathy with Spectral-Domain Optical Coherence Tomography Imaging

First Author: James **TEE**

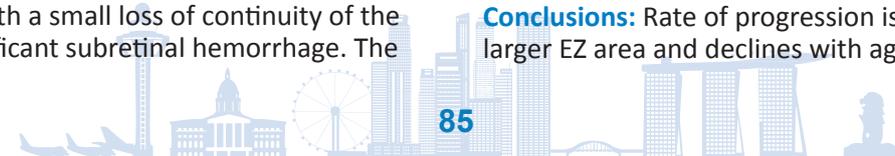
Co-Author(s): Michel **MICHAELIDES**

Purpose: Retinitis pigmentosa GTPase regulator gene (RPGR)-associated retinopathy is an important focus for gene therapy research with human clinical trials planned. As such, a better understanding of its natural history is vital. The ellipsoid zone (EZ) layer visible on spectral-domain optical coherence tomography (SD-OCT) imaging is a good marker for photoreceptor degeneration. By applying advanced metrics for EZ layer analysis, we aim to establish rates of natural disease progression.

Methods: Prospective observational study. Patients with RPGR mutations displaying rod-cone dystrophy phenotype were recruited and underwent imaging at each visit. Horizontal high-density macula scans were acquired with the Spectralis Heidelberg SD-OCT. Following image acquisition, an en-face EZ area was generated and measured with vendor software.

Results: There were 14 subjects: 4 with mutations in RPGR exon 1-14 and 10 with mutations in RPGR ORF15. Median age at first visit was 20.3 (range, 11.1-28.1) years. Median duration of follow-up was 13.3 (range, 12-24) months. Median size of EZ area at presentation was 1.93 (range, 0.17-12.69) mm^2 . Median rate of progression (rate of area constriction) was 0.32 (range, 0-2.73) mm^2/y . Spearman correlation coefficient between progression rate and age: $r_s = -0.851$, $P = 0.000$. Correlation between rate of area constriction and size at presentation: $r_s = 0.877$, $P < 0.0001$.

Conclusions: Rate of progression is greater in eyes with larger EZ area and declines with age. Clinical hetero-



geneity common to genetic conditions is evident. This study demonstrates that EZ area measurements are an objective and sensitive measure of disease progression. SD-OCT imaging coupled with the use of advanced metrics to interrogate data will form an integral component of upcoming human RPGR gene therapy trials.

16:30 - 18:00

Venue: 302

Relationship Between Mean Platelet Volume and Central Retinal Vein Occlusion in Hypertensive Patients

First Author: Pritam **BAWANKAR**

Co-Author(s): Samruddhi **DALAL**, Diva **MISRA**, Preetam **SAMANT**

Purpose: To study the relationship between mean platelet volume (MPV) and central retinal vein occlusion (CRVO) in hypertensive patients.

Methods: One hundred patients presenting to our outpatient department with sudden painless loss of vision with a known history of hypertension who were then diagnosed with CRVO on indirect ophthalmoscopy served as the sample group. One hundred age- and sex-matched patients with a sole history of hypertension without any other systemic disease and best corrected visual acuity (BCVA) of 20/20 in both eyes served as the control group. MPV was recorded in both the groups on the same visit. Confidence intervals were set at 95% level with statistical significance at a P value of <0.05.

Results: MPV was significantly higher among hypertensive cases with CRVO when compared with the hypertensive control group (8.00 ± 0.23 vs 7.56 ± 0.20 fL, respectively; $P < 0.001$).

Conclusions: Our study concluded that MPV was statistically increased in CRVO patients who were hypertensive. Thus, MPV may be a useful predictive tool for identifying hypertensive patients at risk of developing CRVO in future and further studies are warranted in this regard.

16:30 - 18:00

Venue: 302

Reliability of Contrast Sensitivity Evaluation in Age-Related Macular Degeneration Using a Novel Computer-Based Test: Gabor Contrast Sensitivity Test

First Author: Nia **MILASTUTI**

Co-Author(s): Angela Nurini **AGNI**, Indra **MAHAYANA**, Muhammad **SASONGKO**, Tri Wahyu **WIDAYANTI**

Purpose: To assess the reliability of a novel computer-based test (the Gabor contrast sensitivity test) in

patients with age-related macular degeneration (AMD) compared to healthy controls. The second outcome was the correlation between Δ CS and logMAR visus.

Methods: In this prospective cross-sectional study, contrast sensitivity was evaluated in patients with various stages of AMD and healthy controls using Gabor contrast sensitivity test. Test-retest reliability was determined using the interclass correlation coefficient.

Results: Of 11 eyes of preliminary data with mean of age 65.857 ± 8.174 , the median of Δ contrast-sensitivity (CS) in healthy and AMD group were 14.902% and 38.628%, respectively. The difference was 23.726% between the 2 groups with no significant difference ($P = 0.221$). Linear regression analysis was done to show the correlation between Δ CS and logMAR visus with result of $R = 0.454$ ($P = 0.054$). The interclass correlation coefficient (ICC) test of Gabor contrast sensitivity test showed a strong reliability with ICC 0.955 [95% confidence interval (CI), 0.832-0.988; $P < 0.0001$].

Conclusions: As a novel computer-based test, the Gabor contrast sensitivity test is widely available and easy to use compared to other CS tests. From this preliminary study, the Gabor contrast sensitivity test has a strong reliability to be used as a tool to assess the CS of patients with AMD. Hence, further study with larger sample size should be done.

16:30 - 18:00

Venue: 302

Response to Ranibizumab in Eyes with Pigment Epithelial Detachments, Including Eyes that Developed Retinal Pigment Epithelial Tears: Data from the HARBOR Study

First Author: Patricio **SCHLOTTMANN**

Purpose: To evaluate the visual and anatomic outcomes of eyes with wet age-related macular degeneration and pigment epithelial detachment (PED) treated with ranibizumab.

Methods: A total of 1097 study eyes were randomized to ranibizumab 0.5 mg or 2.0 mg as needed (PRN) and monthly. In eyes with PED at baseline, visual acuity and anatomic outcomes were evaluated over 24 months.

Results: A total of 598 eyes had PEDs at baseline. At 24 months, mean change in best corrected visual acuity (BCVA) from baseline was +9.0 letters in eyes randomized to ranibizumab 0.5 mg monthly, +8.4 letters in ranibizumab 0.5 mg PRN, +7.1 letters in ranibizumab 2.0 mg monthly, and +7.2 letters in ranibizumab 2.0 mg PRN. PED resolution occurred most often in eyes randomized to ranibizumab 2.0 mg monthly (70.5%) compared with ranibizumab 0.5 mg monthly (53.2%),



ranibizumab 0.5 mg PRN (44.5%), and ranibizumab 2.0 mg PRN (57.3%). There was a significantly higher rate of MA development at month 24 in eyes with resolution of PED than in eyes with PED present (44% vs 17%, $P < 0.0001$). Twenty-eight (5%) eyes developed a new retinal pigment epithelial (RPE) tear during the study, with 21 of these RPE tears in eyes with the largest PEDs ($\geq 352 \mu\text{m}$) at baseline.

Conclusions: While more PED resolution was seen with a higher ranibizumab dose, there was no additional visual acuity benefit and PED resolution was associated with a higher rate of MA development. On average, patients experiencing on-study RPE tear avoided clinically meaningful vision loss with continued ranibizumab therapy.

14:30 - 16:00

Venue: 300

Retinal Microvasculature During Pregnancy Might Improve Prediction of 5-Year Postpartum Glucose Tolerance Abnormality in Women Prior to Gestational Diabetes Mellitus

First Author: Lingjun LI

Co-Author(s): Yin Bun CHEUNG, Yap Seng CHONG, Ecosse LAMOUREUX, Ryan MAN, Tien WONG

Purpose: Gestational diabetes mellitus (GDM) leads to postnatal maternal glucose tolerance abnormality (including impaired fasting glucose, impaired glucose tolerance, and type 2 diabetes). We aimed to study the longitudinal association between maternal retinal microvasculature during pregnancy and 5-year postpartum glucose tolerance abnormality in Asian women.

Methods: In this prospective cohort, 50 mothers prior to GDM were enrolled as part of the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) study in 2009-2010 and re-assessed 5 years later in 2014-2015. Oral glucose tolerance test (OGTT) and retinal photography were performed during 26-28 weeks gestation, and OGTT was repeated at 5-year postpartum follow-up.

Results: The 5-year incidence of abnormal glucose tolerance was 44% in this sample, including 18 cases of impaired glucose tolerance and 4 cases of type 2 DM. In mothers with both retinal venular widening (upper 50 centile) and arteriolar branching angle narrowing (lower 50 centile), the risk of developing 5-year incident glucose tolerance abnormality was greatly increased by 24 times [odds ratio (OR), 25.26; 95% confidence interval (CI), 1.76 to 362.25], compared to mothers with neither of these signs. In addition to traditional predictors including age, ethnicity, and fasting glucose during mid-late pregnancy, retinal vascular

measures at mid-late pregnancy increased borderline predictive value of 5-year postpartum abnormal glucose metabolism by 12.42% ($P = 0.06$).

Conclusions: Our findings showed, for the first time, that maternal retinal microvascular measures at mid-late pregnancy were associated with incident glucose tolerance abnormality 5 years after delivery among women prior to GDM.

14:30 - 16:00

Venue: 300

Retinal Vascular Caliber Changes After Intravitreal Bevacizumab or Dexamethasone Implant Treatment for Diabetic Macular Edema

First Author: Sanjeeva WICKREMASINGHE

Co-Author(s): Elizabeth ALESSANDRELLO, Samantha FRASER-BELL, Mark GILLIES, Lyndell LIM, Hemal MEHTA

Purpose: To compare changes in retinal vascular caliber after 2 years of treatment with intravitreal injections of bevacizumab (BVZ) or dexamethasone implant (DEX) in patients with center-involving diabetic macular edema (DME).

Methods: At baseline, 88 eyes of 61 patients with center-involving DME were recruited in a prospective, multicenter, randomized, single-masked clinical trial (clinicaltrials.gov identifier NCT01298076). Of these subjects, 22 BVZ (52%) and 22 DEX (48%) treated eyes of 34 patients (56%) had gradable retinal photographs at both the baseline and 24-month visits. Retinal vascular caliber was measured from digital fundus photographs and summarized as central retinal artery (CRAE) and vein (CRVE) equivalents in all gradable eyes at baseline and 24 months.

Results: At 24 months, 40.9% of BVZ and 45.5% of DEX eyes gained 10 or more letters ($P = 0.77$). There was concurrent reduction in mean central macular thickness (CMT), $-157.7 \mu\text{m}$ in BVZ and $-192.5 \mu\text{m}$ in DEX-treated eyes ($P = 0.40$). DEX-treated eyes showed a statistically significant reduction in CRVE compared to BVZ-treated eyes, with a mean change from baseline of $-31.78 \mu\text{m}$ and $+4.34 \mu\text{m}$, respectively ($P < 0.001$). CRAE showed a non-statistically significant trend towards reduction over time in DEX-treated eyes compared to BVZ-treated eyes, with a mean change from baseline of -6.09 and $+1.66$, respectively ($P = 0.077$).

Conclusions: DEX had a significant narrowing effect on venular diameter in eyes with diabetic macular edema not seen with BVZ. These changes in retinal vascular caliber suggest the mechanism of action by which these agents reduce macular edema is different.



16:30 - 18:00

Venue: 302

Saturation Approach to Reduce the Prevalence of Cataract Blindness

First Author: Van **LANSINGH**

Co-Author(s): Elesh **JAIN**, Ranjit **MANIAR**, Venkat **SAM-BANDHAMOORTHY**

Purpose: To present a model in which high volume surgery, coupled by enablement of local district partners, can potentially obtain a sustainable reduction in the prevalence of cataract blindness and deal with incident cases.

Methods: We conducted a door-to-door survey in 5 districts around Jankikund: Sadguru Netra Chikitsalaya, Chitrakoot, Banda, and Hamirpur in Uttar Pradesh; and Panna and Satna in Madhya Pradesh. Those requiring spectacles or medications for minor conditions were given these locally. Cataract and other conditions requiring surgery were referred to the base hospital.

Results: Because of the door-to-door saturation approach, we delivered 16.5% more cataract surgeries than those identified in the survey. We also delivered 17% more non-cataract surgeries. In total, 21,721 more people were positively impacted.

Conclusions: Merely increasing CSR is not enough. Focus your efforts through partners and concentrate your resources.

16:30 - 18:00

Venue: 302

The DRAGON Study: Two-Year Efficacy of Ranibizumab 0.5 mg in Chinese Patients with and Without Polypoidal Choroidal Vasculopathy

First Author: Xiaoxin **LI**

Purpose: To evaluate the efficacy of ranibizumab 0.5 mg in Chinese patients with and without polypoidal choroidal vasculopathy (PCV) enrolled in the DRAGON study.

Methods: DRAGON was a 2-year, phase IV, double-masked, multicenter, controlled study. Patients with neovascular age-related macular degeneration (nAMD) were randomized 1:1 and stratified by baseline PCV or non-PCV status to 2 dosing regimens: ranibizumab monthly in year 1 and pro-re-nata (PRN) guided by visual acuity (VA) stabilization criteria in year 2; or ranibizumab PRN for 2 years. Presence of PCV was assessed by central reading center evaluation of indocyanine green angiography images. For PCV/non-PCV subgroups, mean changes in best-corrected VA (BCVA) and central subfield thickness (CSFT) from baseline

over 2 years were analyzed.

Results: At baseline, the number of PCV/non-PCV patients was 139/189. For monthly/PRN groups, mean BCVA (letters) increased by 12.7/9.4 (baseline, 54.1/54.6) in PCV and 12.1/9.4 (baseline, 53.3/52.7) in non-PCV patients at 1 year, and by 12.3/9.7 in PCV and 10.6/8.7 in non-PCV patients at 2 years. Mean change in CSFT (μm) from baseline was $-180/-152.9$ in PCV and $-157.6/-162.9$ in non-PCV patients at 1 year, and $-176.1/-154.6$ in PCV and $-162.5/-157.5$ in non-PCV patients at 2 years. The mean number of injections for PCV and non-PCV patients was 11.2/8.4 and 11.5/8.2 in year 1 and 4.9/6.0 and 4.7/4.5 in year 2, respectively.

Conclusions: The DRAGON study confirms the benefits of ranibizumab in nAMD patients, with comparable visual and anatomical outcomes observed in PCV and non-PCV patients at 2 years regardless of treatment regimen.

16:30 - 18:00

Venue: 302

Two-Year Outcomes Following Intravitreal Aflibercept for Polypoidal Choroidal Vasculopathy in Japanese Patients

First Author: Yuji **OSHIMA**

Co-Author(s): Tatsuro **ISHIBASHI**, Kumiko **KANO**, Satomi **SHIOSE**, Koh-Hei **SONODA**, Shigeo **YOSHIDA**

Purpose: To evaluate the 2-year outcome of intravitreal injection of aflibercept (IVA) in Japanese patients with polypoidal choroidal vasculopathy (PCV).

Methods: Seventy-three treatment-naive eyes with PCV treated with aflibercept were studied retrospectively. Outcomes were determined at least 2 years after the first aflibercept injection and included mean change of best-corrected visual acuity (BCVA) and mean change in central foveal thickness.

Results: Mean logMAR BCVA at baseline was 0.31. The BCVA was significantly improved to 0.21 logMAR after 2 years of aflibercept treatment ($P = 0.004$). The average central foveal thickness improved significantly from $305.7 \mu\text{m}$ to $224.8 \mu\text{m}$ ($P < 0.0001$). The mean number of aflibercept injections was 9.4 times during 2 years of treatment (6.4 times for the first year, 2.9 times for the second year).

Conclusions: IVA is well tolerated in eyes of Japanese PCV patients. Two-year outcomes of aflibercept treatment for Japanese patients with PCV resulted in stabilization of visual acuity accompanied by anatomical improvement. IVA monotherapy is effective for Japanese PCV patients.



16:30 - 18:00

Venue: 302

Wet Age-Related Macular Degeneration and Smoking: iTRAQ-Based Quantitative Protein Analysis and Bioinformatics Study from Aqueous Humor

First Author: Luzhen **HUANG**

Co-Author(s): Xiaoxin **LI**, Lingling **WANG**

Purpose: To investigate the potential role of smoking in wet age-related macular degeneration (wAMD) by analyzing proteins in aqueous humor (AH) of active smokers and nonsmokers between wAMD and cataract patients.

Methods: AH, 0.1 mL, was collected from 10 wAMD patients (5 smokers and 5 nonsmokers) and 8 patients (4 smokers and 4 nonsmokers) with ARC. Comparative proteomic technique, Isobaric tags for relative and absolute quantitation (iTRAQ) coupled with 2DLC-MS/MS was used to analyze proteins in the collected AH. Proteins with a change of <83% or >120% of controls were considered to be significant to a P value of <0.05. The identified proteins were subjected to subsequent gene ontology analysis using the DAVID database.

Results: Ten proteins that expressed differently in AH samples between wAMD and ARC were identified. Among the active smokers, compared with wAMD patients and ARC patients, 10 proteins were found with a change of >200%. Among the wAMD patients, 20 proteins were found with an increase of >200% when comparing active smokers and nonsmokers. Six protein changes in the above 2 groups were found, including smoothelin, hemoglobin subunit alpha, hemoglobin subunit beta, alpha-enolase, prosaposin, and lacritin.

Conclusions: Smokers had AH altered expression of 6 proteins compared to nonsmokers with wAMD by iTRAQ technology. Increased protein expression or suppression in the eyes of smokers may play a role in eye diseases, including wAMD. Further studies should confirm and expand the conclusions of this pilot study to better understand the role of smoking in eye disease protein regulation.

Retina (Surgical)

Mar 5, 2017 (Sun)

11:00 - 12:30

Venue: 303

Cystectomy with Intraoperative Optical Coherence Tomography for Cystoid Macular Edema in Diabetes: Six-Month Outcome

First Author: Naoko **TACHI**

Purpose: To investigate the effectiveness of cystectomy for cystoid macular edema in diabetes (DCME).

Methods: The surgical records for 20 eyes from 15 patients who received vitrectomy and cystectomy for DCME and were followed up for at least 6 months were retrospectively reviewed. Twelve eyes had combined surgery with phacoemulsification aspiration and intraocular lens implantation. All eyes underwent vitrectomy, internal limiting membrane peeling, and cystectomy. Cystectomy was performed with intraoperative optical coherence tomography (iOCT). The cystoid space was detected by iOCT and the temporal margin and the ceiling of the cystoid space were incised with vitreous scissors. Dense contents of cystoid spaces were washed out with infusion fluid. The best-corrected visual acuity (BCVA) and spectral domain OCT were investigated preoperatively and at 1, 3, and 6 months postoperatively.

Results: Dense contents were intraoperatively removed from the cystoid space. At 6 months after surgery, BCVA in logMAR units was significantly improved from 0.43 ± 0.31 to 0.25 ± 0.23 ($0.01 < P < 0.02$). Central macular thickness was reduced from $460.7 \pm 75.1 \mu\text{m}$ to $391.3 \pm 84.0 \mu\text{m}$ ($P = 0.0075908$). Macular hole formation was not observed either during or after the surgery.

Conclusions: Vitrectomy with cystectomy may be effective for refractory DCME. Cystectomy and drainage of dense fluid in the cysts may prevent intraretinal fluid accumulation and may result in better visual acuity.

11:00 - 12:30

Venue: 303

Effect of Laser Photocoagulation to Hypoxia Inducible Factor-1 α and Intercellular Adhesive Molecule-1 in Proliferative Diabetic Retinopathy

First Author: Vivi **YANDRI**

Co-Author(s): Tjahjono **GONDHOWIARDJO**, Andi **VICTOR**

Purpose: To determine the effect of pre-treatment with laser panretinal photocoagulation (PRP) before vitrec-



tomy to hypoxia-inducible factor-1 α (HIF-1 α) and intercellular adhesive molecule-1 (ICAM-1) in the vitreous fluid of patients with proliferative diabetic retinopathy.

Methods: A post-test only randomized clinical trial open label study was conducted on 22 eyes of 22 patients. Eleven eyes received PRP prior to pars plana vitrectomy and the others were applied as a control. One milliliter of vitreous sample was obtained; then HIF-1 α and ICAM-1 were measured by enzyme-linked immunosorbent assay (ELISA). At the beginning of PRP and just before vitrectomy (1 to 2 weeks after PRP), and also at follow-up 2, 4, and 12 weeks after vitrectomy, central macular thickness (CMT) was measured.

Results: There was no statistically significant difference in the baseline clinical features in these 2 groups, with the exception of the average HbA1c level ($P = 0.007$). In the control and photocoagulation groups, respectively, the average level of HIF-1 α (ng/mL) was 0.152 ± 0.015 and 0.164 ± 0.033 . The level of ICAM-1 (ng/mL) was 17.840 ± 14.140 and 27.027 ± 10.452 . There were no statistically significant differences in the comparison of both HIF-1 α and ICAM-1 in each group. The positive correlation between ICAM-1 and HbA1c was clinically significant ($r = 0.463$, $P = 0.03$). There was a positive correlation between both levels of HIF-1 α of both groups and CMT ($r = 0.447$ and $r = 0.32$).

Conclusions: Laser photocoagulation 1-2 weeks before vitrectomy did not cause lower concentrations of vitreous levels of HIF-1 α and ICAM-1. Glycemic control status that was worse in the laser photocoagulation group may influence the level of HIF-1 α and ICAM-1 in the vitreous.

11:00 - 12:30

Venue: 303

Outcomes of Segmentation and Peeling in Tractional Retinal Detachment in Advanced Diabetic Eye Disease

First Author: Hussain **KHAQAN**

Purpose: To evaluate surgical and visual outcomes in cases of tractional retinal detachment in advanced diabetic eye disease.

Methods: A total of 1020 eyes having tractional retinal detachment in advanced diabetic eye disease were included in the study. Eyes associated with rhegmatogenous retinal detachment were excluded from the study. Best corrected visual acuity (BCVA) and B scan were performed in all patients preoperatively and postoperatively. The study was conducted from July 2006 to June 2016.

Results: In 892 (87.4%) eyes tractional retinal detachment was treated by segmentation and peeling and the retina was flat after surgery with balanced salt

solution inside the vitreous cavity at the end of surgery. In 128 (12.4%) eyes iatrogenic breaks formed during segmentation and peeling at the posterior pole and the retina was completely flat at the end of surgery with air inside the vitreous cavity in 62 eyes, C3F8 in 44 eyes, and silicone oil of 1000 cs in 22 eyes. In 841 (82.4%) eyes BCVA improved ≥ 2 ETDRS lines from baseline, while in 139 (13.6%) eyes BCVA improved by ≥ 1 ETDRS line; in 30 (2.94%) eyes no vision improvement was observed and in 10 (0.98%) eyes vision decreased by a mean of 1 ETDRS line. A total of 136 (13.3%) eyes had cavity hemorrhage at the first postoperative day that resolved in 93 (68.3%) eyes within a mean of 2.3 weeks, while 43 (31.6%) eyes needed cavity wash after 3 weeks.

Conclusions: Segmentation and peeling have a significant role in anatomical and visual restoration in cases of tractional retinal detachment in advanced diabetic eye disease.

11:00 - 12:30

Venue: 303

Restoring Vision with a Suprachoroidal Retinal Prosthesis in Patients with Retinitis Pigmentosa

First Author: Chi **LUU**

Co-Author(s): Penelope **ALLEN**, Lauren **AYTON**, Robyn **GUYMER**, Chris **WILLIAMS**, Jonathan **YEOH**

Purpose: To determine the feasibility, safety, and efficacy of a suprachoroidal retinal prosthesis for restoring vision in subjects with profound vision loss due to retinal degeneration.

Methods: A retinal prosthesis was implanted in the suprachoroidal space in 3 patients with bare light perception [visual acuity (VA) $\leq 20/34,756$] due to retinitis pigmentosa (clinical trials.gov NCT01603576). Clinical assessments, retinal imaging, and CT scans were performed regularly to assess ocular health and the stability of the implant. Efficacy of the device was determined using the Basic Assessment of Light and Motion (BaLM) test, Freiburg Acuity and Contrast Test (FrACT), and by assessing Activity of Daily Living (ADL) and Orientation and Mobility (O&M).

Results: The surgical implantation was uncomplicated in all 3 patients. The devices remained stable during the 2 years studied with no wire breakages or loss of electrode function. Retinal imaging and CT scans showed no lateral movement of the array with time. Stimulation enabled reliable phosphenes to be generated for all 3 patients within safe charge limits. All 3 subjects performed significantly better with the system "on" than with the system "off" for object recognition on BaLM test. With the device "on," visual acuity es-

timated by FrACT was approximately 20/4,451. The performance of O&M and ADL was also significantly improved with the device “on” compared to device “off.”

Conclusions: Suprachoroidal retinal prosthesis appears to be safe and stable over time. The implant improves both visual function and functional vision.

11:00 - 12:30

Venue: 303

Retinal Layer Segmentation After Silicone Oil or Gas Tamponade for Macula-On Retinal Detachment Using Optical Coherence Tomography

First Author: Min KIM

Purpose: To evaluate and compare the effect of silicone oil and gas on the thickness of all retinal layers in eyes with macula-on retinal detachment (RD).

Methods: A total of 367 eyes of 367 patients who received silicone oil tamponade and 310 eyes of 310 patients who received gas tamponade for the treatment of rhegmatogenous RD were initially reviewed. Automated retinal segmentation method using Spectralis optical coherence tomography (OCT) was used for analysis. The primary outcome measure was the change in thickness of each retinal layer in the central 1 mm zone (silicone oil vs gas tamponade).

Results: Eyes in the silicone oil group ($n = 33$) had a statistically significant decrease in total retinal thickness of $23.61 \pm 17.01 \mu\text{m}$ and in the thickness of all retinal layers except for the photoreceptor layer at 6 months after primary RD surgery ($P < 0.001$). In the gas group ($n = 31$), the postoperative change in total retinal thickness was only $0.14 \pm 7.26 \mu\text{m}$ ($P = 0.93$) with no significant decrease in any of the individual retinal layers. Postoperatively, best corrected visual acuity (BCVA) in the silicone oil group was significantly worse than that in the gas group at 6 months and 9 months after RD surgery ($P = 0.003$ and $P = 0.004$, respectively). The postoperative decrease of the ganglion cell layer (GCL), outer plexiform layer (OPL), and outer nuclear layer (ONL) thickness showed significant correlation with BCVA in the silicone oil group (all $P < 0.05$).

Conclusions: Silicone oil tamponade had a significant impact on the reduction of retinal thickness and the reduction of GCL, OPL, and ONL thicknesses showed the strongest correlation with worse visual acuity outcomes.

11:00 - 12:30

Venue: 303

Role of Nd:YAG Laser Hyaloidotomy in the Management of Premacular Subhyaloid Hemorrhage

First Author: Irum RAZA

Purpose: To evaluate the role of early Nd:YAG laser hyaloidotomy in the management of premacular subhyaloid hemorrhage.

Methods: This quasi experimental study was conducted from July 1, 2015 to December 31, 2015. There were a total of 20 patients of premacular subhyaloid hemorrhage who underwent Nd:YAG laser hyaloidotomy. All the patients were followed up on the second day, first week, and second week. Detailed examination was done with special attention paid to note the improvement of vision, clearance of macula, absorption of hemorrhage, and any complication that occurred. Data was analyzed by SPSS version 20 and presented in the form of tables.

Results: There were a total of 20 patients comprising 8 males (40%) and 12 females (60%). The overall mean and standard deviation for patient age was 36.55 ± 14.50 . The age range was 20-65 years. The majority of patients (50%) were from the younger age group of 20-35 years. Most common etiology of hemorrhage was PDR (40%). Although macula was cleared in 15 patients (75%), visual acuity improved in only 13 patients (65%) because of underlying maculopathies. The mean amount of laser energy used was 7.67 ± 2.55 with a range of 4-12 mJ. The hemorrhage took 4 weeks on average to be absorbed from vitreous. Complication in the form of taut epimacular membrane was noted in only 1 patient.

Conclusions: Nd:YAG laser hyaloidotomy is an easy, effective, cheap, and early visual rehabilitating procedure especially helpful in the working age population.

11:00 - 12:30

Venue: 303

Seeing the Invisible with Intraoperative OCT in Surgical Vitreoretinal Animal Research for Upcoming Clinical Applications

First Author: Boris STANZEL

Purpose: The subretinal space is an attractive target for cell and gene therapies. Here we explore the use of the Zeiss RESCAN intraoperative optical coherence tomography (iOCT), which is integrated into an operating microscope, for translational preclinical animal work for stem cell based retinal pigment epithelium (RPE) replacement.



Methods: Pluripotent stem cell derived RPE were transplanted on translucent cell carriers. Rabbits, pigs, and monkeys underwent vitrectomy with removal of posterior cortical vitreous and bleb retinal detachment at the posterior pole. The RPE was removed surgically in some animals. The RPE transplant was maneuvered into the subretinal space using custom instrumentation. A fluid-air exchange flattened the retina. All surgical steps were monitored and/or guided with the iOCT.

Results: All key surgical steps could be imaged in all species. Imaging was most reproducible in rabbits. In pigs and macaques, the default iOCT laser settings did not provide enough contrast, particularly for subretinal structures. Upon increasing the laser power, contrast levels became satisfactory. The b-scan infused into the microscope-integrated HUD allowed real-time feedback for critical maneuvers like RPE scraping and subretinal implantation. The iOCT proved especially useful in identifying the implant's subretinal position under detached retina or in air-filled eyes. Limitations in the iOCT depth of focus sometimes precluded fine resolution of the RPE interface under bleb retinal detachment.

Conclusions: iOCT-based visualization of subretinal maneuvering and implants adds powerful novel possibilities to improve surgical aspects for cell replacement strategies.

11:00 - 12:30
Venue: 303

Vitrectomy with Internal Limiting Membrane Peeling versus No Peeling for Idiopathic Epiretinal Membrane: A Meta-Analysis

First Author: *Wei Cheng CHANG*

Purpose: We conducted a meta-analysis to assess the clinical outcome of vitrectomy with internal limiting membrane (ILM) peeling versus no ILM peeling for idiopathic epiretinal membrane (ERM).

Methods: Databases, including PubMed, Embase, Cochrane, Web of Science, Google Scholar, CNKI databases, FDA.gov, and ClinicalTrials.gov before July 1, 2016, were searched to identify studies comparing clinical outcomes following vitrectomy with ILM peeling and that with no ILM peeling, just ERM peeling alone, for idiopathic ERM. The meta-analysis was performed by RevMan 5.3.

Results: Twelve retrospective studies composed of 776 eyes were identified. They showed that the postoperative BCVA within 12 months was better in the no ILM peeling group [weighted mean difference (WMD), -0.06; 95% confidence interval (CI), -0.11 to -0.01; P = 0.01], but patients in the ILM peeling group had better postoperative BCVA after 18 months (WMD, 0.13; 95%

CI, 0.03 to 0.22; P = 0.010). Vitrectomy with no ILM peeling revealed a greater decrease in postoperative central retinal thickness (CRT) (WMD, 51.55; 95% CI, 18.88 to 84.23; P = 0.002) and higher recurrence rate of ERM [odds ratio (OR), 4.06; 95% CI, 1.87 to 8.78; P = 0.0003]. However, the improvement rate of BCVA (OR, 1.22; 95% CI, 0.46 to 3.21; P = 0.68) and postoperative CRT (WMD, -16.75; 95% CI, -42.26 to 8.77; P = 0.20) were similar between the 2 groups.

Conclusions: Vitrectomy with internal limiting membrane peeling results in better visual improvement in long-term follow-up and lower recurrence rate, but vitrectomy with ERM peeling can achieve better efficacy in central retinal thickness reduction.

Visual Sciences

Mar 2, 2017 (Thu)

11:00 - 12:30
Venue: 310

An Investigation on Regulation of Frizzled 5 Expression During Mouse Retina Development

First Author: *Mengke LI*

Purpose: Frizzled 5 (Fz5)-mediated Wnt signaling plays an essential role in retinogenesis. Loss of function in Fz5 in both mouse and human eyes led to microphthalmia and retinal coloboma. This study aims to understand the gene regulation network centered on Frizzled 5 expression.

Methods: We used the mouse genome assembly tool to analyze genomic sequences of Fz5 promoter. The conserved regions upstream of the Frizzled 5 gene from different species were aligned using CLUSTALW software. The TF search program and MultiTF tools were used to predict transcription factor binding sites annotated in the TRANSFAC database. Predicted upstream regulatory sequences were cloned into the pBluescript vector followed by a NLS-eGFP reporter. Differentially mutated regulatory sequence driven-reporters were electroporated into embryonic retinal explants to monitor the spatial-temporal activities of Fz5 promoter.

Results: Phylogenetic comparison of a 4-kb sequence upstream of Fz5 coding sequence revealed the presence of 3 noncoding sequence clusters that were highly conserved in vertebrates. Then a short 2-kb and long 4-kb sequence were separately cloned into the pBluescript vector before NLS-eGFP and named pLM006 and pLM008, respectively. We performed in vivo transfection of promoter-reporter constructs in embryonic mouse retinas by electroporation. pLM006 and pLM008 were sufficient to drive EGFP reporter expression, and we are continuing to analyze other conserved clusters

of the Fz5 promoter.

Conclusions: We cloned and characterized Fz5 promoter and established in vitro and in vivo assay systems to monitor its activities during retinal development. We identified transcription factor binding sites including Sox2, Otx2, and Pax6 in silico. Further testing of the Fz5 gene regulation network is underway.

11:00 - 12:30

Venue: 310

Associations of Genetic Loci with High Myopia in a Chinese Male Population

First Author: Kai Xiong **CHEONG**

Co-Author(s): Marcus Chiang Lee **TAN**, Mei Hui Melissa **TAN**, Frederick Lian Kheng **TEY**, Pavandip Singh **WASAN**, Rita Yu Yin **YONG**

Purpose: To demonstrate associations of genetic loci with high myopia in young adult Chinese males in Singapore using a list of candidate genetic loci from previous Chinese Han population studies.

Methods: This is a case-control study of 193 high myopes with 135 age- and ethnicity-matched emmetropes as controls. A total of 5 candidate loci represented by 25 single nucleotide polymorphisms (SNPs) were analyzed. DNA extraction from venous blood was achieved using the Qiagen QIAamp DNA Blood Mini Kit and genotyped on the Sequenom MassARRAY platform with the iPLEX Assay. Chi square and logistic regression analyses ascertained association of SNPs with high myopia in dominant, recessive, co-dominant, and allelic models. Linear regression was performed to ascertain association with axial length. Permutation testing was used to correct for multiple testing bias. For loci which demonstrated positive correlation with high myopia, haplotype association tests were performed and linkage disequilibrium maps were constructed.

Results: Two loci, which are VIPR2 (Locus 7q36.3) [RS885863, RS2540352, and RS399867] and SNTB1 (Locus 8q24.12) [RS7839488, RS4395927, and RS6469937], demonstrated significant associations with high myopia. The haplotypes ACGA and GACAT in VIPR2 and ATGA in SNTB1 remained significantly associated with high myopia even after permutation testing. The affected alleles in these SNPs were significantly associated with axial length.

Conclusions: VIPR2 and SNTB1 are associated with high myopia in a Chinese population in Singapore. The mechanisms of how they contribute to high myopia need to be investigated. This work may aid in risk stratification for high myopia in the future.

11:00 - 12:30

Venue: 310

CEP78 is Mutated in a Distinct Type of Usher Syndrome

First Author: Chen **ZHAO**

Co-Author(s): Rui **CHEN**, Xue **CHEN**, Xunlun **SHENG**, Ruifang **SUI**

Purpose: Usher syndrome is a genetically heterogeneous disorder featuring combined visual impairment and hearing loss. Despite a dozen genes involved in Usher syndrome having been identified, the genetic basis remains unknown in 20-30% of patients. In this study, we aimed to identify the novel disease-causing gene of a distinct subtype of Usher syndrome.

Methods: Ophthalmic examinations and hearing tests were performed on Usher syndrome patients in 2 consanguineous families. Target capture sequencing was initially performed to screen causative mutations in known retinal disease-causing loci. Whole exome sequencing (WES) and whole genome sequencing (WGS) were applied for identifying novel disease-causing genes. RT-PCR and Sanger sequencing were performed to evaluate the splicing-altering effect of identified CEP78 variants.

Results: Patients from the 2 independent families showed a mild Usher syndrome featured by juvenile or adult-onset cone-rod dystrophy and sensorineural hearing loss. WES and WGS identified 2 homozygous rare variants that affect mRNA splicing of a ciliary gene, CEP78. RT-PCR confirmed that the 2 variants indeed lead to abnormal splicing, resulting in premature stop of protein translation due to frameshift.

Conclusions: Our results provide evidence that CEP78 is a novel disease-causing gene for Usher syndrome, demonstrating an additional link between ciliopathy and Usher protein network in photoreceptor cells and inner ear hair cells.

11:00 - 12:30

Venue: 310

Comparative Analysis of Common Adenovirus Types Identifies Polymorphisms in the CR1 Genes Associated with Severe Ocular Surface Inflammation in EKC

First Author: Nobuyo **YAWATA**

Co-Author(s): Anshu **ARUNDHATI**, Gabriel **GONZALEZ**, Yu-Chi **LIU**, Jodhbir **MEHTA**

Purpose: Group D human adenoviruses (HAdVs) have diversified through homologous recombination. Subtypes of group D HAdVs cause epidemic keratoconjunctivitis (EKC). Our aim was to elucidate genetic features that distinguish the EKC-causing HAdV subtypes and to



identify the possible mechanisms underlying the severe ocular inflammation characteristic of EKC.

Methods: We used comparative genomics to identify recombination points and polymorphic sites among the main EKC-causing HAdV subtypes D8, D37, and D53, a recombinant type that contains sequences resembling HAdV-D8, D37, and D22. We tested for correlations between virus types and clinical parameters, such as virus copy number, severity of ocular inflammation, and the profiles of cytokines in tear fluid from EKC cases.

Results: The first half of the HAdV-D53 genome was similar to HAdV-D37 except for the hexon gene, which resembles that of HAdV-D22. In contrast, the second half of the HAdV-D53 genome was similar to HAdV-D8. Of note, the HAdV-D53 E3 region that contains various immunomodulatory proteins was distinct from HAdV-D8 and D37. CR1 proteins were the most disparate both from HAdV-D8 and D37 but similar to those of HAdV-D69, which is not associated with EKC. Clinical severity of HAdV-D53 was significantly milder compared to the cases infected by HAdV-D8 and D37. The levels of proinflammatory cytokines in tear fluid including IL-1b, IL-6, and CCL2 were significantly lower in eyes infected with HAdV-D53.

Conclusions: Comparative genomics analysis of group D HAdVs implies that the polymorphisms of CR1 proteins in HAdVs have important roles in determining the severity of ocular surface inflammation in EKC.

11:00 - 12:30

Venue: 310

Creation of a Genetic Reporter in Cultured ES/iPS Cells to Monitor Differentiation of Retinal Progenitors and 3D Retinal Cups

First Author: *Shanzhen PENG*

Purpose: Wnt signaling plays an essential role in retinal development. Fz5 is an import receptor mediating Wnt signaling. The objective of the study was to generate Fz5-eGFP knock-in reporter in ES or iPS cell lines to facilitate identification of in vitro differentiated retinal progenitors or retina tissues.

Methods: We utilized a mutated Cas9 (D10A) to minimize the off-target effect for Cas9 genome editing. Two sgRNA expression vectors and a donor vector with homologous arms flanking the presumed DSB (double strand break) were created. An eGFP reporter was placed between the 2 arms. Homologous genomic recombination was tested in mouse IMCD3 cells. The same constructs were transfected into mouse ES and iPS cells which were undergoing in vitro differentiation.

Results: We first examined membrane-tethered eGFP reporter protein expression in HEK293T cells by Western blotting. To further validate the efficiency of the

gene editing system, the 2 sgRNA expression vectors and donor vector were cotransfected into IMCD3 cells. Nested PCR amplification was performed to examine homology-directed repairing event. Our results showed that homologous recombination happened in IMCD3 cells. We are currently examining the HR-mediated gene editing events in ES and iPS cells and differentiating ES/iPS clones into optic cups.

Conclusions: We used the CRISPR/Cas9 gene editing system to knock-in a reporter for the mouse Fz5 gene, which is expressed during retinal neurogenesis. This gene editing system has been validated in IMCD3 cells. Our ongoing work is to deliver this system to mouse iPS/ES cells to monitor 3D retinal cup differentiation using the knock-in GFP reporter.

11:00 - 12:30

Venue: 310

Expression of Cyclophilin D in Human Retinal Pigment Epithelial Cells During Oxidative Stress

First Author: *Yuan HE*

Purpose: To detect the expression of cyclophilin D in human retinal pigment epithelial (RPE) cells under oxidative stress and explore the possible target to protect RPE cells.

Methods: Cultured cell line (ARPE19 cells) and human primary RPE cells were observed by phase-contrast micrographs. RPE cells were identified using confocal microscopy. With different concentrations of hydrogen peroxide (H₂O₂) treatment (100 μmol L⁻¹, 500 μmol L⁻¹, 1 mmol L⁻¹) for 24 hours, the expression of cyclophilin D was detected by RT-PCR. After pretreatment of the cells with 3 μmol L⁻¹ cyclosporin A (CsA) for 30 minutes, different concentrations of H₂O₂ (80 μmol L⁻¹, 160 μmol L⁻¹, 320 μmol L⁻¹, for 2 hours) were added to the cells then, and cell death was detected by LDH release between the CsA + H₂O₂ groups and H₂O₂ alone groups.

Results: Cultured ARPE19 cells and human primary RPE cells were identified by expressing RPE-65, a specific marker for these cells, using confocal microscopy. The expression of cyclophilin D increased significantly in the cells treated with 100 μmol L⁻¹ H₂O₂ for 24 hours and decreased in the cells treated with 500 μmol L⁻¹ H₂O₂. The expression of cyclophilin D did not increase further in the cells when the concentration of H₂O₂ reached 1 mmol L⁻¹. The release of LDH increased significantly with the increased concentration of the H₂O₂ groups (0 μmol L⁻¹, 80 μmol L⁻¹, 160 μmol L⁻¹, 320 μmol L⁻¹). Compared with the H₂O₂ alone groups, the release of LDH significantly decreased in the CsA + H₂O₂ groups (P < 0.05).

Conclusions: The expression of cyclophilin D increased significantly under oxidative stress, which further increased cell death. We propose that cyclosporin A might be a possible target for the protection of RPE cells.

11:00 - 12:30
Venue: 310

Fenofibrate Attenuates Diabetic Retinopathy by Affecting Nrf2 Expression and NLRP3 Inflammasome Activation

First Author: Qiuping **LIU**
Co-Author(s): Jingming **LI**, Jinglin **YI**, Fengjun **ZHANG**

Purpose: Oxidative stress and neuroinflammation contribute significantly to diabetic retinopathy. Fenofibrate has received great attention as a treatment of diabetic retinopathy. Nuclear factor erythroid-2-related factor 2 (Nrf2) is a master regulator of antioxidative genes. Activation of NLRP3 inflammasome plays a pivotal role in neuroinflammation. The purpose of this study is to evaluate whether fenofibrate ameliorates retinal oxidative damage and neuroinflammation via modulating the Nrf2 pathway and blocking NLRP3 inflammasome activation during diabetes.

Methods: Diabetes was induced by intraperitoneal injection of streptozotocin in C57BL/6J mice. Fenofibrate was given to mice in rodent chow. Retinal distribution and expression of Nrf2 and NLRP3 were determined by immunofluorescence. Retinal oxidative stress was probed with Cellroxi, an indicator of reactive oxygen species (ROS). Inflammatory gene expression including caspase-1 p10 and IL-1 β p17 were examined by Western blot analysis. Retinal leukostasis was evaluated by ConA-lectin staining and vascular leakage was measured by FITC-dextran permeability assay.

Results: Upregulation of Nrf2, activation of NLRP3, and enhanced formation of ROS were observed in diabetic mouse retinas. Notably, Nrf2 was mainly colocalized with Muller cell marker-GS; however, NLRP3 and caspase-1 were prominently colocalized with microglia marker-Iba1. Fenofibrate further increased expression of Nrf2 and reduced formation of ROS in diabetic retinas. In addition, caspase-1 p10 and IL-1 β p17 were dramatically increased in diabetic retinas, which were abolished by fenofibrate intervention. Moreover, fenofibrate treatment also attenuated diabetes-induced retinal leukostasis and vascular leakage in mice.

Conclusions: Fenofibrate attenuates oxidative stress and neuroinflammation in diabetic retinas, which is at least partially through modulating Nrf2 expression and NLRP3 inflammasome activation.

11:00 - 12:30
Venue: 310

GUCA1A Mutation Causes Central Areolar Choroidal Dystrophy, a Well-Defined Condition that Likely Results from Primary Photoreceptor Dystrophies

First Author: Chen **ZHAO**
Co-Author(s): Xue **CHEN**, Xunlun **SHENG**, Biao **YAN**

Purpose: To investigate the genetic basis and pathogenic mechanism for central areolar choroidal dystrophy (CACD).

Methods: Clinical characterizations, whole exome sequencing, and genome-wide linkage analysis were applied on a 5-generation family diagnosed with CACD. In silico analyses and zebrafish models were used to annotate the pathogenesis of GUCA1A mutations.

Results: A novel mutation, GUCA1A p.R120L, was identified in this family. GUCA1A p.R120L was predicted to alter the tertiary structure of GCAP1, a photoreceptor-expressed protein encoded by the GUCA1A gene, and was shown in zebrafish to cause significant disruptions in photoreceptors and retinal pigment epithelium (RPE), together with atrophies of retinal vessels and choriocapillaris, mimicking cardinal features of CACD. Those phenotypes could not be fully rescued by exogenous wild-type GUCA1A, suggesting a likely gain-of-function mechanism for p.R120L. GUCA1A p.D100E, another mutation previously implicated in cone dystrophy, also impaired RPE and photoreceptors in zebrafish but likely via a dominant negative effect.

Conclusions: We have demonstrated GUCA1A as a new CACD-causing gene. Distinct GUCA1A mutations might have diverse pathogenic modes. Though the clinical recognition of CACD is mainly focused on RPE and choriocapillaris defects, these changes are likely secondary to photoreceptor dystrophies, given that all CACD-causing genes identified to date are photoreceptor-specific.

11:00 - 12:30
Venue: 310

Inhibition of Nox1/Nox4 by GKT137831 Attenuates Neovascular Remodeling in a Mouse Model of Laser-Induced Choroidal Neovascularization

First Author: Jingming **LI**
Co-Author(s): Guolong **DING**, Xiaojuan **FAN**, Qiuping **LIU**, Jie **LIU**, Shuyan **ZHU**

Purpose: Neovascular remodeling (NVR), characterized by progression of capillaries into arterioles with perivascular fibrosis, results in end-stage fibrous plaque in wAMD. NADPH oxidases 4 (Nox4) has been implicated in organ remodeling, but its precise mechanisms in



NVR of eyes remains largely unknown. The purpose of this study is to investigate the role of Nox4 and Nox4-modulated signaling pathway in the development of choroidal NVR.

Methods: A mouse model of laser-induced choroidal neovascularization (CNV) was set up in C57BL/6 mice. GKT137831, a Nox1/Nox4 inhibitor, was administered by intravitreal injection. CNV were imaged in vivo with FFA and ICGA. CNV and fibrous plaque were determined with choroidal flatmount or RPE/choroid cryosection staining with antibodies against CD31 and Collagen I. ARPE-19, treated with transforming growth factor- β (TGF- β), was used for in vitro assay. Expression of Nox4 and fibrotic markers in cultured cells and lasered RPE/choroid complex were determined by Western blot analysis.

Results: Nox4 expression was markedly increased in RPE/choroid complex. Intravitreal injection of GKT137831 predominantly decreased lesion volume of CNV and fibrotic plaque. Further, expression of fibrotic markers in RPE/choroidal complex were all suppressed by GKT137831 treatment. Inhibition of Nox4 by siRNA or GKT137831 suppressed TGF- β 2-induced phosphorylation of smad2/3 and expression of fibrotic markers. In contrast, overexpression of Nox4 by adenoviral vector resulted in intensified phosphorylation of smad2/3 and increment of fibrotic markers upon TGF- β 2 stimulation.

Conclusions: Up-regulation of Nox4 causes NVR through synergy with TGF- β 2-initiated signaling pathway in a mouse model of laser-induced CNV. Inhibition of Nox4 has therapeutic potential to attenuate fibrous plaque formation.

11:00 - 12:30

Venue: 310

Mitochondrial DNA Oxidation Induces Imbalanced Activation of NLRP3/NLRP6 Inflammasomes via Upregulation of Caspase-8 and BRCC36 in Ocular Epithelium Facing Environmental Stress

First Author: De-Quan LI

Co-Author(s): Fang BIAN, Xin CHEN, Wei CHI, Xia HUA

Purpose: The concept of innate immunity has been expanded to recognize environmental pathogens other than microbial components. However, whether and how the innate immunity is initiated by epithelium in response to environmental physical challenges such as low humidity and high osmolality is still largely unknown. This study was to explore the potential mechanism by which mucosal epithelium responds to environmental stress via NLRs-mediated innate immunity pathway.

Methods: Two models were used to investigate the

innate immune responses of ocular surface epithelium to environmental physical challenges: primary human corneal epithelial cultures (HCECs) exposed to hyperosmolarity and in vivo mouse ocular surface facing desiccating stress.

Results: In HCECs exposed to hyperosmolarity, the activated NLRP3 with suppressed NLRP6 stimulated caspase-1 activation leading to IL-1 β and IL-18 maturation and secretion. NLRP3-independent caspase-8 activation was revealed to noncanonically activate caspase-1 via reciprocal regulation of NLRP3/NLRP6-mediated inflammasomes. ROS overproduction was observed to induce mitochondrial DNA oxidative damage and BRCC36 deubiquitinating activity. In vivo model of mouse facing desiccating environment displayed an imbalanced activation of NLRP3/NLRP6 inflammasomes and IL-1 β and IL-18 mediated inflammation with stimulated caspase-8 and BRCC3 activity in corneal and conjunctival epithelia, the responses similar to in vitro HCECs under environmental stress.

Conclusions: Our findings for the first time uncover a novel innate immunity pathway by mucosal epithelium, where the oxidized mitochondrial DNA induces the imbalanced activation of NLRP3/NLRP6 inflammasomes and IL-1 β and IL-18-mediated inflammation via stimulation of caspase-8 and BRCC36 in response to environmental stress, which provide a missing link between inflammation and environmental stress.

11:00 - 12:30

Venue: 310

Protective Effects of a HTRA1 Insertion-Deletion Variant Against Age-Related Macular Degeneration

First Author: Tsz-Kin NG

Co-Author(s): Xiaoying LIANG, Fang LU, Calvin PANG, Gary YAM, Zhenglin YANG

Purpose: Age-related macular degeneration (AMD) is a leading cause of visual impairment and irreversible blindness in most developed countries, affecting about 50 million elderly worldwide. Retinal pigment epithelial (RPE) cell degeneration is the pathophysiological cause of AMD, leading to geographic atrophy and choroidal neovascularization. We and others have previously identified several polymorphisms on chromosome 10q26 (rs11200638 in HTRA1 and rs10490924 and c.372_815del443ins54 in LOC387715) associated with AMD. In this study, we investigated the genetic association and biological functions of our previously identified HTRA1 insertion-deletion (indel) variant (c.34delCinsTCCT).

Methods: Two Chinese exudative AMD cohorts with a total of 963 subjects were recruited for the genetic



association study. Wildtype HTRA1 and variant were cloned and expressed in RPE cells, followed by the characterization of their biological functions.

Results: Genetic analysis verified the higher prevalence of c.34delCinsTCCT allele in control subjects than in AMD patients ($P = 8.33 \times 10^{-5}$, odds ratio = 0.226). This protective effect was validated as the haplotype of the c.34delCinsTCCT allele existed independently of the risk haplotype ($P = 6.23 \times 10^{-5}$). In vitro studies showed that recombinant HTRA1 c.34delCinsTCCT variant protein was more localized in the endoplasmic reticulum of RPE cells compared to the wildtype protein, and its secretion was delayed. Moreover, ARPE-19 cells expressing HTRA1 c.34delCinsTCCT variant had higher cell viability, lower cell apoptosis, and were less responsive to anoikis, supporting its protective role.

Conclusions: Our results revealed a protective HTRA1 variant against HTRA1-induced RPE cell death, indicating its involvement in AMD pathogenesis.

11:00 - 12:30

Venue: 310

Wogonin Prevents TLR4-NF- κ B-Mediated Neuro-Inflammation and Improves Retinal Ganglion Cell Survival in Retina After Optic Nerve Crush

First Author: Yue **XU**

Co-Author(s): Jingjing **HUANG**, Xiaoling **LIANG**

Purpose: Chronic neuro-inflammation is involved in the death of retinal ganglion cells (RGCs) in glaucoma.

The aim of this study is to determine whether wogonin can suppress inflammatory responses and rescue RGC death after optic nerve crush (ONC), an ideal animal model of glaucoma.

Methods: Wogonin was administered intraperitoneally 10 minutes after establishment of the ONC model. The density of RGCs was determined in Brn3a stained retinal flat mounts and Western blot analyses. TUNEL staining was used to detect the apoptosis of RGCs. Immunofluorescence staining and Western blot analyses were used to determine the caspase-3 activity, astrogliosis of glial cells, and activation of microglial cells, TLR4, and NF- κ B-P65. The release of pro-inflammatory cytokines was monitored by real-time PCR.

Results: In this study, wogonin treatment reduced RGC loss and inhibited RGC apoptosis demonstrated by the increased Brn3a labeling RGCs at day 14 and the cleaved caspase-3 expression at day 7 after ONC, respectively. In the ONC model, the number of GFAP-positive glial cells and iba1-positive microglial cells were increased, combined with the elevated level of pro-inflammatory cytokines released in retina at day 7. However, most of these responses were inhibited after wogonin treatment. The level of TLR4 expression, NF- κ B-P65 nucleus location, and NF- κ B-P65 phosphorylation were increased in retina at day 1 after ONC, which was significantly reduced after wogonin treatment.

Conclusions: These results demonstrated that wogonin protected RGC survival and suppressed neuro-inflammation in retina after ONC by inhibiting TLR4-NF- κ B pathways. We conclude that wogonin could be a possible strategy for the treatment of glaucoma.



Cataract

Poster No.: EX1-001

Panel No.: 001, Session EX1

Anterior Lens Capsular Complex Measurements Using Spectral Domain Optical Coherence Tomography

First Author: Xiaogang **WANG**

Co-Author(s): Yading **JIA**, Qiang **WU**, Su Hua **ZHANG**, Jing **DONG**

Purpose: To investigate the anterior lens capsular complex (ALCC) in normal Chinese subjects and examine the factors that influence it, such as age, gender, pupil diameter (PD), and signal strength index (SSI).

Methods: A prospective observational case series. One hundred thirty-four normal subjects (134 eyes) were included. Using a pupil reference, the central ALCC (CALCC), nasal 1-mm ALCC (NALCC), temporal 1-mm ALCC (TALCC), and PD were measured manually via spectral domain optical coherence tomography (OCT).

Results: The mean CALCC, NALCC, and TALCC were 33 ± 6 , 36 ± 7 , and 34 ± 6 μm , respectively. The NALCC was significantly thicker than the CALCC ($P < 0.001$) and TALCC ($P < 0.001$). Moreover, CALCC was statistically thinner than TALCC ($P = 0.013$). Age was positively correlated with the CALCC ($r = 0.292$, $P < 0.001$), NALCC ($r = 0.400$, $P < 0.001$), and TALCC ($r = 0.521$, $P < 0.001$). PD, gender, and SSI were not significantly correlated with the 3 ALCC parameters.

Conclusions: Spectral domain OCT can be used to demonstrate the ALCC thickness, and age is positively correlated with the ALCC in the central, nasal, and temporal sides.

Poster No.: EX1-002

Panel No.: 002, Session EX1

Association Between Visual Measures and Driving Behaviors in Older Drivers with Bilateral Cataract

First Author: Jonathon **NG**

Co-Author(s): Seraina **AGRAMUNT**, Kyle **CHOW**, Lynn **MEULENERS**, Nigel **MORLET**

Purpose: To examine associations between objective visual measures and naturalistic driving behavior in older drivers with bilateral cataract.

Methods: Drivers aged 55+ years with bilateral cataract and awaiting first eye cataract surgery were recruited over 10 months. An in-vehicle monitoring device with data logger and GPS receiver was used to measure naturalistic driving behavior 1 week before first eye cataract surgery. Information collected included driving

exposure, number of trips, day/night time driving, and weekend/weekday driving. Participants were tested for MMSE, UFOV, reaction time, visual acuity, contrast sensitivity, and stereopsis. Multiple linear regression was used to examine associations between visual measures and driving exposure.

Results: The 90 participants had a mean age of 73 (SD = 8) years. Almost half (46%) wore bifocal or multifocal glasses. Mean binocular ETDRS acuity was 0.14 ± 0.17 logMAR, binocular contrast sensitivity was 1.66 ± 0.15 log units, and mean stereoacuity was 2.34 ± 0.74 seconds of arc. Drivers on average drove 121.6 km (SD = 102.5) over 16.5 (SD = 10.8) trips during the week with fewer and shorter trips during weekends and at night. Multiple linear regression found only binocular contrast sensitivity ($P < 0.05$) and gender ($P < 0.05$) were significantly associated with driving exposure after adjusting for potential confounders. Participants with better contrast sensitivity and men drove more prior to cataract surgery.

Conclusions: Older drivers with cataract self-regulate driving based on visual function with contrast sensitivity as the most important factor. A better understanding of driving patterns in older drivers with impaired vision from cataract is important to better understand self-regulation strategies that can be recommended.

Poster No.: EX1-003

Panel No.: 003, Session EX1

Cataract Surgery Performed with LenSx Femtosecond Laser: Postoperative Follow-Up of 115 Eyes

First Author: Anthony **LIN**

Co-Author(s): Pei-Tzu **KUAN**, Ming-Hwei **TSAI**

Purpose: To evaluate the visual acuity and spherical equivalent in patients who received cataract surgery performed with LenSx femtosecond laser.

Methods: We collected patients who received femtosecond-assisted cataract surgery in our practice from December 2012 to October 2013. Preoperative parameters such as age, gender, the grading of cataract (using Lens Opacities Classification LOCSIII), intraocular pressure (IOP), specific conditions like trauma, previous ocular surgery, and other preexisting ocular manifestations were all recorded. We arranged postoperative follow-up at day 1, 1 week, 1 month, 3 months, 6 months, and 10 months. Uncorrected visual acuity (UCVA), IOP, refractive error, and other specific findings were all recorded.

Results: Seventy-seven eyes of 77 patients were enrolled. There were 41 males and 36 females. The average age was 63.2 ± 12.1 years old. Preoperative cataract grade was 2.4 ± 0.8 . All the surgeries were



performed smoothly, but there were 14 capsulotomy tags, 4 incomplete capsulotomies, and 2 posterior capsule ruptures. A total of 84 multifocal intraocular lenses (IOLs), 2 accommodative IOLs, 8 toric IOLs, and 20 aspheric IOLs were implanted. Among all eyes, only 1 IOL was not premium. After 10 months of follow-up, visual acuity in half the patients was between 14/20 and 16/20. The postoperative spherical equivalent was -0.08 to -0.33 diopters (D). IOP remained in the normal range in all patients.

Conclusions: Femtosecond cataract surgery provided good results in our practice, including early visual rehabilitation and better predictable refraction. Further study about endothelial cell protection can be investigated.

Poster No.: EX1-004

Panel No.: 004, Session EX1

Comparison of Effective Phacoemulsification Time Between Conventional Cataract Surgery and Femtosecond Laser-Assisted Cataract Surgery

First Author: Anthony **LIN**

Co-Author(s): Pei-Tzu **KUAN**, Ching-Yang **LIN**, Ming-Hwei **TSAI**

Purpose: To compare the effective phacoemulsification time of femtosecond laser-assisted cataract surgery (FLACS) with conventional cataract surgery.

Methods: Fifty eyes underwent FLACS and 50 eyes of 21 patients underwent standard cataract surgery. All the patients were operated on by the same surgeon. All the demographic features were compared between these 2 groups. The grading of lens opacities was recorded preoperatively. Effective phacoemulsification time was recorded and analyzed for each patient.

Results: Patient demographics were similar between groups. There were no differences between age (61.98 ± 7.69 vs 62.8 ± 7.71) or baseline cataract grade (2.3 ± 0.61 vs 2.21 ± 0.72). All the surgeries were done smoothly without complications. The phacoemulsification was performed by Alcon Infinity machine. The mean effective phacoemulsification time in the femtosecond group was 0.22 ± 0.26 seconds compared to 3.52 ± 2.19 seconds in the conventional cataract surgery group. Furthermore, effective phacoemulsification time reduced in the femtosecond group by using lens fragmentation mode. A total of 26% of the femtosecond laser group had 0% effective phacoemulsification time while 16% of the conventional cataract surgery achieved this goal.

Conclusions: FLACS can reduce effective phacoemulsification time. Further investigation is needed into the influence of FLACS on endothelium.

Poster No.: EX1-005

Panel No.: 005, Session EX1

Comparison of Toric IOL Stability with Conventional Limbal Marking vs Callisto Eye Markerless Alignment System

First Author: Sanjana **SRIVATSA**

Co-Author(s): Sheetal **BRAR**, Sri **GANESH**

Purpose: Comparison of refractive outcomes with toric intraocular lens (IOL) implantation in astigmatism correction using limbal marking versus markerless alignment system using the Callisto eye.

Methods: Fifty eyes, divided into 2 groups of 25 each with significant preoperative astigmatism, underwent routine phacoemulsification with toric IOL implantation. Group 1 underwent limbal marking and group 2 used Callisto eye markerless system for toric IOL alignment intraoperatively. Data was analyzed at 2 months postoperatively for residual cylinder and stability of toric IOL with dilated clinical photo and with Zaldivar caliper using iTrace aberrometry.

Results: Mean preoperative astigmatism in group 1 was 2 ± 0.9 vs 2.1 ± 0.9 in group 2 ($P = 0.6$). Postoperative astigmatism by subjective acceptance was 0.3 ± 0.4 in group 1 and 0.3 ± 0.6 in group 2 ($P = 0.8$). Percent of eyes with residual cylinder ≤ 0.5 in the marking group was 95% vs 90% in the markerless group. iTrace showed mean rotation of 6.1 ± 5 in the marking and 7.0 ± 7 in the markerless groups ($P = 0.5$).

Conclusions: Both marking and markerless methods are accurate means of toric IOL alignment. However, the Callisto system makes the process easier, faster, standardized, and more convenient to the operating surgeon.

Poster No.: EX1-006

Panel No.: 006, Session EX1

Daily Challenge of a Diffractive IOL: Quality of Vision

First Author: Andreas **BORKENSTEIN**

Purpose: To evaluate quality of vision in respect to higher order aberrations and reading performance at near and intermediate distances of the acrylic aspheric aberration-free diffractive multifocal intraocular lens (MIOL; Diff-aA, HumanOptics, Germany).

Methods: In this prospective study a total of 36 eyes of 18 patients were enrolled. In all cases the diffractive MC 6125 (Diff-aA, HumanOptics) was implanted. Control exams including visual acuity (ETDRS), Scheimpflug measurement (Pentacam AXL), and wavefront aberrometry (iTrace) were performed 1, 3, and 6 months postoperatively.



Results: All patients achieved very good near (0.18-0.00 logMAR) and far (0.10-0.00 logMAR) visual acuity. Only 3 of 18 patients had higher order aberrations and recognized light glare and halos when working with computer monitors or tablets/smartphones.

Conclusions: The new Diff-aA IOL performed very well and can achieve high spectacle independence. However, higher order aberrations have a strong association with postoperative difficulties in daily life and should be considered preoperatively.

Poster No.: EX1-007

Panel No.: 007, Session EX1

Evaluating the Improvement in Clinical Outcomes with Once-Daily Nepafenac 0.3% Ophthalmic Suspension in Patients with Diabetic Retinopathy Following Cataract Surgery: Outcomes from Two Randomized, Vehicle-Controlled Phase 3 Studies

First Author: Andrew **CHANG**

Co-Author(s): Jennifer **ARNOLD**, Peter **DAVIES**, Wilson **HERIOT**, Nandor **JAROSS**

Purpose: To demonstrate the superiority of once-daily nepafenac 0.3% relative to vehicle based upon clinical outcomes following cataract surgery (CS) in patients with non-proliferative diabetic retinopathy (NPDR).

Methods: In 2 prospective, randomized, phase 3, multi-center, double-masked, parallel-group studies, patients (n = 615, study-1; n = 605, study-2) received nepafenac 0.3% or vehicle once daily in the study eye starting 1 day before surgery and continuing for 90 days post-CS. Key endpoints were proportion of patients i) who developed macular edema (ME) within 90 days post-CS, ii) with improvements in best corrected visual acuity (BCVA) of ≥ 15 letters from preoperative baseline to day 14 and maintained through day 90, and safety.

Results: The incidence of ME was significantly lower in nepafenac-treated patients versus vehicle (study-1: 2.3% vs 17.3%, $P < 0.001$; study-2: 5.9% vs 14.3%, $P = 0.001$; pooled: 4.1% vs 15.9%; $P < 0.001$). A higher proportion of nepafenac-treated patients had BCVA improvement of ≥ 15 letters from preoperative baseline to day 14 and maintained through day 90 compared to vehicle in study-1 (61.7% vs 43.0%, $P < 0.001$) and pooled analysis (55.4% vs 46.7%, $P = 0.003$); the proportion of patients in the 2 treatment groups was similar in study-2 (48.8% vs 50.5%; $P = 0.671$). Rates of treatment-related adverse events were low in both groups (study-1: 2.7% vs 2.3%; study-2: 2.0% vs 2.7%).

Conclusions: Once-daily nepafenac 0.3% used prophylactically for 90 days after CS was superior to vehicle and significantly reduced the risk of postoperative ME

in patients with NPDR with no new safety concerns.

Poster No.: EX1-008

Panel No.: 008, Session EX1

Management of Toxic Anterior Segment Syndrome After Uncomplicated Juvenile Cataract Surgery

First Author: Indri **WAHYUNI**

Purpose: To report management of toxic anterior segment syndrome (TASS) after uncomplicated juvenile cataract surgery.

Methods: A case report. A 9-year-old boy had blurred vision for 2 years previously. Visual acuity in both eyes was hand movements; intraocular pressure (IOP) was within normal limits and anterior segment showed bilateral cataract. Laboratory tests were positive IgG for rubella and CMV. Ultrasonography was within normal limits. In the left eye this patient had uncomplicated cataract extraction with dissection aspiration via clear corneal incision with implantation of foldable intraocular lens. Primary posterior capsulotomy was not performed because of uncooperation. One day postoperatively, visual acuity did not improve; diffuse corneal edema and anterior chamber inflammation including hypopyon were evident. Topical antibiotic and steroid eyedrops were prescribed; atropine eyedrops and intravenous steroid were given also. We performed investigations to find the cause of TASS.

Results: After treatment lasting for 1 week visual acuity improved to 0.8 and anterior chamber reaction decreased considerably. After a thorough investigation, the miotic agent (carbacol) during the operation was supposed as the source of the problem.

Conclusions: After uncomplicated cataract surgery, toxic anterior segment may occur in the early postoperative period, which can be treated successfully with steroids both topical and intravenous. Investigations to find the cause of TASS must be rapidly performed to prevent recurrence of the event.

Poster No.: EX1-009

Panel No.: 009, Session EX1

Novel Optic Design for Multifocal IOL: Initial Results

First Author: Jagadeesh Kumar **REDDY**

Co-Author(s): Ameya **INGAWALE**, Siddharthan **K S**, Rushita **KAMDAR**, Neeraj **SHAH**

Purpose: To evaluate distance and near vision outcomes and photic phenomena of a new hybrid multifocal optic design.

Methods: Forty eyes of 40 patients with senile cataract underwent phacoemulsification with implantation of

the hybrid optic intraocular lens (IOL), a novel intraocular lens with refractive optic for distance and a single central diffractive optic element for near. Uncorrected visual acuity (UCVA) and best spectacle corrected visual acuity (BCVA) for distance and near vision were recorded at 1 week and 6 weeks after surgery along with subjective visual quality.

Results: Forty out of 40 patients had a BCVA of 20/20 for distance, of which 36 had a UCVA of 20/20. Minimal UCVA noted was 20/40 in 2 patients. All patients had a BCVA of N6 for near, of which 34 patients had a UCVA of N6. Minimal UCVA for near was N8. In all, 36 patients achieved spectacle independence. The most common reason for spectacle wear was residual astigmatism. The commonest postoperative complaints were temporal shadow in 15 patients on first visit. This had significantly reduced to 7 patients at the sixth week of follow-up. All the patients were satisfied with their subjective visual quality and none of them reported any disabling photic phenomena on questioning.

Conclusions: The new hybrid optic IOL successfully restores both near and distance vision without any photic phenomenon. It eliminates the visual disturbances associated with diffractive optic IOL for distance vision.

Poster No.: EX1-010

Panel No.: 010, Session EX1

Objective Assessment of Junior Ophthalmology Residents' Phacoemulsification Surgical Training Using ICO-OSCAR

First Author: Charles **ONG**

Co-Author(s): Allan **FONG**, You Jun **LEE**, Mohamad **ROSMAN**, Daniel **TING**

Purpose: To determine the usefulness of ICO-OSCAR:phaco in assessing the initial learning curve of junior ophthalmology residents for phacoemulsification surgeries.

Methods: Single-center prospective descriptive case series involving 9 ophthalmology residents (3 third-years and 6 second-years) at the Singapore National Eye Centre. A total of 319 procedures were performed by these residents between August 1, 2014, and January 22, 2015. They were assessed by cataract senior mentors using the ICO-OSCAR:phaco, a 20-step objective assessment tool. The relationship between the number of surgeries and ICO-OSCAR:phaco score was evaluated using one way ANOVA trend analysis.

Results: The number of surgeries performed had a significant linear trend with the mean ICO-OSCAR:phaco score ($P < 0.001$). The mean score of the first 5 phacoemulsification procedures performed for all the residents was 68.40 ± 12.98 . The mean number of cas-

es required for all residents to achieve 2 or more consecutive scores >85 was 16.11 ± 5.51 . There were no significant differences between mean number of surgeries needed before obtaining 2 or more consecutive scores of >85 between third and second year residents (13.67 ± 4.04 vs 17.33 ± 6.05 , $P = 0.38$). Mean scores for third year residents ($n = 121$) were higher than the mean scores for second year residents ($n = 198$) (83.78 ± 9.74 vs 74.23 ± 13.75 , $P < 0.001$).

Conclusions: The ICO-OSCAR:phaco score is a useful tool to objectively assess the junior ophthalmology residents' learning curve for phacoemulsification surgeries in our center. On average, they were able to consistently score 85 and above from their 20th phacoemulsification procedure onward.

Poster No.: EX1-011

Panel No.: 011, Session EX1

Outcomes of Modified Phacoemulsification Technique in Cases of Chronic Stevens-Johnson Syndrome with Cataract

First Author: Neelima **ARON**

Co-Author(s): Tushar **AGARWAL**, Namrata **SHARMA**, Jeewan **TITIYAL**, Renu **VENUGOPAL**

Purpose: To assess the outcomes of phacoemulsification in patients with chronic sequelae of Stevens-Johnson syndrome (SJS).

Methods: Twenty-one eyes of 16 patients with chronic SJS underwent phacoemulsification. Modifications in the technique such as dye staining of anterior lens capsule, use of endoilluminators, phacoemulsification in the iris plane, and sphincterotomies were done for the successful completion of surgery. The main outcome measures were best-corrected visual acuity (BCVA) and ocular surface stabilization.

Results: The mean patient age was 32 ± 12 years. The mean duration from diagnosis to cataract surgery was 7.83 ± 4.8 years. A total of 28.5% of eyes had an immature cataract, 33% of eyes had a total white cataract, 14% of eyes had a posterior subcapsular cataract, and 23.8% of eyes had a dense cataract with adherent leucoma. The mean preoperative corrected distance visual acuity (CDVA) was 2.31 ± 0.67 logMAR. Phacoemulsification was attempted in all cases. Two eyes of the same patient were converted to extracapsular cataract extraction in view of posterior capsular tear and 1 eye underwent intracapsular cataract extraction due to extreme corneal haze and poor visibility even with the endoilluminator; all 3 were left aphakic. Posterior chamber intraocular lens was placed in the bag in 18 eyes. The mean postoperative CDVA was 0.79 ± 0.46 logMAR at 1 month ($P = 0.001$). On follow-up, 2 eyes developed epithelial defects and 2 eyes developed filamentary keratitis, all resolved with copious lubrication.



Conclusions: Modified technique of phacoemulsification significantly improves vision and reduces the incidence of intraoperative and postoperative complications in patients of chronic SJS with cataract.

Poster No.: EX1-012

Panel No.: 012, Session EX1

Small Incision Cataract Surgery Training: The Efficient Course for Postgraduate Residents

First Author: Ouk **HEAN**

Purpose: To evaluate the visual outcome of cataract surgery performed by various trainees during the small incision cataract surgery (SICS) training course between 2012 and 2014.

Methods: This non-comparative retrospective review focuses on the visual outcome of SICS performed by various trainees during their training. There are 12 candidates so far who have successfully completed this training and a total of 599 cataract surgeries were performed. Data were obtained from each trainee's surgical log book. SICS was the mainstay surgical technique, while some cases were converted to extracapsular cataract extraction (ECCE) due to intraoperative complications.

Results: There were 38% males and 62% females. A total of 95.5% were older than 50 years of age, while rest were less than 50. Presenting visual acuity (VA) in the operated eye was poor in 75% of cases and 25% had borderline VA. On the first postoperative day uncorrected VA of 6/6–6/18 was achieved in 66.5%; 30% had borderline and only 3.5% had poor VA of worse than 6/60. Twelve patients (2%) had corneal edema on the first day, 1 of which was due to intraoperative Descemet membrane detachment. PC rupture vitreous loss occurred in 7 patients, 3 of which were left aphakic. There was 1 case of intraocular lens (IOL) dislocation the day after surgery. Other intraoperative complications included 3 cases of iridodialysis and 2 cases of zonular dialysis.

Conclusions: As SICS technique is required for all eye surgeons in developing countries, the SICS training course has provided a great chance for postgraduate residents as an additional learning opportunity to enhance their surgical skills in cataract surgery.

Poster No.: EX1-013

Panel No.: 013, Session EX1

Visual Outcomes of Intraocular Lens Implantation in the Absence of Capsular Support in a Philippine Tertiary Eye Referral Eye Center: A Retrospective Chart Review

First Author: Roel **VILLANUEVA**

Co-Author(s): Noel **CARINO**

Purpose: To determine the visual outcome of intraocular lens implantation without capsular support done at the University of the Philippines, Philippine General Hospital Department of Ophthalmology and Visual Sciences.

Methods: A retrospective analysis of medical records of patients that underwent intraocular lens implantation with inadequate capsular support [anterior chamber intraocular lens (ACIOL), sutured scleral fixated lens, sutureless (glued) scleral fixated lens, and iris claw fixated lens] done from 2010–2015 was conducted. Main outcome measures included the postoperative best-corrected visual acuity (BCVA) and postoperative complications.

Results: A total of 110 eyes of 109 patients were included in the study. The mean preoperative BCVA of the patients was 1.127 ± 0.19 . Postoperative BCVA for the ACIOL and sutured scleral fixated groups at 2 months were 0.415 ± 0.09 and 0.421 ± 0.71 , respectively, with a significant improvement from the preoperative BCVA ($P = 0.005$). There was no significant improvement from mean preoperative BCVA for the sutureless scleral glued fixated (0.646 ± 0.81) and iris claw fixated lens (0.338 ± 0.15). Comparing the means of each IOL type, there was no statistical significance between mean postoperative BCVA at 2 months between all IOL types. ACIOL had the highest complication rate among the 4 IOL types.

Conclusions: The results indicate that there is satisfactory visual improvement from baseline preoperative BCVA with the use of any type of extracapsular IOL. Two-month postoperative BCVA for the 4 IOL types was comparable to one another. Complications were highest in the ACIOL group.



Comprehensive Ophthalmology

Poster No.: EX1-014

Panel No.: 014, Session EX1

Contribute to Sustainable Development Goals: Environmentally Sustainable Practices at an Eye Hospital in Cambodia

First Author: Manfred MÖRCHEN

Purpose: In recent years a small number of eye hospitals in low and middle income countries have commenced actions aimed at reducing their carbon and overall environmental footprint. They are striving for models seeking, for example, to make cataract surgery more environmentally friendly. The purpose of this case study is to outline comparable actions taken at an eye hospital in rural Cambodia.

Methods: A situational analysis was conducted involving interviews with key personnel and focus group discussions in May 2013. A questionnaire was developed based on the WWF Green Office initiative and adapted to the specific context of an eye hospital in a low and middle income country seeing a total of approximately 30,000 outpatients and performing 2,500 cataract surgeries annually.

Results: The study found that a range of high quality practices had been implemented. For example, instead of relying on air conditioning, well-designed buildings which use a cross-ventilation system with natural airflow together with other practices such as shading of windows were very effective. The hospital had also installed a 3.5 kW solar panel system, together with a 100,000 liter underground water collection system. Collaboration with a local NGO led to the installation of energy efficient improved cook stoves for patient use, resulting in savings of 20 to 30% of wood or charcoal.

Conclusions: These actions are proving to be a model for other hospitals; however, baseline data with more specific estimations of electricity savings and the resulting reduced carbon footprint would provide additional details.

Poster No.: EX1-015

Panel No.: 015, Session EX1

Effects of Presbyopia on Near Stereopsis

First Author: Hyosook AHN

Purpose: To evaluate the influence of presbyopic refraction on near stereopsis.

Methods: Prospective study of 32 patients with presbyopic symptoms with a mean age of 55.1 years old. With manifest refraction correction, patients performed a set of tests including near vision, accommodation

point, and Titmus stereopsis test. After applying the plus lens according to patient age, the same tests were performed to confirm the influence of presbyopic correction on near stereopsis.

Results: In initial examination, mean near vision was 0.5 with maximal accommodation power of 4.6 diopters (D), and stereopsis was -2.1. After presbyopic correction, near vision improved to 0.9 and near stereopsis to -2.1. Among parameters, age and near vision were related with near stereopsis statistically ($P = 0.009$ and $P = 0.030$, respectively).

Conclusions: Patients with presbyopic refraction conducted reduction of near stereopsis. Accordingly, presbyopic correction can improve stereopsis, especially in near work.

Poster No.: EX1-016

Panel No.: 016, Session EX1

Effects of Vitreous Floaters on Activities in Daily Life

First Author: Pall SINGH

Co-Author(s): Wilson WONG JUN JIE

Purpose: To assess the severity of symptomatic floaters and the effect on activities in daily life.

Methods: In this institution-based study 100 outpatients who presented with symptomatic floaters were enrolled. A questionnaire was used to assess the severity of the floaters and the effect on activities of daily life such as reading, driving, working on the computer, watching television, paperwork, using mobile phones, and playing sports.

Results: The mean age of the study population was 55.2 years old (range, 40-73). The mean duration of experiencing floaters was 6 years (range, 6 months to 30 years). A total of 10% of patients had severe symptoms followed by 40% with moderate and 50% with only mild symptoms. The activities most inconvenienced by floaters were driving (45%), reading (33%), and computer work (10%).

Conclusions: Vitreous floaters are harmless from the physician's perspective but it is undeniable that they remain visually troublesome for a substantial number of patients in certain daily activities. There might be treatment options now with the availability of small gauge pars plana vitrectomy or even the non-invasive Nd:Yag laser vitreolysis procedure.



Poster No.: EX1-017

Panel No.: 017, Session EX1

Is Long-Term Ophthalmic Follow-Up Necessary for Treatment Completed Leprosy Patients: A South Asian Study

First Author: Madhuwanthi DISSANAYAKE

Purpose: Ocular complications are some of the dreaded complications of leprosy. They are known to occur before, during, and after the completion of treatment of leprosy. The purpose of this study was to delineate epidemiological and clinical patterns of ocular complications among treatment completed leprosy patients.

Methods: A detailed ophthalmic examination was performed on in-ward patients diagnosed with leprosy in the leprosy hospital. Data were analyzed using SPSS version 21.

Results: The sample size was 31 (20 males, 11 females). Mean age was 71 ± 13 years. All had completed treatment for leprosy with multidrug therapy. Mean duration since completion of the treatment was 28 ± 13 years. Ocular involvement was present in 96.7% (n = 30). All those with ocular involvement had a subnormal corrected visual acuity. Tearing (16.1%, n = 5) and irritation (6.5%, n = 2) were the commonest symptoms. The commonest ocular complication was cataract (90.3%, n = 28) followed by reduced corneal sensation (51.6%, n = 14), lagophthalmos (29.0%, n = 9), madarosis (12.9%, n = 4), and scleral pigmentation (9.7%, n = 3). Corneal opacities were present in 3 patients (9.7%) and dry eyes diagnosed with positive Schirmer test in 3 patients (9.7%). The presence or severity of ocular complications did not significantly correlate with disease duration ($P > 0.05$).

Conclusions: The study showed a high prevalence of leprosy-related ocular complications long after the completion of treatment. Hence, access to ophthalmic care should be provided for patients even long after completion of treatment and regular ophthalmic clinics should be organized for their follow-up.

Poster No.: EX1-018

Panel No.: 018, Session EX1

Novel Technique of Dog Tick Removal from the Eyelid

First Author: Li Lian FOO

Purpose: To describe a case of eyelid tick attachment and the en bloc removal with monopolar cautery.

Methods: Case report.

Results: A 2-year-old girl was found to have a dog tick embedded in her left upper eyelid. En bloc tick removal was carried out using monopolar cautery through the

delivery of sequential thermal energy to the tick's body for it to lose its grip on the host tissue.

Conclusions: The use of monopolar cautery is a novel and safe technique to allow en bloc tick removal while minimizing trauma to the surrounding ocular tissues, thereby preserving ocular architecture.

Poster No.: EX1-019

Panel No.: 019, Session EX1

Pseudophacocele: Atypical Presentation, AS-OCT Picture, and Innovative Management

First Author: Shravan MASURKAR

Co-Author(s): Apoorva AG, Guruprasad AYACHIT, Srinivas JOSHI

Purpose: A rare case with atypical presentation of pseudophacocele which was managed in a new and better way.

Methods: The patient had a history of blunt trauma by a bull's horn. Cataract surgery was done 1 month previously. Painless diminution of vision. On examination, the following were noted: hyphema, aphakia, intraocular lens (IOL) in superior conjunctival space, no subconjunctival hemorrhage. Vitreous hemorrhage was seen on B-scan. Anterior segment optical coherence tomography (AS-OCT) showed a cleft corresponding to the IOL in the subconjunctival space. Superior SICS wound was seen. Diagnosis of pseudophacocele was made.

Results: IOL was freed from the subconjunctival space and implanted in the sulcus after minimal anterior vitrectomy.

Conclusions: There are only few case reports of pseudophacocele and AS-OCT has not been obtained to the best of our knowledge. The same IOL has not been re-implanted in the sulcus. India is a land of SICS. In rural settings pseudophacocele is possible because of blunt injury. Ensuring good SICS tunnels will go a long way in preventing such complications.

Poster No.: EX1-020

Panel No.: 020, Session EX1

Unusual Acute Presentation of Wilson Disease: Case Reports from Bangladesh

First Author: Nuzhat CHOUDHURY

Purpose: Wilson disease is often unrecognized and underdiagnosed, especially in our part of the world. This is more so with acute presentation of the disease.

Methods: We present 2 cases of acute Wilson disease. The first patient was a young male who presented to us with classic features of acute hepatitis including prodrome, while the second patient, a young woman who also presented to us with classic features of prodrome,

had acute liver failure in addition.

Results: On further evaluation both were diagnosed as having acute Wilson disease. In the case of the second patient, she had acute chronic liver failure, ie, flare of Wilson disease inducing acute liver failure in the background of Wilson disease related previously undiagnosed cirrhosis of the liver.

Conclusions: In Bangladesh and in most parts, common causes of acute hepatitis include hepatitis viruses, alcohol, and drugs. However, less common etiologies like Wilson disease must be kept in mind and looked for, wherever there is strong suspicion. Otherwise, many may be denied potential cure.

Cornea, External Eye Diseases & Eye Bank

Poster No.: EX1-021

Panel No.: 021, Session EX1

A Case of Bilateral Microsporidiosis in DSAEK Mimicking Graft Rejection

First Author: Naveen **RADHAKRISHNAN**

Co-Author(s): Mano **DAS**, Venkatesh **PRAJNA**, Lumbini **VATTIKONDA**

Purpose: To report a case of bilateral microsporidiosis in Descemet stripping automated endothelial keratoplasty (DSAEK) mimicking graft rejection.

Methods: Case report.

Results: A 52-year-old male with Fuchs corneal dystrophy underwent DSAEK in both eyes (BE). The patient developed sudden onset redness, pain, and defective vision in the left eye (LE). On examination the uncorrected visual acuity in the right eye (RE) was 6/18 and in LE was 6/60. LE had circumcorneal congestion, host, and graft edema. Anterior chamber and intraocular pressure were normal. An initial diagnosis of graft rejection was made and the patient was treated with hourly prednisolone acetate eye drops. On the third day of onset of symptoms, the patient developed similar signs and symptoms in RE with drop in visual acuity to 6/60. Because of the atypical presentation of graft edema without any other signs of acute rejection, confocal microscopy was done to rule out infective etiology. In confocal microscopy, BE showed hyperreflective dot lesion in the host stroma suggestive of microsporidiosis. The patient was started on fluconazole 0.3% eye drops with reduced dose of topical steroids in BE. There was immediate reduction in graft edema with improvement in signs and symptoms. At 1 month the graft edema in BE had subsided with a uncorrected visual acuity of 6/18 in BE.

Conclusions: Microsporidial keratitis can mimic graft rejection in DSAEK patients and should be kept in mind

while treating non-resolving graft edema.

Poster No.: EX1-022

Panel No.: 022, Session EX1

A Novel Technique for Pterygium Excision with Conjunctival Autograft with Limbal Stem Cells

First Author: Mahendra **JANGIR**

Co-Author(s): Anju **KOCHAR**, Poonam **BHARGAVA**

Purpose: To study the refractive changes, recurrence rate, and qualitative assessment of tear film following pterygium excision with sutureless, glue-free conjunctival autograft with limbal stem cells as primary treatment.

Methods: A prospective, nonrandomized, comparative, interventional case series. This study was carried out on 105 eyes of 98 patients with primary pterygium in 1 or both eyes. Our surgical technique comprised pterygium excision followed by sutureless and glue-free conjunctival autograft with limbal stem cells. Visual acuity, refractive astigmatism, and tear film breakup time (TFBUT) were assessed preoperatively and postoperatively on second month follow-up.

Results: The mean age of the patients was 40.9 ± 12.09 years. Out of 105 patients 34 patients (32.38%) had grade III pterygium, 24 patients each (22.85%) were of grade I and grade II, and the remaining 21.9% were of grade IV. There was significant reduction in refractive astigmatism (mean \pm SD), improvement in visual acuity (mean \pm SD), and change in TFBUT in all grades of pterygium postoperatively along with recurrence in 1 patient, ie, 0.95%.

Conclusions: The present study concludes that pterygium excision reduces refractive astigmatism, improves visual acuity, and change in TFBUT with additional benefits of low recurrence rate and cost-effectiveness credited to sutureless and glue-free conjunctival autograft with limbal stem cells.

Poster No.: EX1-023

Panel No.: 023, Session EX1

Albumen Glue, New Material for Conjunctival Graft Surgery: An Animal Experiment

First Author: Raden Angga **KARTIWA**

Purpose: This study was to investigate albumen glue as an alternative to suture technique in attaching conjunctival graft in rabbits.

Methods: This was an experimental animal study that included 32 eyes (16 rabbits) in PT Bio Farma (Persero) and Histology Laboratorium, Faculty of Medicine, Padjadjaran University from March 2014 to July 2014. The study consisted of the albumen glue group and suture



technique group. The examination included the comparison of conjunctival graft attachment and histologic examination was done to obtain the wound gap. The data analysis was done statistically using Mann-Whitney test for small sample.

Results: The statistical analysis results showed that the graft attachment was significantly better using albumen glue (grade 4) compared to suture (grade 2-3) on day 1 after surgery ($P = 0.000$). The wound gap was smaller using albumen glue ($0-0.33 \mu\text{m}$ versus $5.33-14 \mu\text{m}$; $P = 0.0005$) 10 minutes after surgery and 7 days after surgery ($0 \mu\text{m}$ versus $0.33-4 \mu\text{m}$; $P = 0.0005$).

Conclusions: The graft attachment was better and the wound gap was smaller using albumen glue rather than suture technique.

Poster No.: EX1-024

Panel No.: 024, Session EX1

Altered Patterns of Fungal Keratitis in a London Ophthalmic Hospital: An 8-Year Retrospective Observational Study

First Author: Hon Shing ONG

Co-Author(s): Matthew BURTON, John DART, David MACLEOD, Stephen TUFT

Purpose: In previous studies of fungal keratitis (FK) from temperate countries, yeasts were the predominant isolates with ocular surface disease (OSD) being the leading risk factor. Since the 2005-2006 outbreak of contact lens (CL)-associated *Fusarium* keratitis, there may have been a rise in CL-associated filamentary FK in the United Kingdom. This retrospective case series investigated the patterns of FK from 2007 to 2014. We compared these to 1994-2006 data from the same hospital.

Methods: All cases of FK presenting to our institution between 2007 and 2014 were identified. The definition of FK was either a fungal organism isolated by culture or fungal structures identified by light microscopy (LM) of scrape material, histopathology, or in-vivo corneal confocal microscopy (IVCM). Main outcome measure was the cases of FK per year.

Results: A total of 112 patients had confirmed FK. Median age was 47.2 years. Between 2007 and 2014, there was an increase in annual numbers of FK (Poisson regression, $P = 0.0001$). FK was confirmed using various modalities: 79 (70.5%) had positive cultures, 16 (14.3%) by LM, and 61 (54.5%) by IVCM. Seventy-eight (69.6%) were diagnosed with filamentary fungus alone, 28 (25%) with yeast alone, and 6 (5.4%) with mixed filamentary and yeast infections. This represents an increase in the proportion of filamentary fungal infections from the pre-2007 data. Filamentary fungal and yeast infections were associated with CL use and OSD,

respectively.

Conclusions: The number of FK has increased. This increase is due to CL-associated filamentary FK. Clinicians should be aware of these changes, which warrant epidemiological investigations to identify modifiable risk factors.

Poster No.: EX1-025

Panel No.: 025, Session EX1

Characterization of Modified Chitosan Membrane Cross-Linked with Genipin for Cultured Corneal Epithelial Cells

First Author: Ya-Han LI

Purpose: To modify a chitosan membrane (CM) by cross-linking the chitosan with genipin, a naturally occurring cross-linker extracted from *Gardenia jasminoides fructus*, with the aim of developing a new cell culture support, and to observe the phenotypes of cultured human corneal epithelial cells (HCECs) on genipin-cross-linked chitosan membrane (GCM).

Methods: We tested the cross-linking characteristics and mechanical strength of the GCM. CMs modified by cross-linking with different concentrations of genipin were prepared to investigate the rate of membrane degradation. The biocompatibility of the GCMs was investigated by determining the viability of HCECs cultured on them in vitro. The morphology of the HCECs cultured on CM or GCM was analyzed by confocal microscopy and scanning electron microscopy. Immunocytochemical staining was conducted to determine the phenotypes of the cultured cells.

Results: The fixation index of the GCM was $30.84 \pm 2.97\%$ after treatment of CM with 0.5 mM genipin. A stress-strain test showed that the GCM could tolerate 3 times the mechanical force of noncross-linked CM. The biodegradation rate of GCM was much slower than for CM. A MTT assay showed that cell viability was not affected by cross-linking with 5.0 mM genipin. SEM showed that the cultured HCECs adhered to and grew well on the surface of the GCM. Immunocytochemical staining showed keratin3 and connexin43 immunoreactive HCECs on the GCM and their proliferative ability was not significantly affected by strong immunoreactivity of Ki-67 and p63 markers.

Conclusions: GCM has potential as a scaffold for corneal epithelium in ocular surface surgery plus greater mechanical strength and slower degradation than unmodified CM.

Poster No.: EX1-026
Panel No.: 026, Session EX1

Cheap and Effective Method of Pterygium Surgery: Conjunctival Autografting Using Autologous Fibrin in Blood

First Author: Shilpa **SINGH**
Co-Author(s): Sunil **CHAKRAVARTY**, Anurag **NARULA**

Purpose: To compare 2 techniques of conjunctival autografting (CAG): 1) no glue, no suture technique of using autologous fibrin glue versus 2) using sutures.

Methods: Twenty eyes of 20 patients with pterygium were randomly divided into 2 groups: group I (10 eyes) underwent CAG with sutures and group II (10 eyes) underwent CAG with the patient's own blood coagulum acting as a bioadhesive or fixative.

Results: The time required for the surgery was compared. The patients were then closely followed up for a period of 12 months for anatomy, outcomes of graft, recurrence rate, graft displacement, retraction, inflammatory reaction, if any, graft failure, or any other complications. The duration of surgery was less in group I (mean duration, 26.43 ± 2.35 minutes) than group II (mean duration, 17.45 ± 2.89 minutes). We found that although the rate of recurrence was equal in both groups (10%), the complications regarding graft displacement and graft retraction were also similar in both groups (10%). Patient comfort and satisfaction rate was better in the autologous fibrin group and mean duration of postoperative medicines was less in the autologous serum group.

Conclusions: Our study suggests that autologous fibrin in blood is a useful alternative method for graft fixation in pterygium surgery, which is both cheap and gives excellent results.

Poster No.: EX1-027
Panel No.: 027, Session EX1

Combined Penetrating Keratoplasty with Sutureless Glueless Scleral Fixation IOL: A Novel Technique

First Author: Mano **DAS**
Co-Author(s): Naresh **KANNAN**, Naveen **RADHAKRISHNAN**

Purpose: To evaluate the visual outcomes and complications of combined penetrating keratoplasty (PKP) with sutureless glueless scleral fixation intraocular lens (SFIOL).

Methods: Retrospective analysis.

Results: Five patients were included in the study during the time period of 2014-2016. Three of them were diagnosed as aphakic bullous keratopathy, 1 as pseu-

dophakic bullous keratopathy with decentered IOL, and 1 as post traumatic corneal opacity with aphakia. The median best corrected preoperative visual acuity was light perception (LP) (range, LP-1/60). All the patients underwent a sutureless glueless scleral fixation IOL followed by full thickness penetrating keratoplasty in the same sitting. The intraoperative and postoperative periods were uneventful. At 6 months postoperatively, the median uncorrected visual acuity was 5/60 on Snellen chart (range, 1/60-6/60). All patients had a clear graft with well-centered SFIOL and a normal fundus at 6 months.

Conclusions: Simultaneous sutureless glueless SFIOL with PKP can be safely performed in aphakic patients with corneal decompensation. It also provides advantages of early visual and postoperative rehabilitation, thereby reducing the economic burden to the patient.

Poster No.: EX1-028
Panel No.: 028, Session EX1

Comparative Evaluation of Thin Lenticule Descemet Stripping Automated Endothelial Keratoplasty Using Single and Double Pass Techniques

First Author: Namrata **SHARMA**
Co-Author(s): Tushar **AGARWAL**, Neelima **ARON**, Aarifa **HUSSAIN**, Rajesh **SINHA**, Jeewan **TITIYAL**

Purpose: To compare the outcomes of thin lenticule Descemet stripping automated endothelial keratoplasty (DSAEK) using the single and double pass techniques of donor lenticule preparation.

Methods: Twenty cases of pseudophakic bullous keratopathy were randomly allocated into 2 groups. Group 1 was treated with DSAEK lenticules harvested using the single pass technique and group 2 was treated using DSAEK lenticules harvested using the double pass technique. The primary outcome measures were best-corrected visual acuity (BCVA) and graft thickness (GT) 6 months postoperatively.

Results: There was a significant improvement in visual acuity in both groups. The BCVA improved from 1.44 ± 0.53 to 0.43 ± 0.19 ($P = 0.002$) and 1.75 ± 0.53 to 0.64 ± 0.15 ($P = 0.04$) logMAR units in the single pass group and double pass DSAEK group, respectively, at 6 months. There was no significant difference in final visual outcome between the 2 groups ($P = 0.33$). GT in both groups was $98 \pm 24.46 \mu\text{m}$ and $129 \pm 31.46 \mu\text{m}$, respectively, and was comparable ($P = 0.18$). A significant correlation was found between both postoperative BCVA and contrast sensitivity with GT using Spearman rho correlation analysis ($R = -0.728$, $P = 0.016$ for BCVA and $R = -0.735$, $P = 0.015$ for contrast sensitivity). The percentage of endothelial cell loss was comparable between the 2 groups ($P = 0.3$). No major complica-



tions were observed during the study period except for 1 case of donor perforation in the double pass group during refinement cut.

Conclusions: Both the double pass and single pass techniques are equally effective for donor preparation in DSAEK. The thickness of the graft affects the final visual acuity and contrast sensitivity.

Poster No.: EX1-029

Panel No.: 029, Session EX1

Conjunctival Rotation Flap Technique in Primary and Recurrent Pterygium

First Author: Ellen **YU-KEH**

Co-Author(s): Don Vincent **SALUD**

Purpose: To report the complications and recurrence rates following conjunctival rotation flap technique for primary and recurrent pterygium.

Methods: Retrospective study. Charts of patients who underwent pterygium excision with conjunctival rotation flap having at least 4 weeks of follow-up were reviewed. Early complications within the first 4 weeks of surgery were noted. Recurrence was assessed in patients at 8, 12, and 16 weeks follow-up.

Results: Forty eyes (39 patients) underwent pterygium surgery for primary (32 eyes) and recurrent (7 eyes) pterygium using a conjunctival rotation flap by 1 surgeon. Age range was 27-82 years (mean, 59.2). Early complications included suture granuloma (1 eye), Tenon cyst (2 eyes), and flap displacement (2 eyes). There was no recurrence of pterygium at 8-week (18 eyes), 12-week (14 eyes), and 16-week (5 eyes) follow-up.

Conclusions: The conjunctival rotation flap technique has a low complication rate when performed in primary and recurrent pterygium and is effective in preventing recurrence.

Poster No.: EX1-030

Panel No.: 030, Session EX1

Cornea Bee Stings: A Case Series

First Author: Michael **NGU**

Co-Author(s): Adil **HUSSEIN**, T **NORINA**, Tuan Hazri **TUAN MAT**

Purpose: To report a case series of cornea bee stings.

Methods: A case series.

Results: A 60-year-old man (patient 1), a 55-year-old man (patient 2), and a 14-year-old boy (patient 3) all had alleged bee sting with stinger embedded in cornea. All of them presented to the hospital within a few hours of injury. Patient 1 and 2 had poor visual acuity on presentation with generalized corneal edema and identified stinger in stroma. Patient 3 had relatively

good vision with clear cornea except minimal epithelial defect with stinger. Patient 1 had immediate removal of stinger but was delayed in starting topical corticosteroid. However, patient 2 and 3 were early in starting topical corticosteroid but delayed in removal of stinger. Patient 1 and 2 developed severe toxic keratopathy with ulceration. All 3 of them were treated with topical antibiotic and corticosteroid. Corneal ulcers resolved with anterior stroma scarring. Patient 1 and 3 regained good vision but patient 2 developed anterior subcapsular cataract causing poor vision.

Conclusions: Cornea bee stings are rare and response can range from minimal to severe. Toxic component of venom and inflammatory reactions can lead to severe intraocular damage. Early corticosteroid treatment is to suppress anterior segment inflammation caused by bee venom.

Poster No.: EX1-031

Panel No.: 031, Session EX1

Diagnosis of Viral Keratitis: Comparison of In-House Conventional PCR and Commercial Real-Time PCR

First Author: Savitri **SHARMA**

Co-Author(s): Bagga **BHUPESH**, Sai Jeevana Madhuri **GUDA**, Joveeta **JOSEPH**, Ranjit **KONDURI**, Bhavani **SON-TAM**

Purpose: To compare the efficiency of real-time PCR and conventional PCR in the diagnosis of herpes simplex virus keratitis.

Methods: In this study, 47 corneal scrapings of 45 patients with suspected HSV keratitis were included. DNA was extracted (Qiagen mini kit) and analyzed for the presence of HSV-1 (glycoprotein D gene) by conventional PCR and for the presence of HSV-1 by real-time PCR (R-gene kit, bioMérieux). The kit included detection of HSV-2 and VZV in addition to HSV-1.

Results: Twenty out of 47 [42.55%, 95% confidence interval (CI) 0.27-0.56] samples were positive for HSV-1 DNA by conventional PCR. In comparison, 33/47 (70.21%, 95% CI 0.56-0.83, $P = 0.0062$) were positive for HSV-1 DNA (copy numbers $1.17-1.5 \times 10^7/\text{mL}$) by real-time PCR. In addition, 1 sample (2.12%) was positive for VZV DNA ($4.4 \times 10^6/\text{mL}$) while 1 showed a double infection with both HSV-1 ($1.5 \times 10^7/\text{mL}$) and 2 ($3.57 \times 10^4/\text{mL}$) by real-time PCR assay.

Conclusions: Efficacy of real-time PCR was significantly higher in the diagnosis of HSV-1 keratitis compared to conventional PCR. The kit used in this study was useful to distinguish among HSV-1, 2, and VZV infections, although in this small sample size the study showed a low prevalence of HSV-2 and VZV in viral keratitis. Quantitation of viral copy numbers may help in deter-

mining response to therapy.

Poster No.: EX1-032

Panel No.: 032, Session EX1

Diversity and Distribution of Human Ocular Microbial Communities in Diabetic Patients

First Author: Kuidong **KANG**

Co-Author(s): Suah **KIM**, Su Ah **KIM**

Purpose: The purpose of this study was to identify the differences in the major (core vs variable) microbial genus of human subjects with and without diabetes.

Methods: Bacterial 16S rRNA genes obtained from conjunctival swab from 19 healthy subjects and 30 diabetic patients were sequenced using the Illumina MiSeq platform and sequencing data were analyzed using QIIME 1.8.0. To elucidate microbial diversity in HOS, test programs from various domains of bioinformatics were used.

Results: Diversity index and rarefaction analysis showed that the microbial community of the diabetic patients was more diverse compared to that of the healthy subjects. Proteobacteria, Firmicutes, Actinobacteria, Cyanobacteria, and Bacteroidetes were the dominant taxa present in the HOS and there was a significant difference among relative abundance of bacterial phylum between the diabetic patients and the control. Proteobacteria was more abundant in the diabetic group, whereas Firmicutes was more abundant in the control group. Hierarchical cluster analysis showed that microbial libraries from samples of diabetic patients formed a single separate group, while that of the controls were separated into 2 different clusters.

Conclusions: There was a significant difference of the microbial community composition among diabetic patients and healthy subjects. High abundance of Acinetobacter in the HOS of diabetic patients may arise from unique characteristics of the ocular surface compared to other organ surfaces. Further studies are needed to determine the role of this microorganism in HOS, especially in diabetic patients.

Poster No.: EX1-033

Panel No.: 033, Session EX1

Effectiveness of Triple Tear Film Therapy in Patients with Evaporative Dry Eye Disease

First Author: Kyung Chul **YOON**

Co-Author(s): Won **CHOI**, Yung Hui **KIM**, Hyoseok **LEE**

Purpose: To evaluate the effectiveness of triple tear film therapy [combination of hyaluronic acid 0.1% (HA), diquafosol tetrasodium 3% (DQS), and carbomer-based lipid-containing artificial tear (Liposic EDO, LPO)] in patients with refractory evaporative dry eye disease (EDE).

Methods: One hundred forty-four eyes of 144 patients with EDE refractory to artificial tears were treated with combined HA and DQS (group 1), HA and LPO (group 2), or HA, DQS, and LPO (group 3). Ocular surface disease index (OSDI), tear film breakup time (TBUT), Schirmer score, and corneal and conjunctival staining were evaluated, and noninvasive tear film breakup time (NIBUT) and tear meniscus height (TMH) were also measured by Keratograph 5M before (baseline), 1, and 3 months after treatment.

Results: OSDI, TBUT, and NIBUT improved at 1 and 3 months after treatment in all 3 groups ($P < 0.05$). There were no significant changes in Schirmer, corneal, and conjunctival staining scores and TMH in the groups. At each follow-up visit, OSDI was significantly lower (48.3/45.7/38.8 at 1 month; 44.2/40.5/24.7 at 3 months) and TBUT (4.2/4.7/5.1 sec at 1 month; 4.9/5.4/6.2 sec at 3 months) and NIBUT (3.9/4.4/5.0 sec at 1 month; 4.5/5.1/5.9 sec at 3 months) were significantly higher in group 3 compared to groups 1 and 2.

Conclusions: Although mucin or lipid targeting agents combined with aqueous tears in patients with refractory EDE could improve TBUT and subjective symptoms, triple tear film therapy was most effective in improving tear film quality and symptoms by targeting and supplementation of whole tear film layers.

Poster No.: EX1-034

Panel No.: 034, Session EX1

Effectiveness of the Semiscleral and Hybrid Contact Lenses in Keratoconus

First Author: Tamás **TÖNKÖL**

Purpose: We compared the best corrected visual acuity (BCVA) and the comfort of middle-stage keratoconic patients fitted with the same diameter hybrid and semiscleral contact lens.

Methods: We investigated the results of 64 contact lens fittings retrospectively. Sixteen and 16 patients (32 and 32 fittings) were selected into the hybrid group and the semiscleral group, respectively. All the patients had keratoconus with 45.00–55.00 diopter (D) K-readings in both meridians. We used 13.6 and 14.0 mm diameter hybrid lenses and 14.0 mm diameter semiscleral full rigid contact lens. We checked the uncorrected visual acuity (UCVA), BCVA, topography, slit lamp status, and comfort by questionnaire.

Results: The following results were collected. BCVA was 0.82 ± 0.25 in the hybrid group and 0.84 ± 0.31 in the semiscleral group. The lenses could be worn up to 13.8 ± 2.27 hours (hybrid group) and 11.1 ± 3.98 hours (semiscleral group). The feelings of discomfort grew after 9.68 ± 3.55 and 10.9 ± 2.24 hours and the grade was 4.87 ± 2.80 and 3.31 ± 3.00 (hybrid and semiscleral groups, respectively) before taking out the contact



lenses.

Conclusions: The average BCVA of the hybrid and semiscleral groups did not differ significantly. Both were much better than the BCVA with glasses. The hybrid contact lenses could be worn significantly longer than the semiscleral lenses but with notable discomfort, and this feeling was significantly more severe before taking out the hybrid contact lenses than the semisclerals.

Poster No.: EX1-035

Panel No.: 035, Session EX1

Efficacy of a Fixed Combination of 0.09% Xanthan Gum + Preservative-Free 0.1% Chondroitin Sulfate vs Polyethylene Glycol + Propylene Glycol in Subjects with Dry Eye Disease: A Multicenter Randomized Controlled Trial

First Author: Leopoldo **BAIZA-DURAN**

Purpose: To evaluate the clinical efficacy of a fixed combination of xanthan gum and preservative-free chondroitin sulfate in patients with dry eye disease.

Methods: A phase III, double-blind, masked, controlled, multicenter clinical trial of 148 subjects, randomized to either a fixed combination of xanthan gum 0.09% + chondroitin sulfate 0.1% (XG/CS) ophthalmic solution (n = 76) or a fixed combination of polyethylene glycol 400 0.4% + propylene glycol 0.3% (PEG/PG) (n = 72). The outcome measures included Schirmer test, tear film break-up time (TBUT), and Ocular Surface Disease Index (OSDI) score.

Results: Schirmer test increased in both groups compared to baseline: XG/CS (6.4 ± 2.2 vs 11.0 ± 6.6 ; $P = 0.002$) and PEG/PG (6.5 ± 2.5 vs 10.5 ± 5.6 ; $P = 0.019$). Tear film break-up time increased in both groups: XG/CS (5.5 ± 2.1 vs 7.4 ± 2.9 ; $P = 0.027$) and PEG/PG (5.2 ± 2.0 vs 7.4 ± 2.7 ; $P = 0.046$). The OSDI score decreased to normal values in both groups: XG/CS (19.3 ± 7.4 vs 7.3 ± 5.9 ; $P = 0.001$) and PEG/PG (19.3 ± 7.5 vs 7.9 ± 8.2 ; $P = 0.001$), respectively. Both groups saw decreases in the presence of burning sensation, foreign body sensation, conjunctival hyperemia, and photophobia. The adverse events were not related to the interventions.

Conclusions: Xanthan gum + chondroitin sulfate showed similar clinical efficacy, evaluated with OSDI score, TBUT, and Schirmer test compared to polyethylene glycol/propylene glycol. Xanthan gum + preservative-free chondroitin sulfate is a new option to treat patients with dry eye disease.

Poster No.: EX1-036

Panel No.: 036, Session EX1

Evaluation of Antimicrobial Activities of Amphiphilic Xanthenes Against Gram-Negative Bacteria

First Author: Jun Jie **KOH**

Purpose: Antibiotic resistance is widely associated with failure of clinical treatment, additional mortality, and healthcare costs. In fact, the dread is centered on the immense challenge presented by Gram-negative bacterial resistant antibiotics in the clinic. Here we report the evaluation of amphiphilic xanthenes as a potential scaffold as a treatment for infections caused by Gram-negative bacteria.

Methods: Antimicrobial activities of selected amphiphilic xanthenes were studied. Effects of potential roles of LPS and inner membrane of Gram-negative bacteria on antimicrobial activities of the amphiphilic xanthenes were investigated using synergistic and biophysical approaches. A mouse model of corneal infection was used to evaluate in vivo efficacy of the amphiphilic xanthone derivatives.

Results: The results show that AM-052 and AM-218 were effective against Gram-negative bacteria. Biophysical study revealed that LPS is the main barrier. Encouragingly, efficacy study showed that AM-052 was able to reduce bacterial load after 4 days of treatment in the mouse model of corneal infection.

Conclusions: Overall, this study provides a powerful scaffold with therapeutic potentials for further improvement of the xanthone-based antimicrobials against Gram-negative bacteria.

Poster No.: EX1-037

Panel No.: 037, Session EX1

Evaluation of Rigid Gas Permeable Contact Lens in High Post-Keratoplasty Astigmatism

First Author: Rohit **AGARWAL**

Co-Author(s): Namrata **SHARMA**, Rajesh **SINHA**, Jeevan **TITIYAL**

Purpose: To evaluate fitting parameters and outcomes following rigid gas permeable (RGP) contact lens fitting in cases of high post-keratoplasty astigmatism.

Methods: Forty eyes with post-keratoplasty clear grafts and high astigmatism (≥ 3 diopters) were fitted with 3 types of RGP contact lenses, namely, conventional bicurve, Rose K2 Post Graft (PG), and Rose K2 Irregular Cornea (IC) designs. Each type of RGP lens was fitted 1 after the other in the same sitting and the lens with best comfort and fitting was prescribed and followed up at 1 month and 3 months. A patient comfort questionnaire was assessed on follow-up.

Results: The visual acuity was significantly improved with all the contact lenses. Most patients were fitted with IC (57%, n = 23) followed by PG (28%, n = 11) and biconic (15%, n = 6) lens. IC was accepted more due to better gain in visual acuity, superior fitting, and comfort. It needed lesser number of trial lenses and total chair time. The average duration of daily contact lens wear was 8.75 ± 0.9 hours and no major complications were observed on follow-up. There was significant improvement in visual acuity on regular contact lens wear with flattening of steep axis and reduction in baseline astigmatism of corneal grafts noted at each follow-up.

Conclusions: Rose K2 Irregular Cornea may be the recommended contact lens design for visual rehabilitation of patients with high post-keratoplasty astigmatism.

Poster No.: EX1-038

Panel No.: 038, Session EX1

Eye Donation Activities and Analysis at a Tertiary Care Hospital

First Author: Swaranjali **GORE**

Co-Author(s): Nayana **POTDAR**, Chhaya Ashok **SHINDE**, Shruti **SHIRWADKAR**

Purpose: Corneal blindness is one of the leading causes of reversible blindness both in adults and children. Prevalence of total blindness is 1.1% of which corneal blindness constitutes 0.9%. Corneal blindness can be managed by performing keratoplasty. Enucleation is a procedure to retrieve corneas/eyeballs from cadavers. The enucleated eyeballs are used for corneal transplantation, scleral patch grafts, academic, or research purposes. Tertiary care hospitals play a vital role in harvesting and utilization of eyeballs.

Methods: This was an observational, descriptive, single center study carried out at tertiary care center from June 2015 to May 2016. We noted the general outlook of patients towards eye donation and collected data on the number of enucleations done, donor details, systemic illness, cause of death, and details of recipients, utilization of eyeballs, and so on.

Results: The total eyeballs collected were 54, out of which 30 were utilized for keratoplasty and the remaining were used for academic purposes.

Conclusions: It is observed that there are some misconceptions and lack of motivation for eye donation. Hence, more awareness regarding eye donation needs to be created so that statistics will also improve.

Poster No.: EX1-039

Panel No.: 039, Session EX1

Factors Predicting Change in Corneal Astigmatism Following Suture Removal in Post-Keratoplasty Patients

First Author: Noppawan **URAMPORN**

Co-Author(s): Ngamjit **KASETSUWAN**, Vannarut **SATIT-PITAKUL**

Purpose: The purpose of this study is to identify the factors that can predict corneal astigmatic change following suture removal in post-keratoplasty patients.

Methods: This prospective observational study included the data from 36 events of corneal suture removal from 28 eyes, which had undergone corneal transplantation at least 6 months prior. Sutures were selectively removed from the steep axis of transplanted cornea. Corneal astigmatism was measured before and after suture removal. Three corneal biomechanics parameters obtained from the Corvis ST (Oculus, Wetzlar, Germany), the number of removed sutures, and time of suture removal after surgery were recorded. The correlation between corneal astigmatic change after suture removal and the potential factors were evaluated using Spearman correlation coefficient and linear regression model.

Results: Mean astigmatic change after suture removal was 7.65 ± 6.42 diopters (D) (range, 0.29-9.06 D) by vector analysis at 10 ± 8 weeks after suture removal. Change in corneal astigmatism was significantly correlated with pre-suture removal astigmatism ($R_s = 0.50$, $P = 0.002$). There was no correlation between the duration from corneal transplantation to suture removal and the number of removed sutures with the change in corneal astigmatism ($P > 0.05$). All 3 corneal biomechanics parameters were not correlated with astigmatic change ($P > 0.05$). Linear regression was given by the following equation: astigmatic change = $1.1 \times$ pre-suture removal astigmatism - 0.23 D.

Conclusions: The astigmatic change after corneal suture removal in post-keratoplasty patients was significantly correlated with pre-suture removal astigmatism. These findings will permit a validated approach for reducing corneal astigmatism in post-keratoplasty patients.



Poster No.: EX1-040

Panel No.: 040, Session EX1

Genetic Analysis and Surgical Outcomes for Chinese Children with Congenital Hereditary Endothelial Dystrophy

First Author: Yuxin **GUO**

Co-Author(s): Jing **HONG**

Purpose: To identify the etiological mutations in 6 Chinese children with congenital hereditary endothelial dystrophy (CHED) and review the surgical outcomes of Descemet stripping automated endothelial keratoplasty (DSAEK).

Methods: Six families with CHED were recruited. Genomic DNA were collected to screen for mutations in the solute carrier family 4, member 11 (SLC4A11) gene by touchdown polymerase chain reaction (TD-PCR) and subsequent sequencing analysis. All patients received DSAEK with suture pull-through techniques. Their visual acuity, intraocular pressure, lenticule status, corneal clarity, and complications were recorded at each follow-up.

Results: Ten different mutations in the SLC4A11 gene were identified, 6 of which were not previously reported. The mutations identified consisted of 3 missense, 2 nonsense, 3 frameshift, and 2 splice site mutations. All surgical procedures were uneventful, but lenticule detachment occurred in 3 eyes within the first postoperative day. The average follow-up time was 27.1 months (range, 7-60 months). The best corrected visual acuity (BCVA) at last follow-up was 0.34 ± 0.14 (range, 0.12-0.5), and earlier surgical time tended to result in better visual outcomes.

Conclusions: This study increases the spectrum of SLC4A11 mutations. Based on our findings, we would recommend performing DSAEK as early as possible for CHED patients.

Poster No.: EX1-041

Panel No.: 041, Session EX1

Graft Suturing for Ultrathin Descemet Stripping Endothelial Keratoplasty with Hypertensive Uveitis and Multiple Procedures: A Case Report

First Author: Philip **STANLEY**

Purpose: A 62-year-old Chinese male had multiple recurrences of left eye idiopathic cytomegalovirus-negative nongranulomatous hypertensive anterior uveitis. This was complicated by iris bombe, occlusio pupillae, and corneal edema treated with multiple sessions of Pred Forte and argon/YAG peripheral iridotomy. He required phacoemulsification and synechiolysis and intraocular lens implantation for a visually significant

cataract and eventually an Ahmed glaucoma valve with sulcus tube placement for intraocular pressure control. Ten months later vision had dropped from 6/15 to hand motions secondary to pseudophakic bullous keratopathy with a dilated frozen iris, widespread peripheral anterior synechiae, and iris pigment on the endothelium.

Methods: In February 2016 he underwent Descemet stripping endothelial keratoplasty (DSAEK) using ultrathin tissue inserted with a Tan endoglide. The lenticule was secured with 3 10.0 nylon anchoring sutures in a tangential fashion.

Results: Postoperatively, the graft was attached centrally but scrolled temporally in the area of synechiae and was rebubbled. The anchoring sutures were removed 1 month later. Vision improved to 6/12 and the peripheral graft edema eventually resolved over the next 3 months with no recurrence of uveitis or increased intraocular pressure.

Conclusions: Shallow anterior chambers, as typically seen in eyes of Asians, eyes with narrow angles, peripheral anterior synechiae (PAS), and eyes with previous trauma or glaucoma surgery, pose a challenge for the DSAEK surgeon. This case demonstrates the intraoperative and postoperative challenges and the use of graft transfixation sutures to decrease the risk of graft dislocation.

Poster No.: EX1-042

Panel No.: 042, Session EX1

Idiopathic Bilateral Lipid Keratopathy

First Author: Ming-Hwei **TSAI**

Purpose: To report a case of idiopathic bilateral lipid keratopathy.

Methods: A case report.

Results: A 37-year-old male presented with severe visual disturbances and bilaterally symmetrical lipid infiltrates of the cornea and adjacent limbus. No evidence of previous ocular disease or systemic disorder of lipid metabolism could be detected. Penetrating keratoplasty of both eyes was performed. The corneas were rigid and thick, with posterior bulging into the anterior chamber. Light microscopy revealed deep corneal lipid granules, foamy histiocytes, vascularization, and chronic non-granulomatous inflammation. Transmission electron microscopy showed extracellular lipid spaces and numerous intracytoplasmic lipid vacuoles in histiocytes, keratocytes, conjunctival epithelium, and the endothelium of blood vessels in the corneal stroma and adjacent limbal conjunctiva. Histochemical analysis revealed the presence of neutral fats, free fatty acids, cholesterol, and phospholipids.

Conclusions: We report a case of idiopathic bilater-

al lipid keratopathy without any predisposing factor. Anti-cholesterol treatment and laser photocoagulation can be considered as alternative therapy although most patients need surgery to eradicate the symptoms.

Poster No.: EX1-043

Panel No.: 043, Session EX1

Indication and Outcomes of Triple Procedures in Cases of Corneal Transplantation in a Teaching Hospital

First Author: Pooja **KHAMAR**

Purpose: Penetrating keratoplasty is a corneal transplantation procedure comprising replacement of the full thickness host corneal tissue with full thickness donor corneal tissue. If such surgery is combined with cataract extraction with intraocular lens (IOL) implantation, it is called a triple procedure. The purpose of the study is to find out indications, recovery in visual acuity, and different outcomes in cases of triple procedures.

Methods: This was a prospective analytical study (September 2012 to September 2014). Routine pre-operative and post-operative care were taken in all cases. IOL power was calculated of the same eye if possible. Donor corneal button was kept 0.5 mm bigger than the host button in each case. Minimum follow-up was 6 months post-operatively. $P < 0.05$ was considered as statistically significant.

Results: Forty-one eyes of 41 patients were included. Out of these 20 were male and 21 were female. Mean age was 51 years. Most common indication was corneal ulcer due to injury with vegetative material (21.4%) followed by post traumatic corneal ulcer (14.3%). There was significant association between final visual acuity and pre-operative etiology but non-significant association between etiology and final graft outcome. A total of 28% of patients developed final best corrected visual acuity $>6/36$ and 16% developed perception of light. The most common complication was increased intraocular pressure (30%). Re-infection and endophthalmitis were seen in 2.4% of cases each. None of the patients had graft rejection.

Conclusions: Though triple procedure is a challenging surgical technique, it is helpful in gaining ambulatory vision with minimal complications.

Poster No.: EX1-044

Panel No.: 044, Session EX1

Keratitis with Descemetocoele Complication After Exposure to Soy Seed in 36-Year-Old Woman

First Author: Daniar **SURYOWATI**

Co-Author(s): Ismi **ZUHRIA**

Purpose: To demonstrate a case and proper management of keratitis with descemetocoele to prevent corneal perforation.

Methods: A case report. A 36-year-old woman presented with tearing, itching, and pain in her left eye after being exposed to soy seed since hospital admission 3 months prior. Visual acuity of her right eye was 6/6.6 (on Snellen chart) and her left eye was 1/300. The results of anterior segment examination as seen on slit lamp microscope were conjunctival hyperemia, descemetocoele, hypopyon, and positive fluorescein test. Ocular ultrasonography examination revealed that there were particle-shaped echogenic lesions. Previously the patient had been treated with natamycin and switched to itraconazole. Culture and sensitivity test were also performed on this patient to rule out any bacterial or fungal infection.

Results: After 8 days of evaluation during hospital admission, the results of culture and sensitivity test indicated the absence of bacteria or fungi. The hypopyon was slowly decreasing and the appearance of the cornea was even clearer, but the descemetocoele still need to be treated with cryotherapy or conjunctival flap.

Conclusions: Clinical presentation of bacterial or fungal keratitis needs to be known to all ophthalmologists. Early treatment using proper antifungal topical medication is important to prevent descemetocoele and corneal perforation in this case. Negative culture allegedly resulted from previous long-term antifungal treatment and the use of cotton swab instead of platinum spatula during culture test.

Poster No.: EX1-045

Panel No.: 045, Session EX1

Management and Outcomes of Intraoperative Microperforations During Deep Anterior Lamellar Keratoplasty

First Author: Olivia **HUANG**

Purpose: To report the management and outcomes of intraoperative microperforations during deep anterior lamellar keratoplasty (DALK).

Methods: A retrospective audit of all DALK cases performed from 2004 to 2015 in a tertiary center that had microperforations intraoperatively. We excluded cases with pre-existing corneal perforations before surgery.



Results: There were 90 cases with intraoperative microperforations, of which 39 cases (43.3%) were performed using the Anwar big bubble technique. The most common steps at which microperforation occurred intraoperatively were during deep lamellar dissection (27 cases; 30%), air injection (21 cases; 23.3%), and suturing (18 cases; 20%). Management of the microperforations included a combination of intracameral air bubble injection (42 cases; 46.7%), stromal patching (10 cases; 11.1%), fibrin glue (8 cases; 8.9%), placing of viscoelastic over the defect (1 case; 1.1%), and suturing of the defect (1 case; 1.1%). In cases where the initial technique was the Anwar big bubble technique, conversion to manual dissection was required in 31 cases (34.4%). There were 2 cases that were converted to penetrating keratoplasty (PK) (2.2%). Postoperative DM detachments occurred in 38 cases (42.2%), and the majority (28 cases; 73.7%) occurred on the first postoperative day. Among cases with DM detachments, 21 (55.3%) required repeat air injection and 1 (2.6%) required conversion to PK. The remainder resolved spontaneously.

Conclusions: DALK cases with microperforations intraoperatively are often managed without conversion to PK. A significant proportion of cases develop DM detachments postoperatively (42.2%), and half required repeat air bubbling.

Poster No.: EX1-046

Panel No.: 046, Session EX1

Microsporidial Stromal Keratitis: A Rare Cause of Long-Standing Corneal Infiltrate

First Author: Pragnya **DONTHINENI**

Co-Author(s): Sashwanthi **MOHAN**, Somasheila **MURTHY**

Purpose: To present the clinical features and management of microsporidial stromal keratitis, a rare cause of indolent stromal infiltrate.

Methods: Presenting a retrospective case report of 2 patients presenting with deep stromal corneal infiltrates. Both the patients presented with history of long-standing, unresolving corneal stromal infiltrates following trauma. The infiltrates were culture negative and underwent corneal biopsy as the lesions were deep seated. Microbiological and histopathological evaluation of the corneal biopsy specimen was done.

Results: Microbiology and histopathology of the corneal biopsy of both the patients revealed oval microsporidial spores. Both the cases failed to respond to medical management and underwent therapeutic penetrating keratoplasty. They showed satisfactory results following surgical intervention.

Conclusions: Microsporidial stromal keratitis clinically mimics HSV stromal keratitis and is often underdi-

agnosed. It should be suspected in culture negative stromal keratitis and corneal biopsy is essential for establishing the diagnosis. In the absence of response to effective medical therapy, penetrating keratoplasty gives satisfactory clinical outcomes.

Poster No.: EX1-047

Panel No.: 047, Session EX1

Morphology and Function of Meibomian Glands and Tear Parameters in Junior High School Students

First Author: Takanori **MIZOGUCHI**

Purpose: Aging is a risk factor of Meibomian gland dysfunction, but its development in young people due to the spread of smartphones and personal computers has recently been considered problematic. We measured tear parameters including the morphology and function of the Meibomian glands on school physical examination in junior high school students.

Methods: The subjects were 111 junior high school students (55 females and 56 males) who participated in ophthalmological examinations after obtaining approval from their parents. The test items were subjective symptoms (0-14), study hours (including use of a personal computer: WT), lipid layer thickness (LipView), abnormality of the eyelid margin (0-4), corneal and conjunctival epithelial disorder (SPK score) (0-9), tear breakup time (BUT), area with Meibomian gland loss (meibo-score) (0-6), meibum score (0-3), and Schirmer test. Overall correlation analysis was performed employing Pearson correlation coefficient.

Results: WT was 3.5 ± 1.3 hours; subjective symptoms, 3.7 ± 2.3 ; lipid layer thickness, 68.75 ± 23.06 nm; eyelid score, 0.10 ± 0.33 ; SPK score, 1.08 ± 1.41 ; BUT, 8.6 ± 7.2 seconds; meibo-score, 2.8 ± 1.2 ; meibum grade, 1.8 ± 1.2 ; and Schirmer, 20.2 ± 11.5 mm. The study hours were significantly correlated with subjective symptoms ($R = 0.3284$; $P = 0.0004$). The meibo-score was significantly correlated with the meibum score ($R = 0.2984$; $P = 0.0015$) and lipid layer thickness ($R = -0.2702$; $P = 0.0004$). BUT was significantly correlated with the meibum score ($R = -0.3318$; $P = 0.0004$) and lipid layer thickness ($R = 0.3274$; $P = 0.0005$).

Conclusions: It was clarified that the morphology and function of the Meibomian glands are altered even at 15 years old. The morphological abnormality of the Meibomian glands was more frequently noted in males than in females.

Poster No.: EX1-048
Panel No.: 048, Session EX1

Outcomes of Intravitreal Ganciclovir Treatment for Endotheliitis After Keratoplasty

First Author: Jing **HONG**
Co-Author(s): Yuxin **GUO**

Purpose: To report the clinical features of endotheliitis after keratoplasty and treatment outcomes with intravitreal ganciclovir.

Methods: Eleven eyes of 10 patients with endotheliitis after keratoplasty were reviewed. The aqueous tap for herpes simplex virus (HSV), varicella-zoster virus (VZV), cytomegalovirus (CMV), and Epstein-Barr virus (EBV) polymerase chain reaction (PCR) analyses were performed. Patients were treated with 2-3 intravitreal injections of 1.0-2.0 mg (0.1 mL) ganciclovir according to inflammatory activities and PCR results. Outcomes measures were best corrected visual acuity (BCVA), slit-lamp examination, anterior chamber optical coherence tomography, confocal microscopy, and PCR analyses.

Results: Median age at diagnosis was 65 years. Median duration of follow-up was 13 months. Endotheliitis occurred 5 days to 3 years after last keratoplasty. Clinical features included visual loss, corneal/graft edema, keratoprecipitates (KPs), increased intraocular pressure, and peripheral anterior synechia (PAS). Endothelial alterations such as significant decrease in density, enlarged intercellular gaps, infiltration of inflammatory cells, and owl's eye cells were observed. PCR analyses showed presence of CMV (45.5%), EBV (18.2%), VZV (9.1%), and HSV (9.1%) in the aqueous taps and 2 cases with combined infection. After intravitreal ganciclovir along with ganciclovir gel treatment, inflammatory activities were resolved in all eyes (100%), and PCR analyses of aqueous taps were negative (100%). During follow-up, 5 eyes (45.5%) showed recurrence within 1 year, among which 2 eyes (18.2%) progressed to corneal endothelial dysfunction and required an endothelial keratoplasty.

Conclusions: Intravitreal ganciclovir was effective for endotheliitis after keratoplasty. However, long-term monitoring for recurrence was needed after treatment.

Poster No.: EX1-049
Panel No.: 049, Session EX1

Outcomes of Repeat Deep Anterior Lamellar Keratoplasty for Optical, Therapeutic, and Tectonic Indications

First Author: Jyh Haur **WOO**
Co-Author(s): Hla Myint **HTOON**, Jodhbir **MEHTA**, Donald **TAN**, Yar Li **TAN**

Purpose: To study the outcomes of repeat deep an-

terior lamellar keratoplasty (DALK) following previous DALK for optical, therapeutic, and tectonic indications.

Methods: A retrospective series of 24 patients (24 eyes) who underwent repeat DALK between 1998 and 2014 at the Singapore National Eye Centre. The main outcome measures were survival probabilities in all 3 subgroups (optical, tectonic, and therapeutic) and visual acuity outcomes in the optical group.

Results: Indications for surgeries were optical (75.0%), tectonic (16.7%), and therapeutic (8.3%). Eyes with DALK done for optical indications had better physiologic survival probabilities compared with eyes that underwent DALK for tectonic and therapeutic indications (2-year Kaplan-Meier survival probability of optical 63.7% vs tectonic 25% vs therapeutic 0%, $P = 0.019$). In the optical group, 54.5% ($n = 6$) achieved a best-corrected logMAR visual acuity (VA) of 0.30 or better at last follow-up.

Conclusions: Repeat lamellar keratoplasty over a failed lamellar graft may be considered as a viable option as compared with a repeat penetrating keratoplasty for a variety of optical, tectonic, and therapeutic indications. Eyes with LK done for optical indications had the best prognosis.

Poster No.: EX1-050
Panel No.: 050, Session EX1

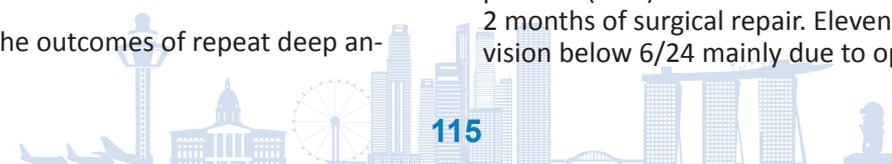
Pattern and Visual Outcome After Surgical Intervention for Corneal Penetrating Injuries in Garhwal Region

First Author: Achyut **PANDEY**

Purpose: To evaluate the pattern and final visual outcome of patients with penetrating corneal injury after surgical intervention in Garhwal region.

Methods: Thirty eyes of 30 patients were included over a period of 12 months in this retrospective study in a tertiary eye care center. Details such as mode of injury, time interval between the injury and the time of clinical presentation, uncorrected visual acuity, slit lamp biomicroscopy revealing the extent of corneal injury, associated cataract, hyphema and uveal prolapse, details of B scan examination, and X-ray of the orbit were collected.

Results: Fourteen (70%) were male, and 6 (30%) were female. Two peak incidences were noted, one below 15 years (45%) and another between 31-45 years (40%). Corneal injury was more common in right eyes (55%). Corneal tear repair alone was done in 14 cases, repair with cataract extraction and IOL implantation in 6 cases, and repair with iris excision in 10 cases. Nine patients (45%) achieved vision of more than 6/24 after 2 months of surgical repair. Eleven patients (55%) had vision below 6/24 mainly due to opacity in the pupil-



lary area.

Conclusions: Penetrating corneal injury was more common in males. Children below 15 years and middle-aged adults between 30-45 years were more prone to ocular injury. The commonest traumatizing agent was found to be a stick. The common findings were hyphema, iris prolapse, and traumatic cataract. Corneal penetrating injury involving the cornea gave good visual prognosis unless it involved the visual axis. The main limiting factors for final visual outcome were corneal scar involving the visual axis and traumatic cataract.

Poster No.: EX1-051

Panel No.: 051, Session EX1

Persistence of Efficacy of 0.1% Ciclosporin A Cationic Emulsion in Subjects with Severe Keratitis Due to Dry Eye Disease

First Author: Andrea **LEONARDI**

Co-Author(s): Mourad **AMRANE**, Gerhard **GARHÖFER**, Marc **LABETOUILLE**, Maite **SAINZ DE LA MAZA**

Purpose: The SANSIKA study showed that once-daily 0.1% ciclosporin A cationic emulsion (CsA CE; Ikervis) improves corneal fluorescein staining (CFS) in subjects with severe keratitis due to dry eye disease (DED). This 2-year, phase III, open-label, nonrandomized post-SANSIKA study assessed the sustained efficacy of treatment with CsA CE after discontinuation in subjects with DED whose CFS improved from severe to moderate/mild during the SANSIKA study.

Methods: To evaluate the duration of efficacy, we followed time to relapse (CFS ≥ 4) over 24 months in 67 subjects who had CFS improvement from 4 to ≤ 2 after 6 or 12 months of treatment with CsA CE in the SANSIKA study.

Results: Of 62 evaluable subjects, only 24 (39%) relapsed during the 24-month follow-up; 35% of subjects previously treated with CsA CE for 12 months relapsed compared with 47% of subjects treated for 6 months. Overall, subjects had a longer duration of lower versus higher CFS scores: CFS = 1 (6.6 weeks/year), CFS = 2 (12.7 weeks/year), and CFS = 3 (2.4 weeks/year). Time to relapse (7.4 vs 5.8 months) and time with CFS = 1 (8.5 vs 2.0 weeks/year) was longer in subjects treated with CsA CE for 12 months versus 6 months. Treatment with CsA CE was not associated with unexpected or late-emerging side-effects.

Conclusions: Treatment with once-daily CsA CE for 12 months was associated with lower relapse rates after discontinuation, longer time to relapse, and better CFS compared with 6-month treatment. Longer treatment period with this improved bioavailable CsA CE may provide sustained improvements in corneal damage and inflammation in severe DED.

Poster No.: EX1-052

Panel No.: 052, Session EX1

Pilot Study on a Novel Optical Coherence Tomography Angiography Technique for Corneal Vascularization in an Animal Model

First Author: Tisha **STANZEL**

Co-Author(s): Marcus **ANG**, Suchandrima **DAS**, Jodhbir **MEHTA**, Sacha **NASO**

Purpose: To describe an optical coherence tomography angiography (OCTA) system adapted for anterior segment imaging compared with indocyanine green angiography (ICGA) in a rabbit corneal neovascularization (CoNV) model.

Methods: Two established rabbit CoNV models were used in this study to validate our OCTA technique: (1) 5 10-0 non-absorbable sutures were placed at superior cornea for the suture-induced group (n = 2); (2) NaOH-soaked filter paper was placed on central cornea for chemical burn group (n = 2). All were compared to fellow eyes and monitored for corneal vascularization using slit-lamp biomicroscopy (Righton NS-2D, Japan), OCTA (AngioVue, Optovue Inc, Fremont, USA), and ICGA (Spectralis, Heidelberg Engineering, Heidelberg, Germany) at postoperative weeks 1, 2, and 3.

Results: In both models, peripheral corneal vessels were first detected at postoperative week 1 and gradually extended into the central cornea at week 2 and peaked at week 3. Suture model was more consistent in inducing CoNV (100%) than the chemical model (50%). The preferred area of CoNV (superior quadrant) could be achieved in all suture model rabbits, but in none of the chemical model. Both OCTA and ICGA were comparable in detecting and creating distinct vessel architecture in superior part of the cornea. However, the en face function of OCTA showed clearer images of superficial CoNV than ICGA. The vessel segmentation in OCTA was easier and could reduce the iris vessel silhouette which appeared in ICGA.

Conclusions: The rapid, non-contact OCTA adapted for the cornea was comparable with ICGA in documenting corneal vascularization in rabbits. A further quantitative analysis comparing both angiographies would affirm the feasibility of OCTA in the animal model.

Poster No.: EX1-053

Panel No.: 053, Session EX1

Prospective Measurement of Pterygium Surgery Satisfaction

First Author: Elliot **CRANE**

Co-Author(s): David **CHU**, Alexander **CRANE**, Mohamad **DASTJERDI**, Remy **FRIEDMAN**, Luis **LEON**

Purpose: As measurements of patient satisfaction

become increasingly prevalent, we sought to quantify patient satisfaction with pterygium surgery (PS), an elective procedure with several indications, including ocular cosmesis.

Methods: This is a prospective longitudinal study measuring subjects' satisfaction with PS. Forty-five patients undergoing PS at an academic center in New Jersey were enrolled to take pre-operative (pre-op) and post-operative (post-op) surveys. Surveys included measurements of subjects' pre-op, post-op, and expected ocular comfort, ocular cosmesis, visual acuity, quality of life (QOL), and satisfaction. Comparisons were made with paired, 2-tailed *t* tests in Microsoft Excel; $\alpha = 0.05$.

Results: Follow-up was obtained for 36/43 (84%) patients (mean \pm standard deviation [SD] age: 50 ± 14 years) at mean \pm SD 155 ± 142 days after surgery. Eighteen (50%) reported family history of pterygium. The most important aspect of PS was vision (77%), comfort (14%), cosmesis (3%), and undecided (6%). Compared to pre-op levels, post-op comfort rose significantly ($P = 0.000043$), cosmesis rose significantly ($P = 0.00018$), and QOL remained unchanged ($P = 0.20$). Post-operatively, 51%, 43%, and 29% of patients met or exceeded their expected pre-op comfort, cosmesis, and QOL improvements, respectively. Subjects reported high levels of satisfaction with (1= unsatisfied, 9 = satisfied) surgery overall (8.2 ± 1.6), comfort (7.9 ± 2.0), cosmesis (7.9 ± 2.0), and vision (8.1 ± 1.6). All 36/36 (100%) subjects would recommend PS to a friend.

Conclusions: Subjects were overwhelmingly satisfied with their PS. Reported levels of comfort and cosmesis rose after PS, but not to the degree subjects expected pre-operatively; subjects reported high levels of satisfaction with these elements regardless.

Poster No.: EX1-054

Panel No.: 054, Session EX1

Recalcitrant Atopic Keratoconjunctivitis in Children: A Case Report and Literature Review

First Author: Lingyi **LIANG**

Purpose: To report a pediatric case of atopic keratoconjunctivitis (AKC) whose clinical characteristics were not inconsistent with typical adult AKC and that was refractory to traditional topical anti-inflammatory and immunosuppressant therapies.

Methods: The record of the case was reviewed.

Results: An 11-year-old boy presented with ocular redness and itching for 3 months and decreased vision for a week in both eyes. Slit-lamp examination revealed typical signs of vernal keratoconjunctivitis such as pave way stone like papillaries in both upper conjunctiva, su-

pericial punctate keratopathy on the right cornea, and sterile shield-shaped ulcer on the left cornea. Physical examination disclosed eczematous lid changes and generalized body rash particularly on the face, neck, and flexor side of limbs. He was diagnosed with AKC in both eyes and atopic dermatitis (AD). The patient did not respond well to conventional topical anti-histamine, mast cell stabilizer, corticosteroids, taclolimus, or even in combination with amniotic membrane transplantation (AMT). After using systemic immunosuppressants, the symptoms were relieved, skin and ocular surface inflammation subsided, pave way stone like papillae disappeared, and the corneal ulcer healed gradually within 8 weeks.

Conclusions: Pediatric AKC should be differentiated from vernal keratoconjunctivitis because they both have upper pave way stone like papillae, but the former accompanies AD. Pediatric AKC warrants proper and aggressive treatment to prevent sight-threatening corneal complications. Systemic immunosuppressants should be considered when traditional topical anti-inflammatory therapies fail.

Poster No.: EX1-055

Panel No.: 055, Session EX1

Role of Eccentric Penetrating Keratoplasty in Management of Postoperative Endophthalmitis with Tunnel Infection

First Author: Erani **BORAH**

Co-Author(s): Harsha **BHATTACHARJEE**, Kasturi **BHATTACHARJEE**, Jnanankar **MEDHI**, Diva **MISRA**, Ronel **SOIBAM**

Purpose: To demonstrate the role of tunnel deroofting with patch graft in the management of postoperative endophthalmitis with tunnel involvement.

Methods: A 50-year-old male patient presented with complaints of diminution of vision, watering, and floaters in the left eye for 7 days. He had undergone phacoemulsification with intraocular lens (IOL) implantation done elsewhere around 3 weeks previously. Examination revealed hand movements (HM) vision with cells, flares, hypopyon in anterior chamber (AC), tunnel abscess, and corneal edema. Vitreous showed clumps of moderate echogenicity on B scan. Diagnosis was established as acute postoperative endophthalmitis with tunnel infection. Tunnel scraping and intravitreal antibiotics (vancomycin + ceftazidime) plus AC tap were done.

Results: Culture of aspirate was positive for a few gram positive and gram negative bacilli. PCR was positive for Eubacterium and panfungal genome. On postoperative examination, vision was not improved and there were corneal infiltrates, exudates in anterior chamber, pupillary membrane, hypopyon, and intragel moderate



reflective echoes on B scan. Following this, intravitreal and intrastromal injection of voriconazole was given and vitreous aspirate was taken. Direct smear examination of the aspirate was positive for gram positive and gram negative bacilli; PCR for Eubacterium genome was positive. On postoperative examination, posterior lens capsule had lots of exudate with the focus of infection localized at the tunnel area. Ultimately, tunnel deroofting with subsequent patch graft was done and intravitreal injection of antibiotics was repeated. Patient clinically improved gradually with vision gain up to 6/60 after about 3 weeks.

Conclusions: Timely intervention in postoperative endophthalmitis with tunnel involvement can control infection and restore vision.

Poster No.: EX1-056

Panel No.: 056, Session EX1

Safety and Efficacy of 0.1% Cyclosporine A Cationic Emulsion in Subjects with Dry Eye Disease and Sjögren Syndrome

First Author: Serge **DOAN**

Co-Author(s): Dominique **BREMOND-GIGNAC**, Béatrice **COCHENER**, Jean-Sébastien **GARRIGUE**, Pierre-Jean **PISELLA**

Purpose: Dry eye disease (DED) associated with Sjögren syndrome (SS) may be severe and difficult to treat. A French early access program assessed the efficacy and safety of 0.1% cyclosporine cationic emulsion (CsA CE) in subjects with DED and SS.

Methods: French national authorities approved a temporary authorization for use of 0.1% (1 mg/mL) CsA CE (October 2013 to June 2015) on a compassionate use basis. This study evaluated the efficacy and safety of once daily 0.1% CsA CE in improving the signs and symptoms in subjects with DED and SS based on follow-up evaluations received at months 1, 3, 6, and 12 post study initiation.

Results: Of the 1212 enrolled subjects, 49.6% were CsA treatment-naïve, 43.8% were previously on Restasis, and 6.6% were on hospital-compounded CsA formulations. Among the 590 (48.7%) subjects with SS, 40% were CsA-naïve and 57% and 3%, respectively, were switched to CsA CE from Restasis and hospital-compounded CsA. At each of the follow-up periods evaluated, signs and symptoms of keratitis completely resolved, stabilized, or improved in nearly 90% of the subjects with DED and SS. A total of 8.6% of overall subjects achieved CFS grade 0 at month 6. At month 12, none of the enrolled subjects reported worsening of signs and symptoms. The most frequent adverse events were moderate and local and included instillation site pain (21%), eye irritation (16%), and eye pain (13%).

Conclusions: In subjects with DED with severe keratitis and SS, 0.1% CsA CE is beneficial for stabilizing and/or improving corneal damage and symptoms.

Poster No.: EX1-057

Panel No.: 057, Session EX1

Sodium Hyaluronate in the Treatment of Dry Eye Syndrome: A Systematic Review and Meta-Analysis

First Author: Bryan **ANG**

Co-Author(s): Hla Myint **HTOON**, Priscilla **WANG**, James **SNG**, Louis **TONG**

Purpose: To compare the efficacy of sodium hyaluronate (HY) with non-HY based artificial tears in the treatment of dry eye syndrome.

Methods: A systemic review and meta-analysis. A literature search was conducted across PubMed, Cochrane Central Register of Controlled Trials, and Scopus databases from inception up to May 2016. Clinical trials comparing HY against non-HY based preparations were included. Randomized controlled trials (RCTs) examining Schirmer I (SH) and tear breakup time (TBUT) results underwent meta-analyses with calculation of the pooled standardized mean differences (SMDs) with 95% confidence intervals (CIs).

Results: Eighteen studies were included in the systematic review. The most common outcome measures were TBUT, SH, ocular staining, and symptoms. The majority of studies showed superiority of HY over non-HY preparations in improving ocular staining and symptoms. Seven RCTs, including 383 eyes randomized to HY and 596 eyes to non-HY preparations, underwent meta-analysis for SH. Nine RCTs, including 458 eyes randomized to HY and 651 eyes to non-HY preparations, underwent meta-analysis for TBUT. By fixed-effects modelling, HY demonstrated greater improvement of SH compared to non-HY preparations (SMD, 0.238; 95% CI, 0.107 to 0.369; $P < 0.001$). By random-effects modelling, HY demonstrated less improvement of TBUT (SMD, -0.564; 95% CI, -1.090 to -0.0384; $P = 0.035$).

Conclusions: While meta-analyses demonstrated a difference in effect on SH and TBUT between HY and non-HY based artificial tears, this difference was not clinically significant. Superiority of one preparation over another was not consistently observed across all outcome measures and may reflect a lack of difference in overall efficacy between both artificial tears.

Poster No.: EX1-058

Panel No.: 058, Session EX1

Subgroup Analysis of Two Phase III Studies of 0.1% Cyclosporine A Cationic Emulsion in Subjects with Dry Eye Disease

First Author: Andrea **LEONARDI**

Co-Author(s): Gerhard **GARHÖFER**, Dahlia **ISMAL**, Marc **LABETOUILLE**, Maite **SAINZ DE LA MAZA**

Purpose: Dry eye disease (DED) increases the risk of ocular surface damage, severe keratitis, vision loss, and impaired quality of life. In 2 randomized phase III studies (SANSIKA and SICCANOVE), 0.1% (1 mg/mL) cyclosporine A cationic emulsion (CsA CE) improved ocular damage and inflammation in subjects with moderate-to-severe DED over 6 months. This analysis evaluated the efficacy of CsA CE in improving signs of DED in specific subject subgroups.

Methods: Efficacy data from SANSIKA (n = 215) and pooled efficacy data from SANSIKA and SICCANOVE (n = 629) were used during analysis. Change in corneal fluorescein staining (CFS) from baseline to month 6 was analyzed in subgroups of DED subjects defined by age, sex, menopausal status, DED duration (<4 to ≥12 years), and Sjögren syndrome (SS) status.

Results: In the pooled analysis, 65% of subjects were <65 years old, 83% were female (72% in menopause), and 38% had SS. The overall change in CFS score from baseline to month 6 favored CsA CE over vehicle (treatment difference -0.303; 95% confidence interval, -0.464 to -0.142). In SANSIKA and the pooled analysis, age, sex, menopausal status, DED duration, and SS status did not impact the effect of CsA CE on the CFS score. In the subset of subjects with severe keratitis, the effect of CsA CE on CFS was comparable across all subgroups. CsA CE was well-tolerated, with a safety profile consistent with ophthalmic CsA use during at least 6 months.

Conclusions: CsA CE is well-tolerated and comparably efficacious in improving signs of DED across multiple DED subject subpopulations.

Poster No.: EX1-059

Panel No.: 059, Session EX1

Successful Phacoemulsification with Perioperative Topical Ascorbic Acid in Four Patients with Corneal Endothelial Disorders

First Author: Chia-Yi **LEE**

Co-Author(s): Hung-Chi **CHEN**, David **MA**, Chi-Chin **SUN**, Wei-Chi **WU**

Purpose: To report successful phacoemulsification in 4 patients with corneal endothelial disorders, with the aid of perioperative topical ascorbic acid to prevent

postoperative corneal endothelial decompensation.

Methods: Retrospective case series and a review of literature.

Results: Four eyes of 4 patients who underwent phacoemulsification during 2012-2016 were enrolled. Pre-existing corneal endothelial disorders included Fuchs corneal endothelial dystrophy in 3 eyes (Patients 1, 3, and 4) and endotheliitis in 1 eye (Patient 2). Topical ascorbic acid (50 mg/mL) was applied to all 4 patients for 2 months before and after the surgery with a frequency of 4 times per day. After the surgery, all eyes experienced improved visual acuity (VA) and stable intraocular pressure compared to the preoperative status. No signs of corneal endothelial decompensation, such as deteriorated VA, corneal edema, or reduced corneal endothelial count, were detected during the follow-up period up to 48 months.

Conclusions: Perioperative administration of topical ascorbic acid showed promise for prevention of corneal endothelial dysfunction in high-risk patients undergoing phacoemulsification. In summary, it may be considered as an alternative therapy other than triple procedure in patients expecting to undergo cataract surgery.

Poster No.: EX1-060

Panel No.: 060, Session EX1

Systemic Cyclosporin A versus Mycophenolate Mofetil Immunosuppression in High-Risk Penetrating Keratectomy

First Author: Kenric **FAN**

Co-Author(s): Marcus **ANG**, Hla Myint **HTOON**, Jodhbir **MEHTA**

Purpose: To compare outcomes of survival rates and side effects after systemic immunosuppression with cyclosporin A (CsA) and mycophenolate mofetil (MMF) following high-risk penetrating keratoplasty (PK) surgery.

Methods: A total of 149 patients who underwent 326 PKs were selected for this retrospective study. Of which 172 PK surgeries in 67 subjects were enrolled. Sixty-four subjects received multiple surgeries in at least 1 eye. Fifty-five grafts received CsA, and 25 grafts received MMF exclusively. Fourteen grafts received both CsA and MMF at any point of time of survival, and 78 grafts received neither. Graft failure was defined as endothelial immune reactions or rejection. Survival duration was recorded and analyzed using Kaplan-Meier survival analysis, and survival was compared between CsA and MMF. Renal, hepatic, and hematological side effects that occurred during graft survival were also recorded and compared.

Results: Overall survival of grafts on CsA and MMF was 63.6 and 60.5 months, respectively (P = 0.82). Grafts

with neither and both agents survived 38.6 and 60.6 months, respectively ($P = 0.03$). Rejection-free graft survival after 1 year was 78.2% in the CsA group and 84% in the MMF group, with 3-year rejection-free rates at 41.0% and 38.8%, respectively. A total of 58.2% of grafts with CsA and 56.0% of MMF grafts experienced renal, hepatic, or hematological side effects.

Conclusions: There was no significant difference between CsA and MMF as long-term immunosuppression agents for PK surgeries. There was no significant difference in side effect occurrences between CsA and MMF, with both serving as equal alternatives for each other.

Poster No.: EX1-061

Panel No.: 061, Session EX1

Terrien Marginal Degeneration Complicated by Corneoscleral Cyst

First Author: Tian Loon LEE

Purpose: Terrien marginal degeneration (TMD) is a slow progressive thinning of the peripheral cornea the etiology of which is unknown. It initially manifests in the superior cornea before progressing circumferentially. We present a case of TMD in a young Chinese girl complicated by a corneoscleral cyst that ultimately underwent surgical treatment with cyst excision, corneal patch graft, and amniotic membrane graft.

Methods: A 12-year-old Chinese girl presented initially with redness and discharge of her eyes. She was diagnosed with TMD and received treatment. She subsequently developed a corneoscleral cyst 2 years later which doubled in size within 1 year. She underwent a cyst excision with lamellar corneal graft patching and amniotic membrane grafting under general anesthesia. Histopathological examination of the cyst wall showed areas of cystic degeneration, squamous metaplasia, mild acute and chronic inflammatory exudate, with no evidence of malignancy.

Results: This is a unique case highlighting the rare complication of corneoscleral cyst in a young patient with inflammatory TMD.

Conclusions: Excision of the cyst with a patch graft to cover the scleral defect and amniotic membrane grafting without any chemical cautery is effective in preventing recurrence.

Poster No.: EX1-062

Panel No.: 062, Session EX1

Three-Year Follow-Up of KeraKlear Keratoprosthesis

First Author: Jorge ALIO

Purpose: To report 3 years of follow-up of KeraKlear keratoprosthesis implanted without total corneal

trephination.

Methods: Patients were considered for implantation with the new keratoprosthesis model (KeraKlear) if they were at high risk of failure with standard PK or showed conditions with a poor prognosis for corneal graft surgery of any type. We used FS laser to create the surgical planes adequate for the purpose of the Kpro implantation; 15 eyes were implanted with the KeraKlear keratoprosthesis either onto the deep stroma or over the Descemet membrane, and the Kpro was implanted intralamellarly in 11 eyes and epidescemetically in 4 eyes. Main outcome measures were anatomical outcomes and visual outcomes.

Results: For the intralamellar technique, the anatomical outcome was excellent in 5 eyes with no complications. The other 6 eyes developed complications such as deep corneal inflammatory membrane, totally vascularized cornea, extrusion of the Kpro, and corneal melting, all of which were managed successfully. No eye was lost. For the epidescemetical technique, the anatomical outcome was excellent in all 4 eyes. Visual outcomes showed improvement in the visual function in 45% of the eyes.

Conclusions: The new KeraKlear Kpro shows to be a viable alternative to corneal transplantation with potential advantages like decreased risk of endophthalmitis and other severe complications like glaucoma. KeraKlear Kpro is better tolerated and less prone to complications when implanted epidescemetically. Anatomical and visual outcomes are good if adequate selection criteria is followed.

Poster No.: EX1-063

Panel No.: 063, Session EX1

Tick Infestation of the Eyelid and Removal with Forceps and Punch Biopsy

First Author: Eok-Soo SUH

Purpose: Ocular tick infestation can occur in any age group or gender with exposure in an endemic setting. All parts of the ocular tissue have been reported to be susceptible to tick infestation. We present a rare case of tick infestation of the eyelid in an 88-year-old female.

Methods: The patient was referred for a yellowish lesion of the right upper eyelid. She had a history of sting 2 days before presentation and developed eyelid swelling with mucopurulent discharge the next day. Slit lamp examination showed blepharitis and revealed that the lesion was the body of a hard tick, firmly attached to the eyelid.

Results: First, blunt forceps were used for removal of the tick under a surgical microscope. However, attempted removal resulted in the disembodiment of

the parasite and retention of the mouthparts in the skin. The retained tick parts were excised en bloc by skin punch biopsy. The tick was identified as *Ixodes nipponensis*. Subsequent treatment was given for blepharitis and skin lesion.

Conclusions: This case introduces a rare tick infestation of the eyelid and the proper management. Less than 20 documented cases of tick infestation of the eyelid have been reported worldwide, and this is the first case from the ophthalmological society in South Korea.

Poster No.: EX1-064
Panel No.: 064, Session EX1

Treatment of Keratitis-Ichthyosis-Deafness Syndrome with Subconjunctival Bevacizumab

First Author: Elliot **CRANE**
Co-Author(s): David **CHU**, Karl **HOEGLER**

Purpose: To report the ocular manifestations, clinical course, and management of a case of keratitis-ichthyosis-deafness (KID) syndrome.

Methods: Retrospective case report.

Results: A 17-year-old male presented with right eye (RE) redness for 2 months and bilateral deafness for 12 years. His visual acuity (VA) was 20/40 in the RE and 20/25 in the left eye (LE). External examination revealed severe facial ichthyosis, complete bilateral milphosis, and bilateral Meibomian gland dysfunction. Slit lamp examination (SLE) of the RE revealed conjunctival injection, corneal neovascularization, and interstitial keratitis. SLE of the LE revealed a clear cornea. VA in the RE worsened to 20/400 over the next 2 years despite topical and systemic corticosteroids. A diagnosis of KID syndrome was suggested and confirmed with genetic analysis revealing a heterozygous D50N mutation in the GJB2 gene. Ten years after presentation, VA in the RE was hand motions with a white plaque covering 90% of the corneal surface. Monthly subconjunctival injections of bevacizumab were started. One year later, the white plaque regressed to 70% of the corneal surface with counting fingers visual acuity and is currently stable. Subconjunctival bevacizumab injections, started earlier in the disease course in the LE, have successfully maintained 20/80 VA. Neither eye received surgical intervention.

Conclusions: Bevacizumab may not completely reverse neovascularization, but it may prevent further neovascularization from occurring. It was able to provide stable, partial regression of our patient's corneal neovascularization. Therefore, the use of subconjunctival bevacizumab may be useful in the treatment of keratitis due to KID syndrome.

Poster No.: EX1-065
Panel No.: 065, Session EX1

Unfolded Protein Response Activation in Human Primary Pterygium

First Author: Jing **YANG**
Co-Author(s): Sheng **ZHOU**

Purpose: In this study, we aimed to investigate the unfolded protein response (UPR) activation in human primary pterygium.

Methods: Human primary pterygium specimens and normal Tenon capsule specimens were obtained and processed within 2 hours from primary pterygium patients after excision surgery or from fresh cadaver normal human eyes. The mRNA levels of UPR-related factors in the human primary pterygium tissue were detected by real-time PCR assay. The UPR-related protein levels were detected by immunohistochemical staining and Western blot analysis.

Results: We found that the UPR-related gene transcription level and protein expression level were both increased in the human primary pterygium group when compared with the normal control.

Conclusions: These results suggest that the 3 UPR pathways are all activated in human primary pterygium tissue, which indicates the involvement of ER stress in the progress of pterygium and the potential mechanism as ER stress induced inflammation for the pterygium.

Glaucoma

Poster No.: EX1-066
Panel No.: 066, Session EX1

360-Degree Contiguous Selective Laser Trabeculoplasty for Medically Unresponsive Glaucoma

First Author: Thanendthire **SANGAPILLAI**
Co-Author(s): P **BHAVANI**, L H **HAN**

Purpose: To determine the intraocular pressure (IOP) lowering efficacy of 360-degree contiguous selective laser trabeculoplasty (SLT) as an adjuvant in primary and secondary open-angle glaucoma receiving medical therapy.

Methods: Retrospective review of open angle glaucoma patients who underwent 360-degree contiguous SLT between December 2014 and December 2015. Patients with previous argon laser trabeculoplasty, trabeculectomy, and glaucoma drainage devices were excluded. Repeat SLT treatment was performed when further IOP reduction was necessary. Demographics, laser parameters, number of medications, and IOP at



baseline and after SLT at week 1, 4, 12, 24, and 52 were collected. The patients with IOP reduction of more than 20% from baseline were determined. Data were analyzed with paired *t* test. $P < 0.05$ was considered to be statistically significant.

Results: Total of 31 eyes of 19 subjects with mean age of 60.1 years old were included. Mean IOP was 23.7 mm Hg at baseline. Mean IOP decreased significantly to 18.0 mm Hg at week 1 ($P = 0.015$), 16.7 mm Hg at week 4 ($P = 0.002$), 16.5 mm Hg at week 12 ($P = 0.002$), 16.8 mm Hg at week 24 ($P = 0.001$), and 16.7 mm Hg at week 52 ($P = 0.012$). Mean IOP reductions $> 20\%$ were seen in 48.4% ($n = 15$) and were statistically significant at 1 year post SLT. Three patients required repeat SLT at a mean interval of 46.7 weeks. No complications were encountered.

Conclusions: 360-degree contiguous SLT has shown to be effective in lowering IOP and can be an adjunct in medically treated glaucoma patients.

Poster No.: EX1-067

Panel No.: 067, Session EX1

A Rare Case of Endogenous Steroid-Induced Glaucoma Secondary to Cushing Syndrome Presenting as Refractory Ocular Hypertension and Exophthalmos

First Author: Kelvin **WAN**

Co-Author(s): Evan P F **YIU**, Hon Wah **YUNG**

Purpose: To describe the presentation, investigation, treatment, and associated clinical challenges in diagnosing and managing a patient with endogenous steroid-induced glaucoma.

Methods: A single case report and literature review.

Results: A 49-year-old woman presented incidentally with ocular hypertension (OHT). During the course of her follow-up, her OHT was medically uncontrolled and she developed bilateral proptosis. She was managed as active Graves ophthalmopathy but did not respond to pulse methylprednisolone and later orbital fat decompression. Systemic review revealed that she had Cushingoid facies and poorly controlled systemic hypertension and episodes of hypokalemia for 1 year. Her serum cortisol level was markedly elevated; further investigations revealed that she had an adrenal adenoma as the cause of her Cushing syndrome. She underwent bilateral nonpenetrating deep sclerectomy and later laparoscopic adrenalectomy. Her intraocular pressure and systemic disturbances were normalized afterwards. A review of the literature will be discussed.

Conclusions: Ocular manifestations in Cushing syndrome may include OHT and exophthalmos, which was present in up to one third of the patients in Harvey Cushing's original case series. This case highlights the

importance of a careful systemic review in diagnosing endogenous Cushing syndrome. Endogenous Cushing syndrome should be suspected in those with OHT refractory to medical treatment and with systemic features of endocrine disturbances.

Poster No.: EX1-068

Panel No.: 068, Session EX1

An Automated System for Angle Classification in Anterior Segment Optical Coherence Tomography Images

First Author: Damon **WONG**

Co-Author(s): Tin **AUNG**, Mani **BASKARAN**, Huazhu **FU**, Yanwu **XU**

Purpose: To evaluate the performance of an automated system for angle classification in anterior segment optical coherence tomography (AS-OCT) images.

Methods: Our proposed AGARPLUS system consists of AS-OCT segmentation, clinical measurement, and angle classification. In the segmentation phase, we employ the automatic AS-OCT structure segmentation method based on label transfer technique. The key idea is to make use of a reference image set containing manually labeled markers to guide the segmentation of major AS-OCT structures, including the corneal boundary, iris region, and trabecular-iris contact. After AS-OCT structure segmentation, the AGARPLUS system automatically calculates measurements of the anterior chamber. These clinical measurements are combined with the visual features based on the appearance of the angle. Together, these features act as the inputs in a linear support vector machine classifier for angle-closure glaucoma classification.

Results: A total of 7379 AS-OCT images (6484 open and 895 closed angles) from 2113 subjects were collected from a Zeiss Visante AS-OCT system. The ground truth was manually labelled by an expert. The dataset was divided equally and randomly into training and testing sets, and the resulting accuracy was calculated as the area under the receiver operating characteristic curve (AUC). This process was repeated 10 times and the AUC obtained for each repetition was averaged. The overall performance of the system based on the averaged AUC was calculated as 0.925.

Conclusions: AGARPLUS, a novel automated angle classifier using AS-OCT images, is presented. Experimental results on a large dataset of images are promising for the use of AGARPLUS for the automated analysis of AS-OCT images.

Poster No.: EX1-069
Panel No.: 069, Session EX1

An Insight into Probable Causes of Severe Vision Loss in Cases with Advanced Glaucoma: A Pilot Study

First Author: Ankur **SINHA**
Co-Author(s): Ajay **JHINJA**

Purpose: It is well accepted that early detection of glaucoma and timely institution of therapy can help preserve vision. However, there is a large number of patients still suffering from advanced glaucoma. The exact cause of this damage may be non-modifiable as a part of the natural disease process. In some cases, this could be due to non-compliance, misdiagnosis, missed diagnosis, and so on, which can be modified well in time. The study was done to find out the proportion of cases where active intervention or inactive omission could help.

Methods: Sixty-four patients (51 males/13 females) with mean age of 55.45 ± 17.84 years were included in a hospital-based study. All the patients had total cupping and/or advanced field loss but useful vision in either or both eyes. Detailed history was taken for probable cause of advanced disease along with detailed examination. The specific questions included how, when, and what the diagnosis was, as well as when the last eye examination was performed. Compliance and self-medication were also noted.

Results: The mean best corrected logMAR acuity was $0.48 (6/18) \pm 0.47$. Fifty percent (32) were ignorant about disease, 18.75% (12) had eye consultation in the last 5 years and were missed, 14.06% (9) were non-compliant, 7.81% (5) were misdiagnosed as OAG for other types, and 1 each were on self-steroid treatment, missed earlier than non-compliant, misdiagnosed and non-compliant, misdiagnosed and ignorant, and ignorant and non-compliant.

Conclusions: A total of 68.75% of advanced glaucoma patients were either ignorant or missed on presentation; hence, increasing awareness of glaucoma in the public and practicing ophthalmologists is key to preventing advanced glaucoma.

Poster No.: EX1-070
Panel No.: 070, Session EX1

Analysis of Interleukin-6 (-174) Locus Polymorphism and Serum IL-6 Levels with the Severity of Normal Tension Glaucoma

First Author: Chun-Yuan **WANG**

Purpose: In normal tension glaucoma (NTG), factors other than elevated intraocular pressure are likely to have a role in the pathogenesis of optic neuropathy.

The interleukin-6 (IL-6) (-174) G allele has also been shown to increase the IL-6 protein. We hypothesized that the IL-6 (-174) polymorphism may be a genetic factor predisposing the severity of glaucoma. The aim of the present study was to evaluate IL-6 polymorphism and serum IL-6 levels as a potential risk factor related to the severity of NTG.

Methods: A total of 256 people with NTG in the Chinese population were enrolled. Patients were genotyped for the IL-6 (-174) C/G polymorphism. Serum IL-6 levels was measured by ELISA. Age at diagnosis, cup/disc (C/D) ratio, rim area (RA), retinal nerve fiber layer thickness (RNFL), and visual field (VF) were analyzed.

Results: IL-6 (-174) GC genotype in NTG patients was significantly associated with smaller C/D ratio ($P = 0.04$), larger RA ($P = 0.04$), and thicker RNFL ($P = 0.05$) compared with IL-6 (-174) GG patients. The allele frequency of IL-6 (-174) C was significantly higher in the NTG patients at early-moderate stage than at advanced stage according to C/D ratio [odds ratio (OR), 0.55; 95% confidence interval (CI), 0.31-0.99]. PSD of VF was borderline lower in IL-6 (-174) GC patients ($P = 0.06$). Serum IL-6 levels were borderline higher in advanced stages than in early-moderate stages.

Conclusions: The IL-6 (-174) GC genotype is associated with smaller C/D ratio, larger RA, and thicker RNFL than IL-6 (-174) GG in NTG patients. We found IL-6 (-174) G/C polymorphism and serum IL-6 levels may be associated with the severity of NTG.

Poster No.: EX1-071
Panel No.: 071, Session EX1

Angiogenesis-Related Vascular Endothelial Growth Factor Family in Neovascular Glaucoma Eyes

First Author: Shida **CHEN**
Co-Author(s): Wenbin **HUANG**, Wei **WANG**, Xiulan **ZHANG**, Minwen **ZHOU**

Purpose: This study aimed to evaluate the angiogenesis-related factors of the vascular endothelial growth factor (VEGF) family in the aqueous humor of patients with neovascular glaucoma (NVG).

Methods: This study involved 22 eyes of 22 patients with advanced NVG requiring antiglaucomatous surgery and 20 control subjects with cataracts. The NVG eyes received an intravitreal injection of ranibizumab (IVR) treatment before antiglaucomatous surgery. Aqueous humor and blood were collected at the time of IVR and cataract surgery. Protein concentration of VEGF-A, VEGF-B, and placenta growth factor (PIGF) in aqueous humor and plasma was determined by ELISA tests.

Results: The mean concentration (standard deviation)



of VEGF-A and PIGF in the aqueous humor of patients with NVG were 3037 (2387) pg/mL and 1078 (712) pg/mL, respectively; both were significantly higher than the control group (both $P < 0.001$). However, levels of VEGF-A and PIGF in the serum of NVG and control subjects remained low. High concentrations of VEGF-A were closely correlated with high levels of PIGF in patients with NVG ($r = 0.593$, $P = 0.004$). Concentrations of VEGF-B in aqueous humor and serum remained unchanged ($P > 0.05$).

Conclusions: There were high concentrations of angiogenesis factors of the VEGF family, with the exception of VEGF-B, in the aqueous humor of patients with NVG, and there was a positive correlation between VEGF-A and PIGF. High PIGF levels in patients with NVG may provide another potential target for treatment of NVG.

Poster No.: EX1-072

Panel No.: 072, Session EX1

Anterior Migration of Triamcinolone Acetonide Predisposes to Ocular Hypertension After Posterior Subtenon Injection for Macular Edema

First Author: Yun-Hsiang **YANG**

Co-Author(s): Yi-Ting **HSIEH**, Wei-Cherng **HSU**

Purpose: To evaluate the effect of anterior migration of triamcinolone acetonide on ocular hypertension after posterior subtenon injection of triamcinolone acetonide (PSTA) for macular edema.

Methods: One hundred twenty-four eyes from 99 patients who received PSTA for macular edema were prospectively enrolled. The extent of anterior migration of triamcinolone acetonide was recorded right after the injection. Fisher exact test and Cox regression analysis were used to evaluate the correlation between anterior migration of triamcinolone acetonide and ocular hypertension, which was defined as an intraocular pressure (IOP) > 21 mm Hg.

Results: A total of 194 PSTAs were given to 124 eyes. Anterior subtenon migration occurred in 17% and anterior subconjunctival migration occurred in 12% of injections. After PSTA, ocular hypertension occurred in 6.1% of those without anterior migration, in 25.6% of those with anterior subtenon migration, and in 34.8% of those with anterior subconjunctival migration after PSTA ($P = 0.013$). Compared to those without anterior migration of triamcinolone acetonide, the hazard ratio for ocular hypertension was 4.512 ($P = 0.042$) in those with anterior subtenon migration and 6.790 ($P = 0.020$) in those with anterior subconjunctival migration.

Conclusions: Anterior migration of triamcinolone acetonide after PSTA would predispose eyes to ocular hypertension. Careful injection to restrict the triamcin-

olone particle behind the equator could lower the rate of ocular hypertension after PSTA.

Poster No.: EX1-073

Panel No.: 073, Session EX1

Associated Factors in Adherence to Anti-Glaucoma Eyedrop Instillation from a Nationwide Prospective Study in Japan

First Author: Masako **SAKAMOTO**

Co-Author(s): Makoto **ARAIE**, Kenji **KASHIWAGI**

Purpose: To investigate associated factors in adherence to anti-glaucoma eyedrop instillation among participants in a nationwide prospective questionnaire study named the Glaucoma Research on Adherence to Fixed Combination Eye Drops in Japan (GRACE).

Methods: GRACE enrolled glaucoma patients who planned to introduce any type of fixed combination as the first time. Participants answered a questionnaire survey 3 times during the study period: on the day (pre-treatment), 4-6 weeks (first revisit), and 6 months (second revisit) after fixed combination introduction. One of 2 kinds of leaflets were randomly delivered to the participants on the day and first revisit. One leaflet explained how to correctly instill eyedrops, while the other leaflet explained the clinical meaning of intraocular pressure reduction as additional information. Definition of poor adherence was forgetting to instill eyedrops same or more than once during 1 week before revisits.

Results: A total of 2,775 patients (68.2 ± 12.1 years) completed the study protocol. Rates of poor adherence were 27.6% at pre-treatment, 17.1% at first revisit, and 20.6% at second revisit, respectively. The logistic analysis revealed that significantly associated factors to poor adherence at second revisit were a history of poor adherence at first revisit, having burden for eyedrop instillation, and the acceptable number of instillation times. Rate of correct answers to questions about glaucoma knowledge improved after introduction. No significant difference was observed between the 2 leaflets in poor adherence.

Conclusions: Introduction of fixed combination improved adherence. Some factors were related to this.

Poster No.: EX1-074

Panel No.: 074, Session EX1

Association of Optic Disc Hemorrhages with Vascular Symptoms in Open Angle Glaucoma

First Author: Karin **PILLUNAT**

Purpose: To investigate a possible association between optic disc hemorrhages (ODH), blood pressure parameters (BP), and the occurrence of vascular symptoms

such as vertigo, a tendency to collapse, tinnitus, cold extremities, migraine, and headaches in patients with normal tension glaucoma (NTG) and high tension glaucoma (HTG).

Methods: One hundred thirteen patients with NTG and 148 patients with HTG were included. Each participant had a complete glaucoma workup, 24-hour BP monitoring, and answered a standardized questionnaire regarding vascular symptoms. The association with the occurrence of an ODH was tested with a contingency analysis and verified with the Chi square test.

Results: Out of the 113 NTG patients, 32 (28.3%) had an ODH in at least 1 eye, and 81 (71.7%) had no ODH. ODH in NTG patients was statistically significantly associated with symptoms of vertigo ($P = 0.004$) and tinnitus ($P = 0.032$), but not with BP parameters ($P = 0.336$), the tendency to collapse ($P = 0.528$), cold extremities ($P = 0.952$), migraine ($P = 0.388$), or headaches ($P = 0.343$). In HTG patients, ODH occurred in 15% of cases and showed no statistically significant correlation with BP parameters ($P = 0.102$) nor for the mentioned vascular symptoms (vertigo: $P = 0.462$, tinnitus: $P = 0.653$, the tendency to collapse: $P = 0.283$, cold extremities: $P = 0.722$, migraine: $P = 0.245$, and headaches: $P = 0.448$).

Conclusions: Vertigo and tinnitus seem to be associated with the occurrence of an ODH in NTG patients but not in HTG patients. Migraine does not show an association with ODH, neither in NTG nor in HTG patients. BP parameters, the tendency to collapse, cold extremities, or headaches were also not associated with ODHs in NTG and HTG patients.

Poster No.: EX1-075

Panel No.: 075, Session EX1

Bilateral Nanophthalmos, Angle Closure Glaucoma, and Pigmentary Retinal Degeneration: A New Syndrome? A Case Report

First Author: Shahnaz **BEGUM**

Co-Author(s): Md Sharfuddin **AHMED**, Shah-Noor **HASAN**, M Nazrul **ISLAM**, Syeed **KADIR**

Purpose: To report a case of nanophthalmos with associated angle closure glaucoma and pigmentary retinal degeneration: a rare combination.

Methods: The patient presented to us with profound loss of vision in both eyes. He had trabeculectomy in the right eye and laser peripheral iridotomy in the left eye done elsewhere. Ocular examination revealed characteristic findings of nanophthalmos with poor vision in both eyes (right > left) and raised intraocular pressure (IOP) in the left eye. We performed trabeculectomy with mitomycin-C and cataract extraction in the left eye and kept it aphakic.

Results: The patient had relatively good vision and well-controlled IOP to date.

Conclusions: We will maintain good follow-up of the patient as this case represents a distinct combination of rare features, probably a new syndrome. Management of glaucoma in this type of patient is challenging.

Poster No.: EX1-076

Panel No.: 076, Session EX1

Bilateral Nanophthalmos, Pigmentary Retinal Degeneration, and Angle Closure Glaucoma: A New Syndrome? A Case Report

First Author: Shahnaz **BEGUM**

Purpose: To report a case of nanophthalmos with associated angle closure glaucoma and pigmentary retinal degeneration: a rare combination.

Methods: A patient presented to us with profound loss of vision in both eyes. He had trabeculectomy in the right eye and laser peripheral iridotomy in the left eye performed elsewhere. Ocular examination revealed characteristic findings of nanophthalmos with poor vision in both eyes (right > left) and raised intraocular pressure (IOP) in the left eye. We performed trabeculectomy with mitomycin C and cataract extraction in the left eye and kept it aphakic.

Results: The patient has maintained relatively good vision and well-controlled IOP to date.

Conclusions: We continue to follow up with the patient, as this case represents a distinct combination of rare features, probably a new syndrome. Management of glaucoma in this type of patient is challenging.

Poster No.: EX1-077

Panel No.: 077, Session EX1

Biometric Predictors of Intraocular Pressure Change After Cataract Surgery in Eyes with Primary Angle Closure Suspect

First Author: Eray **ATALAY**

Co-Author(s): Tin **AUNG**, Baskaran **MANI**, Monisha **NONGPIUR**, Shamira **PERERA**, Sushma **VERMA**

Purpose: To evaluate the change in intraocular pressure (IOP) after cataract surgery and its relation to preoperative biometric characteristics in eyes with primary angle closure suspect (PACS).

Methods: We assessed 53 eyes of 53 subjects with PACS which underwent uncomplicated cataract surgery. All eyes had undergone bilateral laser peripheral iridotomy prior to surgery. The absolute change in IOP was defined as the difference in IOP between the preoperative measurement and the measurement 6 months after surgery. Biometric parameters were measured



using anterior segment optical coherence tomography (AS-OCT). Multiple regression analysis was performed to determine factors that were associated with the absolute change in IOP.

Results: One eye was excluded from the analysis due to poor quality AS-OCT image, leaving a total of 52 eyes for the final analysis. There were more females ($n = 40$, 77%) and the mean age of the subjects was 73.0 ± 5.7 years. IOP dropped on average by 3.3 ± 2.8 mm Hg (19.9%) from the preoperative mean of 16.0 ± 3.0 mm Hg. In the multiple linear regression analysis adjusted for age and gender, a higher preoperative IOP ($\beta = 0.71$, $P < 0.001$) predicted a greater absolute change in IOP. None of the biometric parameters were associated with the absolute change in IOP.

Conclusions: Patients with a higher preoperative IOP had a greater IOP reduction after cataract surgery in eyes with PACS.

Poster No.: EX1-078

Panel No.: 078, Session EX1

Cogan-Reese Syndrome: A Case Report

First Author: Daryle Jason YU

Co-Author(s): John Mark DE LEON

Purpose: To report a case of Cogan-Reese syndrome (CRS) and to highlight its pathophysiology, clinical presentation, and management.

Methods: This is a case report.

Results: A 43-year-old female presented with a 2-month history of persistent left eye pain associated with left-sided headache and blurring of vision, described as seeing "rainbows" which was usually perceived upon waking up and gradually improved during the day. Slit-lamp examination of the left eye showed mild corneal edema with guttata. Pigmented nodules on the anterior peripheral iris surface and inferonasally directed corectopia were observed. Intraocular pressure (IOP) was 50 mm Hg and gonioscopy revealed peripheral anterior synechiae in all quadrants. Specular microscopy of the left eye recorded reduced endothelial cell density with pleomorphism and polymegathism, and the cells appeared as dark areas with light central spot. These clinical observations were consistent with CRS. Since the IOP was refractory to medical management, the patient underwent trabeculectomy with mitomycin C. IOP was successfully lowered to 10 mm Hg postoperatively; however, the symptoms of morning blurring persisted.

Conclusions: CRS, one of the variants of iridocorneal endothelial syndrome, is characterized by abnormal proliferation of the corneal endothelium. This resulted in obstruction of the iridocorneal angle and the iris changes, eventually leading to increased IOP, one of its

most common complications. A good anterior segment examination with the aid of specular microscopy is important in making a diagnosis. Our patient had refractory secondary angle closure glaucoma warranting trabeculectomy, which successfully lowered the IOP, though with persistence of the corneal edema.

Poster No.: EX1-079

Panel No.: 079, Session EX1

Comparing Trabeculectomy Outcomes Between First and Second Operated Eyes: A Multicenter Study

First Author: Kentaro IWASAKI

Co-Author(s): Masaru INATANI

Purpose: To compare surgical outcomes between the first and second operated eyes in patients who underwent trabeculectomy in both eyes.

Methods: This retrospective clinical cohort study at 5 clinical centers in Japan included 84 patients with open-angle glaucoma who underwent primary trabeculectomy in both eyes. The primary outcome was surgical success or failure, with failure being defined according to 3 criteria: <20% reduction of the preoperative intraocular pressure (IOP), or Criterion A, IOP > 21 mm Hg; B, IOP > 18 mm Hg; or C, IOP > 15 mm Hg. Cases of reoperation, a loss of light perception vision, or hypotony were also considered as "failures."

Results: There were no significant differences in success rate for any of the 3 criteria between the first and second operated eyes. For patients whose first trabeculectomy was successful, when the second trabeculectomy was performed ≥ 2 months after the first, the survival curves for all 3 criteria for the second trabeculectomy were significantly worse than those for patients waiting a shorter interval between trabeculectomies (Criterion A, 52.0% vs 83.6%, $P = 0.0031$; B, 51.5% vs 80.4%, $P = 0.026$; C, 51.1% vs 80.4%, $P = 0.048$). In multivariable analyses, a longer interval between trabeculectomies was a significant prognostic factor for surgical failure (Criterion A, $P = 0.0055$; B, $P = 0.0023$; C, $P = 0.027$).

Conclusions: If the first trabeculectomy is successful, a long interval before the second trabeculectomy increases the risk of surgical failure in the second eye. This result has clinical implications for developing surgical strategies for patients with bilateral glaucoma.

Poster No.: EX1-080
Panel No.: 080, Session EX1

Comparison of Corvis ST, Noncontact, and Goldmann Applanation Tonometers for Intraocular Pressure at Different Levels

First Author: Yingqi LI
Co-Author(s): Shaolin DU, Wenbin HUANG, Jiawei WANG, Xiulan ZHANG

Purpose: An ideal tonometer is expected to measure intraocular pressure (IOP) at different levels. Thus we compared IOP measurements at different levels obtained using the noncontact tonometer (NCT), Goldmann applanation tonometer (GAT), and Corvis ST (CST).

Methods: This prospective study involved 212 participants, including 137 patients and 75 control volunteers. Based on the GAT IOP readings, participants were divided into the following categories: level A, <10 mm Hg; level B, 10 to 21 mm Hg; level C, >21 to ≤40 mm Hg; and level D, >40 mm Hg. IOP measurements by CST, GAT, and NCT for different levels were analyzed using a mixed-model analysis of variance. The agreement between the devices was assessed through Bland-Altman plots at different IOP levels. Linear regression was used to analyze the relationships between central corneal thickness (CCT) and the IOP measurements of GAT, CST, and NCT.

Results: Differences for IOP measured by CST, NCT, and GAT were observed at levels A and D ($P = 0.000$, $P = 0.030$). Bland-Altman analysis revealed a bias between CST and GAT, CST and NCT, and NCT and GAT at different levels. The NCT overestimated IOP more than CST did at level D, while it underestimated IOP at level A. CST showed better agreement with GAT than NCT did. IOP measured by NCT increased more than other measurements per μm increase in CCT.

Conclusions: The accuracy of CST is comparable to that of GAT. The CST is a better alternative method when measuring lower and higher IOP than NCT.

Poster No.: EX1-081
Panel No.: 081, Session EX1

Comparison of Relationships Between Anterior Chamber Depth and Other Ophthalmic Biometrical Ocular Factors at the Central and Peripheral Anterior Chamber Portions Among Japanese Residents

First Author: Kazuyoshi KITAMURA
Co-Author(s): Tatsuya CHIBA, Kenji KASHIWAGI, Joji TANABE

Purpose: To compare relationships between anterior chamber depth (ACD) and other ophthalmic biomet-

rical ocular factors at the central and peripheral ACD among Japanese residents.

Methods: An ophthalmic health examination was performed in Chuo, Yamanashi, Japan in 2016. This examination included non-contact intraocular pressure (IOP) measurement, axial length, anterior chamber depth at the center and peripheral portions, lens thickness, slit-lamp examination, and fundus examination in addition to a medical questionnaire. ACDs at the central and peripheral were measured by a non-contact optic device and a scanning peripheral anterior chamber depth analyzer (SPAC), respectively. SPAC evaluated the peripheral anterior chamber configuration into 12 grades. The shallowest and deepest anterior chamber depth were categorized as grade 1 and grade 12, respectively.

Results: A total of 216 Japanese residents participated in this study. Of these, 203 participants (54 males and 149 females, 62.9 ± 13.1 years old), or 365 eyes, were subject to the analysis after eliminating eyes matching exclusion criteria. The demographics of enrolled participants were mean IOP of 13.2 ± 2.6 mm Hg (6.3-25.3 mm Hg), mean central corneal thickness of 520.0 ± 35.1 μm (402-635 μm), mean axial length of 23.8 ± 1.3 mm (20.78-29.41 mm), mean central anterior chamber depth of 3.2 ± 0.4 mm (2.23-4.26 mm), mean lens thickness of 4.5 ± 0.4 mm (1.67-5.57 mm), and mean SPAC grade of 7.4 ± 2.0 (grades 2-12). Both central and peripheral ACDs showed a significant positive correlation with axial length and a significant negative correlation with lens thickness. Only central ACD showed a significant negative correlation with corneal thickness.

Conclusions: Both peripheral and central ACDs showed significant correlations with some biometrical ocular factors in both positive and negative fashions.

Poster No.: EX1-082
Panel No.: 082, Session EX1

Concentrations of Soluble IL6 Receptor and Soluble gp130 in Aqueous Humor of Patients with Primary Open Angle Glaucoma

First Author: Toshihiro INOUE
Co-Author(s): Miyuki INOUE-MOCHITA, Sachi KOJIMA, Hidenobu TANIHARA

Purpose: To evaluate the concentrations of soluble IL6 receptor (sIL6R) and soluble gp130 (sgp130) in aqueous humor of patients with primary open angle glaucoma.

Methods: Eight patients with primary open angle glaucoma (POAG) and 10 non-glaucomatous patients with cataract were enrolled in this cross-sectional study. Aqueous humor samples were collected from the anterior chamber at the beginning of the intraocular surgery, and the concentrations of sIL6R and sgp130 were measured using multiplex immunoassay. The correla-



tions among the analytes were assessed by calculating the Spearman correlation coefficients.

Results: The mean aqueous concentrations (\pm SD) of sIL-6R and sgp130 in POAG patients were significantly higher (157.5 ± 118.9 pg/mL and 14.8 ± 4.3 ng/mL, respectively) compared to cataract patients (73.9 ± 32.6 pg/mL and 7.6 ± 2.5 ng/mL, respectively). The concentrations of sIL6R and sgp130 were correlated with each other in POAG patients ($\rho = 0.91$, $P = 0.002$), while the corresponding values were not correlated with each other in cataract patients ($\rho = 0.60$, $P = 0.067$).

Conclusions: sIL6R and sgp130 were elevated in the aqueous humor of POAG patients, and their concentrations were correlated with each other.

Poster No.: EX1-083

Panel No.: 083, Session EX1

Diagnostic Ability of Automated Pupillography in Glaucoma

First Author: Chaitra **AROOR**

Co-Author(s): Harsha **RAO**, Rohit **SHETTY**

Purpose: To evaluate the diagnostic ability of automated pupillography measurements in glaucoma and study the effect of inter-eye asymmetry in glaucomatous damage on the diagnostic ability.

Methods: In an observational, cross-sectional study, 47 glaucoma patients and 42 control subjects underwent automated pupillography using a commercially available device. Diagnostic abilities of the pupillary response measurements were evaluated using area under receiver operating characteristic (ROC) curves (AUC) and sensitivities at fixed specificities. Influence of inter-eye asymmetry in glaucoma [inter-eye mean deviation (MD) difference on visual fields (VF)] on the diagnostic ability of pupillography parameters was evaluated by ROC regression approach.

Results: The AUCs of automated pupillography parameters ranged from 0.60 (amplitude score with peripheral blue stimulus) to 0.82 (amplitude score with full field white stimulus, Amp-FF-W). Sensitivity at 95% specificity ranged between 5% (amplitude score with full field blue stimulus) and 45% (amplitude score with full field green stimulus). Inter-eye MD difference significantly affected the diagnostic performance of automated pupillography parameters ($P < 0.05$). AUCs of Amp-FF-W at inter-eye MD difference of 0 dB, 5 dB, 10 dB, and 15 dB were 0.71, 0.80, 0.87, and 0.93, respectively, according to the regression model. The corresponding sensitivities at 95% specificity were 20%, 34%, 50%, and 66%, respectively.

Conclusions: The diagnostic abilities of even the best automated pupillography parameters were only moderate in glaucoma. The performance of these pupillog-

raphy measurements in detecting glaucoma significantly increased with greater inter-eye asymmetry in the glaucomatous damage.

Poster No.: EX1-084

Panel No.: 084, Session EX1

Effect of Phacoemulsification on Intraocular Pressure in Angle Closure Disease

First Author: Ng **AARON**

Co-Author(s): Jason **CHENG**, Yong Seng **TAM**

Purpose: To determine the efficacy of phacoemulsification on lowering intraocular pressure (IOP) in eyes that have primary angle closure suspect (PACS), primary angle closure (PAC), primary angle closure glaucoma (PACG), and acute angle closure glaucoma (AACG) 12 months after surgery.

Methods: Retrospective case review of all patients who had laser peripheral iridotomy and phacoemulsification performed from 2011 to 2013. Preoperative IOP, anterior chamber depth (ACD), axial length (AL), and IOP at 12 months after surgery were recorded.

Results: One hundred patients were included, of which 16 had PACS, 30 had PAC, 42 had PACG, and 12 had AACG. The average age was 73.2 years, the average AL was 22.8 ± 1.1 mm, and ACD was 2.52 ± 0.29 mm. Overall, the mean IOP reduced from 17.12 ± 5.7 mm Hg to 14.2 ± 3.3 mm Hg ($P = 0.01$) and the mean number of medications reduced from 1.2 ± 1.0 to 0.7 ± 1.4 ($P = 0.03$) after 12 months. For each subtype of angle closure the mean IOP reduced from 14.6 ± 3.7 to 13.0 ± 2.5 mm Hg ($P = 0.006$), 16.4 ± 3.2 to 14.4 ± 2.5 mm Hg ($P = 0.007$), 17.9 ± 5.4 to 15.0 ± 3.9 mm Hg ($P = 0.007$), and 19.6 ± 10 to 12.8 ± 3.0 mm Hg ($P = 0.05$) (PACS, PAC, PACG, and AACG, respectively). The PACS group started with no medications and this was unchanged after surgery. The mean number of medications reduced from 0.92 to 0.79 ($P = 0.82$), 1.69 to 0.95 ($P < 0.01$), and 1.91 to 0.25 ($P = 0.01$) for PAC, PACG, and AACG, respectively.

Conclusions: Phacoemulsification is effective in lowering the IOP in patients with angle closure disease. The mean IOP and medication number was reduced after 12 months in all subgroups of angle closure. The reduction in IOP and medications was greatest in the AACG group.

Poster No.: EX1-085
Panel No.: 085, Session EX1

Effect of Prophylactic Nd:YAG Laser Iridotomy on Corneal Endothelial Cell Density and Morphology in Indonesian Eyes

First Author: Mohammad **PRAYOGO**
Co-Author(s): Angela **AGNI**, Retno **EKANTINI**

Purpose: To evaluate the effect of prophylactic Nd:YAG laser peripheral iridotomy (LPI) on corneal endothelial cell density (ECD) and morphology in dark-irides Indonesian eyes of primary angle closure suspects (PACS) and chronic angle closure glaucoma (CACG).

Methods: In this prospective, non-randomized study, eyes with PACS or CACG were treated with Nd:YAG LPI. The central ECD and morphology was measured using non-contact specular microscope Tomey EM-3000 at baseline and at 1-month follow-up.

Results: Sixteen eyes with PACS and 30 eyes with CACG (39 patients) were included. The mean age was 55.5 ± 5.86 years (42-72 years), with the majority of patients being female (73%). The ECD was significantly lower at month 1 (2516.02 ± 285.57 cell/mm², $P < 0.001$) compared to baseline (2591.13 ± 314.67 cell/mm²). The percentage of hexagonal cells was also significantly lower at month 1 ($43.26 \pm 8.19\%$, $P < 0.001$) compared to baseline ($48.04 \pm 8.96\%$), which means an increase of pleomorphism. Coefficient of variation was significantly higher at month 1 ($42.86 \pm 8.72\%$, $P < 0.001$) compared to baseline ($37.30 \pm 6.17\%$), which means an increase of polymegathism. There were no differences in reduction of ECD ($P = 0.07$), reduction of hexagonal cell percentage ($P = 0.28$), and increase of coefficient of variation ($P = 0.78$) between groups which underwent LPI with total energy ≤ 40 mJ and >40 mJ. However, reduction of ECD was significantly higher ($P = 0.02$) in groups which underwent LPI with energy per session of 20.1-40 mJ and >40 mJ compared with 0-20 mJ.

Conclusions: This study confirms that Nd:YAG LPI leads to a reduction in the average corneal endothelial cell density and an increase of polymegathism and pleomorphism of endothelial cells.

Poster No.: EX1-086
Panel No.: 086, Session EX1

Effects of Valsalva Maneuver on Anterior Chamber Parameters and Choroidal Thickness in Healthy Chinese: An AS-OCT and SS-OCT Study

First Author: Xingyi **LI**
Co-Author(s): Xiulan **ZHANG**, Shida **CHEN**

Purpose: This study concurrently evaluates the effects of the Valsalva maneuver (VM) on anterior and poste-

rior ocular biometric parameters and determines the relationship between them in healthy Chinese.

Methods: Sixty-three volunteers enrolled in this prospective, cross-sectional study. The anterior and posterior ocular biometric parameters before and during the VM were measured using anterior segment optical coherence tomography (AS-OCT) and swept-source optical coherence tomography (SS-OCT). Intraocular pressure (IOP), blood pressure (BP), and refractive error were recorded before and during the VM.

Results: Sixty-three volunteers (126 eyes), including 17 males and 46 females, were studied. The mean IOP increased with statistical significance. No significant changes in the different layers of retina or choroidal thickness (CT) were observed. Compared with baseline, the anterior chamber parameters sharply decreased, with smaller angle opening distance (AOD500) ($P < 0.001$), AOD750 ($P = 0.007$), trabecular-iris space area (TISA500) ($P = 0.027$), TISA750 ($P = 0.007$), and anterior chamber volume (ACV) ($P = 0.036$). The regression analyses showed that, after adjusting for age, gender, spherical equivalent, axial length, IOP, systolic BP, and diastolic BP, the Δ IOP were associated with the baseline IOP ($\beta = 0.251$ [0.100, 0.402], $P = 0.002$) and Δ ACW ($\beta = -3.119$ [-6.221, -0.017], $P = 0.049$).

Conclusions: This is the first study to evaluate the effects of the VM on anterior and posterior ocular biometric parameters simultaneously. We found that the VM could cause significant IOP increase and narrowing of the angles in healthy subjects. However, it didn't change the CT at the macular region. The relationship between IOP elevation and choroidal expansion during the VM needs to be investigated further.

Poster No.: EX1-087
Panel No.: 087, Session EX1

Efficacy and Safety of Different Routes of Mitomycin C Application in Trabeculectomy

First Author: Sarayut **NIJVIPAKUL**
Co-Author(s): Wasu **SUPAKONTANASAN**, Yanin **SUWAN**, Chaiwat **TEEKHASAENEE**

Purpose: To compare the efficacy and safety of sub-conjunctival mitomycin C (MMC) injection to standard MMC placement during trabeculectomy.

Methods: Retrospective cohort study. A total of 33 eyes that underwent primary trabeculectomy were divided into 2 groups (14 eyes in the MMC injection group and 19 eyes in the MMC placement group). All surgeries were performed by 2 glaucoma consultants at Ramathibodi Hospital with 1-year postoperative follow-up. The outcome measures included intraocular pressure (IOP), endothelial cell loss, and complications.

Results: Mean IOP decreased from 20.21 ± 4.49 and



24.6 ± 10.55 preoperatively to 10.71 ± 2.97 and 12.73 ± 5.14 in the MMC injection group and the MMC placement group at 12 months after surgery (P = 0.65 between groups). Percent central endothelial cell loss from preoperative compared at 3-month follow-up visit were 2.4 and 2.23 cell/mm³ in the injection and placement groups, respectively (P = 0.69). No cases of blebitis and postoperative endophthalmitis were reported in both groups.

Conclusions: Both MMC injection and placement during trabeculectomy are shown to be effective in IOP reduction with comparable postoperative complications.

Poster No.: EX1-088

Panel No.: 088, Session EX1

Efficacy and Safety of Phacoemulsification and Intraocular Lens Implantation versus Laser Peripheral Iridotomy in Primary Angle Closure with Coexisting Cataract: A Meta-Analysis

First Author: Jingjing **HUANG**

Co-Author(s): Weirong **CHEN**, Xiaohang **WU**, Li **ZHANG**

Purpose: To compare the efficacy and safety of phacoemulsification and intraocular lens implantation (phaco/IOL) versus laser peripheral iridotomy (LPI) in primary angle closure (PAC) with coexisting cataract.

Methods: A comprehensive search was performed in PubMed, Embase, Web of Science, and the Cochrane Library to identify controlled clinical trials comparing phaco/IOL with LPI published before July 2016. Efficacy estimates were measured by mean difference in intraocular pressure (IOP), best corrected visual acuity (BCVA), mean Shaffer gonioscopy grading (MSGG), anterior chamber depth (ACD) changes, number of ocular hypotensive drugs after surgery, and odds ratio (OR) for conditional success rate. Safety estimates were measured by evaluating the mean difference of corneal endothelial cell count (CECC) and OR of surgical complications.

Results: Five controlled clinical trials with 224 eyes from 224 patients meeting the predefined criteria were included in the meta-analysis. Postoperative IOP in the phaco/IOL group was significantly lower than those in the LPI group. Phaco/IOL did not achieve significantly improved visual outcomes. Greater postoperative MSGG and greater ACD change, as well as larger conditional success rate in the phaco/IOL group compared with LPI group, were observed. The loss of CECC and incidence of surgical complications were similar between the 2 groups.

Conclusions: Phacoemulsification is associated with better efficacy and equivalent safety versus LPI for PAC treatment. Early phacoemulsification can be consid-

ered an effective strategy for PAC management.

Poster No.: EX1-089

Panel No.: 089, Session EX1

Factors Related to Hypertensive Phase After Glaucoma Drainage Device Implantation

First Author: Orathai **PITUKCHEEWANONT**

Co-Author(s): Sunee **CHANSANGPETCH**, Visanee **TANTI-SEVI**

Purpose: To evaluate factors related to the hypertensive phase (HP) after glaucoma drainage device (GDD) implantation.

Methods: Retrospective chart review of glaucoma patients who underwent GDD implantation since 2004 and completed 12 months of follow-up was performed. Patients were divided into presence or absence of HP. The data were analyzed for factors associated with hypertensive phase. The surgical outcomes including surgical failure, postoperative visual acuity, postoperative number of medications, postoperative intraocular pressure (IOP), and postoperative complications were compared between the 2 groups.

Results: Seventy-two patients were included. Most were diagnosed with secondary glaucoma (N = 51, 70.8%) and Baerveldt was the most implanted GDD (N = 49, 68.1%). Mean ± SD IOP was significantly lower from 27.1 ± 9.6 mm Hg preoperation to 13.7 ± 5.9 mm Hg at 12-month follow-up (P < 0.001). Hypertensive phase was identified in 38/72 patients (52.8%). Risk factor of hypertensive phase was preoperative visual acuity equal to or better than 20/70 [P = 0.021; odds ratio (OR), 7.5; 95% confidence interval (CI), 1.4-41.4]. Presence of underlying heart disease was a protective factor for HP (P = 0.027; OR, 0.06; 95% CI, 0.00-0.72). Failure rate at 12 months was 24/72 (33%). There was no difference in all surgical outcomes between the 2 groups. Survival analysis also showed no significant difference between the HP and non-HP group.

Conclusions: HP commonly occurred after GDD implantation. Preoperative visual acuity was a risk factor for the development of HP, whereas presence of underlying heart disease was a protective factor. No association between HP and surgical outcomes was identified.

Poster No.: EX1-090

Panel No.: 090, Session EX1

Female Reproductive Factors and Open Angle Glaucoma: Korea National Health and Nutrition Examination Survey 2010-2011

First Author: Jaeyeun **LEE**

Co-Author(s): Joon Mo **KIM**, Miyeon **LEE**, Ki Ho **PARK**

Purpose: The purpose of this study was to analyze the relationship between female reproductive factors and

open angle glaucoma (OAG) in Korean adult females.

Methods: A total of 5032 women, who participated in the Korean National Health and Nutrition Examination Survey, a population-based cross-sectional study using a complex, stratified, multistage, probability-cluster survey from 2010 to 2011, and their demographic, comorbidity, and health-related behavior information was obtained via interview. Glaucoma diagnosis was based on criteria established by the International Society of Geographic and Epidemiologic Ophthalmology. We analyzed the relationship between female reproductive factors (the age at menarche, age at menopause or reproductive duration, parity) and intraocular pressure (IOP) and prevalence of glaucoma.

Results: The prevalence of OAG was 3.88% in women. There was a significant difference in mean age at menarche, history of parous, number of parity, and history of oral contraceptive use between the subjects with OAG and those without. Mean IOP of women whose menopause occurred after age 52 and who had more than 35 years of reproductive period was higher. Number of parity was positively correlated with prevalence of OAG.

Conclusions: In this population-based study, women who experienced later natural menopause and had long reproductive duration had higher IOP, and prevalence of OAG increased with number or parity history. Female reproductive factors seem to have association with OAG and further study is needed.

Poster No.: EX1-091

Panel No.: 091, Session EX1

Fixed Combination of Anti-Glaucoma Eye Drops Improves Medication Adherence

First Author: Yuka **HASEBE**

Co-Author(s): Makoto **ARAIE**, Kenji **KASHIWAGI**

Purpose: We investigated the adherence and related factors by new introduction of fixed combination drops based on a nationwide prospective questionnaire survey, the Glaucoma Research on Adherence to Fixed Combination Eye Drops in Japan (GRACE).

Methods: GRACE enrolled patients who planned to introduce any type of fixed combination for the first time. Participants answered a questionnaire survey on the day of and at revisit in 4-6 weeks after fixed combination introduction. Physicians in charge were also required to answer another questionnaire survey separately on the day of fixed combination introduction. One of 2 leaflets were randomly delivered to the participants before fixed combination description. One leaflet explained how to correctly instill eyedrops, while other leaflet explained the clinical meaning of intraocular pressure reduction in addition to how to correctly instill eyedrops. Definition of non-adherence

was forgetting to instill eyedrops 1 or more times during the past 1 week before revisit.

Results: In total, 3,597 patients (68.4 ± 12.2 years) satisfied the study protocol. Introduction of fixed combination significantly reduced the number of anti-glaucoma eyedrops from 1.93 ± 0.78 to 1.34 ± 0.54 ($P < 0.0001$) and also significantly improved adherence ($P < 0.00001$). Significantly related factors to non-adherence at revisit were a history of non-adherence reported either by patients or physicians before introduction, acceptable instillation times reported by patients both at the first and second questionnaires, and having a burden for eyedrop instillation reported by participants. No significant difference was observed between the 2 leaflets in poor adherence.

Conclusions: Fixed combination significantly improved adherence and some factors were significantly associated with adherence.

Poster No.: EX1-092

Panel No.: 092, Session EX1

Malignant Glaucoma Managed with Nd:YAG Capsulotomy: A Case Report

First Author: Shih-Chun **CHAO**

Co-Author(s): Hung-Jui **HSU**

Purpose: To report a case of malignant glaucoma treated with Nd:YAG capsulotomy.

Methods: Case report and review of the literature.

Results: A 63-year-old man with a history of hypertension and diabetes mellitus with end stage renal disease under hemodialysis came to our outpatient department complaining of progressive low vision in both eyes (OU) for 2 months. On examination, bilateral senile cataracts were diagnosed and he received phacoemulsification and intraocular lens (IOL) implantation in the right eye (OD). Postoperatively, his condition was smooth and visual acuity (VA) increased. One week later, he returned to our outpatient department with severe pain (OD). Elevated ocular pressure up to 50-60 mm Hg (OD) was noted. Combigan was given but with poor response. Slit lamp exam showed corneal edema, fixed and parietic pupil (OD) with iris bombe, very shallow anterior chamber, and significant anterior rotation of the ciliary body with forward rotation of IOL-iris plane. Nd:YAG capsulotomy was performed immediately. After capsulotomy, the intraocular pressure (IOP) decreased dramatically and VA increased from counting fingers (CF) at 30 cm to 0.6.

Conclusions: Malignant glaucoma needs prompt diagnosis and management. Medical treatment includes IOP-lowering agents but there is usually a poor response. The goal of Nd:YAG laser hyaloidotomy, in turn, is to tear the anterior hyaloid face, as a result of which



the depth of the anterior chamber is normalized. This treatment can be conducted through surgical iridectomies or laser iridotomies, often in many places. It is carried out centrally, to the back of the lens capsule, or in combination with capsulotomy in pseudophakic patients.

Poster No.: EX1-093

Panel No.: 093, Session EX1

Measurement of Anterior and Posterior Ocular Parameters During Valsalva Maneuver in Healthy Subjects: An Ultrasound Biomicroscope and Swept-Source Optical Coherence Tomography Study

First Author: Kai **GAO**

Co-Author(s): Fei **LI**, Xiulan **ZHANG**

Purpose: In order to find out if the anterior choroid is involved in ocular changes during the Valsalva maneuver (VM) and the relationship between changes in different ocular parameters, we performed a cross-sectional study in healthy Chinese subjects.

Methods: This cross-sectional study used ultrasound biomicroscope (UBM) and swept-source optical coherence tomography (SS-OCT) to measure the anterior and posterior ocular biometric parameters before and during VM. Fifty-three volunteers were recruited. Intraocular pressure (IOP), blood pressure (BP), heart rate (HR), axial length (AL), and refractive error were recorded before and during VM.

Results: VM caused elevated IOP. During VM, no significant change was found in thickness of ILM, GCC, GCL, retina, or posterior choroid. There was a significant increase in anterior parameters including CBT0, CT4, and APCB but not TCA or pupil diameter (PD). Multivariate regression using GEEs model of Δ APCB showed an association between Δ APCB and sex ($P < 0.001$), baseline APCB ($P < 0.001$), baseline TCA ($P < 0.001$), Δ CBT0 ($P = 0.009$), Δ CT4 ($P = 0.011$), and Δ TCA ($P < 0.001$).

Conclusions: This is the first study to use UBM and SS-OCT to provide simultaneous measurements of the anterior and posterior choroid before and during Valsalva maneuver. We found that the VM did not affect the posterior choroid, but it did cause thickening of the ciliary body and anterior choroid. Thickening of the anterior choroid and ciliary body led to larger anterior placement of the ciliary body and narrowed anterior chamber. IOP elevation and occurrence of acute attack could be related to the anterior choroid but not posterior choroid.

Poster No.: EX1-094

Panel No.: 094, Session EX1

Morphology of the Optic Disc in the Tajimi Study Population

First Author: Naomi **MATAKI**

Co-Author(s): Makoto **ARAIE**, Aiko **IWASE**, Atsuo **TOMI-DOKORO**

Purpose: To assess optic disc morphology and disc-fovea distance (DF)/mean disc diameter (DD) ratio, as well as related factors in Japanese subjects in a population-based setting.

Methods: Digital fundus photographs obtained from 2,634 subjects, representing 87% of 3,021 participants aged 40 years or older in the Tajimi Study, a population-based glaucoma survey, were analyzed planimetrically.

Results: The disc size averaged 2.28 mm², the ovality (maximal/minimal disc diameter ratio) 1.12, and the DF/DD ratio 2.94. After adjusting for other systemic and ocular factors, the disc size was correlated with the spherical equivalent refraction (SE); the ovality and DF/DD ratio negatively with SE and disc size ($P < 0.0001$). These parameters did not differ significantly between 2,095 ophthalmologically normal eyes and 58 eyes with open angle glaucoma (OAG). The angle of the long axis of the disc with ovality of >1.10 was between 91 and 120 degrees in 53% of the subject eyes.

Conclusions: The reference data of disc morphology and DF/DD ratio in a Japanese population were provided. SE showed significantly negative correlation with disc size, and disc size and SE showed significant negative correlation with ovality and DF/DD ratio. Disc morphology and DF/DD ratio showed no significant difference between normal and OAG eyes.

Poster No.: EX1-095

Panel No.: 095, Session EX1

Multifocal Visual Evoked Potentials in Pre-Perimetric Glaucoma: A Longitudinal Study

First Author: Hema **ARVIND**

Purpose: To examine the ability of low-luminance achromatic (LLA) and blue-on-yellow (BonY) multifocal visual evoked potentials (MfVEP) to identify visual field defects in patients with pre-perimetric glaucoma who eventually develop repeatable visual field defects.

Methods: Observational, longitudinal study. Forty-nine patients with at least 1 glaucomatous disc and normal, reliable visual fields in that eye and 14 normal controls were included. All participants underwent complete ophthalmic examination including Humphrey visual fields (HVF), short wavelength automated perimetry (SWAP), frequency doubling perimetry (FDT Matrix),

Spectralis optical coherence tomography (OCT), Heidelberg Retinal Tomography (HRT 3), and color stereoscopic optic disc photographs. After the baseline visit, the tests were repeated at 6 months, then yearly. Control subjects had yearly testing. MfVEPs were recorded using LLA as well as BonY stimulation.

Results: Patients (64.89 ± 8.15 years) were followed up for 3-6 years. Twenty (29.9%) eyes showed confirmed progression on visual fields. Of those, baseline defects could be identified in 15 (75%) eyes on LLA mfVEP, 12 eyes (60%) on BonY mfVEP, 6 (30%) eyes on SWAP, 7 (35%) eyes on FDT-Matrix, and 9 eyes (45%) each on HRT and OCT. The LLA showed a significantly higher detection rate compared to the subjective perimetric tests, SWAP and FDT-Matrix ($P < 0.05$, McNemar test). The differences were not significant when LLA was compared with the structural tests.

Conclusions: LLA mfVEP identified visual field defects in 75% of eyes with pre-perimetric glaucoma, who eventually developed repeatable defects on standard white-on-white perimetry. This was significantly higher than SWAP and FDT-Matrix.

Poster No.: EX1-096

Panel No.: 096, Session EX1

Ocular Response Analyzer Parameters in Subtypes of Angle Closure

First Author: Peng Yi **TAN**

Co-Author(s): Tin **AUNG**, Monisha **NONGPIUR**

Purpose: To evaluate corneal hysteresis (CH) and intraocular pressure (IOP) measured by the Ocular Response Analyzer (ORA) and central corneal thickness (CCT) in subjects with primary angle closure suspect (PACS), primary angle closure (PAC), primary angle closure glaucoma (PACG), and previous acute PAC (APAC); and to identify the factors associated with CH.

Methods: This was a cross-sectional study of 631 subjects with angle closure (205 PACS; 132 PAC; 231 PACG; 63 APAC). CH and corneal resistance factor (CRF) were measured using the ORA. IOP by Goldmann applanation tonometry (IOP-GAT) and CCT by ultrasound pachymetry were obtained. Mean differences in the parameters among the subgroups were evaluated by analysis of variance (ANOVA). One eye per subject was assessed.

Results: The mean age \pm standard deviation of study subjects was 68.2 ± 8.0 years, with a majority of Chinese ($n = 595$; 94.3%) and women ($n = 368$; 58.3%). CH and CRF were lowest in the PACG group followed by APAC, PAC, and PACS, respectively ($P < 0.001$ for CH and CRF). CCT was lowest in the PACG group ($P = 0.002$). IOP-GAT was lowest in the PACS group but not significantly different between the other subgroups. After adjusting for age, gender, and IOP-GAT, CH persisted to be

lower in eyes with PACG ($P < 0.001$). CH was negatively correlated with age ($r = -0.20$, $P < 0.001$) and IOP-GAT ($r = -0.23$, $P < 0.001$) and positively correlated with CCT ($r = 0.36$, $P < 0.001$). On multivariate analysis, a lower CH was significantly associated with steeper corneal curvature ($\beta = -0.21$, $P < 0.001$), thinner CCT ($\beta = 0.38$, $P < 0.001$), higher IOP-GAT ($\beta = -0.18$, $P < 0.001$), and a diagnosis of PACG (compared to PACS, $P = 0.03$).

Conclusions: PACG was associated with significantly lower CH, CRF, and thinner CCT compared to PACS, PAC, and APAC.

Poster No.: EX1-097

Panel No.: 097, Session EX1

Optical Coherence Tomography Angiography for Glaucoma Diagnosis

First Author: Henry **CHEN**

Co-Author(s): Chun Hsiu **LIU**, Wei-Chi **WU**

Purpose: We investigated optic disc and peripapillary retinal vascular changes in glaucoma with optical coherence tomography angiography (OCTA) to determine the relationship of nonperfusion measurements with traditional measures of function and structure.

Methods: This was an observational cohort study. One hundred twenty-eight eyes of 80 healthy subjects and open-angle glaucoma (OAG) participants with good-quality scans were included in the analysis. Retinal vasculature information was summarized as a vessel density map and as vessel density (%), which is the proportion of flowing vessel area over the total area evaluated. The clinical features, optic disc images, and perimetric defects of both normal subjects and glaucoma patients were analyzed.

Results: In healthy eyes, a dense microvascular network around the disc was visible on OCT angiography. In glaucomatous eyes, this network was visibly attenuated globally and focally. Peripapillary retinal non-perfusions are associated with and also corresponding with areas of nerve fiber layer thinning, ganglion cell complex thinning, and visual field defects, and these diagnostic modalities are synergistic.

Conclusions: We demonstrated that OCTA based on the SSADA can detect reduced peripapillary retinal perfusion in glaucomatous eyes and can be visualized as focal defects in vivo. OCTA may add valuable new information for glaucoma assessment and has the potential to reveal the blood flow mechanism related to glaucoma.



Poster No.: EX1-098

Panel No.: 098, Session EX1

Outcome of Trabeculectomy in Primary Angle Closure Glaucoma

First Author: Duangdao THATSNARONG

Purpose: To study the outcome of trabeculectomy in patients with primary angle-closure glaucoma.

Methods: This is a retrospective study performed on data from patients with primary angle-closure glaucoma (PACG) who underwent trabeculectomy at Met-tapracharak Hospital, Thailand between January 2012 and December 2012. The outcomes of trabeculectomy were assessed in terms of final intraocular pressure (IOP), visual acuity change, and the incidence of complications. A complete success was defined as achieving IOP of 21 mm Hg or less without medication and a qualified success was defined as IOP of 21 mm Hg or less with antiglaucoma medications.

Results: A total of 36 eyes from 36 patients were reviewed. The average follow-up period was 23.5 ± 8.8 months. The overall success rate was 80.5%. A complete success in final IOP was found in 21 patients (58.3%), and a qualified success was found in 8 patients (22.2%). Two patients (5.5%) had lost 2 or more lines of Snellen acuity at the last follow-up visit compared with their preoperative visual acuity and 88.9% of patients had unchanged visual acuity at last follow-up. Bleb encapsulation and increasing cataract formation (19.4% and 16.7%, respectively) were the most frequent complications found in this study.

Conclusions: Trabeculectomy can provide a good success rate in patients with PACG. However, this procedure has risks of visual loss and some complications.

Poster No.: EX1-099

Panel No.: 099, Session EX1

Postoperative Outcomes After Ex-PRESS Shunt Implantation Compared with Trabeculectomy

First Author: Shih-Chun CHAO

Co-Author(s): Shih-Hao TZENG

Purpose: To compare the postoperative outcomes of Ex-PRESS shunt and trabeculectomy for more than 1 year of follow-up.

Methods: Information was collected from the charts of 12 eyes with consecutive Ex-PRESS procedures and 12 eyes with consecutive trabeculectomy procedures with more than 1 year of follow-up. Outcome measures included intraocular pressure, requirement of glaucoma medications, and postoperative complications.

Results: Average follow-up was 11.7 months. The

preoperative intraocular pressure was 40.2 ± 9.5 in the Ex-PRESS group and 39.9 ± 5.7 in the trabeculectomy group. The preoperative requirement of glaucoma medications was 3.1 ± 0.7 in the Ex-PRESS group and 3.5 ± 0.8 in the trabeculectomy group. Three (25%) had hypotony in the Ex-PRESS group and 1 (8.3%) in the trabeculectomy group within 1 month of follow-up. There were no intraoperative complications. The postoperative intraocular pressure was 19.7 ± 11.6 in the Ex-PRESS group and 14.8 ± 5.5 in the trabeculectomy group ($P > 0.05$). The postoperative requirement of glaucoma medications was 1.1 ± 0.6 in the Ex-PRESS group and 1.6 ± 1.1 in the trabeculectomy group ($P > 0.05$).

Conclusions: According to our study, the Ex-PRESS device provides similar IOP control to trabeculectomy. The Ex-PRESS device provides similar decreasing requirements for glaucoma drugs to trabeculectomy. Hypotony happened more in the Ex-PRESS group, we speculate due to the influence of the Ex-PRESS model and scleral flap suture. There remains a need for long-term prospective studies between the 2 procedures.

Poster No.: EX1-100

Panel No.: 100, Session EX1

Prescription Refill Monitoring at a Major Academic Center

First Author: Avni BADAMI

Co-Author(s): Manishi DESAI, Kathryn KOSTEVA

Purpose: The purpose of this study is to assess whether glaucoma medications prescribed are reaching the pharmacy, and more importantly, if patients are obtaining these medications. The first step to medication compliance is medication availability and we often find on follow-up visits that patients for various reasons are not obtaining medications. This project allows us to detect common workflow problems applicable to any major eye practice in order to improve medication compliance.

Methods: Prescription refills are requested through telephone messages, which are transcribed onto a paper refill request form and then prescribed by a physician. With institutional review board approval, for a period of 1 week, all prescription refill requests were recorded and pharmacies were contacted the week and month following prescription refill requests to determine if the requested medications were received. The data were retrospectively reviewed.

Results: In the study period, 67 patients requested 86 medications. Forty-six (53.5%) requested medications were picked up by the patient, 25 (29.0%) requested medications were filled by the pharmacy but never picked up, 11 (12.8%) requested medications were not available due to insurance coverage, and 4 (4.7%)

requested medications were previously discontinued by the physician.

Conclusions: A majority of glaucoma medication refill requests are received by patients but there still exists a large number of requested medications that are never picked up. This study provides insight into the first barrier to medication compliance: receiving the medication. Further studies are needed to implement improvement measures to increase the number of medications received by patients.

Poster No.: EX1-101

Panel No.: 101, Session EX1

Primary Angle Closure Glaucoma Susceptibility Gene PLEKHA7 Association with Tethering Forces in the Eye

First Author: Mei Chin **LEE**

Co-Author(s): Tin **AUNG**, Anita S Y **CHAN**, Walter **HUNZIKER**, Eranga **VITHANA**

Purpose: Signaling molecules that regulate contractile and tethering mechanisms are important for understanding the fundamental processes in various pathological conditions. Maintenance of barrier function is attained through the balance between actomyosin contractile and focal adhesion tethering forces. In our previous studies, PLEKHA7 was colocalized with actin in primary angle closure glaucoma (PACG)-related and blood-aqueous barrier (BAB) structures; this finding prompted us to examine the molecular mechanisms that tie PLEKHA7 with focal adhesion complexes.

Methods: Modulation of PLEKHA7 expression levels via overexpression constructs or with PLEKHA7-specific shRNA constructs in primary human trabecular meshwork (HTM) cells were analyzed for wound healing kinetics. Whole cell lysates from HTM cells were used in protein immunoprecipitation for PLEKHA7 interactors within the focal adhesion complex and cytoskeletal proteins. Frozen and paraffin-embedded human globes were sectioned and used for immunofluorescence analysis of PLEKHA7 together with phosphorylated paxillin protein within PACG-related and BAB structures.

Results: Sixty percent faster wound closure was observed if PLEKHA7 was overexpressed, while in cells with reduced PLEKHA7 levels wound closure kinetics was 30% slower compared to controls, and this could be rescued by re-expression of PLEKHA7. Endogenous immunoprecipitation of PLEKHA7 is a novel interactor of paxillin and focal adhesion kinase (FAK). Specific PLEKHA7 colocalization with paxillin within the BAB structures (nonpigmented ciliary epithelium, iris microvasculature) and PACG-related structures (iris and ciliary muscle) were also observed.

Conclusions: PLEKHA7 is a novel interactor of paxil-

lin and FAK. Colocalization of PLEKHA7 with paxillin within the BAB- and PACG-related structures suggests PLEKHA7 has a role in tethering mechanisms important for BAB function.

Poster No.: EX1-102

Panel No.: 102, Session EX1

Relationship Between Laser Speckle Flowgraphy and Optical Coherence Tomography Angiography Measurements of Ocular Microcirculation

First Author: Naoki **KIYOTA**

Co-Author(s): Hikoshi **KUNIKATA**, Toru **NAKAZAWA**, Kazuko **OMOMDAKA**, Yukihiro **SHIGA**

Purpose: To investigate the relationship between laser speckle flowgraphy (LSFG) and optical coherence tomography angiography (OCTA) measurements of ocular microcirculation in normal and open-angle glaucoma (OAG) subjects.

Methods: This study included 18 eyes of 18 OAG patients and 10 eyes of 10 age-matched healthy controls. LSFG was used to measure mean blur rate (MBR), which represents optic nerve head (ONH) microcirculation and can be divided into vessel-area MBR (MV) and tissue-area MBR (MT). OCTA was used to measure a new parameter, peripapillary relative intensity (PRI), in the superficial retina, superficial choroid, and deep choroid. The association between them was then determined.

Results: MV, MT, and PRI in the superficial retina and PRI in the superficial choroid were lower in the OAG subjects than the controls ($P = 0.02$, $P < 0.001$, $P = 0.02$, and $P = 0.008$, respectively). PRI in the superficial retina was correlated with MV and MT ($R = 0.68$, $P < 0.001$ and $R = 0.63$, $P < 0.001$, respectively). PRI in the superficial choroid was also correlated with MV and MT ($R = 0.45$, $P = 0.02$ and $R = 0.57$, $P = 0.002$, respectively). Multiple regression analysis revealed that MV and MT independently contributed to PRI in the superficial retina ($P = 0.008$ and $P = 0.04$, respectively), while only MT contributed to PRI in the superficial choroid ($P = 0.03$).

Conclusions: OCTA-measured PRI, as well as LSFG-measured MBR, may be a promising biomarker of ocular microcirculation to detect ocular diseases such as OAG.

Poster No.: EX1-103

Panel No.: 103, Session EX1

Results of FP7 Ahmed Glaucoma Valve Implantation in Advanced Glaucoma Cases

First Author: Mahmood **ALI**

Co-Author(s): James **STANDEFER**, Farah **AKHTAR**

Purpose: To assess clinical outcomes in the first 6



postoperative months in intractable glaucoma cases receiving the FP7 model Ahmed glaucoma valve (AGV) implant.

Methods: This hospital-based prospective case series included 33 eyes which had intractable glaucoma and underwent Ahmed valve FP7 implant insertion at a tertiary care eye hospital between July 2014 and February 2016. Only patients with a minimum of 6 months' follow-up were included. Success was defined as intraocular pressure (IOP) greater than 8 mm Hg and less than 18 mm Hg on the last 2 visits with a decrease of no more than 2 lines in visual acuity.

Results: Overall 18 (54.54%) eyes had controlled IOP till the last follow-up at 6 months without additional medications while 15 (45.45%) eyes required additional topical medications. Hypertensive phase was exhibited in 24 (72.72%) patients, which was controlled with topical medication in 16 (48.48%) eyes, needling in 4 (12.12%) eyes, and digital massage in 4 (12.12%) eyes. There were 6 patients (18.18%) who exhibited shallow AC on postoperative day 1 and 7. Visual acuity returned to baseline between 4 and 6 weeks after the operation. The major complications were hyphema in 10 (30.30%) eyes, choroidal detachment in 4 (12.12%) eyes, tube exposure in 2 (6.06%) eyes, iris incarceration in 1 (3.03%) eye, and decreased vision in 3 eyes (3.03%).

Conclusions: The overall success rate of FP7 AGV is comparable to that of prior studies using different implants. The incidence of serious postoperative complications is low after FP7 AGV insertion.

Poster No.: EX1-104

Panel No.: 104, Session EX1

Retinal Nerve Fiber Layer Cleavages in Glaucoma Patients

First Author: Yun **HSIA**

Co-Author(s): Jehn-Yu **HUANG**, Chien-Chia **SU**, Tsing-Hong **WANG**, Chung-May **YANG**

Purpose: To investigate the structural and functional characteristics of the retinal nerve fiber layer cleavages (RNFLc) in glaucoma patients.

Methods: This is a retrospective and observational case series. Basic ophthalmic examinations, color fundus photography, optical coherence tomography (Cirrus HD-OCT 4000, Carl Zeiss Meditec Inc), and visual field test (program 24-2, Humphrey Field Analyzer II; Carl Zeiss Meditec Inc) were performed on a 6-month basis for all patients. Progression was monitored by the guided progression analysis.

Results: We had 42 eyes in 29 subjects, and their mean age was 44.0 ± 11.5 years (range: 17-70). The average axial length was 27.1 ± 1.0 mm and the spherical equivalent was -8.10 ± 2.70 diopters (D). The most

common location was along the superior-temporal arcade (50.8%) and the lesion had more association with veins (88.5%). Morphological classification delineated cystoid space in 61 locations (100%), vascular microfold in 50 locations (82%), and lamellar holes in 28 locations (45.2%). Deviation map in Cirrus OCT showed 13% of the lesions. Corresponding visual field defect was noted in 4.9% of the locations. After 26.5 ± 13.1 months of follow-up, there was no functional or structural progression in the subjects enrolled in this study.

Conclusions: RNFLc was not associated with significant functional or structural changes in glaucoma patients after long-term follow-up.

Poster No.: EX1-105

Panel No.: 105, Session EX1

Retrospective Analysis of Real-World Data of Tafluprost 0.0015% in the Philippines

First Author: Joseph Anthony **TUMBOCON**

Co-Author(s): Anne Marie **MACASAET**

Purpose: To investigate the intraocular pressure (IOP)-lowering effect and safety of tafluprost in a routine clinical setting in the Philippines.

Methods: A retrospective review of patients on tafluprost 0.0015% (BAK 0.001% preserved) with a minimum follow-up of 3 months was conducted. The main outcome measure was mean IOP change at 3 months from baseline. Subgroup analysis was done based on therapeutic pattern and diagnosis. Other secondary outcome measures were IOP at other time points and adverse reactions.

Results: A total of 329 eyes of 177 patients with a mean age of 64.8 years and average follow-up of 8.8 months were included. The most common diagnosis was primary open-angle glaucoma (34.9%), followed by primary angle-closure glaucoma post laser iridotomy (24.0%), primary angle-closure post laser iridotomy (15.5%), ocular hypertension (14.6%), secondary glaucoma (6.7%), and normal-tension glaucoma (4.3%). The mean IOP change at 3 months from baseline (SD; mean percentage IOP change; baseline IOP; P value) was -6.18 mm Hg (SD, 4.06; -26.37% ; 23.44 mm Hg; $P < 0.001$). IOP reduction was sustained throughout the study period ($P < 0.001$). Subgroup analysis showed a 3-month mean IOP reduction of -8.34 mm Hg (SD, 2.57; -31.24% ; 26.70 mm Hg; $P < 0.001$), -5.08 mm Hg (SD, 2.86; -23.68% ; 21.45 mm Hg; $P < 0.001$), and -1.00 mm Hg (SD, 3.08; -6.31% ; 15.84 mm Hg; $P = 0.007$) for the treatment-naïve ($n = 203$), add-on ($n = 53$), and replacement therapy ($n = 73$) subgroups, respectively. Conjunctival hyperemia (14.3%) was the most common adverse reaction.

Conclusions: Tafluprost is a safe and effective IOP-lowering treatment in a routine clinical setting.

Poster No.: EX1-106
Panel No.: 106, Session EX1

Risk Factors Associated with Recurrent Disc Hemorrhage in Primary Open-Angle Glaucoma

First Author: Bo Ram **SEOL**
Co-Author(s): Jin Wook **JEOUNG**, Ki Ho **PARK**

Purpose: To evaluate the risk factors associated with recurrent disc hemorrhage (DH) in primary open-angle glaucoma (POAG).

Methods: One hundred seventy-eight eyes of 178 POAG patients (89 eyes with recurrent DH, 89 control eyes) were included in this study. Frequently recurrent DH was defined as at least 3 occurrences of DH during the follow-up period. Associations between eye-related variables and systemic variables and frequently recurrent DH were investigated by multivariate logistic regression analysis.

Results: Among the eye-related variables, higher percentage reduction of intraocular pressure (IOP) (odds ratio, 0.959; 95% confidence interval, 0.926–0.994; $P = 0.020$) decreased the risk of recurrent DH, while among the systemic variables, prone or lateral decubitus sleeping position (odds ratio, 1.999; 95% confidence interval, 1.051–3.801; $P = 0.035$) increased it, according to multivariate regression analysis results. According to our analysis of all the eye-related and systemic variables, higher percentage reduction of IOP (odds ratio, 0.963; 95% confidence interval, 0.929–0.999; $P = 0.046$) decreased the risk of recurrent DH.

Conclusions: Lower percentage reduction of IOP in POAG was associated with recurrent DH.

Poster No.: EX1-107
Panel No.: 107, Session EX1

Screening Capability and Reliability of a Newly Developed Glaucoma Screening Test Program

First Author: Natausmi **TAKAHASHI**
Co-Author(s): Kazunori **HIRASAWA**, Kazuhiro **MATSU-MURA**, Nobuyuki **SHOJI**, Kana **YAZAKI**

Purpose: To assess the reliability and screening capability of a newly developed glaucoma screening test (GST) program, which consists of 28 test points, for early and moderate glaucoma.

Methods: One hundred three eyes of 103 glaucoma patients and 38 eyes of 38 normal participants were included in this study. Glaucoma patients were divided into early glaucoma (early, Humphrey MD better than -3 dB), moderate glaucoma (moderate, Humphrey MD between -3 and -6 dB), and advanced glaucoma (advanced, Humphrey MD worse than -6 dB) groups. All

glaucoma patients and normal participants underwent the Octopus G Dynamic threshold test once and the Octopus GST twice in random order. Screening capability of GST was compared with that of the G Dynamic threshold test using area under the curve (AUC). Reliability was determined by agreement of glaucoma detection based on the best cut-off criteria as well as the agreement rate of each test point.

Results: The AUC of G Dynamic, GST1, and GST2 were 0.947, 0.864, and 0.889 in early; 0.994, 0.970, and 0.969 in moderate; and 1.000, 1.000, and 1.000 in advanced group, respectively. The AUC did not differ significantly among the methods. The agreement rates of glaucoma detection in early, moderate, and advanced groups were 81.8%, 100%, and 100%, respectively, and those of each test point were 92.6%, 83.5%, and 83.8%, respectively.

Conclusions: The screening capability and reliability of GST in early, moderate, and advanced glaucoma patients was high, suggesting that GST would be an effective clinical perimetric method for glaucoma screening.

Poster No.: EX1-108
Panel No.: 108, Session EX1

Traumatic Optic Neuropathy Secondary to Acupuncture Treatment for Glaucoma: A Case Report

First Author: Wen Yee **LEE**
Co-Author(s): Tung Wan **CH'NG**, Ahmad **SAAD**

Purpose: To report a case of traumatic optic neuropathy (TON) following acupuncture treatment for glaucoma.

Methods: Case report.

Results: A 63-year-old Chinese man with bilateral advanced primary open angle glaucoma (POAG) presented with sudden painless loss of vision in the right eye after acupuncture therapy for his glaucoma in both eyes. The right vision had dropped to 2/60 from pre-morbid vision of 6/7.5, while the left vision remained unaffected (6/9). Clinically traumatic optic neuropathy was suspected based on the finding of marked relative afferent pupillary defect (RAPD) and localized hemorrhage over the right optic disc. There was evidence of penetration of the globe as suggested by presence of localized sub-conjunctival hemorrhage over the superior temporal part of the right eye.

Conclusions: Reported adverse events of acupuncture include traumatic cataract, oculomotor nerve injury, and retinal puncture. We reported a case of clinical TON and self-sealed globe perforation following acupuncture. Main acupoints used in acupuncture treatment of glaucoma (acupoint Tongziliao GB-1 which is located lateral to the lateral canthus, acupoint Jingming



BL-1 which is located above the medial canthus, and acupoint Chengqi ST-1 which is located at the inferior border of the orbit) are anatomically predisposed to optic nerve injury and globe perforation. The needle is required to advance deeply to achieve an ache radiating to behind the eye. The acupuncture technique of this acupoint which is described in the Chinese literature has probably confused the acupuncturist from imminent globe puncture and nerve injury. Thus, anatomical understanding of the eye is essential to avoid visual threatening complications.

Poster No.: EX1-109

Panel No.: 109, Session EX1

XEN Tube: The New Surgical Device of Micro-Invasive Subconjunctival Drainage

First Author: Jacopo **GUIDOTTI**

Co-Author(s): Andre **MERMOUD**

Purpose: The aim of this study is to analyze the clinical outcomes of the XEN Tube and to establish the safety and efficacy.

Methods: Patients with established glaucoma necessitating surgical treatment were included in the study. They were followed for more than 18 months (before surgery, day 1, day 3, 1 week, and 1, 3, 6, 12, 18, and 24 months after surgery). Intraocular pressure (IOP) change, reduction in glaucoma medications, visual acuity, and safety were recorded.

Results: One hundred fifty eyes were implanted with the XEN. Mean age was 75.5 years old. Preoperative mean IOP was 19.5 mm Hg (92% of eyes treated with anti-glaucomatous drops). Postoperative mean IOP was 12.3 mm Hg including patients with complications; postoperative IOP (in patients without complications or medical treatment) was 10.8 mm Hg. Mean IOP reduced from 19.5 mm Hg (± 5.64) to 12.3 mm Hg (± 7.36). The mean number of glaucoma medications was reduced by 90%. The main long-term postoperative complication was needling (41 eyes; 27%). More specifically 28 eyes needed 1 needling, 11 eyes needed 2, and 2 eyes needed 3 needlings after 127 days on average. Anti-glaucomatous drops were instilled in 16 eyes (11%) after 127 days on average.

Conclusions: In 16 months of follow-up, there was a significant drop in IOP as well as in the number of glaucoma medications. Very few complications were reported. Needling with MMC injection was needed in 27% of cases, which indicates that fibrotic reaction remains a problem with this new technique. Further follow-up and a higher number of patients will be needed to fully understand this new technology.

Intraocular Inflammation, Uveitis & Scleritis

Poster No.: EX1-110

Panel No.: 110, Session EX1

A Case of Cat Scratch Disease First Presenting as Hypertensive Retinopathy

First Author: Chan-Wei **NIEN**

Co-Author(s): Ming-Hwei **TSAI**, Chun-Hsian **TU**

Purpose: To describe a case of ocular bartonellosis in 1 patient with bilateral sudden painless vision loss and neuroretinitis.

Methods: A case report.

Results: One 37-year-old woman came to our ophthalmologic outpatient department and complained of bilateral central scotoma and painless vision loss in the past 1 week. Measured visual acuity was counting fingers at 1 meter in the left eye (OS) and 20/20 in the right eye (OD), and blood pressure showed a hypertensive status. The funduscopy in both eyes revealed swollen optic disc, macular exudates in a stellate pattern, and flame-shaped hemorrhage. The ocular condition did not improve despite good blood pressure control. Besides, intermittent mild fever up to 37.5°C and general malaise were also noted. After physical examination, supraclavicular, periauricular, and posterior cervical chain lymphadenopathy were noted. Cat scratch disease was suspected. Serum samples were collected and *Bartonella henselae* IgG was positive at a titer of 1:1024. Cat scratch disease was diagnosed; 100 mg twice per day was prescribed and 4 weeks later, her condition improved with visual acuity of 0.7 (OS) and 0.8 (OD).

Conclusions: Cat scratch disease is not common and its clinical presentation is similar to hypertensive retinopathy. We should closely observe patients, not only in the eye area but the whole body condition.

Poster No.: EX1-111

Panel No.: 111, Session EX1

Challenging Diagnosis and Management of a Pregnant Woman with Scleritis: A Case Report

First Author: Rizki **NAULI**

Co-Author(s): Susi **HERYATI**

Purpose: To report a case of a pregnant woman with scleritis.

Methods: An observational case report. A gravida 2 para 1 28-year-old woman in the 25th week of gestation presented with a chief complaint of decreased vision in both eyes, no severe eye pain, and photophobia, preceded by headache, redness, epiphora, and

bluish appearance of both eyes. She had experienced recurrent redness of both eyes since 2 years prior. From anterior segment examination we found ciliar injection, scleral thinning with uveal shadow, and scleral staphyloma only in the left eye; cicatrix and neovascularization of cornea and posterior synechiae only in the right eye; and hazy lens in both eyes. Ultrasonography found vitreous opacity with incomplete posterior vitreous detachment of both eyes and retinal traction in the right eye. Blood test suggested high ESR, RF (-), ANA (+) with centromere pattern, and ANCA (-). The patient was diagnosed with necrotizing scleritis, anterior uveitis, corneal cicatrization, and vitreous opacity. Patient was given artificial tears and fluorometholone 0.1% eye drops.

Results: Later on, ANA profile test was performed and revealed Ro-52 recombinant (++) result. The patient was given additional methylprednisolone 1 x 48 mg/day tapered off in a week. After 3 weeks of therapy, sclera appeared less inflamed and uveal shadow was less apparent, although visual acuity remained the same.

Conclusions: Scleritis is an immune-mediated disease that has a complex pathophysiology: 40% are associated with an underlying systemic autoimmune disease and 50% remain idiopathic. One and a half necrotizing scleritis is associated with flares of underlying disease and requires therapy for both ocular and systemic disease.

Poster No.: EX1-112

Panel No.: 112, Session EX1

Clinical Features and Treatment Response of Patients with Granulomatous Uveitis from a Tertiary Hospital in the Philippines

First Author: James Paul GOMEZ

Purpose: To determine the clinical characteristics and treatment response of patients with granulomatous uveitis [tuberculous (TB) uveitis, Vogt-Koyanagi-Harada (VKH) disease, sympathetic ophthalmia (SO)].

Methods: Retrospective analysis of patients with granulomatous uveitis from June 2006 to June 2015. Eyes were designated as either acute or chronic disease based on the Standardization of Uveitis Nomenclature (SUN) classification. Treatment was deemed successful if there was visual acuity (VA) improvement from baseline. Data was analyzed using descriptive and correlational tests.

Results: Sixty eyes of 37 patients were included in this study. There were 13 (19 eyes), 18 (35 eyes), and 6 (6 eyes) patients with TB uveitis, VKH, and SO, respectively. Mean age was 38.51 years (range, 16-75 years) including 35 males and 25 females. Eyes were

categorized into 20 acute cases and 40 chronic cases. The mean visual acuity at baseline and final consult were 1.24 and 0.99 logMAR units, respectively. Overall, there was an improvement in VA in all groups. However, there was no statistically significant difference in baseline and final among the 3 ($P = 0.14, 0.58$). Visual acuity deterioration was associated with younger age ($P < 0.05$) and increased intraocular pressure at baseline ($P < 0.05$). There was also a weak association between female sex and visual acuity improvement ($P = 0.10$).

Conclusions: Overall, there were 36 eyes with treatment success compared to 24 eyes which failed to show VA improvement. SO appears to have the most favorable prognosis, as all eyes in this group showed VA recovery. Treatment inadequacies and the development of ocular complications hindered treatment success.

Poster No.: EX1-113

Panel No.: 113, Session EX1

Comparison of Ocular Syphilis Phenotypes Between HIV-Infected and Non-HIV Adult Patients

First Author: Yan Yee HAH

Co-Author(s): Rupesh AGRAWAL, Su Ling HO, Stephen TEOH, Sae Cheong YAP

Purpose: The incidence of new infection with syphilis has increased worldwide over the past 2 decades and is notably more common among individuals co-infected with human immunodeficiency virus (HIV). Our aim was to compare the clinical manifestations and characteristics of ocular syphilis among HIV-positive and HIV-negative patients.

Methods: A retrospective study was done on patients diagnosed with ocular syphilis at a tertiary referral eye care center in Singapore between January 2005 and October 2015. Demographic characteristics, clinical presentations, investigations such as syphilis and HIV confirmatory tests, lumbar puncture, and pre- and post-treatment visual outcomes were recorded.

Results: Thirty-two eyes of 21 (16 eyes in 11 HIV-positive and 16 eyes in 10 HIV-negative) patients were included. All patients were male, with median age at presentation of 50 years. A total of 7 eyes had panuveitis and they all occurred in the HIV group. Acute anterior uveitis was the commonest presentation in the non-HIV group (7/16 eyes). Neurosyphilis was more common in the HIV-positive group (7/9 patients). The outcome of ocular syphilis post-treatment was generally good with most (23/32 eyes, 71.9%) having good visual acuity of 6/12 or better in the affected eye with similar distribution seen in both groups.

Conclusions: Patients with HIV co-infections presented



differently with ocular syphilis from non-HIV patients with higher likelihood of panuveitis and neurosyphilis. The higher rate of neurosyphilis warrants a routine lumbar puncture in all HIV-positive patients presenting with ocular syphilis. Prompt diagnosis and treatment of ocular syphilis can result in good outcomes even in HIV co-infected patients.

Poster No.: EX1-114

Panel No.: 114, Session EX1

Endophthalmitis Associated with Corneal Suture: Series of Delayed-Onset Stitch Abscess

First Author: Yueh-Chang **LEE**

Co-Author(s): Nancy **CHEN**

Purpose: To describe 3 cases of endophthalmitis secondary to corneal sutures.

Methods: A retrospective review was done of 3 patients who presented over a period of 2 months with corneal suture-related bacterial stitch abscess that progressed to endophthalmitis. Intracameral, intravitreal, topical, and systemic antibiotics were used to control the infection.

Results: All 3 patients had 10-0 nylon corneal suture over 11 o'clock, complicated with stitch abscess and hypopyon. Despite intensive intracameral, intravitreal, topical, and systemic broad-spectrum antibiotic treatment for suture-related infective keratitis, the prognosis of endophthalmitis varied in these patients. One patient was discharged after the infection was controlled. Another patient was discharged against medical advice because the endophthalmitis had a rapid downhill course. The other patient was treated with corneal patch graft repair of perforated keratitis and was discharged after the infection was controlled afterwards. The visual acuity upon discharge ranged from no light perception to 20/100.

Conclusions: In spite of prompt diagnosis and treatment, prognosis varies among patients with corneal suture-related endophthalmitis. If corneal suture is left in situ postoperatively, patients should be educated about possible complications of corneal sutures.

Poster No.: EX1-115

Panel No.: 115, Session EX1

Growth Hormone Releasing-Hormone Receptor Antagonist Inhibits Synthesis and Secretion of Pro-Inflammatory Cytokines in Explant Cultures of Rat Iris and Ciliary Body During Lipopolysaccharide-Induced Inflammation

First Author: Jialin **REN**

Co-Author(s): Sun On **CHAN**, Puiying **LEUNG**, Calvin **PANG**, Qiuxiao **YU**

Purpose: A recent study showed that growth hormone releasing-hormone receptor (GHRHR) antagonist MIA-602 is a potent anti-inflammatory agent for endotoxin-induced uveitis in adult rats. We explored whether this phenomenon occurs directly in the iris and ciliary body, which express high levels of GHRHR, without the influence of circulating leukocytes.

Methods: Male Sprague Dawley rats (220~240 g) were anesthetized and perfused with sterile saline. Ciliary body and iris were cultured in the upper chamber of Transwell. The explants were pre-incubated with MIA-602 (1 μ M) for 1 hour followed by exposure to 100 ng/mL lipopolysaccharide (LPS) for 24 hours. Control preparations were treated with LPS only. The tissues were processed for RT-PCR, Western blots, and immunocytochemistry. The medium was collected for ELISA to detect secretion of inflammatory cytokines. All data were analyzed by Mann-Whitney tests.

Results: GHRHR increased significantly both in mRNA (2.40-fold, $P < 0.05$, $n = 5$) and protein levels (1.47-fold, $P < 0.01$, $n = 8$) in ciliary body and iris explants after LPS treatment. Immunocytochemistry showed that the increased GHRHR staining was localized in the ciliary and iris epithelial cells. RT-PCR showed that interleukin 6 (IL-6), interleukin-1 β , and inducible nitric oxide synthase were decreased in the MIA-602 group when compared with the LPS group ($P < 0.05$, $n = 8$). ELISA assays showed that the surge in IL-6 protein after LPS treatment was suppressed significantly when the tissues were pretreated with MIA-602 ($P < 0.05$, $n = 4$).

Conclusions: The findings indicate that iris and ciliary epithelial cells respond directly to LPS stimulation by upregulating GHRHR and producing inflammatory cytokines. GHRHR antagonist has high therapeutic potential for treatment of uveitis. (Supported by Hong Kong General Research Fund-CUHK14113815).



Poster No.: EX1-116
Panel No.: 116, Session EX1

OASIS Report 4: Analysis and Outcome of 80 Patients with Herpetic Anterior Uveitis at a Tertiary Referral Eye Care Center in Singapore

First Author: Rosalynn **SIANTAR**
Co-Author(s): Rupesh **AGRAWAL**, Su Ling **HO**, Rachel **LIM**, Stephen **TEOH**, Elizabeth **WONG**

Purpose: Herpetic uveitis is a common cause of anterior uveitis (AU). We investigated the epidemiology, clinical features, and treatment outcome of herpetic AU in an Asian population.

Methods: This is a retrospective observational study of Asians from 2005-2014 at a Singapore tertiary referral eye center. Patients with clinically diagnosed herpes simplex (HSV) and varicella zoster virus (VZV) AU were included. The patients' data collected were age, gender, race, presenting visual acuity (VA) and at last follow-up, presenting symptoms and signs, anterior chamber (AC) tap results, treatment regimen, and recurrences if any.

Results: Eighty patients were included. The mean age was 56.8 ± 16.3 (11-93) years. The commonest presenting symptoms were eye redness, pain, and blurring of vision. Mean presenting VA (Snellen logMAR) was 0.39 and improved by last follow-up to 0.21 ($P < 0.001$). The commonest presenting signs were AC inflammation in all patients (graded by SUN classification), followed by keratic precipitates (82.50%) and stromal edema (33.75%). A total of 56.2% of patients had AC reaction of 2+ and above. Thirty cases were HSV and 50 were VZV related. A total of 27.5% of patients had an AC tap; 7.5% were HSV-positive and 1.25% were VZV-positive. Complications included raised intraocular pressure (31.25%) and corneal scarring (26.25%). A total of 91.3% of patients had oral acyclovir, 65.8% had acyclovir ointment, and 11.2% had oral prednisolone with significant heterogeneity in duration of treatment.

Conclusions: In our study, herpetic AU patients commonly presented with eye redness and AC inflammation. We found significant heterogeneity in treatment regimens. Almost half the patients had recurrence warranting prolonged therapy with oral acyclovir.

Poster No.: EX1-117
Panel No.: 117, Session EX1

Ocular Autoimmune Systemic Inflammatory Infectious Study (OASIS) Report 2: Investigations, Complications, and Treatment

First Author: Muhammad Amir **BIN ISMAIL**
Co-Author(s): Rupesh **AGRAWAL**, Elizabeth **CHEN**, Su Ling **HO**, Stephen **TEOH**

Purpose: To identify the investigations, complications,

and management of ocular inflammatory disease at a tertiary referral eye care center in Singapore over a 12-year period.

Methods: Retrospective study of the clinical records of 2200 consecutive new cases from the Ocular Autoimmune Systemic Inflammatory Infectious Study (OASIS) database from 2004-2015. Analysis of the database was done to report investigations, complications, and management in patients with ocular inflammation.

Results: The most common investigation done in our patients was complete blood count (43.9%) and inflammatory markers [ESR (41.3%) and CRP (34.1%)]. A total of 24.6% of patients were treated with systemic corticosteroids, 8.7% of patients required additional immunosuppressants, and 0.9% required additional immunosuppressants and biologic agents. The most common complications seen were raised intraocular pressure (IOP) (16.0%), followed by cystoid macular edema (2.7%) and cataract (2.6%).

Conclusions: Ocular inflammation represents a significant proportion of patients presenting to the tertiary eye clinic, with inherent complications. A comprehensive clinical examination, coupled with relevant investigations, is needed to establish the correct diagnosis and guide subsequent management.

Poster No.: EX1-118
Panel No.: 118, Session EX1

Preclinical Safety Evaluation of Anti-Angiogenic Agents and Biodegradable Nanoparticles Following Intravitreal Injection in Rabbits

First Author: Yong **LI**
Co-Author(s): Ben Alfyan **ACHIRN ZAMAN**, Joanna Marie **BUSOY**, Jay Ji-Ye **WEI**

Purpose: The purpose of this study was to evaluate safety and tolerability of anti-angiogenic agents, a small peptide in Dutch-belted (DB) rabbits and biodegradable nanoparticles in New Zealand white (NZW) rabbits, over 8 weeks from a single intravitreal (IVT) injection.

Methods: The anti-angiogenic small peptide and the nanoparticles were formulated in a fixed volume with a single dose of the intravitreal injection. Ocular inflammation was evaluated in preclinical observation using slit lamp for anterior segment screening. Retinal toxic effects were determined by the profile of fundus photographic images, fluorescein angiography (FA), and optical coherence tomography (OCT). All imaging was performed at baseline and scheduled time points in conscious animals that were manually restrained.

Results: A mild inflammatory reaction in the anterior chamber was observed from 1 day to 3 weeks after the intravitreal injection of the small peptide in DB rabbits



and the nanoparticles in the NZW rabbits. SUN grading with aqueous flare of 1+ to 2+ and 0.5+ for 1–5 cells per field peaked at 3 days after the injection and resolved in 3 weeks subsequently. No retinal toxic effects were identified by fundus photography, OCT, as well as FA during the study period.

Conclusions: A single intravitreal administration of the anti-angiogenic small peptide and the nanoparticles included an early onset uveitic reaction by slit-lamp examinations in rabbits. No retinal safety concerns were identified from the preclinical observations and evaluations.

Miscellaneous

Poster No.: EX1-119

Panel No.: 119, Session EX1

Changes in Intraocular Temperature Under Various Environmental Conditions (Animal Study)

First Author: Oleg **ZADOROZHNYI**

Co-Author(s): Valeriya **MYRZENKO**, Volodymyr **NAUMENKO**, Rudolph **NAZARETYAN**, Nataliya **PASYECHNIKOVA**

Purpose: To study ocular temperature distribution in the rabbit in dependence on ambient temperature.

Methods: To measure ocular temperature a thermoelectric device was developed; the latter consisted of a microprocessor module, polytetrafluoroethylene microprobes (diameter, 0.6 mm) with thermocouple sensors and computer software for visualization and registration of temperature parameters in real time. The device allows measurements (every 4 seconds) in the temperature range from 10°C to 120°C with $\pm 0.05^\circ\text{C}$ accuracy. The experiment was conducted on 21 rabbits (42 eyes) which were divided into 3 groups. Group 1 consisted of 11 rabbits (22 eyes), the ocular temperature measurements of which were made at ambient temperature with the range of 23°C to 24.5°C, while groups 2 and 3 consisted of 5 rabbits (10 eyes) each with ambient temperatures with the range of 14.5°C to 15.5°C and 30°C to 32°C, respectively.

Results: The lowest temperature was noted on the outer corneal surface, and then it increased gradually in the inner segments of the eye and reached its maximum in the retina and subtenon space. A mean temperature gradient between the outer corneal surface and the retina was 3.23°C, 4.68°C, and 3.85°C in groups 1, 2, and 3, respectively. No significant difference between temperatures in the left and right eyes of the experimental animals was observed.

Conclusions: Raising and lowering the ambient temperature increases the temperature gradient between

the external and internal structures of the rabbit eye.

Neuro-Ophthalmology

Poster No.: EX1-120

Panel No.: 120, Session EX1

Beneficial Plasmapheresis Response in Neuromyelitis Optica-Related Optic Neuritis

First Author: Shaoying **TAN**

Co-Author(s): Shihui **WEI**, Jie **ZHAO**

Purpose: To determine the clinical characteristics associated with the response of plasmapheresis, a beneficial rescue therapy, in steroid-refractory neuromyelitis optica-related optic neuritis (NMO-ON).

Methods: Forty-four acute, steroid-refractory NMO-ON patients with 72 affected eyes were prospectively recruited and treated with a succession of plasma exchange (PE). The association of clinical, radiographic, and serological features with beneficial plasmapheresis response was statistically identified by univariate and multiple mixed effect logistic regression.

Results: Best-corrected visual acuity improvement was observed in 51.4% (37 eyes) of the affected eyes. Younger patients had a higher success rate of plasmapheresis ($P = 0.006$). Unobserved optic nerve atrophy ($P = 0.046$) and remaining pupillary reflex ($P = 0.008$) were associated with favorable response independently. There was no difference of visual outcomes among the lesions presenting on optic nerves alone or coexisting with brain and spinal cord lesions in magnetic resonance imaging (MRI). No association was found between NMO-IgG (Aquaporin-4 Antibody, AQP4-Ab) serostatus and plasmapheresis response.

Conclusions: A minimal structural and functional defect of the optic nerves in younger patients is suggested to be the determinant of effectiveness of plasmapheresis in neuromyelitis optica-related optic neuritis.

Poster No.: EX1-121

Panel No.: 121, Session EX1

Bilateral Optic Neuritis Post Human Papillomavirus Vaccination: A Case Report

First Author: Michael **NGU**

Co-Author(s): Adil **HUSSEIN**, T **NORINA**

Purpose: To report a rare case of bilateral optic neuritis post human papillomavirus (HPV) vaccination.

Methods: A case report.

Results: A 13-year-old Malay girl presented with sudden onset of bilateral blurring of vision for 3 days. Left vision was worse than right. It was associated with pain

on eye movement. She had received the first dose of HPV vaccination 3 weeks prior to presentation followed by upper respiratory tract infection. Other systemic review was unremarkable. Her visual acuity was impaired in both eyes with counting fingers in the right eye and hand movements in the left eye. The optic nerve functions were also reduced in both eyes with no relative afferent pupillary defect. Both anterior segments were normal. Fundus examination revealed bilateral hyperemic swollen discs. Computerized tomography (CT) of orbits suggested bilateral optic neuritis. Patient was treated with corticosteroid regime according to the Optic Nerve Treatment Trial. She responded well and the optic nerve functions improved.

Conclusions: Optic neuritis post HPV vaccination is a rare condition. Early diagnosis enabled us to initiate treatment early and prevent further progression of the disease.

Poster No.: EX1-122

Panel No.: 122, Session EX1

Clinical Features of IgG4-Related Ophthalmic Disease

First Author: Bo WAN

Purpose: To evaluate the ocular manifestations and specificity of IgG4-related ophthalmic disease (IgG4-ROD).

Methods: Four IgG4-ROD patients with orbital manifestations were reviewed from May 2015 to June 2016.

Results: There were 3 males and 1 female in 4 IgG4-ROD patients with an average age of 49 years. All patients, 2 of whom also showed autoimmune pancreatitis or hypophysitis, presented with an enlargement of bilateral lacrimal glands, distinctive features of IgG4-ROG on MRI, and elevated serum IgG4 concentrations. Lacrimal gland biopsy had been done in 1 with positive histopathological and immunohistochemical results for IgG4-ROD. All patients had an effective treatment outcome after corticosteroid therapy.

Conclusions: IgG4-ROD with typical features of ocular as well as systemic manifestations and susceptibility to corticosteroid treatment could be diagnosed correctly. The imaging examinations, either with ocular B scan or MRI, and laboratory tests are very significant in diagnosis. Biopsy of enlarged glands is the key to an accurate diagnosis.

Poster No.: EX1-123

Panel No.: 123, Session EX1

Clinical Features of Neurosyphilis as an Initial Finding of Optic Neuritis

First Author: Shanshan CAO

Co-Author(s): Hong LI, Shaoying TAN, Shihui WEI

Purpose: To study the characteristics of neurosyphilis as an initial finding of optic neuritis for better treatment.

Methods: Retrospective analysis of clinical data of 16 cases (27 eyes) with neurosyphilis as an initial finding of optic neuritis from October 2010 to December 2012 in General Hospital of PLA. Clinical features were collected and analyzed.

Results: The mean age of scheduled patients was 49.63 ± 9.05 years. There were 11 cases (68.8%) involving both eyes; all cases showed impaired vision with different levels. Lumbar puncture was requested and performed for all patients. The cerebrospinal fluid (CSF) Treponema pallidum particle agglutination assay (TPPA) analysis was positive in 16 patients. The CSF cell count increase involved 9 (56.3%) patients and 10 (62.5%) cases presented with increased CSF protein level.

Conclusions: Syphilitic optic neuritis is a condition that manifests with severe visual loss and is prone to involving both eyes. Additionally, some patients have a smaller pupil diameter. Due to the particularity of the infective routes of the disease, patients often conceal their history; besides, the manifestations of ocular syphilis are complicated, which results in misdiagnosis or no diagnosis. Clinical manifestations combined with detailed history and signs of serum and cerebrospinal fluid examination can guide accurate diagnosis and protect against permanent vision loss.

Poster No.: EX1-124

Panel No.: 124, Session EX1

Demographic Profile of Patients Presenting to a Neuro-Ophthalmology Clinic of a Tertiary Eye Care Center

First Author: Rohit SAXENA

Co-Author(s): Rebika DHIMAN, Pradeep SHARMA, Digvijay SINGH

Purpose: To evaluate the clinical and demographic profile of neuro-ophthalmic disease at a tertiary care center.

Methods: A retrospective review of hospital records was conducted at a tertiary level eye care center during 1 year. All patients with neuro-ophthalmic disease were evaluated at the neuro-ophthalmology clinic where they underwent a detailed clinical history and examination to establish the diagnosis.



Results: A total of 30,111 patients visited the ophthalmology outpatient department of our center, of which 1597 (5%) were suspected to have a neuro-ophthalmic disease and were referred to the specialized neuro-ophthalmology clinic for detailed evaluation. The mean age of the referred patients was 31 years (31 ± 19.53) with a male predominance. Among 1597 patients, optic nerve disorders were noted in 63.8% ($n = 1020$), cranial nerve palsy in 7% ($n = 114$), cortical visual impairment in 6.5% ($n = 105$), while 6% ($n = 96$) were miscellaneous disorders including disc hypoplasia, blepharospasm, optic nerve head drusen, etc. Among the patients with optic nerve disorders, primary optic neuropathy (traumatic optic neuropathy, hereditary neuropathy, tumor-related neuropathy, retrobulbar neuritis, toxic neuropathy, and neuropathy of unknown cause) was noted in 42.8% ($n = 685$) and secondary optic neuropathy (ischemic optic neuropathy, post papilloedema optic neuropathy, post-papillitis, neuroretinitis, inflammatory optic neuropathy) was noted in 20.9% ($n = 335$). A total of 16.4% ($n = 263$) of patients were wrong referrals.

Conclusions: Traumatic and ischemic optic neuropathies form a large number of cases referred to a neuro-ophthalmology clinic and research to identify appropriate treatment options for these growing potentially blinding disorders is essential.

Poster No.: EX1-125

Panel No.: 125, Session EX1

Discrepancy Between OCT Measurements and Visual Function in Non-Glaucomatous Optic Neuropathy

First Author: Noel **CHAN**

Co-Author(s): Carmen **CHAN**, Jerry Ka-Hing **LOK**

Purpose: Optical coherence tomography (OCT) has been widely employed to evaluate optic nerve pathology. Current literature has demonstrated good correlation between visual function and retinal nerve fiber layer thickness (RNFLT) in glaucoma and other optic neuropathies such as compressive optic neuropathy or MS-related optic neuritis.

Methods: We identified 3 young patients with bilateral optic atrophies from our neuro-ophthalmology clinic who demonstrated marked discrepancies between visual function and OCT findings.

Results: Two of them had bilateral optic neuritis and 1 had suffered from tuberculosis meningitis. Upon recovery, all of them enjoyed good visual acuities with normal visual fields despite having a mean peri-papillary RNFLT of 68.33 μm .

Conclusions: Although OCT findings usually correlate well with visual function and they are useful for objec-

tive monitoring in most optic neuropathies, exceptions do exist as demonstrated in our study. Clinical correlation with caution is prudent in OCT interpretation, especially for young patients.

Poster No.: EX1-126

Panel No.: 126, Session EX1

Giant Cell Arteritis with Ophthalmic Artery Occlusion: A Case Report

First Author: Hui-Chen **CHENG**

Co-Author(s): Han-Chung **LIU**, An-Guor **WANG**

Purpose: To report a case of giant cell arteritis with ophthalmic artery occlusion.

Methods: Case report.

Results: A 91-year-old male complained of sudden visual loss in the right eye for 1 day. His visual acuity (VA) was no light perception in the right eye and 6/60 in the left eye. The color sense was 0/15 and 11/15 in the right and left eyes separately using Ishihara color plates. Relative afferent pupillary defect was noted in the right eye. Fundoscopy showed grayish color of the retina in the right eye and fluorescein angiography (FAG) showed delayed filling in both retina and choroid in the right eye. Visual field (VF) examination revealed total obscuration in the right eye. Blood tests showed significant elevated C-reactive protein (CRP, 17.26 mg/dL) and erythrocyte sediment rate (ESR, 93 mm/hr). Brain magnetic resonance imaging (MRI) revealed perineural enhancement in bilateral optic nerves and absent flow in right ophthalmic artery. The patient then received steroid pulse therapy under the impression of giant cell arteritis (GCA). Subsequent temporal artery biopsy confirmed the diagnosis of GCA. Two months after diagnosis, his VA improved to counting fingers in the right eye and 6/30 in the left eye. The FAG also showed improved retinal and choroidal flow in the right eye.

Conclusions: We reported a case of GCA with ophthalmic artery occlusion. Despite the rarity of GCA in Asian countries, high clinical vigilance was still needed for an old patient with sudden visual loss and elevated CRP/ESR.

Poster No.: EX1-127

Panel No.: 127, Session EX1

Intravitreal Bevacizumab Injections Induced Posterior Reversible Encephalopathy Syndrome with Persistent Brain MRI Changes

First Author: Meng-Chun **CHIANG**

Co-Author(s): Lee-Jen **CHEN**

Purpose: Posterior reversible encephalopathy syndrome (PRES) is a clinical syndrome characterized by

typical neuroimaging features and symptoms including visual disturbances, headache, seizures, and altered consciousness. A few cases of PRES associated with intravenous bevacizumab have been reported, but there has been only 1 case of PRES associated with intravitreal bevacizumab (IVB) injections in the literature. Here we present a unique case of PRES with irreversible brain MRI changes after IVB injections.

Methods: Case report.

Results: A 47-year-old male, without any past ocular or medical diseases, presented with metamorphopsia in the left eye for several months. Ophthalmological examination revealed polypoidal choroidal vasculopathy, and the patient received 2 IVB injections. Three months later, he came back complaining of sudden headache and loss of vision. Brain MRI revealed multiple, small, bilateral periventricular deep and subcortical white matter signal changes over the frontal and parietal-occipital lobes. Oral prednisolone was given, and the patient's headache and visual disturbance resolved within days after treatment. A follow-up brain MRI 3 months later revealed persistent high signal intensity spots unchanged in the involved areas.

Conclusions: To the best of our knowledge, this is the first case of IVB injection-associated PRES with irreversible brain MRI changes. Clinicians should be vigilant of the possibility of PRES after IVB injections, especially for patients who develop headache and visual changes. Controlling risk factors such as blood pressure before and after IVB treatment should also be emphasized.

Poster No.: EX1-128

Panel No.: 128, Session EX1

New Optical Migraine Axis: Study of Corneal Nerve Changes and Aberrations

First Author: Rashmi **DESHMUKH**

Co-Author(s): Tushar **GROVER**, Rohit **SHETTY**, Rushad **SHROFF**

Purpose: The current study investigates the role of a dysfunctional tear film and ocular aberrations as possible triggers in migraine and the changes in corneal nerves in relation to the ocular symptoms of migraine.

Methods: Thirty eyes of 15 patients with migraine and photophobia formed group 1, 30 eyes of 15 patients with migraine without photophobia formed group 2, and 30 eyes of 15 controls formed group 3. Dry eye evaluation included Schirmer test, tear film break-up time, corneal esthesiometry, and lipid layer analysis using Lipiview interferometer (TearScience, Morrisville, NC). Wavefront aberrations were measured using Optical Path Difference (OPD III, Nidek, Japan). The intraocular light scatter was quantified using the objective scatter index (OSI) of the optical quality analysis system (OQAS; Visiometrics, Terrassa, Spain). The corneal

nerves from central cornea were assessed by confocal imaging (Heidelberg Engineering GmbH) using a 400 x 400 μm^2 frame followed by quantitation (CC Metrics, UK). Measured parameters were compared between the 3 groups using ANNOVA test.

Results: Statistically significant differences were found between total aberrations, higher order aberrations, Lipiview interferometric coloric units, and OSI ($P < 0.05$) between patients of migraine as compared to normal. Significant differences in corneal nerve parameters were found in patients of all 3 groups.

Conclusions: Ocular aberrations and tear dysfunction are higher in patients with migraine as compared to controls. Ocular surface disease adds to the aberrations and they together acting as potential triggers. Corneal nerve alterations may have a role to play in ocular symptomatology in migraine.

Poster No.: EX1-129

Panel No.: 129, Session EX1

Ophthalmic Manifestation in Pituitary Involved Granulomatosis with Polyangiitis: A Case Report and Literature Review

First Author: Xia **ZHANG**

Co-Author(s): Jin **MA**, Yong **ZHONG**

Purpose: Pituitary involved granulomatosis with polyangiitis (GPA) are extremely rare. Here we present a pituitary GPA that resulted in bilateral blindness and review the presentations of ocular, chiasmal, and cranial nerve involvement in all 50 cases of pituitary GPA.

Methods: Case report and literature review.

Results: A 20-year-old Chinese man was referred for repeated fever, headache, diplopia with best corrected visual acuity (BCVA) of 10/20 bilaterally, ptosis, and right side abduction restricted. VF showed bitemporal hemianopsia. Laboratory test showed hypothyroidism and negative autoimmune marks. MRI showed enlarged pituitary gland. He was diagnosed with lymphocyte hypophysitis and was treated with IV dexamisone and recovered in 2 months. Two years later he was back for recurrence of headache. With oral prednisone therapy, his right eye visual acuity rapidly decreased to hand movements (HM) in 1 month. Repeat MRI showed new invasive suprasellar CNS lesion. All infection and autoimmune related tests showed negative results. His right eye visual acuity decreased to no light perception (NLP) in 6 days, followed by left eye visual acuity decrease to NLP in 2 weeks. A craniotomy biopsy was conducted and suggested granulomatosis with polyangiitis. Treated with IV methylprednisolone, he claimed complete remission of symptoms. MRI after 15 months of follow-up showed no recurrence.

Conclusions: In a literature review we found ocular

involvement in 35% of pituitary GPA, including visual field defect, visual loss, scleritis, and diplopia. Visual field defects are always related to anterior lobe defects. Progressive visual loss means the lesion was invasive and always means recurrence and bad prognosis.

Poster No.: EX1-130

Panel No.: 130, Session EX1

Optic Neuropathy and Visual Loss Due to Posterior Ethmoidal Mucocele: Interventional Case Report

First Author: Preethi JAYABAL

Purpose: To report an interesting case of optic neuropathy secondary to a posterior ethmoidal mucocele.

Methods: A 60-year-old female presented with progressive blurring of vision in the left eye for a year. Clinical examination revealed visual acuity (VA) of 6/9, relative afferent pupillary defect (RAPD), dyschromatopsia, optic disc pallor, and marked limitation of inferior visual field on perimetric testing. Neuroimaging showed a heterogenous mass arising from the left posterior ethmoidal cell causing compression of the left orbital apex and optic nerve. She underwent endoscopic sinus surgery; intraoperative findings of a mucocele within the left posterior ethmoid sinus causing erosion of medial orbital wall up to the lateral optic strut and an area of bony dehiscence of the roof of the posterior ethmoid with exposed dura were noted. Anterior and posterior ethmoidectomy and complete endoscopic marsupialization of the mucocele was performed.

Results: The patient demonstrated dramatic recovery of VA to 6/6, improvement of dyschromatopsia, and visual field defects the next day after surgery. Histopathological examination of the excised specimen confirmed the mucocele. Cultures were negative for bacterial and fungal growth.

Conclusions: Although mucoceles are benign lesions, posterior ethmoidal mucoceles may cause compressive optic neuropathy due to their location. Surgical decompression should be considered for visual recovery regardless of the timeline of presentation.

Poster No.: EX1-131

Panel No.: 131, Session EX1

Optical Coherence Tomography Angiography in a Patient with Optic Atrophy After Non-Arteritic Anterior Ischemic Optic Neuropathy

First Author: Tomoaki HIGASHIYAMA

Co-Author(s): Yasuhiro NISHIDA, Masahito OHJI

Purpose: To report retinal perfusion in an eye with non-arteritic anterior ischemic optic neuropathy (NAION) using optical coherence tomography (OCT)

angiography.

Methods: A case report.

Results: A 75-year-old female noticed an inferior visual field (VF) defect in the right eye. The critical flicker frequency was 28 Hz in the right eye and 35 Hz in the left eye. A relative afferent pupillary defect was detected in the right eye. Slit-lamp biomicroscopy revealed edema of the optic disc in her right eye. Fluorescein angiography showed hypoperfusion in the superior temporal area. VF testing showed an inferior VF defect in the right eye. Magnetic resonance imaging did not show high intensity in the right optic nerves. A diagnosis of NAION was made in the right eye. The inferior VF defect in the right eye did not change after the onset. Retinal nerve fiber layer (RNFL) loss and ganglion cell complex (GCC) loss in the upper retina were seen in the right eye after onset. OCT angiograms of the disc and the macula showed decreased retinal perfusion in the upper retina of the right eye.

Conclusions: Decreased retinal perfusion in the retina was shown noninvasively by OCT angiography, corresponding to the RNFL loss and GCC loss due to NAION.

Poster No.: EX1-132

Panel No.: 132, Session EX1

Predictive Value of Infraorbital Nerve Enlargement in Detecting IgG4-Related Orbital Disease

First Author: Sieh Yean KIEW

Co-Author(s): Anita CHAN, Si Rui NG, Sunny SHEN

Purpose: To suggest a reproducible method for radiological measurement of the infraorbital nerve (ION), report normal values in our population, and to compare these to measurements taken from patients with biopsy-proven IgG4-related orbital disease (IgG4-ROD) and other orbital inflammatory diseases.

Methods: Retrospective case-controlled review of 179 thin-slice (3 mm) CT images was performed. Seventy-six scans were performed for unilateral facial fracture or blunt trauma (normal/non-inflammatory controls), 37 scans for severe thyroid eye disease, and 66 CT scans performed in cases of biopsy-proven orbital inflammation (17 IgG4-ROD, 23 cases of orbital lymphoma, 26 cases of idiopathic orbital inflammation). The diameter of the ION was measured by 2 assessors in 2 dimensions at the equator and at the first retrobulbar cut.

Results: ION diameter in normal non-inflammatory controls was 3.54 mm (± 0.49 mm, SD) at the equator of the globe and 3.34 mm (± 0.51 mm, SD) at the first retrobulbar cut. ION diameter was significantly larger in the IgG4-ROD group compared to both normal non-inflammatory [$P = 0.002$, Mann-Whitney U with Bonferroni correction (significance level 0.02)] and

non-IgG4 orbital inflammation groups ($P = 0.016$). No statistical difference was detected in ION diameter between normal non-inflammatory controls and those with non-IgG4-related orbital inflammation ($P = 0.030$). Receiver operator curve analysis identified an ideal cut-off value of 4.45 mm for identifying patients with IgG4-ROD (sensitivity 68.8%, specificity 95.1%).

Conclusions: This study defines the CT measurements of the normal ION in our Southeast Asian population as 3.34 mm (± 0.51 mm, SD) at the first retrobulbar cut and suggests a cut-off value of 4.45 mm to define ION enlargement.

Poster No.: EX1-133

Panel No.: 133, Session EX1

Risk Factors Differentiating Non-Arteritic Anterior Ischemic Optic Neuropathy Between Young and Elderly Patients

First Author: Shanshan CAO

Co-Author(s): Hong LI, Shaoying TAN, Shihui WEI

Purpose: To analyze clinical differences between young and elderly patients with non-arteritic anterior ischemic optic neuropathy (NAION).

Methods: A total of 255 patients with NAION were divided into young patients (group A) and elderly patients (group B). Neuro-ophthalmic examination, vertebral artery ultrasound, 24-hour ambulatory blood pressure monitoring, and magnetic resonance imaging were performed in these patients to identify features related to NAION.

Results: Risk factors including hypertension, diabetes, smoking, and cup-to-disc ratio were compared between these 2 groups. Compared to 6.84% in group B, the incidence of homocysteine was 18.46% in group A ($P = 0.01$). Anticardiolipin antibody syndrome was 7.70% in group A, significantly higher than that of 1.05% in group B ($P = 0.013$). Otherwise, diabetes was 29.23% in group A, which was lower than that of 50.00% in group B. In addition, there were 8 patients in group A that had had surgery before the onset, a predisposing factor much more common in young NAION patients. Moderate and severe coronary artery stenosis patients in the elderly group were higher than that in the young patient group (25.71% and 12.86%). For 24-hour ambulatory blood pressure monitoring, the daytime and night diastolic pressure was 124.29 ± 17.21 mm Hg and 120.58 ± 19.98 mm Hg, respectively, in group A, which was higher than that of 120.63 ± 11.61 mm Hg and 118.43 ± 14.58 mm Hg in group B ($P > 0.05$), respectively.

Conclusions: NAION patients have a relatively good visual prognosis but with a higher incidence in the contralateral eye. Young NAION patients are more prone to

homocysteine and anticardiolipin antibody syndrome.

Poster No.: EX1-134

Panel No.: 134, Session EX1

Superior Segmental Optic Hypoplasia: A Case Series and the Importance of Regular Monitoring

First Author: Jonathan HO

Co-Author(s): Simon KO

Purpose: Superior segmental optic hypoplasia (SSOH) is a congenital disorder that is expected not to progress. We aimed to present the clinical features and ocular imaging findings of confirmed cases. The importance of continuous surveillance is highlighted as glaucomatous optic neuropathy can co-exist.

Methods: Retrospective review of the records of 4 patients diagnosed with SSOH.

Results: Among the 4 patients with SSOH (3 females), 2 patients presented with transient visual loss, 1 with headache, and 1 with incidental discovery of raised intraocular pressure (IOP). Mean age at presentation was 47.0 ± 10.5 years and mean follow-up period was 127.3 ± 207.9 months. Mean refractive error was -5.02 ± 1.42 diopters spherical equivalent. All eyes had typical optic nerve head appearance, superior entry of central retinal vessel, and thinning of superior and nasal retinal nerve fibre layer (RNFL). Optical coherence tomography RNFL measurements confirmed such findings. Five eyes showed perimetric loss at corresponding areas by 24-2 standard achromatic perimetry. Two patients had consistent elevated IOP > 21 mm Hg, with 1 requiring medical treatment. No eyes demonstrated visual field progression within the follow-up period.

Conclusions: SSOH is a disorder to be differentiated from open angle glaucoma; however, they can co-exist in some, rendering long-term follow-up of such patients mandatory.

Poster No.: EX1-135

Panel No.: 135, Session EX1

Temporary Visual Deficit Due To Posterior Reversible Encephalopathy Syndrome in a Case of End Stage Renal Disease

First Author: Li-Ching LAI

Co-Author(s): Michael CHOU

Purpose: To report a case of temporary visual deficit due to posterior reversible encephalopathy syndrome (PRES).

Methods: Case report.

Results: A 45-year-old male was admitted due to bilateral visual disturbance, ocular pain, and dizziness. The



patient had been diagnosed with both hypertension and type 2 diabetes mellitus over 10 years prior and was currently undergoing regular hemodialysis for end stage renal disease. Ocular examination disclosed visual acuity of 0.09 in the right eye (OD) and 0.5 in the left eye (OS). Blood examination was nonspecific except a mildly elevated CRP level. Under the suspicion of cerebral vascular disease, non-enhanced computed tomography (CT) was arranged; results did not reveal lesions or signs of acute ischemic or hemorrhagic stroke. Magnetic resonance imaging (MRI) was performed and revealed multiple hyperintense signal changes at cerebral watershed areas, periventricular, parietal-occipital, cerebellar, and brainstem areas visualized at FLAIR images; PRES was suspected. Intravenous nicardipine was given for control of blood pressure, and the patient reported improvement of visual symptoms. Visual field examination revealed peripheral visual field defects of both eyes. The patient was eventually discharged with improved condition.

Conclusions: PRES is a condition associated with characteristic neuroimaging findings of posterior cerebral white matter edema. Symptoms include insidious onset of headache, decreased consciousness, confusion, visual disturbances, and seizure. PRES has been known to be associated with several conditions, most commonly hypertensive encephalopathy, eclampsia, and the use of cytotoxic and immunosuppressant drugs. Although few cases of permanent visual impairment have been reported, symptoms are often reversible with spontaneous recovery in days to weeks after correction of inducing factors.

Poster No.: EX1-136

Panel No.: 136, Session EX1

Treatment Window for Delayed Application of Trans-Scleral Electrical Stimulation in Rat Optic Nerve Crush Model

First Author: Shasha **YU**

Co-Author(s): Kin **CHIU**, Vincent W H **LEE**, Xin **TANG**

Purpose: To evaluate the effect of delayed trans-scleral electrical stimulation (TsES) on retinal ganglion cell (RGC) survival and retinal function changes in the optic nerve crush (ONC) rat model.

Methods: Adult SD rats were divided into 4 groups, 8 animals in each group. Seven days before optic nerve injury, RGCs were retrogradely labeled by applying Fluoro-Gold (FG) on the surface of superior colliculus. The optic nerve of the right eye was crushed by ultra-fine forceps for 5 seconds at 1.5 mm from the optic nerve head. For the TsES treatment, 2 curved gold TsES pads were applied outside the sclera. TsES was applied either immediately (0d) or 3 days (3d) after ONC. At 1 week after ONC, electroretinogram (ERG) was done

before sacrificing the rats. The retina was halved, the superior retina was flat mounted, and FG labeled RGCs were counted. The inferior retina was processed for the detection of histopathologic and immunohistochemical changes in the retinal sections.

Results: Comparing to ONC alone, TsES at 0d and 3d showed neuroprotective effects. The respective RGC survival rates were 59%, 67%, and 70% at 1 week. The preserved amplitudes of photopic negative response (PhNR) were 31.34%, 62.61%, and 77.19%. Immunoreactivity of phospho-Akt and BDNF were detected in the surviving RGCs and showed obvious up-regulation in the TsES groups compared with the control group.

Conclusions: A delay in TsES by 3 days showed a similar neuroprotective effect on RGCs as immediate TsES treatment, probably through up-regulation of p-Akt and BDNF in the RGCs.

Poster No.: EX1-137

Panel No.: 137, Session EX1

Wall-Eyed Bilateral Internuclear Ophthalmoplegia as a First Presentation in a Human Immunodeficiency Virus-Infected Patient

First Author: Yunita **MANSYUR**

Purpose: To report a case of wall-eyed bilateral internuclear ophthalmoplegia in a human immunodeficiency virus (HIV)-infected patient.

Methods: A case report. A 30-year-old male presented with binocular diplopia. History taking, visual acuity, and anterior and posterior examinations were performed. Ancillary tests including MRI scan and laboratory were conducted.

Results: Diplopia was reported 10 days prior to admission, accompanied by fever and headache. Best corrected visual acuity (BCVA) in both eyes was 6/6. Bilateral adduction disturbance, vertical gaze nystagmus, and large angle in primary gaze were found. Anterior and posterior segments were within normal limits, with no RAPD and visual field defect. Brain MRI revealed lesions in the midbrain and occipital region of the corticomedullary junction in both hemispheres of the cerebellum, suggested as a sign of cerebritis in the midbrain and cerebellum. Laboratory examination presented serologic evidence of HIV and toxoplasmosis infection. We collaborated with the neurology and tropical infection departments and treated the patient with systemic antibiotics, antifungals, diuretics, and neuroprotectors. Improvement of ocular movement was shown 2 weeks from the beginning of treatment.

Conclusions: Based on ophthalmic and systemic examinations the patient was considered as wall-eyed bilateral internuclear ophthalmoplegia. Wall-eyed bilateral

internuclear ophthalmoplegia is an uncommon disorder of ocular movement found as a complication of HIV infection.

Ocular Imaging

Poster No.: EX1-138

Panel No.: 138, Session EX1

Achieving Retinal Thickness and Volume Comparability Between Spectral Domain and Time Domain Optical Coherence Tomography Through Adjustment of Segmentation Lines

First Author: Kelvin **LI**

Co-Author(s): Tock-Han **LIM**, Colin **TAN**

Purpose: To achieve retinal thickness and volume comparability between spectral domain (SD-OCT) and time domain optical coherence tomography (TD-OCT) through adjustment of segmentation lines.

Methods: In a prospective study, SD-OCT and TD-OCT were sequentially performed on 200 eyes of 100 healthy individuals. Central retinal thickness (CRT), central point thickness (CPT), and 1-mm volume of the Early Treatment Diabetic Retinopathy Study grid were compared between the 2 machines. The segmentation lines on SD-OCT were manually adjusted by a trained operator and the parameters compared again with TD-OCT.

Results: The mean CRTs of Spectralis and Stratus were significantly different (268.2 μm vs 193.9 μm , $P < 0.001$). After adjustment of segmentation lines, the mean adjusted Spectralis CRT was 197.3 μm , with the difference between SD-OCT and TD-OCT measurements decreasing from 74.3 μm to 3.4 μm ($P < 0.001$). Similar trends were obtained for central 1-mm volumes and CPT. Interoperator and intraoperator repeatability for adjustment of the segmentation lines were good, with an intraclass correlation of 0.99 for both.

Conclusions: Manual adjustment of SD-OCT segmentation lines reliably achieves retinal thickness and volume measurements that are comparable to that of TD-OCT. This is valuable to allow comparisons in multicenter clinical trials where different OCT machines may be used.

Poster No.: EX1-139

Panel No.: 139, Session EX1

Anterior Chamber Anatomy is Altered in SPARC-Deficient Mice

First Author: Henrietta **HO**

Purpose: SPARC (secreted protein, acidic and rich in cysteine) is a matricellular protein known to be integral

in extracellular matrix (ECM) assembly. We hypothesize that SPARC may be involved in the development of ocular structures. In this study, we aim to characterize anterior chamber angle parameters in SPARC-null mice.

Methods: Eyes of SV129 wild-type (WT) and transgenic mouse strains with gene knockout mutations of SPARC (S-/-), Hevin (Hv-/-), and SPARC/Hevin double knockout (HvS-/-) were imaged using the RTVue (Optovue Inc, Fremont, California, USA) anterior segment optical coherence tomography (ASOCT). Anterior chamber depth (ACD), angle opening distance (AOD), and the trabecular-iris space area (TISA) were measured in both eyes. Both eyes were analyzed using linear regression analysis and adjusted for age, gender, and pupil diameter (PD).

Results: After correcting for age, gender, and PD, significant differences in ACD, TISA, and AOD were found between S-/- ($n = 35$) and HvS-/- ($n = 65$) compared to WT ($n = 53$) (ANCOVA, $P < 0.001$ for all parameters in all groups). WT and Hv-/- ($n = 46$) were found to have structurally similar anterior segments. In all groups, central corneal thickness (CCT) was not found to be significantly different compared to WT.

Conclusions: In conclusion, S-/- mice have deeper anterior chambers as well as deeper and wider drainage angles compared to WT. In contrast, Hevin appears to have no phenotypic effect on the anterior chamber angle.

Poster No.: EX1-140

Panel No.: 140, Session EX1

Characterization of Choroidal Morphological and Vascular Features in Diabetes and Diabetic Retinopathy

First Author: Preeti **GUPTA**

Co-Author(s): Ching-Yu **CHENG**, Gemmy **CHEUNG**, Ecosse **LAMOUREUX**, Charumathi **SABANAYAGAM**, Tien **WONG**

Purpose: We aimed to characterize specific morphological and vascular features of the choroid in Indian adults with diabetes and diabetic retinopathy (DR).

Methods: Consecutive participants from the Singapore Indian Eye Study's 6-year follow-up examination underwent choroidal imaging using spectral domain optical coherence tomography (SD-OCT) with enhanced depth imaging. Raw OCT images were loaded on a custom-written application on MATLAB that enabled delineation for detailed morphological and vascular analyses. Multiple linear regression analyses were performed to assess differences in choroidal characteristics by DR.

Results: Of the 463 recruited participants, 273 had no diabetes (mean age was 60.1 ± 6.8 years), 100 had



diabetes but no DR (61.8 ± 7.4 years), and 89 had DR (62.4 ± 6.0 years). In multiple regression analysis, after accounting for relevant confounders, compared to those without diabetes, participants with diabetes had significantly thinner mean CT (mean difference [MD] = $-25.19 \mu\text{m}$, $P = 0.001$), smaller choroidal volume (MD = -0.23 mm^3 , $P = 0.003$), more inflection points (MD = 1.78 , $P < 0.001$), and lesser choroidal vascular area within the foveal (MD = -0.024 mm^2 , $P = 0.001$) and macular (MD = -0.095 mm^2 , $P < 0.001$) regions. Among the diabetic group, subjects with DR had significantly thicker mean CT (MD = $25.91 \mu\text{m}$, $P = 0.001$), greater choroidal volume (MD = 0.24 mm^3 , $P = 0.009$), lesser inflection points (MD = -0.478 , $P = 0.045$), and greater choroidal vascular area at foveal (MD = 0.016 mm^2 , $P = 0.019$) and macular (MD = 0.057 mm^2 , $P = 0.016$) regions, compared to those without DR.

Conclusions: Choroidal morphology and vasculature were altered in Indian adults with diabetes and DR. These findings may provide insights into choroidal changes in diabetes and DR.

Poster No.: EX1-141

Panel No.: 141, Session EX1

Comparison of Two Optical Coherence Tomography Angiography Systems for Corneal Vascularization

First Author: Hon Shing **ONG**

Co-Author(s): Marcus **ANG**, Jodhbir **MEHTA**

Purpose: To compare 2 optical coherence tomography angiography (OCTA) systems adapted for anterior segment imaging in eyes with corneal vascularization.

Methods: This is a prospective, observational study. Subjects with corneal vascularization had OCTA scans performed using commercially available systems, ie, split-spectrum amplitude decorrelation algorithm angiography system (SSADA, AngioVue; Optovue Inc, USA) and spectral-domain OCTA (Angioscan; Nidek Co Ltd, Japan). Measurements such as signal strength, vessel density, and repeatability between OCTA systems were compared.

Results: We obtained substantial repeatability in terms of image quality score ($\kappa = 0.86$) for all OCTA scans (10 eyes), with a mean score of 2.4 ± 1.0 for the SD OCTA system and 2.8 ± 0.5 for the SSADA OCTA system ($P = 0.142$). The correlation between OCTA systems was moderately good in terms of vessel density ($r = 0.721$), with no significant difference between systems (SD: $18 \pm 5\%$ vs SSADA: $16 \pm 5\%$, $P = 0.906$).

Conclusions: We found promising evidence that 2 rapid, non-contact OCTA systems may successfully delineate vessels in the anterior segment. Further prospective studies are required to confirm if this relatively

new imaging technique may be used for vessel quantification and serial imaging.

Poster No.: EX1-142

Panel No.: 142, Session EX1

Factors Affecting Choroidal Thickness in Healthy Adults

First Author: Colin **TAN**

Co-Author(s): Kai Xiong **CHEONG**, Louis **LIM**

Purpose: To determine the factors affecting choroidal thickness (CT) in various regions of the macula among healthy young adults.

Methods: In a prospective cohort study of 150 healthy volunteers, spectral domain optical coherence tomography of the macula was performed using a standardized imaging protocol. Manual grading of the choroidal boundaries was performed by trained graders to determine choroidal thickness in various ETDRS subfields. Multiple linear regression analyses were performed to determine the factors affecting CT.

Results: The mean central subfield CT was $324.9 \mu\text{m}$ (range, $123\text{-}566 \mu\text{m}$) and varied significantly with both spherical equivalent ($P < 0.001$) and axial length ($P < 0.001$), but not with age or gender. On multiple linear regression analysis using spherical equivalent, the coefficients were 20.0 for the central subfield, ranged from 16.9 to 19.9 for the inner subfields, and decreased to 13.9 to 16.2 for the outer subfields. Performing regression analysis using axial length, the coefficients were -36.4 for choroidal thickness for the central subfield and -30.5 to -34.5 for the inner subfields.

Conclusions: Choroidal thickness varies significantly with spherical equivalent and axial length in all regions of the macula. The rates of change were greater in the central and inner subfields compared with the outer subfields.

Poster No.: EX1-143

Panel No.: 143, Session EX1

Fast Automated Layer Segmentation of Optical Coherence Tomography Images

First Author: Chingis **KHARMYSSOV**

Co-Author(s): Match Wai Lun **KO**

Purpose: The aims are to increase the segmentation accuracy and to reduce the processing time for the segmentation of retinal pigment epithelium (RPE) and internal limiting membrane (ILM) layers from the spectral domain optical coherence tomography (SD-OCT) image by combining the graph algorithm and signal intensity variation based segmentation techniques.

Methods: Twenty images were processed and analyzed. Local extrema of each column from the inten-

sity image were used to identify RPE points. Intensity thresholding technique was used to identify ILM. Areas without or having abnormal local extrema were erased and the gaps were filled with the shortest path graph cut approach.

Results: Comparison results showed a good agreement between the segmented layer profiles using the proposed algorithm and manual segmentation (relative percentage error: $1.96\% \pm 0.70\%$). The processing time of the proposed algorithm and solely intensity algorithm did not show substantial change; however, the latter could not segment all the points and required additional processing. The processing time of the solely graph algorithm (34.3 s) was about 4 times higher than the processing time of the proposed algorithm (9.3 s). In addition, the RPE detection accuracy of the proposed algorithm ($1.96\% \pm 0.7\%$) was higher than that in the graph algorithm ($21.79\% \pm 16.33\%$).

Conclusions: This paper demonstrates an improved algorithm which blends 2 techniques for the segmentation of the SD-OCT image. The proposed algorithm performs calculations with increased accuracy and reduced processing time for the segmentation of RPE and ILM layers.

Poster No.: EX1-144

Panel No.: 144, Session EX1

Multispectral Imaging: A Novel Imaging Modality

First Author: Cheng **YONG**

Co-Author(s): Xiaoxin **LI**

Purpose: Multispectral imaging (MSI) is a noninvasive technology initially used in clinical application, which generates a series of spectral slices throughout the entire depth of the retina and choroid using an extensive range of monochromatic light sources, enabling the view of different sectional planes of the retinal and choroidal structures enface. The aim of this study was to describe the characteristics of central serous chorioretinopathy (CSCR), retinal pigment epithelium (RPE) tear, choroidal metastasis, and retinal vein occlusion (RVO) by MSI.

Methods: Patients with CSCR, RPE tear, choroidal metastasis, and RVO were evaluated by MSI.

Results: MSI permitted the visualization of RPE leakage and neurosensory detachment and allowed for good detection of CSCR. In RPE tear, MSI can reveal highly defined boundaries of RPE tear. Moreover, MSI was capable of finding tumor cells involving the choroid in choroidal metastasis. MSI could also be used in detecting the nonperfusion area, especially in RVOs.

Conclusions: MSI provides a new, nicer enface imaging which showed retinal, subretinal, and choroidal tissue

lesions.

Poster No.: EX1-145

Panel No.: 145, Session EX1

Predicting the Inter-Eye Asymmetry in Functional and Structural Damage in Glaucoma Using Automated Pupillography

First Author: Chaithra **AROOR**

Co-Author(s): Harsha **RAO**, Rohit **SHETTY**

Purpose: To predict the inter-eye asymmetry in functional [mean deviation (MD) on visual field (VF)] and structural [retinal nerve fiber layer (RNFL) and ganglion cell complex (GCC)] thickness on spectral domain optical coherence tomography (SDOCT) measurements in glaucoma using the automated pupillography parameters.

Methods: Fifty-nine subjects with a diagnosis of either glaucoma or glaucoma suspect underwent automated pupillography along with VF and SDOCT examinations. Association between pupillography and the absolute inter-eye difference in MD, RNFL, and GCC measurements were evaluated using regression analysis after accounting for the multicollinearity.

Results: Univariate regression analysis showed statistically significant associations ($P < 0.05\%$) between multiple pupillography parameters and the inter-eye difference in MD, RNFL, and GCC thickness measurements. Multivariate regression with less strongly correlated parameters identified inter-eye difference in amplitude change (Ac) percent to be the parameter that best predicted the inter-eye asymmetry in MD (inter-eye asymmetry in MD = $2.20 + 1.33 \times$ inter-eye difference in Ac percent, $R^2 = 0.36$), RNFL thickness ($3.38 + 3.55 \times$ inter-eye difference in Ac percent, $R^2 = 0.49$), and GCC thickness ($4.49 + 2.06 \times$ inter-eye difference in Ac percent, $R^2 = 0.41$). Ability of inter-eye Ac percent difference to predict inter-eye asymmetry in MD, RNFL, and GCC thickness was better in patients with angle closure disease ($R^2 = 0.38, 0.79, 0.66$, respectively) compared to those with open angles ($R^2 = 0.25, 0.15, 0.16$, respectively).

Conclusions: The predicting ability was better in patients with angle closure compared to those with open angles and was best predicted by the inter-eye difference in Ac percent on automated pupillography.



Poster No.: EX1-146

Panel No.: 146, Session EX1

Using Regression Analysis to Predict Retinal Thicknesses on Spectral Domain Optical Coherence Tomography from Time Domain OCT

First Author: Kelvin **LI**

Co-Author(s): Tock-Han **LIM**, Colin **TAN**

Purpose: To derive methods to calculate equivalent retinal thicknesses on spectral domain optical coherence tomography (SD-OCT) from time domain OCT (TD-OCT).

Methods: In a prospective cohort study, 100 consecutive healthy individuals without ocular disease underwent sequential scanning with SD-OCT and TD-OCT using a standardized protocol. From the first 60 eyes, retinal thickness measurements as well as other significant factors such as spherical equivalent were collected. Linear regression analysis was performed to obtain an equation. This equation was used to calculate predicted SD-OCT values from TD-OCT measurements of the remaining 140 eyes.

Results: Of the 140 eyes from the test group, the mean central retinal thickness was 268.0 μm ($\text{SD} \pm 17.0$) using SD-OCT and 193.3 μm ($\text{SD} \pm 17.4$) using TD-OCT, with a mean difference of 74.7 μm ($P < 0.001$). Using the equation, the average predicted retinal thickness on SD-OCT was 267.9 μm ($\text{SD} \pm 17.2$) with an intraclass correlation coefficient of 0.95. The mean difference was 0.78 μm . Of the test group, 63.3% had a difference within 5 μm of the actual value.

Conclusions: The linear regression equation can be reliably used to convert central retinal thickness values from TD-OCT to predicted SD-OCT value. These methods may allow comparison of OCT values from SD-OCT and TD-OCT devices in clinical trials and standard patient care.

Ocular Oncology & Pathology

Poster No.: EX1-147

Panel No.: 147, Session EX1

A Rare Case of Coexisting Choroidal Melanoma in a HIV Positive Patient on ART with Acute Anterior Uveitis

First Author: Erani **BORAH**

Co-Author(s): Manabjyoti **BARMAN**, Harsha **BHAT-TACHARJEE**, Dipankar **DAS**, Jayanta **DAS**, Diva **MISRA**

Purpose: To report a rare case of coexisting choroidal melanoma in a HIV positive patient on ART with acute anterior uveitis.

Methods: A 33-year-old female presented with diminu-

tion of vision (DOV) in the right eye (OD) for 3 months and pulmonary Kochs under ATT. She was diagnosed as choroidal melanoma (OD) and pulmonary Kochs. She was retrovirus positive on ART. Visual acuity (VA) OD was no perception of light (PL negative) with restricted ocular motility and best corrected visual acuity (BCVA) of 20/20, N-6 in the left eye (OS). On SLE exam of OD, microcystic corneal edema, anterior chamber (AC) cells, flare, post synechiae, and raised intraocular pressure (IOP); fundus could not be visualized. Topical low potency steroid and iotim 0.5% eye drop to the OD was prescribed. B scan USG of OD noted exudative RD with choroidal mass of 18 x 20 x 13.4 mm with acoustic hallowing. D/D of choroidal melanoma and choroidal metastasis was made. MRI of the orbit revealed extension to the optic nerve head. Sclera overlying the mass was focally thinned out in superolateral aspect with hazy episcleral fat planes. Ipsilateral lacrimal gland, LR, and SR muscles were hazy with fuzzy margins.

Results: Diagnosis was made as a retrovirus positive case on ART presenting with acute anterior uveitis with a coexisting choroidal melanoma (OD) and an early extraocular spread. The patient was referred for control of active tuberculosis (TB) and to an oncologist.

Conclusions: Coexisting ocular tumors may be present in a retrovirus positive patient presenting with ocular symptoms. Therefore, an early diagnosis is very important as chemotherapy may be difficult in these immunocompromised patients once there is distant metastasis.

Poster No.: EX1-148

Panel No.: 148, Session EX1

A Rare Case of Retrobulbar Kimura Disease: Challenge in Diagnosis and Management

First Author: Anissa **WITJAKSONO**

Co-Author(s): Neni **ANGGRAINI**, Mutmainah **MAHYUDIN**, Nurjati **SIREGAR**

Purpose: To report a rare case and demonstrate proper diagnosis as well as management of Kimura disease.

Methods: A case report. A 68-year-old male presented with unilateral blurred vision and gradual protrusion since 6 months prior. Initial ophthalmological examination showed a proptotic right eye with visual acuity of 6/20, 30 degrees of exotropia, and ocular movement limitation to inferior, temporal, and nasal quadrant. CT scan revealed a distinct border retrobulbar isodense lesion sized 14 mm x 12 mm in inferior retrobulbar intraconal with minimal post-contrast enhancement. Tumor extirpation and biopsy through orbital laterotomy was performed.

Results: Histopathology and immunohistochemistry examination showed lymphoid cells with abundant eosinophil and lymphoid follicle with positive CD31, CD20, and CD3, yet negative CD34. Postoperatively,

methylprednisolone was given until 6 months post surgery; visual acuity had improved to 6/12 with no visible proptosis and after 9 months there was no sign of recurrence.

Conclusions: Kimura disease is a rare chronic inflammatory soft tissue disease of the head and neck region found mostly in Asian men within their second to third decade of life. Sites with predilection are preauricular, retroauricular, parotid subcutaneous, and submandibular region. Our case presented with a retrobulbar tumor, confirmed by histopathology and immunohistochemistry as Kimura disease with successful management through surgical excision and corticosteroid administration. To our findings, a retrobulbar Kimura disease case has never been reported previously.

Poster No.: EX1-149

Panel No.: 149, Session EX1

Atypical Teratoid Rhabdoid Tumor

First Author: Puneet **JAIN**

Co-Author(s): Santosh **HONAVAR**, Kaustubh **MULAY**

Purpose: To report the use of eye-conserving multimodal management in a rare case of atypical teratoid rhabdoid tumor of the orbit.

Methods: A 3-year-old female presented to us with proptosis of the left eye with features of compressive optic neuropathy. MRI showed a large intraconal mass with variable internal intensity located close to the optic nerve. Incision biopsy was performed for tissue diagnosis.

Results: Histopathology along with immunohistochemistry confirmed the diagnosis of extrarenal noncerebral atypical teratoid rhabdoid tumor. Bone marrow examination and systemic workup were negative for metastasis. The patient underwent stereotactic radiotherapy (4600 cGy) sandwiched between 2 sets of 3 cycles of chemotherapy with vincristine, adriamycin, and cisplatin. She remains clinically stable with PET-proven inactive residual disease at 18 months of follow-up without any ocular or systemic complications.

Conclusions: Multimodal treatment involving chemotherapy and radiation can achieve eye salvage in rare conditions such as atypical teratoid rhabdoid tumor.

Poster No.: EX1-150

Panel No.: 150, Session EX1

Case Series of Two Patients with Primary Malignant Melanoma of the Lacrimal Sac

First Author: Tessa **ANINDYA**

Co-Author(s): Neni **ANGGRAINI**

Purpose: To demonstrate 2 rare cases of primary malignant melanoma of the lacrimal sac.

Methods: Patients were both female, 38 years old and 46 years old, with lacrimal sac mass, bloody discharge, and epiphora. The first patient was previously diagnosed with chronic dacryocystitis and treated with antibiotics and anti-inflammatories for 2 months, which resulted in worsening condition and enlarged swelling. Computed tomography scan revealed solid mass at lacrimal sac 13 x 12 x 7.4 mm in size with no bone destruction. Patient underwent total mass removal surgery, which revealed solid highly pigmented mass. The second patient also had enlarged mass within 2 months. Other complaints included obstructed left nose and epistaxis. Computed tomography scan revealed solid mass at left medial canthal region involving inferior orbit, nasolacrimal duct, left nose cavity, and maxillary sinus. Incisional biopsy revealed a malignant melanoma. Patient underwent eye exenteration, maxillectomy, and radical neck dissection.

Results: In both patients, histopathology examination revealed malignant melanoma. Radiotherapy was done on the first patient for local control of wound margin. Follow-up 8 months post surgery in our first patient and 4 months in our second patient revealed no sign of local recurrence. No sign of distant metastatic lesion was found in both patients.

Conclusions: Primary malignant melanoma of the lacrimal sac is rare and often mimics chronic dacryocystitis. It is important to understand this disease entity for accurate diagnosis and management.

Poster No.: EX1-151

Panel No.: 151, Session EX1

Childhood Orbital Malignancy: A Diagnostic Dilemma

First Author: Siti Amirah **HASSAN**

Co-Author(s): A R **ROSNIZA**, Norlaila **T**, Lai-Yong **TAI**

Purpose: We present a rare case of bilateral pediatric orbital tumors with a diagnostic dilemma.

Methods: Case report.

Results: A 10-month-old girl presented with 1-week history of rapidly progressive right eye ptosis and bilateral proptosis. Examination disclosed that the child could follow and fix small objects; both eyes had normal intraocular pressure. There was marked proptosis in both eyes with right eye ptosis and restriction on right eye elevation, and the remainder of extraocular movements were fairly full. Relative afferent pupillary defect was negative. The remainder of ocular examination, including fundus, showed normal findings. Magnetic resonance imaging (MRI) and computed tomography (CT) scan of the brain and orbit showed bilateral calcified enhancing extraconal masses. There was no brain involvement. Ultrasound of the abdomen showed right vascularized pelvic mass. Based on the clinical



findings and imaging studies, the differential diagnosis included lymphoma and metastatic neuroblastoma. A confirmatory right orbital biopsy was performed which showed malignant small round cells with Ki-67 proliferative index 80%. The preliminary report revealed high-grade lymphoma. Further flow cytometry and immunohistochemical stains were done and the features were most consistent with orbital myeloid sarcoma. The patient was referred to pediatric oncology for co-management. The clinical, radiological, and histopathological diagnostics of childhood orbital malignancy has given rise to a diagnostic dilemma.

Conclusions: Orbital involvement by acute myeloid sarcoma is relatively rare among orbital tumors. However, in the setting of simultaneous bilateral orbital tumors in children, myeloid sarcoma is highly likely. Any child with bilateral orbital mass of uncertain origin should undergo prompt evaluation for underlying AML.

Poster No.: EX1-152

Panel No.: 152, Session EX1

Combined Endoresection and Ruthenium Brachytherapy for the Treatment of Large Malignant Choroidal Melanoma in Thailand

First Author: Duangnate **ROJANAPORN**

Co-Author(s): Rangsim A**AROONROCH**, Taweewat **AT-TASETH**, Rawi **BOONYAOPAS**, Donrudee **SIRINIL**, Tharikarn **SUJIRAKUL**

Purpose: To evaluate the safety and efficacy of combined tumor endoresection and brachytherapy for the treatment of large malignant choroidal melanoma.

Methods: Interventional case series.

Results: Of 6 patients, 4 had surgery as a primary treatment, and 2 had surgery due to tumor recurrence after ruthenium brachytherapy. Three patients were male (50%). The mean age at presentation was 52.8 years (range, 26 to 64). Presenting symptoms were decreased vision in 5 (83.3%) and floaters in 1 (16.7%) patient(s). The visual acuity ranged from 20/20 to hand movements. The mean tumor basal diameter and tumor thickness were 10.2 (range, 6.6 to 12.6) and 8.6 mm (range, 6.8 to 11.5), respectively. All patients denied enucleation. Patients were well aware of the potential risk of the surgery. Pars plana vitrectomy and tumor endoresection with silicone oil tamponade combined with ruthenium brachytherapy was performed. Cryotherapy at sclerostomy sites was performed at the end of surgery. The calculated radiation dose was 10,000 cGy at 3 mm thickness. Two patients (33%) developed postoperative subretinal hemorrhage, which spontaneously resolved. None of our patients developed retinal detachment, local tumor recurrence, or distant metastasis with a mean follow-up time of 10.3 months (range, 8-16).

Conclusions: Combined tumor endoresection with ruthenium brachytherapy may be considered as an alternative treatment to enucleation or iodine-125 plaque brachytherapy for large malignant choroidal melanoma. In our series, there was no major short-term complication. A longer follow-up period and more patients are required to evaluate long-term efficacy and safety of this treatment modality.

Poster No.: EX1-153

Panel No.: 153, Session EX1

Fibromyxoma

First Author: Utami **WIDIJANTO**

Purpose: To report a patient with left eye proptosis due to fibromyxoma.

Methods: Case report.

Results: A 41-year-old female complained of protruding left eye for 1 month, redness, and lacrimation. The left eye was painless and did not cause any other symptoms. Her physical examination was normal. The visual acuity of the left eye was 6/7.5. Exophthalmometry examination showed 11 mm axial proptosis. There was limitation of eye movement in medial gaze. MSCT of the orbit showed multilobulated multiple solid mass on intra and ekstraconal retrobulbar left and widening and urgent tortuosity ophthalmica vein optic nerve and musculus ekstraorita, causing proptosis bulbi with destruction left sphenoid wing. She underwent an anterior orbitotomy. Tumor mass was smooth on the surface, pink, elastic, shaped like a cyst, and lobulated corresponding to the macroscopic picture of fibromyxoma. Histopathological examination revealed fibromyxoid connective tissue stroma, swollen hyperemia, lymphocytes, histiocytes, and polymorphonuclear leukocytes corresponding to fibromyxoma.

Conclusions: Clinically, the diagnosis of fibromyxoma may be difficult. Histologically, however, the lesion can be clearly defined and differentiated from other lesions due to its unique and characteristic features.

Poster No.: EX1-154

Panel No.: 154, Session EX1

Giant Cutaneous Melanoma with Scleral Invasion: Case Report

First Author: Pei-Shin **HU**

Co-Author(s): Ho-Ling **CHEN**, San-Ni **CHEN**

Purpose: Melanoma of the eyelid is a relatively rare tumor making up less than 1% of eyelid cancers. We report a case of massive cutaneous melanoma extended to the whole conjunctiva and cornea with deep scleral invasion.

Methods: Case report.

Results: A 91-year-old woman presented with a huge black mass involving both right upper and lower eyelids with a history of progressive enlargement of preexisting melanocytic nevi at the right lower lid for 2 years. The patient lost vision due to total synechiae between the eyelid mass and ocular surface (conjunctiva and cornea). MRI showed a 4.8 x 4.2 cm eyelid mass with ocular surface involvement. Brain MRI, chest X-ray, and abdominal ultrasonography revealed no evidence of liver, lung, or brain metastasis. Exenteration was performed under general anesthesia smoothly and surgical margin was free from tumor. Grossly, tumor size was 4.8 x 3.9 x 3.4 cm. Histopathology showed malignant nodular melanoma (Breslow thickness 21 mm). The patient had no local recurrences or systemic metastasis at 6-month follow-up.

Conclusions: Cutaneous melanoma with scleral invasion is rare. A review of the literature suggests that nodular melanoma is rapidly growing and easily metastasizes. Ophthalmologists have to be aware of early diagnosis and intervention for any change of preexisting melanocytic nevi to avoid missing this potentially vision- and life-threatening lesion in patients presenting with eyelid tumors.

Poster No.: EX1-155
Panel No.: 155, Session EX1

Histopathological Characteristics and Treatment Modality of Eyelid Tumor Cases

First Author: Eunike **LAHAGU**
Co-Author(s): Purjanto **UTOMO**

Purpose: Skin cancers commonly affect the eyelids and periocular region, particularly in high UV exposure zones. Orbital invasion is a serious and potentially fatal complication of cutaneous neoplasia. The aim of this study was to explore the epidemiology, focusing on histopathological characteristics and treatment modality of eyelid tumors.

Methods: This was a 2-year retrospective study, involving all eyelid tumor cases during 2014-2015. Patient characteristics were determined based on age, gender, occupation, types, histopathology, modality of treatment, and recurrency. Data was analyzed descriptively and quantitatively.

Results: There were 41 cases during 2 years, with a mean age of 52 years old. There were 17 males and 24 females, and most of them were farmers (44%). Type of the tumors were malignant (58.5%) and benign (41.5%). The histopathological characteristics were basal cell carcinoma (22%), sebaceous gland carcinoma (22%), and dermoid cyst (9.8%), respectively. There was significant positive correlation between age with type of the tumors ($P = 0.021$). Increased age could predict the histopathological type of the tumor ($P = 0.018$). The treat-

ment modality for the tumors in this study was wide excision (41.6%), extirpation (46.4%), and exenteration (12%). The recurrence of the tumors was 24.4%, and most of them were basal cell carcinoma (30%).

Conclusions: Basal cell carcinoma was the most frequent and had highest recurrence rate among the other tumors. Age could predict the histopathological type of the tumors. The management was carried out regardless of the severity of the tumors.

Poster No.: EX1-156
Panel No.: 156, Session EX1

Iridocyclectomy for Iris and Ciliary Body Tumors in Thailand

First Author: Tharikarn **SUJIRAKUL**
Co-Author(s): Rangsim AROONROCH, Taweewat AT-TASETH, Rawi BOONYAOPAS, Duangnate ROJANAPORN, Donrudee SIRINIL

Purpose: To report a case series of iris and ciliary tumors treated with iridocyclectomy.

Methods: Interventional case series of 6 patients with various iris and/or ciliary body tumors treated with iridocyclectomy at the ocular oncology service of Ramathibodi Hospital in Bangkok, Thailand.

Results: Of 6 patients, 4 presented with iris mass and 2 with irido-ciliary body mass. Four patients (67%) were male. The mean age at the time of diagnosis was 33.2 years (range, 14 to 58 years). Decreased vision was the leading symptom in all patients, with visual acuity ranging from 20/30 to 20/60. All patients underwent iridocyclectomy under general anesthesia. The histopathological diagnosis was iris malignant melanoma (spindle B cell type) in 1 patient, iridociliary malignant melanoma (spindle B cell) in 1 patient, Ebstein-Barr virus associated iris leiomyosarcoma in 2 patients, iridociliary leiomyoma in 1 patient, and iris metastasis consistent with primary lung cancer in 1 patient. Progression of lens opacity was noted in 1 patient and required cataract surgery. One patient developed persistent ocular hypotony and subsequently had retinal detachment, which was successfully reattached with pars plana vitrectomy with silicone oil tamponade. During the mean follow-up time of 18.2 months (range, 8-35), no local recurrence or distant metastasis were observed.

Conclusions: Iridocyclectomy is a promising treatment for iris and ciliary body tumors; however, longer follow-up is required to evaluate the safety and risk for tumor recurrence.



Poster No.: EX1-157

Panel No.: 157, Session EX1

Masquerading Panuveitis

First Author: Nilutparna **DEORI**

Co-Author(s): Harsha **BHATTACHARJEE**, Kasturi **BHATTACHARJEE**, Dipankar **DAS**, Deepika **KAPOOR**, Samir **SERASIYA**

Purpose: To report a case of abdominal non-Hodgkin lymphoma (NHL) masquerading as panuveitis.

Methods: A 53-year-old male having abdominal NHL who had received R-CHOP chemotherapy 1 year back presented with diminution of vision, hypopyon, and panuveitis along with ptosis of right upper lid for the past month. On examination, the hypopyon was thick with convex configuration. B-scan USG in the right eye showed vitreous echoes and increased RC thickness. UBM showed edematous thickening of ciliary body (CB) and iris. General examination showed left sided lower motor facial palsy. MRI of the brain was normal. A diagnosis of panuveitis following intraocular metastasis of abdominal lymphoma was made. Topical and oral corticosteroids were started under the care of an internist. The patient was followed up at 1 week and every month thereafter.

Results: At 6 weeks, there was improvement in visual acuity, reduction of hypopyon, vitreous haze, and improvement of facial palsy. Repeat MRI showed regression of CB and iris edema. However, intraocular pressure (IOP) was raised which was controlled with topical anti-glaucoma drugs. On his last visit at 3 months, he had recurrence of inflammation in the same eye with increase of hypopyon from 1 mm to 3 mm with loss of foveal reflex. He had also developed increased facial palsy on the left side of his face. IOP was raised to 32 mm Hg and was put on intensified anti-glaucoma medication.

Conclusions: Extraocular NHL metastasis to the eye is a rare entity and thus it is important to consider this differential in ocular masquerades of an elderly patient.

Poster No.: EX1-158

Panel No.: 158, Session EX1

Massive Vitreous Seeding in Malignant Choroidal Melanoma: A Rare Presentation Treated with Combined Tumor Endoresection and Ruthenium Brachytherapy

First Author: Duangnate **ROJANAPORN**

Co-Author(s): Rangsimma **AROONROCH**, Rawi **BOONYA-OPAS**, Suradej **HONGENG**, Donrudee **SIRINIL**, Tharikarn **SUJIRAKUL**

Purpose: To report 2 cases of malignant choroidal melanoma with massive vitreous seeding treated with

combined tumor endoresection and brachytherapy as an alternative to enucleation.

Methods: Case series of 2 patients diagnosed with malignant choroidal melanoma with massive vitreous seeding treated with combined tumor endoresection and ruthenium plaque brachytherapy.

Results: Two male patients (aged 26 and 61 years old) presented with pigmented choroidal mass with retinal invasion located at equator and massive pigment clumping dispersed in vitreous cavity. Initial visual acuity was 20/40 for both patients. The tumor size (basal diameter x thickness) of the first and second patients was 7.7 x 10.3 mm and 11.3 x 11.5 mm, respectively. Both patients denied enucleation. Pars plana vitrectomy and tumor endoresection with silicone oil tamponade combined with ruthenium brachytherapy was performed. Patients were well aware of the risk of tumor recurrence and systemic metastasis. At the time of operation, vitreous biopsy was performed initially, then main tumor biopsy was performed. Pathological results confirmed the diagnosis of malignant melanoma in both specimens. No postoperative complication, tumor recurrence, or systemic metastasis was detected during the follow-up period (16 and 9 months).

Conclusions: Massive vitreous seeding is a rare presentation of malignant choroidal melanoma and may not be controlled with local brachytherapy alone due to the dispersive nature of the tumor cells. In order to remove all tumor cells in the vitreous cavity, we propose tumor endoresection and brachytherapy as an alternative treatment to enucleation. Long-term follow-up is required to evaluate the risk of local recurrence and systemic metastasis of this surgical technique.

Poster No.: EX1-159

Panel No.: 159, Session EX1

Neovascularization at the Disc in a Case of Optic Disc Melanocytoma

First Author: Dipak **NAG**

Co-Author(s): Ava **HOSSAIN**, Rinku **PAUL**, Pankaj **ROY**

Purpose: To demonstrate new vessel formation in a case of optic disc melanocytoma.

Methods: Observational case report.

Results: A 28-year-old female came to the hospital with the complaint of loss of vision in her right eye for 1 month. On examination her best corrected visual acuity was counting fingers (CF) at 2 feet in the right eye and 6/6 in the left eye. Her medical history was unremarkable and no history of antecedent trauma was elicited. The left eye was essentially normal. Right afferent pupillary defect was noted. Slit lamp biomicroscopy examination of right fundus revealed an uneven elevated pigmented dark brown mass adjacent to the optic

disc with hypopigmentation in between and around, which was about 5 disc diameters in size, extending on to the temporal part of the fundus involving the macular region. Fundus fluorescence angiography showed obscured fluorescence in the lesion area and hyperfluorescence in irregularly arranged vessels around it in the early stage, which increased in size as well as in intensity in the late stage suggestive of neovascularization. Optical coherence tomography showed the extension of mass in the sensory retina with subsensory fluid denoting necrosis and inflammation of the tumor.

Conclusions: Rapid visual loss occurs due to tumor necrosis itself and inflammation, which essentially lead to the formation of new vessels around the lesion. So far, this is the first case reported where associated neovascularization occurred in a case of optic disc melanocytoma.

Poster No.: EX1-160
Panel No.: 160, Session EX1

Ophthalmic Metastasis: Different Manifestations

First Author: Hashim **SURAYA**
Co-Author(s): Radzlian **BIN OTHMAN**, Rosniza **ABD RAZAK**, Wan Mariny **WAN KASSIM**

Purpose: To present different manifestations of ophthalmic metastasis.

Methods: Case reports.

Results: Case 1: A 52-year-old man with a history of nasopharyngeal carcinoma in 2011 completed chemotherapy and radiotherapy. He had recurrence of nasopharyngeal carcinoma in September 2015 but refused further treatment. He presented with painless right medial canthal mass of 6 months' duration, gradually increasing in size. Upon examination, there was a right medial canthal mass measuring 4 x 3.5 cm, hard in consistency, erythematous and shiny looking of underlying skin appearance, and non-mobile. Incisional biopsy done was and HPE, recurrent nasopharyngeal nonkeratinizing carcinoma with orbital region involvement. CT scan of the brain/neck/thorax showed features suggestive of recurrent nasopharyngeal carcinoma with extensive local extension and destructive right orbital mass. Subsequently the patient underwent right total exenteration. Case 2: A 62-year-old man with underlying chronic obstructive airway disease who was an active smoker presented with exudative retinal detachment with uncontrolled intraocular pressure. B-scan showed choroidal mass. Plain and CECT of the brain, orbits, and thorax (HRCT) showed changes consistent with lung malignancy with ocular and brain metastasis. Right eye enucleation was done and he was referred to the oncologist for further management.

Conclusions: Although ophthalmic metastasis is rare,

any patient with proptosis with a history of malignancy should be evaluated for ophthalmic metastasis. Ophthalmic metastasis may represent the initial manifestation of undiagnosed systemic neoplasia. Imaging and immunohistochemical panel can be helpful in differentiating and ruling out other diagnoses. Careful ophthalmologic examination can yield a diagnosis. Radiotherapy is the primary management and allows most patients to maintain useful vision.

Poster No.: EX2-161
Panel No.: 161, Session EX2

Primary Eyelid Tuberculosis Mimicking Basal Cell Carcinoma

First Author: Riffat **RASHID**
Co-Author(s): Mohammad **MOSTAFA HOSSAIN**, Nazmul **ROBI**, Sadia **SULTANA**

Purpose: To report a case series of eyelid tuberculosis which is very exceptional and where the clinical polymorphism explains the delayed diagnosis.

Methods: Three female patients (aged 14 years and 35 years) of poor socioeconomic background presented with non-healing ulcer of lids following history of lid abscess. The ulcer was non-responsive to antibiotic drugs. Biopsy proved the diagnosis of tuberculosis. Follow-up did not reveal any other tuberculosis focus and the patients' evolution was good under anti-tubercular treatment.

Results: Eyelid tuberculosis is an uncommon disease and mostly primary. However, it may also be secondary to pulmonary tuberculosis. Our cases were primary lid tuberculosis as proved by Mantoux test. All cases responded to antitubercular drugs. The eyelid contamination may be secondary to trauma.

Conclusions: Clinical presentation of eyelid tuberculosis resembles basal cell carcinoma. Thus, diagnosis is difficult and sometimes delayed.

Poster No.: EX2-162
Panel No.: 162, Session EX2

Primary Mucinous Carcinoma of Eyelid: Case Report and Review of the Literature

First Author: Pei-Shin **HU**
Co-Author(s): San-Ni **CHEN**, Shu-Yun **YANG**

Purpose: To report a patient with primary mucinous carcinoma of the eyelid and review the literature.

Methods: Case report.

Results: A case report is presented of a 48-year-old woman with a right upper lid tumor. The patient underwent a surgical excision and reconstruction. This patient had no local or systemic recurrences at 6 months.



Systemic investigations were undertaken to exclude the possibility of metastatic mucinous carcinoma. A review of the literature suggests that eyelid primary mucinous carcinoma is a low-grade malignant tumor with the potential for recurrence.

Conclusions: Primary mucinous carcinoma is a rare adnexal tumor of the eyelid. Ophthalmologists have to be aware of the diagnosis to avoid missing this potentially malignant lesion in patients presenting with eyelid tumors.

Poster No.: EX2-163

Panel No.: 163, Session EX2

Profile of Orbital Tumors in Northeast India: A 13-Year Review

First Author: Samir **SERASIYA**

Co-Author(s): Kasturi **BHATTACHARJEE**, Dipankar **DAS**, Surpriya **HAWAIBAM**, Deepika **KAPOOR**, Prabhjot Kaur **MULTANI**

Purpose: The purpose of this research was to present the histopathological profile of orbital tumors presenting at a tertiary eye care institute in northeast India between October 2003 and May 2016.

Methods: This hospital-based study is a retrospective review of 13 years of medical records of histopathologically proven cases of orbital tumors at a tertiary eye care center in northeast India. The clinical history, site of involvement, and pathological diagnoses were retrieved from ocular pathology registers. External examination including gross examination, tumor size measurements, and transillumination test was carried out, following which all specimens were fixed, processed, and stained by hematoxylin-eosin stain. Special stains including immunohistochemistry were done, wherever indicated. The final histopathology report was prepared by 2 ocular pathologists.

Results: Among 376 orbital tumors reviewed, 159 (42.29%) were malignant and 217 (57.71%) were benign tumors. Non-Hodgkin lymphoma (52.83%) was the most common malignant tumor followed by adenocystic carcinoma of the lacrimal gland (11.65%). Cysts (38.71%) were found to be the most common benign orbital tumors followed by cavernous hemangioma (13.36%).

Conclusions: Globally, orbital tumors are an important cause of morbidity and rarely, mortality. Histopathology and immunohistochemistry are vital pathology studies, which help to diagnose a tumor with more accuracy. This present study documents the profile of orbital tumors at a tertiary eye care institute in northeast India. This would serve as a reference for this geographical region, help to understand the geographic variation, and guide in planning resources for screening, as well as for early diagnosis and curative treatment.

Poster No.: EX2-164

Panel No.: 164, Session EX2

Regression of Choroidal Metastasis Secondary to Lung Cancer with Intravitreal Injection of Bevacizumab

First Author: Yin-Yang **LEE**

Purpose: To report a case of a complete regression of choroidal metastasis secondary to non-small-cell lung cancer (NSCLC) with intravitreal injection of bevacizumab.

Methods: Retrospective case review of a female patient treated with intravitreal bevacizumab for choroidal metastases secondary to NSCLC. Best corrected visual acuity (BCVA), color fundus, and optical coherence tomography (OCT) were compared during the 1-month treatment period.

Results: One week after the single injection of bevacizumab (2.5 mg), BCVA had improved to 6/12 from 6/60 and the subretinal fluid had regressed significantly. No further mass-like lesion was detected. OCT revealed that the retina and RPE layer were flattened.

Conclusions: Intravitreal bevacizumab could be a treatment option for patients with choroidal metastasis of NSCLC.

Poster No.: EX2-165

Panel No.: 165, Session EX2

Retinoblastoma in Thailand: Report from a Tertiary Referral Center

First Author: Taweewat **ATTASETH**

Co-Author(s): Rangsimma **AROONROCH**, Suradej **HONGENG**, Duangnate **ROJANAPORN**, Donrudee **SIRINIL**, Tharikarn **SUJIRAKUL**

Purpose: To report demographic data, clinical classifications, and treatment outcomes of retinoblastoma patients in Ramathibodi Hospital, Bangkok, Thailand.

Methods: Retrospective case series.

Results: There were 69 eyes of 46 patients with retinoblastoma. Of 46 patients, 32 were treatment naive, and 14 had previous treatment. Twenty patients (43.5%) were male. The mean age at diagnosis was 12.2 months (range, 1 to 40 months). Twenty-three patients (50%) had bilateral retinoblastoma. Only 1 patient (2.2%) had familial retinoblastoma. Of 69 eyes, extraocular retinoblastoma was found in 4 eyes (5.8%). Of 65 eyes with intraocular retinoblastoma, the eyes were classified as International Classification of Retinoblastoma (ICRB) group A (n = 1, 1.5%), group B (n = 12, 18.5%), group C (n = 4, 6.2%), group D (n = 12, 18.5%), and group E (n = 36, 55.4%). Our treatment modalities included systemic chemotherapy, intraarterial chemotherapy (IAC),

Ruthenium-106 plaque brachytherapy, external beam radiotherapy, cryotherapy, transpupillary thermotherapy, subtenon chemotherapy, and intravitreal chemotherapy. At the mean follow-up of 44.9 months (range, 2.6 to 114.9 months), the overall globe salvage rate of intraocular retinoblastoma was 46.2%, with a globe salvage rate of 100% in ICRB groups A and B, 75% in group C, 66.7% in group D, and 16.7% in group E. The overall survival rate was 95.7%. Two patients passed away due to brain metastasis and febrile neutropenia.

Conclusions: Treatment of retinoblastoma is challenging. With recent advanced treatment modalities available at our center, globe salvage is more promising. However, enucleation is still required to save the patient's life in advanced retinoblastoma.

Poster No.: EX2-166

Panel No.: 166, Session EX2

Systemic Propranolol Reduces Progressive Capillary Hemangioma

First Author: Rina WULANDARI

Purpose: Steroid has been established to be a treatment of capillary hemangioma, but another treatment using systemic propranolol has been also increasing. This study shows further details on the management of capillary hemangioma using systemic oral propranolol to reduce development and its complications.

Methods: A 5-month-old baby girl presented with a mass on her left eye. The mass was found at the lower eyelid of the left eye since birth. It was red in color, approximately rice sized, and getting larger over time until it covered her left cheek and left eye. The mass also bled 4 times. Physical examination of the left eye showed that visual acuity and other anterior segment examination was difficult to evaluate due to covering mass of 6.5 x 6 x 3 cm from the upper eyelid to the left cheek. We diagnosed this patient with capillary hemangioma and she was treated using oral propranolol titrated to 2 mg/kg/day divided into 3 doses after previous consultation with the pediatric department for any contraindication.

Results: After receiving treatment for 3 days, half of the anterior segment was able to be examined and the mass continued to shrink for the next 4 months with the same regimen.

Conclusions: Management of capillary hemangioma using oral propranolol 2 mg/kg/day in this case has been giving good outcomes. Improvements in clinical appearance were recognizable and promising.

Ophthalmic Education

Poster No.: EX2-167

Panel No.: 167, Session EX2

Comparison of Undergraduate Clinical Ophthalmology Learning Methods: Smartphone Television Display versus Slit Lamp Teaching Tube

First Author: Wenting ZHOU

Purpose: To compare medical students' preference of smartphone television display (SPTD) to a slit lamp teaching tube (SLTT) in undergraduate clinical ophthalmology education.

Methods: This is a prospective, randomized cross-over comparative study. The medical students in groups of 2 were randomly assigned to 2 teaching sessions using either the SPTD followed by SLTT or vice versa. After both the teaching sessions, students were asked to provide feedback on the 2 teaching methods by answering 6 questions in a survey. All participating students were sent the results of the study 1 month after the completion of the study and were asked to reflect upon the outcome by answering 3 further questions.

Results: In total, 38 students were recruited. The overall satisfaction scores were significantly higher in students tutored using the SPTD than the SLTT (mean 8.6 ± 1.5 , 7.5 ± 1.0 , respectively, $P < 0.01$). The students preferred the SPTD compared to the SLTT in terms of "visualizing exactly what was described" (8.5 ± 1.4 vs 7.0 ± 1.3 , $P < 0.01$), "seeing the signs described all the time" (8.4 ± 1.3 vs 7.2 ± 1.2 , $P < 0.01$), "understanding ocular anatomy" (8.3 ± 1.2 vs 7.6 ± 1.2 , $P < 0.01$), and "confidence in identifying clinical signs" (8.4 ± 1.2 vs 7.5 ± 1.2 , $P < 0.01$). All of 14 students who responded to our follow-up survey agreed with our interpretation of the data and would support the use of the SPTD in undergraduate clinical ophthalmology teaching.

Conclusions: Our study has demonstrated that SPTD as a teaching aid can significantly increase the satisfaction of undergraduate medical students during their ophthalmology attachment.

Poster No.: EX2-168

Panel No.: 168, Session EX2

How a Singapore Residency Program Successfully Incorporated Simulator Training into its Cataract Training Module

First Author: Zheng Xian THNG

Co-Author(s): Llewellyn LEE, Shaan WIRYASAPUTRA

Purpose: Our center's ophthalmology residency program is a 5-year training program. To enhance the cat-



aract training program in our institute, we have been using the EYESI simulator machine as part of our training syllabus. Residents have to successfully complete the simulator modules before embarking on surgery in patients. The aim of this project is to assess the efficacy of the EYESI simulator machine in enhancing our residents' learning experience and skills when starting phacoemulsification cataract surgery.

Methods: To assess the utility of the simulator, we tracked posterior capsule rupture (PCR) complication rates of residents and also gathered anonymous feedback on how the residents felt the simulator modules facilitated their learning. Additionally, we also gathered anonymous feedback from senior cataract surgeons on how the EYESI cataract simulator modules have impacted residents' surgical skills.

Results: The PCR rates for phacoemulsification cataract surgery were 1.93% for the residents. Overall, 85.71% of residents felt they were more confident in performing surgery after using the simulator. A total of 100% of the senior cataract surgeons surveyed felt simulator training was a useful addition to the residency program's cataract training. There was a 13.4% increase in residents' surgical scores post simulator training.

Conclusions: Residents have given positive feedback with respect to the cataract training modules on the EYESI simulator. The modules have afforded them more confidence in performing several crucial steps of phacoemulsification surgery. PCR rates among our residents are significantly lower than those described in current literature and this points to a robust cataract training program.

Poster No.: EX2-169

Panel No.: 169, Session EX2

Optimizing Electronic Results Acknowledgement Rates in the Singapore National Eye Centre

First Author: Val **PHUA**

Co-Author(s): Rahat **HUSAIN**, Yu Qiang **SOH**

Purpose: Singapore National Eye Centre recently implemented an electronic system of ordering laboratory and radiological investigations and an electronic results acknowledgement module. The stipulated time frame for results acknowledgement is within 48 hours for abnormal results and within a week for all other results. However, there has been a mean daily rate of 6.05% of unacknowledged abnormal results since implementation (n = 145–416), which can lead to serious adverse events and compromised patient safety. We performed root-cause-analysis of the problem and implemented measures to increase the rates of results acknowledgement at our center.

Methods: Our team of doctors took over the role of results acknowledgement for 2 weeks to understand the intricacies and identify issues on the ground. Having identified the main issues and how to deal with them, PDSA cycles were performed to optimize electronic results acknowledgement rates. A major intervention was the design and enforcement of a daily roster where junior ophthalmologists were scheduled to identify all unacknowledged critical results and to acknowledge and act on them accordingly. All doctors in the center were also educated on the importance of results acknowledgement, with remedial technical training provided where necessary.

Results: A results acknowledgement rate of 100% was achieved. This was sustainable even with new doctors rotating through the system regularly. There have been no reports of unacknowledged abnormal results leading to adverse clinical outcomes during the follow-up period.

Conclusions: It is possible to achieve 100% electronic results acknowledgement rates with sustained vigilance and awareness from the relevant stakeholders.

Ophthalmic Epidemiology

Poster No.: EX2-170

Panel No.: 170, Session EX2

Association of Keratoconus with Other Diseases: Another Look Based on Taiwanese National Health Insurance Research Database

First Author: Yueh-Chang **LEE**

Co-Author(s): Yuan-Chieh **LEE**

Purpose: To evaluate the association between keratoconus (KC) and other diseases identified in previous literature, including diabetes, autoimmune diseases, allergic immune disorders, corneal dystrophy, and glaucoma.

Methods: A retrospective observational case-control study of randomly sampled 1 million enrollees from the 2005 National Health Insurance Research Database (NHIRD) enrollment file who were diagnosed with KC (years 2000-2011; n = 241) and 964 age- and gender-matched controls. We calculated the prevalence of the following diseases: diabetes, rheumatoid arthritis, ulcerative colitis, arthropathy, amyloidosis, systemic lupus erythematosus, celiac disease, multiple sclerosis, myasthenia gravis, polymyalgia rheumatica, idiopathic thrombocytopenic purpura, Crohn disease, autoimmune hepatitis, asthma, irritable bowel syndrome, ophthalmic diseases, corneal dystrophy, and glaucoma. The odds ratio (OR) of having these diseases among patients with KC was compared with controls.

Results: The association between KC and the follow-



ing diseases was statistically significant: asthma [OR = 1.75 (1.18-2.59)], irritable bowel syndrome [OR = 2.18 (1.44-3.31)], and glaucoma [OR = 4.82 (2.68-8.67)]. The association between KC and the remaining diseases did not reach statistical significance.

Conclusions: We found associations of KC with allergic immune disorders and glaucoma; whether KC shares similar pathogenesis with these diseases should be investigated in future study.

Poster No.: EX2-171

Panel No.: 171, Session EX2

Correlating Myopia Severity with Visual Performance in a Young Asian Male Population

First Author: Bryan **ANG**

Co-Author(s): Kai Xiong **CHEONG**, Edmund Wei Long **LIM**, Marcus Chiang Lee **TAN**, Mei Hui Mellisa **TAN**, Colin **TAN**

Purpose: To examine the visual performance in a young Asian male population with severe myopia.

Methods: A cross-sectional study of right eyes of 148 emmetropes [spherical equivalent (SE) -0.50 to +1.00 diopters (D)] and 564 severe myopes (SE \leq -6.00 D) categorized into 3 groups (Group 1: SE -6.00 to $>$ -8.00 D; Group 2: SE -8.00 to $>$ -10.00 D; Group 3: SE \leq -10.00 D). Multivariate regression analyses adjusting for age and ethnicity examined the relationship between corrected distance visual acuity (CDVA) [photopic, mesopic, and Super Vision Test-Night Vision Goggles (SVT-NVG)] and contrast sensitivity (CS) (mesopic and SVT-NVG) with SE and axial length (AL).

Results: The mean age of subjects was 21.07 ± 1.17 years and the majority were Chinese (91.9%). The mean SE was 0.10 ± 0.23 D for emmetropes and -8.76 ± 2.04 D for severe myopes ($P < 0.001$). Higher degrees of myopia were associated with reduced CDVA and CS and increased AL (all $P < 0.001$). Among severe myopes, Group 1 had the highest proportion of subjects with good CDVA (photopic \geq 6/6, mesopic \geq 6/6, and SVT-NVG \geq 6/7.5 logMAR) and CS (mesopic \geq 0.75 and SVT-NVG \geq 0.35 logCS) compared to Groups 2 and 3 (all $P < 0.001$). Among severe myopes with good VA (photopic \geq 6/6, mesopic \geq 6/6, or SVT-NVG \geq 6/7.5 logMAR), Group 1 had the highest proportion of subjects who achieved mesopic CS \geq 0.75 and SVT-NVG CS \geq 0.35 logCS (both $P < 0.001$). Multivariate analyses demonstrated that reduced VA and CS were associated with decreased SE and increased AL (all $P < 0.001$).

Conclusions: Higher degrees of myopia are associated with reduced VA and reduced CS.

Poster No.: EX2-172

Panel No.: 172, Session EX2

Current Status (2016) of Ophthalmology in Taiwan

First Author: Wen-Ming **HSU**

Purpose: To describe the current status of ophthalmology in Taiwan in 2016.

Methods: Data was searched for and collected concerning ophthalmic history, ophthalmic services, research, and publications in ophthalmology in Taiwan from ophthalmic publications and various journals.

Results: Many eye doctors have contributed to the development of ophthalmology in Taiwan in the past 150 years (1865-2015). Nowadays, the workforce of ophthalmologists in Taiwan (2016) is in a relatively abundant state at 74.1 ophthalmologists per million people (23.5 million people with 1,740 ophthalmologists). The ophthalmic education in Taiwan is adequate in both basic and continuing education, and ophthalmic services are adequately available. From 2001 to 2016, the average yearly cataract surgery rate (CSR) in Taiwan was 5,720 per million people. An average of 128,500 (113,000-157,000) cataract extractions with intraocular lens implants (95% with phacoemulsification) and 780 (680-860) keratoplasty procedures were performed annually. The major areas of biomedical research in ophthalmology in Taiwan are ophthalmic epidemiology, glaucoma, vitreo-retinal diseases, cornea, and stem cells. From 1990 to 2016, Taiwanese ophthalmologists published 28 monographs, 18 textbooks, and 7,850 scientific articles.

Conclusions: Currently in Taiwan, the manpower is abundant, the ophthalmic education is adequate in both basic and continuing education, and ophthalmic services are adequately available. The future objectives of Taiwanese ophthalmologists are to promote preventive ophthalmology, to expand efforts in basic research, and establish a national eye disease registry.

Poster No.: EX2-173

Panel No.: 173, Session EX2

Myopic Macular Degeneration and Impact on Visual Impairment in Singaporean Adults with High Myopia

First Author: Yee-Ling **WONG**

Co-Author(s): Ching-Yu **CHENG**, Seang Mei **SAW**, Chee-Wai **WONG**, Tien **WONG**, Anna **YEO**

Purpose: To determine the impact of myopic macular degeneration (MMD) in Singaporean adults with high myopia from 3 population-based cross-sectional studies in Singapore.

Methods: Subjects with high myopia, defined as having



at least 1 eye with spherical equivalent (SE) of -6.0 diopters (D) and worse, were selected from 3 cross-sectional studies. A total of 319 subjects aged 40 to 80 years with high myopia were chosen, consisting of 88 Malay, 74 Indian, and 147 Chinese subjects. Standardized refraction and ophthalmic examination [including measurement of best-corrected visual acuity (BCVA)] and fundus photography were conducted. MMD was graded following the Meta-PM classification system, and Meta-PM categories were specified on a standardized template. Eyes with Meta-PM categories 2, 3, or 4 were considered as having MMD.

Results: Three hundred nine subjects had gradeable photographs, of which 21.4% (N = 66) had MMD. The mean SE for subjects with MMD was -9.6 D, which was 1.9 D (95% CI, 1.2-2.6, $P < 0.001$) worse than those without MMD. Subjects with MMD had greater visual impairment (33.3% with low vision and 7.9% with blindness), compared to those without MMD (16.1% with low vision and 2.1% with blindness) ($P < 0.001$). The median BCVA of subjects with MMD category 2 was 0.22 (IQR, 0.12-0.67) and MMD plus lesions category was 0.31 (IQR, 0.12-0.5), which were significantly higher than MMD category 1 (0.1; IQR, 0-0.3) and MMD category 0 (0.1; IQR, 0-0.14) ($P < 0.001$).

Conclusions: MMD may lead to low vision and blindness in adults with high myopia, posing potential public health problems in visual impairment.

Poster No.: EX2-174

Panel No.: 174, Session EX2

National Blindness Survey in India 2015-18: Methodology and Planning

First Author: Praveen **VASHIST**

Co-Author(s): Noopur **GUPTA**, Promila **GUPTA**, Vivek **GUPTA**, Atul **KUMAR**, Suraj **SINGH**

Purpose: National Programme for Control of Blindness in India has goals of eliminating avoidable blindness by the year 2020. The government of India is conducting a national blindness survey to assess the prevalence of blindness and its causes including the prevalence of diabetic retinopathy.

Methods: We used Rapid Assessment of Avoidable Blindness (RAAB-6) technique for assessing the prevalence and causes of avoidable blindness. The survey is being conducted in 30 districts representing 23 states across the country. These districts are selected by probability proportionate to size (PPS) random sampling among the 640 districts enlisted in the 2011 census. The survey will cover a sample of 3000 people above the age of 50 years in each district. The sample from the entire country will amount to 90,000 people. Each participant will undergo a structured evaluation for history of diabetes; random capillary blood sugar mea-

surement; presenting visual acuity using 6/12, 6/18, and 6/60 Snellen optotypes; pinhole vision; lens examination; dilated examination as needed; and ascertainment of principle cause of visual impairment/blindness for each eye as well as assessment of diabetic retinopathy and maculopathy by indirect ophthalmoscopy. All these assessments will be done by house-to-house visit.

Results: A total of 14 districts have been completed so far. To complete 1 district, it took around 20-25 days with teams of 12 members, depending upon the geographical location.

Conclusions: RAAB is a suitable survey technique in low- and middle-income countries that can estimate the prevalence and cause of blindness and visual impairment.

Poster No.: EX2-175

Panel No.: 175, Session EX2

The Different Faces of IgG4-Related Ophthalmic Disease

First Author: Yuen Ting **KWOK**

Co-Author(s): Andy **CHENG**, Hunter **YUEN**

Purpose: IgG4-related disease (IgG4-RD) is a systemic fibroinflammatory disorder characterized by lymphoproliferation and infiltration of IgG4-positive plasma cells. When the ocular adnexa or the orbit is involved, it can be termed IgG4-related ophthalmic disease (IgG4-ROD). Lacrimal gland is the most commonly involved orbital structure but involvement of the trigeminal nerve branches, extraocular muscles, and orbital soft tissue were also reported. This current study aims to report the different clinical presentations and sites of involvement by IgG4-ROD.

Methods: This is a retrospective case series. All patients with histological confirmation of IgG4-ROD were identified from 3 institutions in Hong Kong from July 2013 to June 2016. Demographic data, clinical presentation, and serological and radiological data were reviewed.

Results: A total of 21 patients with histological proof of IgG4-RD were identified. Majority of patients presented with bilateral lacrimal gland swelling (dacryoadenitis), followed by orbital soft tissue involvement, trigeminal nerve enlargement, and extraocular muscle involvement. One patient presented with recurrent scleritis with a pinkish subconjunctival patch, which is infrequently reported. Extra-nodal marginal zone B cell lymphoma with a background of IgG4-ROD was seen in 1 patient.

Conclusions: IgG4-ROD can have a diverse clinical presentation depending on the type of orbital tissue involved. A high level of suspicion with early biopsy is

crucial for diagnosis.

Poster No.: EX2-176

Panel No.: 176, Session EX2

Trachoma Survey in India 2015-16: Methodology and Planning

First Author: Suraj **SENJAM**

Co-Author(s): Promila **GUPTA**, Vivek **GUPTA**, Noopur **GUPTA**, Atul **KUMAR**, Praveen **VASHIST**

Purpose: Globally 53 countries, including 3 from South-east Asia, are endemic for blinding trachoma. India is uncertain about trachoma endemicity. It is worthwhile to know the current status of active and blinding trachoma so that the country can achieve trachoma elimination by 2020. We will highlight the currently undergoing trachoma survey methodology in India and thereby share the survey micro-planning activities.

Methods: We employed the World Health Organization approved population-based survey methodology to find the prevalence of active and blinding trachoma in 9 districts chosen based on previously reported cases and the rapid assessment technique in 15 districts to find high-risk communities. In rapid, there were 500 children aged 1-9 years from 10 clusters, 50 from each; whereas a sample of 2000 children for active with 100 from each cluster from 20 and 8000 adults, 400 from each cluster, for blinding trachoma were examined in each district. To select the households, we used compact segment technique for prevalence and convenience sampling for rapid. We divided teams as pre-survey, survey, and post-survey teams. Their roles and responsibilities were well defined.

Results: So far, all the districts have been covered. Around 6-7 days for rapid and 12-14 days for prevalence were taken to complete the survey in 1 district by different teams of 6-8 members and 10-12 members in each survey, respectively.

Conclusions: Trachoma rapid assessment and prevalence survey can be suitably adopted in a developing country to assess trachoma status. A well-planned and proficient coordination of activity is essential for such a mega-survey.

Orbital and Oculoplastic Surgery

Poster No.: EX2-177

Panel No.: 177, Session EX2

A Rare Case of Globe Luxation

First Author: Vaibhab **SHARMA**

Co-Author(s): Shweta **WALIA**

Purpose: To report a rare case of globe luxation follow-

ing trauma due to fall from height with injury to the orbital bony structures.

Methods: Case presentation.

Results: A 40-year-old male patient presented to the emergency department with a history of fall from height, following which he complained of severe pain and complete loss of vision in his right eye. On examination, the right globe was found to be displaced anteriorly, and the posterior part of the globe was caught tightly between the closed eyelids. Upper and lower eyelid tear was present medially. Visual acuity was reduced to no perception of light. The conjunctiva showed tear superior to limbus. The cornea showed signs of exposure keratopathy. The pupil was mid-dilated, and the anterior chamber was of normal depth and contour. The central fundus could not be visualized clearly, due to corneal translucency. Ocular motility was severely restricted in all positions of gaze. The other eye was clinically unremarkable. CT revealed disruption of intraorbital segment of right optic nerve; associated intraorbital hematoma was present. There was disruption of the superior, inferior, medial, and lateral rectus muscles and proptosis of the right eye. There was a fracture in the roof of the right orbit.

Conclusions: In globe luxation, if the globe is viable, it is important to find and repair all extraocular muscles. A complete tarsorrhaphy helps in keeping the globe in position. In comparison with initial enucleation, its advantage is that the patient need not sacrifice an organ, and we can easily fit an ocular prosthesis with better motility on a phthisic eye.

Poster No.: EX2-178

Panel No.: 178, Session EX2

ABCDEF: Causes of Patient Dissatisfaction After Blepharoplasty

First Author: Brian **CHON**

Purpose: To identify causes of postoperative patient dissatisfaction after blepharoplasty.

Methods: A retrospective chart review was performed of a single academic institution's oculofacial patient population. We only included those patients with chart documentation of dissatisfaction with surgical outcome. Blepharoplasty included upper-only, lower-only, and combined upper and lower blepharoplasty surgeries. A total of 91 patient charts were included. A categorical system of complaints, ABCDEF, was used to then categorize patient complaints. Images were reviewed for signs that best matched patient complaints to the ABCDEF categories. If appropriate, multiple categories could be used for the same patient.

Results: The most common category of complaints were F, or fill, in 58.2% of patients. This was followed



by B, borders, and A, asymmetry, at 42.9% and 35.2%, respectively. D (dryness), C (canthi/corners), and E (expectations) were less common but still reported in a large percentage of the patient population.

Conclusions: We present a simple mnemonic, ABCDEF, to organize the many symptoms that can cause dissatisfaction after blepharoplasty. The ABCDEF mnemonic is useful as a reminder of factors to check but should not be relied upon as an all-inclusive list. The most common complaints included A, B, and F, or asymmetry, borders, and fill. Asymmetry is assessed by comparing the right and left eyes for gross differences. Borders can be checked by evaluating the eyelid creases and margins for height, contour, and symmetry. Fill is assessed by ensuring excess tissue has been removed but not to the point of hollowness.

Poster No.: EX2-179

Panel No.: 179, Session EX2

Assessment of Visual Function Before and After Blepharoptosis Surgery Using Extended Müller Tucking

First Author: Kazuhiko DANNOUE

Purpose: The number of patients visiting eye clinics for age-related blepharoptosis has been increasing. We investigated changes in visual function before and after blepharoptosis surgery using extended Müller tucking, a technique reported by Miyata.

Methods: We studied 34 eyes of 18 patients who underwent surgery at Dannoue Eye Clinic. The surgical procedure was as follows: an eyelid skin incision was made with a CO2 laser, and then, the orbicularis oculi muscle was resected up to the middle of the tarsus. The tissue above the tarsus at the eyelid margin was held with Pean forceps and pulled obliquely upward to give the tarsus a domed shape. Consequently, the Müller muscle was sterically exposed and then tucked at 2 points. Marginal reflex distance (MRD), visual acuity, Schirmer value, tear film break-up time (BUT), contrast sensitivity, ocular aberration, and all-round visual field were measured before, and 1, 3, and 6 months after surgery.

Results: MRD improved from 0.52 mm (± 0.67) before surgery to 3.06 mm (± 0.67) at 1 month, 3.09 mm (± 0.84) at 3 months, and 3.28 mm (± 0.95) at 6 months after surgery. Contrast sensitivity tended to be improved at 1 and 3 months after surgery. At all postoperative time points, the visual field in all directions except the inferonasal direction showed improvement. After surgery, dry eye occurred in 2 eyes but was resolved with eye drops.

Conclusions: By 6 months after blepharoptosis surgery using extended Müller tucking, sufficient eyelid ele-

vation had been obtained. In addition, visual function was improved.

Poster No.: EX2-180

Panel No.: 180, Session EX2

Autologous Fat Transfer for Periorbital (Face) Grooves

First Author: Hui CHEN

Purpose: Fat loss and redistribution has increasingly been recognized as an important aspect of facial aging, especially in the periorbital grooves and wrinkles. The effect of autologous fat transfer applied in the periorbital grooves and wrinkles was evaluated.

Methods: Autologous fat transfer was performed in 30 women aged from 35-50. All women were followed up for 1-4 years. A questionnaire about the effect was given, and the quality of skin, dry eye, and possible complications were observed.

Results: Twenty-nine women were very satisfied with the cosmetic effect at 1 month after operation, and 1 woman was satisfied with the result; dry eye disappeared in 1 woman. Skin quality improved in 20 women. No severe complication was observed in 30 women; however, all experienced 1-2 weeks of swelling in the middle face.

Conclusions: Autologous fat transfer provides an effective alternative of volume restoration for periorbital rejuvenation.

Poster No.: EX2-181

Panel No.: 181, Session EX2

Clinical Analysis After Treatment of 23 Orbital Trapdoor Fracture Cases

First Author: Wei LU

Purpose: To analyze treatment modalities for orbital trapdoor fractures based on clinical data.

Methods: Clinical data for orbital trapdoor fractures diagnosed at the Second Hospital of Dalian Medical University between November 2012 and July 2014 were retrospectively reviewed. Twenty-three cases meeting our study criteria were included. All fractures were approached transconjunctivally. For 16 cases, absorbable material was chosen to reduce and rigidly fix the fractures, while for 7 cases, the bone and soft tissue were just reduced to anatomical positions. Efficacy of either treatment modality was assessed by reviewing CT scans as well as clinical manifestations of diplopia, enophthalmos, and eyeball motility at 1 week and 6 months of follow-up.

Results: In 23 cases before and after surgery there was no significant change in visual acuity. Preoperatively,

21 patients had diplopia, 20 had motility limitations, while 2 had enophthalmos. Postoperatively, all cases of enophthalmos were repaired. Two patients had residual diplopia and limitation of eyeball motility for up gaze. Postoperative CT scans showed proper orbital reconstruction with anatomic reduction of herniated orbital soft tissue and fracture fixation.

Conclusions: Orbital trapdoor fracture is a special type of small fracture area including line-shaped, green-stick fracture. Patients can have the special manifestation of nausea and vomiting. Cases in which the forced-duction test is negative always need emergent surgery within 48 hours. Transconjunctival approach is the proper choice; during reduction and fixation of the fracture, we can use absorbable material or just put the bone and soft tissue in the anatomical position.

Poster No.: EX2-182

Panel No.: 182, Session EX2

Clinical Analysis of Hyaluronic Acid Injection to Correct Enophthalmos of Orbital Fracture

First Author: Wei LU

Purpose: Clinical analysis of hyaluronic acid (HA) injection to correct enophthalmos after orbital fracture.

Methods: Clinical data of orbital fractures between September 2014 and September 2015 were retrospectively analyzed, containing 14 male cases and 7 female cases. Three cases (14.3%) had not undergone surgical treatment before, while 18 cases (85.7%) were treated by operation, including 11 (47.6%) cases of floor fracture, 6 (28.6%) cases of medial wall fracture, and 1 (4.8%) case of medial wall and floor fracture. During the procedure the hyaluronic acid was injected in the space between the periosteum and extraocular muscle core. Based on the value of enophthalmos and the condition of the eye during injection we decided the amounts to inject. We tried to inject a single site and observe the systematic condition of the patient during the injection. Efficacy of either treatment modality was assessed by reviewing CT scans as well as clinical manifestations of enophthalmos and visual acuity with 6-12 (average, 8.9) months of follow-up.

Results: In 21 patients before and after injection there was no statistically significant difference in visual acuity. Before injection, the average measurement of 21 patients' enophthalmos was 2.67 ± 0.53 mm 1 week after injection; 20/21 (95.2%) cases of enophthalmos were totally corrected. The average measurement of 21 patients' enophthalmos was 0.48 ± 0.60 mm 6 months after injection; 4/21 (19.1%) cases of enophthalmos recurred. In 17/21 (80.9%) cases, the hyaluronic acid was absorbed partly, and the measurement of enophthalmos was 1.48 ± 0.52 mm. The manifestation of diplopia or globe movement limitation was not recorded. After

injection the CT scan showed the position of the hyaluronic acid was proper in the orbit. No case of infection or rejection was recorded.

Conclusions: Intraorbital HA injection can repair enophthalmos effectively.

Poster No.: EX2-183

Panel No.: 183, Session EX2

Clinical Outcomes of Conservative Management and Probing in Children Less Than 3 Years with Congenital Nasolacrimal Duct Obstruction

First Author: Prabhjot Kaur MULTANI

Co-Author(s): Kasturi BHATTACHARJEE, Nilutparna DEORI, Deepika KAPOOR, Diva MISRA, Samir SERASIYA

Purpose: To assess the clinical outcome of conservative management and probing in children less than 3 years with congenital nasolacrimal duct obstruction (CNLDO).

Methods: Hospital-based, prospective, interventional study of CNLDO cases. Children less than 13 months were in group 1 and those more than 13 months of age were in group 2. Lacrimal sac massage with or without topical antibiotics was given to group 1 and probing under anesthesia done in group 2. Success of the treatment was defined as resolution of all the symptoms for 1 month. The lacrimal sac regurge sample was collected on presentation and subjected to staining and culture.

Results: Eighty-six eyes of 70 patients with CNLDO were included. Group 1 had 41 eyes and group 2 had 45 eyes. Mean age was 5.41 months and 21.04 months in groups 1 and 2, respectively. Sixty-two patients (72.1%) had epiphora and mucopurulent discharge at presentation. Microbiology report showed no growth in 23 samples (24.73%) and mixed infection in 7 samples. Most common isolates were *Streptococcus pneumoniae* (20.43%), *Hemophilus influenzae* (15.05%), and *Staphylococcus aureus* (11.83%). Success rate after 6 months was 85.37% and 82.22% in groups 1 and 2, respectively.

Conclusions: Lacrimal sac massage and topical antibiotics have a high success rate in children < 13 months of age. Probing is a safe and effective treatment option in children above 13 months of age as primary treatment or after failed conservative management. The cure rate of probing at the age of 14–20 months is high enough to justify an initial late probing in CNLDO.



Poster No.: EX2-184

Panel No.: 184, Session EX2

Demographic Pattern and Treatment Outcome of Primary Orbital Lymphoma: Our Experience

First Author: Sadia SULTANA

Purpose: Primary orbital lymphoma comprises 1% of all non-Hodgkin lymphoma. Our purpose of study was to analyze the demographic pattern, clinical features, and treatment outcome of primary orbital lymphoma.

Methods: It was a retrospective study conducted from January 2011 to December 2015 with an average follow-up of 2 years. Total number of patients was 72. Patients with systemic features and involvement of other lymphoid organs were excluded. Demographic profile, clinical and histopathological features, and treatment outcome were analyzed.

Results: Most of the patients presented with palpable orbital mass, progressive proptosis, ptosis, motility restriction, and reduced vision. Sixty-four patients presented with unilateral orbital lesion. Most of the tumors were of low grade non-Hodgkin lymphoma (low grade, 60 patients; intermediate grade, 5 patients; and high grade, 7 patients). Most of the tumors were of B-cell lineage (83%) followed by diffuse large B-cell lymphoma (7%), MALToma (4.3%), marginal zone lymphoma (4.3%), and lymphoblastic lymphoma (1.4%). All the patients with low grade lymphoma responded to radiotherapy and intermediate and high grade lymphoma responded to combined radiotherapy and chemotherapy. There was no recurrence during the average 2 years of follow-up.

Conclusions: Primary orbital lymphoma is a relatively uncommon presentation of non-Hodgkin lymphoma. The majority are of low grade and of B cell lineage and mostly unilateral. High degree of clinical suspicion and adequate investigations can make the proper diagnosis. Radiotherapy and in some cases combined radiotherapy and chemotherapy can cure the patient with a very low recurrence rate.

Poster No.: EX2-185

Panel No.: 185, Session EX2

Discussion of Clinical Usefulness of Dacryoscintigraphy in Patients with Nasolacrimal Duct Obstruction Prior to Endoscopic Dacryocystorhinostomy

First Author: Dong Ju KIM

Co-Author(s): Minwook CHANG, Ji-Hyun PARK

Purpose: To evaluate the clinical usefulness of dacryoscintigraphy in patients with nasolacrimal duct obstruction prior to endoscopic dacryocystorhinostomy.

Methods: Data were collected retrospectively from 2011 to 2015. A total of 127 eyes of 109 patients complaining of epiphora were divided into 3 groups by dacryoscintigraphy: pre-sac (group 1), intra-sac (group 2), and intra-ductal (group 3) types. We confirmed the obstructive sites of lacrimal passage both by probing with Bowman probe and dacryocystography and excluded all the cases of not passing lacrimal pathway or without obstruction of lacrimal pathway. Surgical outcome was evaluated postoperatively by patency of rhinostomy, subjective improvement of epiphora, and complications.

Results: The anatomical success rate of endoscopic dacryocystorhinostomy was 94% in group 1, 93.3% in group 2, and 95.7% in group 3. The functional success rate was 92% in group 1, 83.3% in group 2, and 93.6% in group 3. Functional failure rates (functional failure/total failure) were 25%, 60%, and 33.3% in each group. Highest functional failure rate was in the intra-sac group, but there was no significant difference of functional failure rate among the 3 groups ($P = 0.322$). There were no statistically significant risk factors associated with success rate according to subdivided groups ($P > 0.05$).

Conclusions: In patients with nasolacrimal duct obstruction, preoperative evaluation of obstruction level using dacryoscintigraphy may not be useful for predicting the surgical outcome of endoscopic dacryocystorhinostomy.

Poster No.: EX2-186

Panel No.: 186, Session EX2

Eye Injury Due to Land Mine

First Author: Duong DIEU

Purpose: To report a case of severe lesions in both eyes and limbs caused by exploding land mine followed up after 1 year of treatment.

Methods: Case report with diagnosis, treatment, and follow-up including vision, intraocular pressure (IOP), and presence of sympathetic ophthalmia.

Results: A 30-year-old male farmer who presented with multiple injuries and blurred vision due to an exploding land mine had clinical signs of soft tissue injury of the lower extremities and upper limbs and tendon injury on the finger of the left hand. Both eyes were closed-globe injuries. In the right eye (RE), small pieces occupied 1/2 corneal surface; hyphemia with 2 mm. Visual acuity (VA) was hand movements (HM) at 0 and 3 meters. IOP was soft. In the left eye (LE) foreign bodies were lodged into 1/3 corneal surface. There was no hyphemia. VA was counting fingers (CF) at 5 meters. IOP was 10 mm Hg. Ultrasonography and fluorescein angiography showed mass hemorrhage in the vitreous body and detachment of vitreoretina of RE > LE. Di-

agnosis was trauma group 1-3 (eyes + body). Foreign bodies were extracted in the course of hospital admission. Local and general steroid was used for treatment of uveitis. The patient was followed up at 1 month, 3 months, 6 months, and 1 year. RE was atrophic ocular with soft IOP and VA of no perception of light. LE VA was CF at 3 meters with IOP 10 mm Hg. There was no sympathetic ophthalmia.

Conclusions: The result of treatment of this case is still blindness. This depends on the situation of the lesion which was caused by an exploding land mine and on the primary injuries, especially blast injury. The prevention of land mine trauma is the first step to saving patients' vision as well as their lives.

Poster No.: EX2-187

Panel No.: 187, Session EX2

Histopathology-Confirmed Pseudotumors and "Pseudo" Pseudotumors: A Case Series

First Author: Maria Donna SANTIAGO

Purpose: To characterize the clinical and pathological features of 15 patients with histopathology-confirmed orbital inflammatory disease that presented as an orbital neoplasm and histopathology-confirmed orbital neoplasm that presented as an orbital inflammatory disease.

Methods: The medical records for all the patients with histopathology-confirmed orbital inflammatory disease ("pseudotumor") that presented as orbital neoplasms and histopathology-confirmed orbital neoplasms that presented as idiopathic orbital inflammatory disease from May 2004 to April 2015 were reviewed. The biopsies were performed under the primary service of one surgeon (M.D.D.S.), the presenting author of this study. The data extracted included age, gender, presenting signs and symptoms, diagnostic imaging features, histopathological features, clinical course, treatment regimen, and outcome.

Results: The study included 12 male and 3 female patients. There were 5 patients in the histopathology-confirmed idiopathic orbital inflammatory disease group and 10 patients with histopathology-confirmed orbital neoplasms. The mean age of patients in the histopathology-confirmed idiopathic orbital inflammatory disease ("pseudotumor") group was 27.25 years. The presenting symptoms and signs included proptosis, diplopia, and inflammation. The mean age of the histopathology-confirmed orbital neoplasm group was over 50 years. The presenting symptoms and signs included proptosis, inflammation, orbital pain, and epiphora. Four of the patients previously underwent biopsy.

Conclusions: Improved diagnostic safety is crucial to differentiate between idiopathic orbital inflammatory disease and non-inflammatory conditions such as

neoplasms. The optimal approach is best determined by extracting a detailed history, performing a comprehensive physical examination, and securing appropriate radiological evaluation.

Poster No.: EX2-188

Panel No.: 188, Session EX2

Is There Any Place for a Combination in Ptosis Surgery?

First Author: Pham TRONG VAN

Co-Author(s): Nguyen HIEN, Pham HONG VAN

Purpose: To evaluate results of the combination between maximal aponeurosis resection and sling using either silicone rod or fascia lata.

Methods: Descriptive noncomparative study. Fascia lata was harvested through a small incision (3 cm) without stripper. Silicone rod can be replaced by normal DCR tube because of cost and availability. Sling material was inserted through pentagone-shaped tunnel using syringe. Patients were followed at regular intervals at 1 month, 3 months, and 1 year for MRD1, lid lag, and lagophthalmos.

Results: Twenty-six patients using fascia lata and 27 patients using silicone rod with ptosis and poor levator function were grouped for sling operation using fascia lata and silicone rod. In the group using fascia lata, success rates after 1 week, 1 month, and 3 months were 73.1%, 84.6%, and 88.5%. Lid lag occurred in 23 eyes. Two eyes had undercorrection after 1 week but symmetry after 1 month. One eye had entropion. Three eyes had keratitis that resolved after 3 months. In the group using silicone rod the success rate was 92.6%, with 1 eye recurrent, 1 eye overcorrected, and 2 eyes with dermal chalasis.

Conclusions: Patients had stable outcomes with smooth eyelid contour. Such complications as entropion and retraction occurred in the group with fascia lata because of fascia fibrosis and contraction. Maximal aponeurosis resection assures a sufficient temporary eyelid elevation and good contour. Sling material can be inserted and adjusted easily and gently to elevate the margin to 1 centimeter above the desired level.

Poster No.: EX2-189

Panel No.: 189, Session EX2

Late Dacryocystorhinostomy Failure from Lacrimal Sump Syndrome with Pseudo-Sac Formation

First Author: James SNG

Co-Author(s): Margarita BONDOC, Tian Loon LEE, Jin Keat SIOW, Chee-Chew YIP

Purpose: The authors report a case of lacrimal sump



syndrome (LSS) with pseudo-sac formation adjacent to the dacryocystorhinostomy (DCR) ostium due to severe postoperative scarring.

Methods: A retrospective case report of DCR failure from LSS with pseudo-sac formation.

Results: A 53-year-old Chinese woman underwent functional endoscopic sinus surgery (FESS) for chronic sinusitis 15 years previously. She developed left NLDO 2 years post-FESS and right dacryocystitis 10 years post-FESS. The right endoscopic DCR was successful. The left DCR failed and required revision DCR 3 years previously. However, it failed again with symptomatic epiphora necessitating a second revision DCR. Intraoperatively, left nasal endoscopy showed cicatricial narrowing around a patent common canalicular opening and a transverse fibrotic shelf inferiorly. The latter formed a pseudo-sac causing tear retention and stasis. The pseudo-sac was marsupialized endoscopically by removing the fibrotic shelf and pericanalicular cicatrix. Intraoperative mitomycin-C (0.4 mg/mL x 5 minutes) was applied and washed off followed by bi-canalicular lacrimal stenting. Three months postoperatively, the patient remained symptom-free with a negative dye disappearance test and patent ostium.

Conclusions: Intense postoperative scarring may cause late DCR failure secondary to LSS with pseudo-sac formation, despite a good sized ostium. Controlled endoscopic scar resection, anti-metabolite application, and bi-canalicular lacrimal stenting may effectively treat LSS to improve symptoms and signs.

Poster No.: EX2-190

Panel No.: 190, Session EX2

Novel Technique of Customized Rotating Bone Saw-Assisted Beveled Osteotomies in Lateral Orbitotomy for Orbital Neoplasms

First Author: Maria Donna SANTIAGO

Purpose: To evaluate the success rate of a novel method of beveled osteotomy for lateral orbitotomy using a customized 21 mm stainless steel rotating saw in lateral orbitotomy.

Methods: This paper represents a case series (30 orbits from 29 patients) of lateral orbitotomies for excision biopsy of orbital neoplasms over a 14-year period (from September 2001 to July 2016). It is a retrospective observational study. The surgeries were performed under the primary service of 1 surgeon, the presenting author of this study. All patients were treated via beveled osteotomies in lateral orbitotomy using a stainless steel, 21 mm diameter, customized rotating bone saw. Preoperative and postoperative measurements were tabulated and statistically analyzed.

Results: The case series demonstrated that beveled

osteotomies in lateral orbitotomy using a stainless steel, 21 mm diameter, customized rotating bone saw were technically possible and provided ample exposure for excision biopsy of all neoplasms in this study. No patient required the use of miniplate hardware in repositioning the lateral orbital wall nor complained of a palpable deformity of the lateral orbital wall.

Conclusions: The modified technique of beveled osteotomies in lateral orbitotomy provides excellent access to the lateral subperiosteal, peripheral, and central surgical spaces. The exposure was adequate for excision biopsy of all neoplasms in this study. The technique promotes osseous union without the use of miniplate hardware. The use of a stainless steel 21 mm diameter customized rotating bone saw facilitated the successful outcome of the beveled technique.

Poster No.: EX2-191

Panel No.: 191, Session EX2

Ocular Prosthetics: A Ten-Year Experience in a Tertiary Care Hospital

First Author: Suriya Abu WALED

Co-Author(s): Shantha AMRITH, Rosemarie Sarmiento CLEMENTE, Gangadhara SUNDAR, Stephanie YOUNG

Purpose: To describe the indications, types, and outcomes of ocular prosthetics for the rehabilitation of anophthalmic sockets and phthisical eyes over a 10-year period in a tertiary care hospital.

Methods: Retrospective review of all patients who received various forms of ocular prosthetics managed by the ocular prosthetic and oculoplastic services at a tertiary care ophthalmic institution from 2006-2015.

Results: A total of 144 patients were managed, comprising 102 adults and 42 children, with a mean age of 33.5 years. Most patients received unilateral prosthesis (99.3%, n = 143) with only 1 child requiring bilateral prosthesis. Majority were males (65.3%). Types of ocular prosthesis included customized ocular prosthesis (n = 86), scleral shell (n = 19), iris-painted conformers (n = 36), and others (n = 2). Indications for the various prosthesis included 1) post enucleated sockets (52.1%) for trauma (n = 12), infections (n = 30), and ocular malignancies (n = 33); 2) post eviscerated sockets (29.9%) for trauma (n = 16) and infections (n = 27); 3) phthisical eyes (15.3%); 4) post exenterated sockets (2.1%); and 5) severe microphthalmos (0.7%). Most ocular prosthesis moulds were obtained as outpatients (66.0%, n = 95) while 34% (n = 49) of patients had impression moulds obtained under general anaesthesia. All patients were able to tolerate their prosthesis well with minimal complaints, good symmetry, and good social acceptance. Motility was good in 22.2%, fair in 52.8%, and poor in 25.0%. Patient satisfaction rates were good (71.5%), fair (21.5%), and poor (6.9%).

Conclusions: Ocular prostheses offer good structural, functional, and psychological rehabilitation for anophthalmic patients. Increased awareness of this invaluable clinical service among ophthalmologists and other medical professionals is strongly encouraged.

Poster No.: EX2-192
Panel No.: 192, Session EX2

Orbital Blow-Out Fractures: Floor, Medial Wall, and Combined Floor and Medial Wall

First Author: Stephanie **YOUNG**
Co-Author(s): Shantha **AMRITH**, Gangadhara **SUNDAR**

Purpose: Orbital blow-out fractures usually occur in the orbital floor and medial wall where the bones are thinnest. It has been described that medial wall blow-out fractures may be more common in the Asian population. Our aim in the study was to describe the prevalence of the various types of orbital blow-out fractures and evaluate the postoperative outcomes with various implants in the repair of these fractures.

Methods: A retrospective review of all patients with pure blow-out fractures who had undergone orbital fracture repair in a single tertiary trauma center from January 2005 to December 2014 was performed.

Results: Our study comprised 84 patients and 88 orbits. The types of fractures included isolated orbital floor blow-out fractures (59.1%), combined orbital floor and medial wall fractures (29.5%), and isolated medial wall blow-out fractures (11.4%). Isolated medial wall fractures had less diplopia and ocular motility restriction than isolated floor fractures ($P < 0.01$). The implants used included bioresorbable implants [poly-L/DL-lactide implants (P[L/DL]LA) 85/15 (RapidSorb), (P[L/DL]LA) 70/30 (PolyMax), polycaprolactone (PCL) (OsteomeshTM), and (P[L/DL]LA) 70/30 (MacroPore)], as well as titanium implants. There was significant improvement in ocular motility, diplopia, enophthalmos and infraorbital hypoesthesia postoperatively at week 1, 1 month, and 6 months ($P < 0.001$) for all implants. Comparison of results between the various implants and types of fractures showed no significant difference in postoperative outcome and complications.

Conclusions: Orbital floor and medial wall blow-out fractures are relatively common and can be managed by proper reconstruction and restoration of preorbital orbital volume, with either titanium or bioresorbable implants.

Poster No.: EX2-193
Panel No.: 193, Session EX2

Outcome of Orbital Wall Reconstruction with the Use of Titanium Implants

First Author: Janice Jing Chee **CHEUNG**
Co-Author(s): Siu Chung **FUNG**, Kenneth Kai Wang **LI**, Theresa Siu Ting **MAK**, Derek Kim Hun **YU**

Purpose: To study the outcomes of orbital wall fracture repair by using titanium mesh for orbital wall reconstruction.

Methods: A retrospective review of patient records was performed for 13 patients with orbital wall reconstruction surgery done from August 2011 through April 2016 between 2 hospitals. Orbital wall reconstruction was performed using orbital titanium plate fixed at the inferior orbital rim with screws. Surgical outcomes including improvement in diplopia, ocular motility, maximal residual ocular restrictions, and complications were recorded.

Results: This retrospective case series includes 13 patients (12 male and 1 female) with ages ranging from 20-56 years old (mean age, 36 years old). The series included 12 out of 13 (92.3%) of the patients with orbital wall blowout fractures involving at least 1 orbital wall; 1 out of 13 (7.7%) required reconstruction after tumor resection. Postoperative diplopia improved in 10 cases (76.9%), stayed the same in 2 cases (15.4%), and worsened in 1 case (7.7%). Similarly, ocular motility improved in 10 cases (76.9%) and worsened in 3 cases (23.1%). Postoperatively, there was residual diplopia on up-gaze in 10 cases, none in down-gaze, lateral gaze diplopia in 2 cases, and medial gaze diplopia in 3 cases. No intraoperative or postoperative complications were noted in any of the cases.

Conclusions: The use of titanium plate in orbital reconstruction surgery was found to be safe with a low complication rate and produced satisfactory postoperative outcomes. There was improvement in ocular motility and subjective diplopia in most cases. The most common residual symptom was diplopia on up-gaze.

Poster No.: EX2-194
Panel No.: 194, Session EX2

Periorbital Necrotizing Fasciitis: A Case Series

First Author: Shantha **AMRITH**
Co-Author(s): Stephanie **YOUNG**

Purpose: Periorbital necrotizing fasciitis (NF) is uncommon because of the excellent blood supply to the area; nevertheless, when it occurs it can lead to deep orbital extension and associated complications of blindness and even death. The aim of this case series was to review our experience handling such cases and describe the clinical parameters and outcomes in periorbital NF.



Methods: The case logs of 2 surgeons were used to identify cases of NF. Chart reviews were performed to characterize clinical metrics.

Results: Six patients (2 males, 4 females; mean age, 58.1 years) were identified with periorbital NF. Of these patients, 5 (83.3%) had underlying immunodeficiencies consisting of Waldenstrom macroglobulinemia, angio-immunoblastic T cell lymphoma, post renal transplant, poorly controlled diabetes, and chronic kidney disease. One patient had antecedent trauma, and another had a history of infected facial lesion. Causative organisms included *Pseudomonas aeruginosa*, methicillin-resistant *Staphylococcus aureus*, and *Mucor*. All patients had necrosis of the periorbital skin including the upper lids, medial canthus, and supra-brow region. Other signs included eyelid edema, discharge, blurring of vision, and ophthalmoplegia. Two patients received medical treatment without debridement, another 3 underwent surgical debridement, while 1 underwent exenteration. More severe presentation of ophthalmoplegia correlated with the requirement for exenteration. More severe immunosuppression correlated with poorer outcomes, with 2 patients succumbing to the disease.

Conclusions: Outcome depends on prompt recognition and early treatment. Physicians must maintain a high index of suspicion for NF, which demands emergent hospital admission, broad-spectrum systemic antibiotic therapy, and surgical debridement of necrotic tissue.

Poster No.: EX2-195

Panel No.: 195, Session EX2

Phthiriasis Palpebrarum: A Case Report

First Author: Hung-Jui HSU

Purpose: To report a case and review related literature of phthiriasis palpebrarum.

Methods: A case report.

Results: An 81-year-old female presented with itching and irritation of both eyes for 2 weeks. She had a history of cataract surgery in both eyes 2 years previously. Slit lamp examination showed both eyelids reddened and multiple small dark round protuberances over the upper and lower eyelid margin. We mechanically removed all nits with forceps after application of gentamicin ointment. Diluted 5% povidone-iodine was applied to eyelashes and no further symptoms were reported.

Conclusions: Phthiriasis palpebrarum is an uncommon cause of blepharitis. It may be difficult to diagnose positively for an inexperienced doctor. One treatment choice can be to mechanically remove the nits. Other treatments like cryotherapy, argon laser photocoagulation, yellow mercuric oxide, and oral medication have been reported.

Poster No.: EX2-196

Panel No.: 196, Session EX2

Preoperative Predictors of Outcomes of Orbital Floor Fracture Repair

First Author: Yan Tong KOH

Co-Author(s): Clarissa CHENG, Llewellyn LEE

Purpose: Orbital floor fracture is a common injury sustained after blunt force impact to the orbit. Although consequences of orbital floor fractures have been well studied, outcomes of surgical repair to ameliorate complications such as enophthalmos and diplopia have not been systematically analyzed. Our study aims to investigate for preoperative predictors of favorable surgical outcomes.

Methods: Retrospective review of 59 consecutive cases of orbital floor fractures that underwent orbital floor repair between January 2000 and December 2009. Significant enophthalmos (greater than 2 mm on Hertel exophthalmometer), significant diplopia (objective diplopia within 30 degrees of primary gaze on binocular single vision test), extensive fracture (greater than 50% on computed tomography), and muscle entrapment (examined intraoperatively) were analyzed at presentation, 1 week (POW1), and 6 months (POM6) post-repair.

Results: Subjects with significant enophthalmos preoperatively were 4.7 times more likely to have significant enophthalmos at POM6 ($P < 0.01$). Fracture extent was not associated with postoperative enophthalmos at POM6 ($P = 0.5$). Subjects with preoperative diplopia were 1.5 times more likely to have significant diplopia at POM6 ($P = 0.3$). Postoperatively, significant diplopia and significant enophthalmos reduced by 57% ($N = 17/30$) and 53% ($N = 9/17$) at POM6, respectively, although this was not statistically significant. On multivariate analysis, surgery for muscle entrapment was significantly associated with surgical success at POM6 ($P = 0.03$).

Conclusions: Presence of enophthalmos and diplopia preoperatively predicted a higher risk of these complications postoperatively. Orbital floor fracture repair provided modest reduction of significant diplopia and enophthalmos.

Poster No.: EX2-197

Panel No.: 197, Session EX2

Surgical Outcome of Lateral Tarsal Strip

First Author: Syeed KADIR

Co-Author(s): Md Sayedul HOQUE, Riffat RASHID, Shahab UDDIN

Purpose: To analyze the effectiveness of lateral tarsal strip (LTS) for the surgical repair of marginal malposition of the lower eyelid.



Methods: This retrospective interventional study includes patients with involuntional entropion and involuntional and paralytic ectropion who underwent lateral tarsal strip surgery in a tertiary care eye hospital from January 2013 to December 2015. All records were examined to determine the indications, management strategy, surgical outcome, and postoperative complications.

Results: Lateral tarsal strip procedure was done in 46 lower eyelid marginal malpositions of 41 patients. Among them, 36 cases were unilateral and 5 cases were bilateral. In bilateral cases, 3 were involuntional entropion and 2 were involuntional ectropion. Twenty-four (52%) eyelids were involuntional entropion, 16 (35%) eyelids presented involuntional ectropion, and 6 (13%) eyelids showed paralytic ectropion. A total of 31 (75.61%) males and 10 (24.39%) females made the study group. The mean age was 61.34 ± 5.74 years ranging from 26 to 85 years. Forty-three (93.47%) eyelids obtained satisfactory correction of eyelid ectropion and entropion with unique lateral tarsal strip procedure. Two eyelids showed undercorrection and another 1 was overcorrected. Two eyelids (4.34%) recurred after 6 months of surgery in involuntional entropion. The average follow-up period was 8 months.

Conclusions: Lateral tarsal strip (LTS) is a successful surgical technique to correct all types of marginal malposition of the lower eyelid.

Pediatric Ophthalmology & Strabismus

Poster No.: EX2-198

Panel No.: 198, Session EX2

Analysis of Anomalous Head Posture in Albinism and Effect of Nystagmus Surgery on Head Posture

First Author: Karthikeyan **ARCOT SADAGOPAN**
Co-Author(s): He **CAO**, Lizhen **CHEN**, Dennis **LAM**, Lei **ZHU**

Purpose: The purpose of the study was to evaluate the patterns of anomalous head posture (AHP) seen in oculocutaneous albinism (OCA) and ocular albinism (OA) and to analyze the effect of extraocular muscle surgery on AHP.

Methods: In a retrospective consecutive case series review, the charts of 80 consecutive patients seen in an 18-month period with either OCA or OA were reviewed. The presence and the nature of AHP, when present, were documented. In patients who had undergone surgery, pre-operative and post-operative photographs and videos were compared and analyzed. Patients operated elsewhere were included, if pre-operative photos or videos and surgical records were available.

Results: Seventy-seven children had OCA and 3 had OA. There were 48 males and 32 females. Forty-four had an AHP. Eighteen had surgery for 1 or more of the following; nystagmus, AHP, strabismus. A significant improvement in AHP was observed in 8 patients. Two patients showed no improvement. Three patients, who had no AHP pre-operatively, developed AHP following surgery. There was a change in the AHP in 4 patients. One patient neither had nor developed AHP after surgery. Spontaneous change in AHP during follow-up was observed in 7 unoperated patients.

Conclusions: AHP is common in OCA. Chin down is the commonest anomalous head posture. The risk of recurrence, development of a new AHP and also development of an AHP when none existed earlier, should be thoroughly discussed with the parents. Spontaneous changes in AHP are common and surgery at a younger age should be approached with caution.

Poster No.: EX2-199

Panel No.: 199, Session EX2

Analysis of Surgical Outcome and Cost Effectiveness of Pediatric Adjustable Suture Strabismus Surgery Using Fells Technique

First Author: Lizhen **CHEN**
Co-Author(s): Karthikeyan **ARCOT SADAGOPAN**, He **CAO**, Dennis **LAM**

Purpose: The use of adjustable sutures in strabismus surgery especially in children has been debated. Though long-term studies have not yet shown adjustable suture strabismus surgery to be better than scleral fixation, many recent studies have shown a better success rate for adjustable procedures at least in the short term. The purpose of the study was to analyze the surgical outcome and cost effectiveness of adjustable suture strabismus surgery in children.

Methods: In a retrospective consecutive case review, children less than 18 years who underwent adjustable suture strabismus surgery performed by a single surgeon using "Fells Technique" during a 1-year period in a private clinic in China were evaluated. Successful alignment was defined as deviation within 8 prism diopters (PD) at 3 months' follow-up.

Results: Thirty children were treated with adjustable suture strabismus surgery using "Fells Technique." Six were for partial refractive accommodative esotropia, 5 each for superior oblique palsy and intermittent exotropia, 3 for infantile esotropia, 2 for Duane retraction syndrome, 2 for oculomotor nerve palsy, and 1 each for abducent nerve palsy, Brown syndrome, inferior oblique palsy, ocular fibrosis, infantile exotropia, consecutive esotropia, and sensory exotropia. Only 6 patients with complex strabismus required adjustment.



Conclusions: Adjustable suture strabismus surgery is a safe, effective, and also cost-effective procedure with good surgical outcome and minimal complications. Despite concerns regarding another anesthesia, most parents preferred having the adjustable procedure as it offered them an opportunity to finetune the alignment. Surgeon's adjustment rate and complexity of strabismus also influence the cost effectiveness of the procedure.

Poster No.: EX2-200

Panel No.: 200, Session EX2

Assessment of Fixation Status in Intermittent Exotropia

First Author: Hyosook AHN

Purpose: To quantify the severity and progression of intermittent exotropia using a new scoring system.

Methods: The new scoring system is based on the patient's potential to regain the phoria for both distance and near fixation which consists of 0 to 8 observation scales after cover-uncover test. Inter-rater and test-retest reliability were assessed from a cohort 10 patients who were video-recorded while undergoing the scoring test. Validity was evaluated by comparing with clinical variables of intermittent exotropia.

Results: Inter-rater reliability was acceptable for both distance and near. Test-retest reliability was excellent for both distance and near (ICC = 0.849 and 0.727). A broad representation of the total score was significantly linked to the age of onset and the amount of exophoria.

Conclusions: The new scoring system is a reliable and valid tool for assessing the severity of intermittent exotropia.

Poster No.: EX2-201

Panel No.: 201, Session EX2

Burden of Strabismus and Amblyopia at a Tertiary Care Center

First Author: Mukesh PATIL

Co-Author(s): Rohit SAXENA, Digvijay SINGH, Divya SINGH

Purpose: To understand the disease burden of strabismus and amblyopia at a tertiary care center.

Methods: A hospital-based observational study was conducted at a tertiary care hospital in India. All patients with strabismus or amblyopia, who presented over a 1-year period, were identified and evaluated with a detailed clinical history and examination.

Results: A total of 24,475 patients presented to the hospital, of which 20% were children and a total of

1950 had strabismus or amblyopia, of which over half of the population consisted of children. Overall magnitude of amblyopia and strabismus was 2.0% [95% confidence interval (CI), 1.8-2.2] and 6.9% (95% CI, 6.6-7.2), respectively. Among younger children, the burden of amblyopia and strabismus was 84.4% and 26.6%, respectively. Strabismus was noted in 84.6% (n = 1649), most of which was of the comitant subtype (78.1%, n = 1288) with an equal distribution of exotropia and esotropia. Paralytic [12.9% (n = 251)] and restrictive squint [4.7% (n = 85)] constituted the remaining burden of strabismus.

Conclusions: Strabismus and amblyopia affect a sizeable proportion of patients presenting to a tertiary care ophthalmology setup. A significantly higher burden is present in the pediatric population. The majority of the cases of strabismus are of the comitant variety, which do not merit tertiary level eye care. Thus, there is a need to improve pediatric eye care at a secondary level to reduce the immense burden on tertiary care centers.

Poster No.: EX2-202

Panel No.: 202, Session EX2

Characteristics of Retinopathy of Prematurity

First Author: Melita DJAJA

Purpose: To report the characteristics of retinopathy of prematurity (ROP), which was examined by binocular indirect ophthalmoscope, and the relation to age of gestation, post menstrual age, baby birth weight, and current weight.

Methods: A retrospective study involving babies who were referred from the department of pediatrics for ROP screening. A total of 151 premature or low birth weight babies received ROP screening from January to June 2016. Gestational age, post menstrual age at the time of screening, birth weight, baby weight at the time of screening, and diagnosis by binocular indirect ophthalmoscopy were recorded.

Results: The incidence rate was 3%. There were 5 ROP cases found. Three of them were diagnosed as stage 3 ROP and treated with laser photocoagulation. All ROP babies were born at <30 weeks gestational age with birth weight \leq 1500 g. There was a significant correlation of gestational age with ROP incidence (P = 0.01), while post menstrual age (P = 0.13), birth weight (P = 0.10), and current weight (P = 0.857) were not significantly related to ROP incidence. The range of gestational age was 21-39 weeks with a mean of 31 weeks. Standard deviation was \pm 2.8 weeks.

Conclusions: The incidence rate was 3%, and gestational age can be used as predictive factor for ROP. Other factors, such as post menstrual age, birth weight, and current weight, showed no association with ROP inci-

dence.

Poster No.: EX2-203
Panel No.: 203, Session EX2

Characteristics of Students in Low Vision Clinics of Changhua Show Chwan Memorial Hospital from 2012 to 2013

First Author: Pei-Tzu **KUAN**
Co-Author(s): Shih-Chun **CHAO**, Ching-Yang **LIN**

Purpose: To report the characteristics of students in low vision clinics at Changhua Show Chwan Memorial Hospital from 2012 to 2013.

Methods: A cross-sectional observational study in cooperation with special counseling teachers and optometrists to give a full assessment and medical service to students with visual impairment.

Results: We collected 65 visits of 30 students in our low vision clinics from September 2012 to December 2013. The age ranged from 5 to 15 years old with mean of 10.3. There were 18 (60.0%) boys and 12 (40.0%) girls. Twenty-six students were qualified with visual impairment and 22 of them were low vision students. The leading cause of low vision was retinopathy of prematurity (10/30; 33.3%), followed by brain-related visual disorder, amblyopia, and congenital cataract. Retina (11/30; 36.7%) was the main anatomical site to cause low vision, followed by brain (4/30; 1.3%), globe appears normal (3/30; 10.0%), lens (2/30; 6.7%), optic nerve (1/30; 3.3%), and uvea (1/30; 3.3%).

Conclusions: The number of students with visual impairment or low vision was still underestimated compared to our previous study. Under the "Professional Counseling Program of Visual Disability Students," we hope we can provide an integrated medical resource for parents to train and restore the residual visual function of the students, as well as offering some recent epidemiology on visually impaired children in Taiwan.

Poster No.: EX2-204
Panel No.: 204, Session EX2

Effects of Refractive Amblyopia on Visual Function in Southeast Asian Children

First Author: Jia Quan **CHAUNG**
Co-Author(s): Audrey **CHIA**, Joanna **SAIGAL**, Nathan **SIAW**, Handa **SWATI**

Purpose: To investigate the effect of refractive amblyopia on complete visual function in comparison with age-matched controls.

Methods: Children with refractive amblyopia and age-matched controls (aged 4 to 8 years) were recruited. Outcome measures included visual acuity, refractive error, contrast sensitivity, accommodation, binocularity,

stereoacuity, and hand-eye coordination.

Results: A preliminary analysis was conducted for 30 subjects and 30 controls. Among study subjects, 36.7% were male, 70.0% were Chinese, 36.7% were hyperopic, 70.0% myopic, and all had astigmatism. Children in the amblyopic group and control groups were aged 6.10 ± 1.29 and 6.42 ± 1.25 years, respectively ($P = 0.340$). Study subjects had lower stereoacuity scores with only 10.0% attaining a stereoacuity of 40-60 seconds compared to 96.7% in the control group; 56.7% and 33.3% had stereoacuity of 100-200 seconds and more than 400 seconds, respectively ($P < 0.001$). Study subjects also had reduced accommodative amplitudes (15.4 ± 4.70 vs 19.3 ± 1.18 D, $P < 0.001$) and binocular function, with 20.0% unable to see 4 lights on Worth-4-Dot test ($P = 0.024$). Contrast sensitivity ($1.31 \pm 0.25\%$) and hand-eye coordination (52.0 ± 17.6) were similar in both groups.

Conclusions: Children with refractive amblyopia also had reduced accommodation, stereoacuity, and binocularity. However, contrast sensitivity and hand-eye coordination were similar to that of controls.

Poster No.: EX2-205
Panel No.: 205, Session EX2

Evaluation of the Use of a Portable, Non-Contact Digital Fundus Camera by Health Care Workers as a Potential Retinopathy of Prematurity Screening Tool in a Large Public Hospital in Thailand

First Author: Sasapin **PRAKALAPAKORN**
Co-Author(s): Sharon **FREEDMAN**, Amy **HUTCHINSON**, Kittisak **KULVICHIT**, Piyada **SAEHOUT**, David **WALLACE**

Purpose: The purpose of this study was to evaluate 1) the feasibility of having a non-ophthalmologist health care worker (HCW) in Thailand obtain digital retinal images of premature infants using a portable, non-contact retinal camera that were of sufficient quality to grade for retinopathy of prematurity (ROP) screening and 2) the accuracy of grading these images to identify infants who developed type 1 ROP.

Methods: We prospectively recruited infants undergoing ROP screening examinations at a large public hospital in Bangkok, Thailand. When these infants were screened for ROP by a retinal specialist, a trained HCW imaged their retinas with Pictor (Volk Optical Inc, Mentor, OH). These digital posterior pole images were graded by 2 masked ROP experts. We evaluated the percentage of gradable images (ie, receiving a grade of fair or good image quality and having 3 or 4 gradable quadrants) and the accuracy of experts grading these images for pre-plus or plus disease (positive screening test) to identify infants who developed type 1 ROP.



Results: Fifty-six infants were included. Overall, 86% of eye imaging sessions and 79-80% of infant imaging sessions were considered gradable. Among gradable images, the sensitivity of both graders for identifying type 1 ROP by grading for the presence of pre-plus or plus disease was 1.0 and the specificity was 0.94 and 0.79 for grader 1 and 2, respectively.

Conclusions: In a middle-income country, it was feasible for a trained non-ophthalmologist HCW to obtain digital retinal images of infants using Pictor that were of sufficient quality to accurately grade for type 1 ROP.

Poster No.: EX2-206

Panel No.: 206, Session EX2

Foveal Avascular Zone in Eyes with a History of Retinopathy of Prematurity

First Author: Akiko **MIKI**

Co-Author(s): Shigeru **HONDA**, Yukako **IOUE**, Makoto **NAKAMURA**, Kaori **UEDA**, Yuko **YAMADA**

Purpose: To quantify the foveal avascular zone (FAZ) using optical coherence tomography angiography (OCTA) in eyes with a history of retinopathy of prematurity (ROP) in comparison to control eyes, and to identify the associated factors including retinal thickness, axial length, refractive error, and visual acuity.

Methods: OCTA was performed using Avanti RTVue 100 XR OCT system (Optovue, Inc, Fremont, CA, USA) in subjects with a history of ROP (ROP group, n = 17; age range, 6 to 15 years) and in age-matched control subjects (control group, n = 30; age range, 6 to 15 years). A scan area of 3 × 3 mm was selected in the superficial retinal layers. The foveal avascular zone area was measured using ImageJ software. The foveal retinal thickness (FT) was measured using Cirrus HD-OCT with the macula cube scan.

Results: The FAZ area was $0.36 \pm 0.11 \text{ mm}^2$ in the control group, whereas it was $0.26 \pm 0.21 \text{ mm}^2$ in the ROP group, which were significantly different ($P = 0.036$). The FT was significantly thicker in the ROP group ($255.19 \pm 26.21 \mu\text{m}$) than in the control group ($238.90 \pm 15.97 \mu\text{m}$) ($P = 0.026$). The refractive error was significantly lower in the ROP group (-2.83 ± 5.04) than the control group (1.04 ± 2.60) ($P = 0.002$). Multivariate analysis showed that the FAZ area was significantly associated with FT ($P < 0.0001$).

Conclusions: Eyes with a history of ROP had a small FAZ area. The FAZ area was associated with FT.

Poster No.: EX2-207

Panel No.: 207, Session EX2

Incontinentia Pigmenti with Pseudo-Retinopathy of Prematurity in a Filipino Female: A Case Study

First Author: Corinna Elise **SAMANIEGO**

Co-Author(s): Milagros **ARROYO**, Patricia Yukiji **VILLA**

Purpose: To describe the pathophysiology, clinical manifestations, and management of the ocular sequelae of incontinentia pigmenti (IP), as illustrated by a case of IP with retinal disease in a Filipino neonate.

Methods: This is a case report on IP in a newborn Filipino female with findings of peripheral retinal ischemia and neovascularization. Both PubMed and local databases were used to review the current literature on IP and its associated ocular anomalies. Data was then correlated to the patient's case in order to describe the epidemiology, pathophysiology, clinical manifestations, and management of the ocular abnormalities in IP.

Results: IP is an X-linked genodermatosis with manifestations in other tissues of neuroectodermal origin such as the central nervous system, teeth, dermal appendages, and eyes. A live, term female was born via normal spontaneous delivery with no neonatal oxygen requirement. Cutaneous lesions evident at birth led to the diagnosis of IP. Fundus findings included initial intraretinal hemorrhages with eventual development of a peripheral ridge-like formation similar to that seen in stage 3 zone II of retinopathy of prematurity (ROP). The patient underwent prompt prophylactic laser ablation, which resulted in resolution of neovascularization on the ridge.

Conclusions: Ocular manifestations of IP occur in about 35% of affected individuals. Early detection of ocular disease in patients with IP is essential. A case of IP presented with pseudo-ROP findings of stage 3 zone II, which can be associated with a risk of retinal detachment without intervention.

Poster No.: EX2-208

Panel No.: 208, Session EX2

Interventional Management of Retinopathy of Prematurity: A Case Series

First Author: Kuku **PRASETYO**

Purpose: To present the outcome of interventional management of retinopathy of prematurity (ROP) cases that were managed by intravitreal anti-vascular endothelial growth factor (VEGF) injection or laser indirect ophthalmoscopy during 2015.

Methods: This is a retrospective study of data taken from the vitreoretina unit at National Eye Center, Cicendo Eye Hospital in 2015. Data was taken from medi-

cal records of patients diagnosed with ROP and treated with intravitreal anti-VEGF injection or laser indirect ophthalmoscope. Data was recorded including history of pregnancy and birth, stage and zone of ROP first diagnosed, interventional management, and outcome of management.

Results: There were 129 cases diagnosed with ROP during 2015 in the vitreoretina unit. Two patients were treated with laser indirect ophthalmoscope: 3 eyes were diagnosed with ROP stage 3 zone 2 and 1 eye was diagnosed with ROP stage 2 zone 2 with 1 of them having regressed ROP after extra laser indirect ophthalmoscope; another was unable to be followed up because he was referred for sepsis. Two patients treated by intravitreal anti-VEGF injection were diagnosed with ROP stage 3 zone 1 in 2 eyes and ROP stage 3 zone 2 in 1 eye. Patients had regressed ROP in zone 3 after intravitreal injection without any complications. One patient received both anti-VEGF intravitreal injection and laser indirect ophthalmoscope.

Conclusions: Intravitreal anti-VEGF, laser indirect ophthalmoscope, and the combination of both could be promising for future management of retinopathy of prematurity if given at the exact time.

Poster No.: EX2-209

Panel No.: 209, Session EX2

Long-Term Outcome of Ocular Deviation Following Unilateral Recession and Resection Surgery in Adult Sensory Exotropia

First Author: Rerkchai THARWARANAN

Purpose: To evaluate the relationship between immediate and long-term outcomes of unilateral recession and resection surgery in adult sensory exotropia, and to evaluate factors associated with long-term outcome and time to non-success following surgery.

Methods: This was a retro-prospective study involving adult patients aged 18 years or older with sensory exotropia who underwent unilateral recession and resection surgery between 2005 and 2013 and were followed up for at least 2 years. Early postoperative deviation at time after suture adjustment was used to evaluate the relationship between immediate and long-term outcomes. Long-term success was defined as angle of deviation within 10 prism diopters (PD) of orthotropia. Factors influencing outcome and time to non-success were analyzed.

Results: A total of 38 patients were enrolled. The mean age at surgery was 31.8 years (range, 13-65 years). The mean preoperative exotropia was 47 PD (range, 25-70). The median follow-up time was 4.7 years (range, 2-10 years). Successful outcome was found in 50% of patients at 2 years. Patients with immediate postop-

erative esotropia between 10 and 30 PD achieved the highest chance of success compared to patients who had less esotropia or patients who had exotropia initially (67%, 62%, and 10%, respectively). Preoperative angle of deviation was the factor associated with long-term outcome ($P = 0.041$). Ninety-five percent (18/19) of patients in the non-success group developed recurrent exotropia. Mean time to failure in the non-success group was 1.5 years.

Conclusions: Unilateral recession and resection surgery achieved 50% success in adult sensory exotropia. Immediate postoperative overcorrection results in the highest chance of successful outcome.

Poster No.: EX2-210

Panel No.: 210, Session EX2

Occurrence of Different Types of Manifest Strabismus in Patients Aged 1-25 Years

First Author: Abdus Salam ARIF

Purpose: To find the occurrence of different types of manifest strabismus (tropias) and to determine the most prevalent type and the presence of associated refractive errors as well as amblyopia in squint patients aged 1-25 years.

Methods: A total of 58 consecutive strabismus patients were examined attending the outpatient department within the time period of 2 months, according to the set criteria. Detailed strabismus evaluation was done including visual acuity (VA) measurement with Snellen and Lea symbols or assessed qualitatively through light fixation and follow and by performing cover tests and Krimsky test.

Results: Overall occurrence of manifest strabismus was found to be 4.3%, with much greater frequency of comitant type. A total of 49% had esotropia, out of which 56% was accommodative esotropia, followed by 40% constant esotropia and 4% infantile esotropia. A total of 51% had exotropia, out of which 73% was constant exotropia, followed by 27% intermittent exotropia. No pure vertical deviations were seen. Overall amblyopia was observed in 43.1% of strabismus patients, with unilateral amblyopia in 60% and bilateral amblyopia in 40%.

Conclusions: Strabismus and associated refractive errors and amblyopia should be treated as early as possible by correcting with glasses, patching therapy, exercises, prisms, or through surgical intervention. Early diagnosis, proper assessment, best possible treatment, and well-planned follow-ups can result in the restoration and development of binocularity as well as lead to improved cosmetic appearance of the patient.



Poster No.: EX2-211
Panel No.: 211, Session EX2

Psychological Impact of Eye Drop Administration in Children

First Author: Jane LIM

Purpose: To determine the psychological effects of eye drop administration in children.

Methods: Children requiring eye drops for cycloplegic refraction were recruited. Nurses administered eye drops in 2-3 cycles spaced 5-10 minutes apart, and optometrists performed refraction 30 minutes after the last drop. Ophthalmologists, nurses, and optometrists rated the children's cooperation level at first review, after each eye drop, at refraction, and at final review. Parents chose a personality type best describing their child and monitored their child's anxiety using a modified Yale Preoperative Anxiety Scale (m-YPAS). Children were "uncooperative" if nurses noted significant distress during the first drop cycle.

Results: A total of 298 children 2-12 years of age were included. Of these, 26% experienced pre-drop distress and 13% were uncooperative with drops. Compared to cooperative children, uncooperative children tended to be younger [2.0-4.9 years vs ≥ 8 years; odds ratio (OR), 4.11; 95% confidence interval (CI), 1.14-14.83; $P = 0.031$], male (OR, 2.55; 95% CI, 1.06-6.10; $P = 0.036$), had a previous negative eye drop experience (84.2% vs 25.3%; $P < 0.001$), and were more anxious (m-YPAS scores, 41.4 ± 22.0 vs 30.6 ± 12.6 ; $P < 0.001$). Children described as "demanding and aggressive" were more uncooperative. It took longer to instill drops (3.1 vs 1.3 minutes) and perform refraction (11.6 vs 7.2 minutes) in uncooperative children.

Conclusions: A small group of children were uncooperative with eye drops and 25% experienced significant pre-drop anxiety. Factors, such as age, gender, a previous negative eye drop experience, and pre-drop anxiety, associated with uncooperativeness need to be considered when developing strategies to improve the eye drop experience in children.

Poster No.: EX2-212
Panel No.: 212, Session EX2

Retinal Structure Changes in Unilateral Amblyopia Using Spectral Domain Optical Coherence Tomography

First Author: Tanyatuth PADUNGKIATSAGUL
Co-Author(s): Wadakarn WUTHISIRI, Apatsa LEKSKUL

Purpose: The purpose of this study was to investigate the possible changes in circumpapillary retinal nerve fiber layer (cpRNFL), macular thickness (MT), and foveal thickness (FT) in amblyopic eyes of patients with uni-

lateral amblyopia using spectral domain optical coherence tomography (SD-OCT).

Methods: This was a prospective institutional study of patients aged ≥ 10 years old with unilateral amblyopia (anisometropic, strabismic, deprivative, or mixed). Comprehensive ophthalmic examination was completed and retinal structures including cpRNFL, MT, and FT were measured by SD-OCT (Cirrus HD-OCT).

Results: Twenty-three patients with unilateral amblyopia with a mean age of 31.4 years old were included. Fourteen (60.9%) were anisometropic, 7 (30.4%) were strabismic, and 2 (8.7%) were deprivative. Retinal structure measurements of an amblyopic eye and normal fellow eye were compared, respectively. The mean cpRNFL thickness was $95.00 \mu\text{m} (\pm 17.19)$ vs $99.82 \mu\text{m} (\pm 13.03)$ ($P = 0.301$), the mean macular thickness was $271.41 \mu\text{m} (\pm 19.35)$ vs $280.13 \mu\text{m} (\pm 11.26)$ ($P = 0.076$), and the mean foveal thickness was $249.46 \mu\text{m} (\pm 30.74)$ vs $245.81 \mu\text{m} (\pm 25.40)$ ($P = 0.671$). SD-OCT assessments revealed no statistically significant difference was found.

Conclusions: Using high-definition SD-OCT, the mean cpRNFL and mean FT of amblyopic eyes were slightly greater than the normal eyes, although they were not statistically significant. Amblyopia does not seem to have a profound effect on the cpRNFL, macula, and fovea.

Poster No.: EX2-213
Panel No.: 213, Session EX2

Sensitivity and Specificity of Different Tests to Detect Visual Impairment in 3- to 6-Year-Old Children

First Author: Jyothi THOMAS

Purpose: Preschool vision screenings are endorsed as a cost-effective way to detect vision impairment in children. Poor vision hampers social and psychological well-being and affects productivity in adulthood.

Methods: Ethics committee approval and parental consent were obtained. Each child was assessed with LEA, HOTV, and E charts for vision, stereo acuity measurement with Randot preschool, photo refraction, cover tests, cycloplegic refraction, and retinal evaluation. Visual impairment (VI) was defined as presenting visual acuity of $< 6/12$ (Dandona et al). ROC analysis and intraclass correlation coefficient (ICC) were employed for data analysis.

Results: A total of 200 eyes (100 patients) were analyzed; 52% were males and 48% were females. Mean age was 64.6 ± 12.3 months. Median visual acuity and stereo acuity was 0.27 logMAR (0.1, 0.6) and 200 sec of arc (60,800), respectively. Ninety-seven eyes (49.5%) had visual impairment, and refractive error was noted

in 80 eyes. Forty-five eyes (22.5%) had amblyopia of which 39 (86.6%) were of refractive etiology. Sensitivity for Lea symbol chart was 91.8%, and Randot preschool stereotest was 56.2% for visual impairment detection. There was good agreement between visual acuity charts in detecting visual impairment ($r = 0.990$, $P < 0.001$).

Conclusions: The sensitivity of visual acuity charts are high in detecting visual impairment in preschoolers. Refractive error was observed to be the main cause of visual impairment.

Poster No.: EX2-214

Panel No.: 214, Session EX2

Superior Oblique Transposition for Third Nerve Palsy

First Author: Vu **ANH**

Co-Author(s): Nguyen **HIEN**

Purpose: To evaluate the effectiveness of superior oblique tendon transposition in the management of ocular deviation secondary to complete congenital third nerve palsy.

Methods: Prospective study of 19 patients with complete congenital third nerve palsy who underwent muscle surgery using superior oblique tendon transposition. All patients also underwent ptosis surgery.

Results: Fifteen patients (78.95%) achieved good results, 3 patients had fair, and 1 patient had poor results. Follow-up ranged from 6 months to 24 months (mean, 11.8 months). No operative complications occurred.

Conclusions: Superior oblique tendon transposition is easy, safe, technically undemanding, and effective for the management of patients with complete congenital third nerve palsy. Patients with congenital third nerve palsy often achieve reasonable cosmesis with strabismus and ptosis surgery.

Poster No.: EX2-215

Panel No.: 215, Session EX2

Targeting Diverse Pathways for Pharmacological Intervention in Retinopathy of Prematurity: An Experimental Study

First Author: Neelima **ARON**

Co-Author(s): Shorya **AZAD**, Rajvardhan **AZAD**, Parijat **CHANDRA**, Madhu **NATH**, Velpandian **THIRUMURTHY**

Purpose: To evaluate the anti-angiogenic effect of marine isolates, bryostatin and dolastatin, in a rat model of retinopathy of prematurity (ROP).

Methods: Retinopathy was induced by exposing neonatal rat pups to hyperbaric oxygen 75% from postnatal day 7 to postnatal day 12 followed by randomization

into 5 groups, namely, bryostatin and dolastatin (test drugs), bevacizumab and thalidomide (positive controls), and sham (saline-injected controls), based on the treatment administered. The retinal vasculature was evaluated by calculating the tortuosity indices of vessels and focal electroretinographic responses in terms of b wave amplitude were recorded from ROP rats on day 17 and day 25 using MICRON-III imaging system. ROP rats were compared to room air raised rats.

Results: Retinopathy was seen in the form of tortuosity of vessels at the posterior pole with arteries being affected more than veins. A significant increase in arteriolar tortuosity and a decrease in b wave amplitude was seen in sham as compared to room air. On comparison of drug-treated groups with sham, a reduction in disease process was seen in all groups with a maximum reduction in tortuosity of vessels and the highest b wave amplitude noted in bryostatin, with a significant correlation between the two.

Conclusions: Bryostatin (protein kinase C modulator) has a potential anti-angiogenic effect on the progression of ROP and may hold a promising future in the treatment of ROP. Dolastatin failed to decrease retinopathy significantly at test dose but its potential as an anti-angiogenic agent cannot be ignored.

Poster No.: EX2-216

Panel No.: 216, Session EX2

Viral Conjunctivitis: Clinical Profile and Treatment Patterns at a Pediatric Hospital

First Author: Valencia Hui Xian **FOO**

Co-Author(s): Audrey **CHIA**, Champika **PERERA**

Purpose: To study clinical outcomes and treatment of children with viral conjunctivitis.

Methods: A retrospective review of children (<14 years) presenting at the emergency department (ED) with viral conjunctivitis and subsequently referred to the eye clinic (EC) between January 2013 and December 2013 was performed.

Results: A total of 359 children were included in the study. The majority of the children were aged <3 years (49.3%) and had symptoms for 3-7 days (59.9%) before presentation to the ED. Children presented to the EC at 4.74 ± 3.87 days later, upon which conjunctivitis had resolved in 25.5%. Seventy-seven (20.6%) had significant pseudomembranes and corneal ulceration was noted in 35 (9.4%). Most of the children had been started on topical or oral antibiotics at ED (40.1%), and 120 (33.4%) were started on topical steroids at EC with a steroid response [intraocular pressure (IOP) > 25 mm Hg] recorded in 12 (3.2%). Full resolution was achieved at a mean of 11.32 ± 7.61 days after presentation to EC, but persistent nummular keratitis was noted in 3.5%.



Conclusions: Viral conjunctivitis resolved fully over time in all children but some developed ocular pathology which resulted in significant distress and discomfort during the course of the illness.

Refractive Surgery

Poster No.: EX2-217
Panel No.: 217, Session EX2

A Comparative Study of Transscleral Suture-Fixated and Scleral-Fixated Intraocular Lens Implantation

First Author: Yu **MIZUNO**
Co-Author(s): Katsumasa **ITAKURA**, Kaori **KOMATSU**, Satoshi **OKIMOTO**, Yosuke **SUGIMOTO**

Purpose: To compare the short-term clinical outcomes between scleral-fixated and transscleral suture-fixated intraocular lens (IOL) implantation.

Methods: Twenty eyes of 19 patients were included; 10 eyes in each group. Patients in group 1 underwent transscleral suture-fixated IOL implantation and those in group 2 underwent scleral-fixated IOL implantation. The postoperative best corrected visual acuity (BCVA), degree of astigmatism, IOL astigmatism (total astigmatism – corneal astigmatism), and refractive error were all measured at 1 week and 1 month.

Results: The mean preoperative BCVA in logarithm of the minimum angle of resolution (logMAR) was 0.26 ± 0.14 and 0.16 ± 0.12 in groups 1 and 2, respectively. Mean postoperative BCVA was improved in both groups at 1 month (group 1: 0.21 ± 0.11 ; group 2: 0.09 ± 0.05). The degree of astigmatism and IOL astigmatism did not show any significant difference between the 2 groups at 1 week or 1 month. Refractive error in group 2 was significantly less than group 1 at both 1 week and 1 month ($P = 0.02, 0.04$), respectively. Reverse pupillary block was seen in group 1 (10%); ocular hypertension was the most common complication observed in group 2 (20%).

Conclusions: Scleral-fixated IOL implantation is equivalent to transscleral suture-fixated IOL implantation in BCVA and IOL astigmatism from the early postoperative period without serious complications. Scleral-fixated IOL implantation appears to provide more stable fixation in comparison with suture-fixated IOL implantation.

Poster No.: EX2-218
Panel No.: 218, Session EX2

Changes in Anterior Chamber Angle Structures After Implantable Phakic Intraocular Lens with Centraflow Technology: An AS-OCT Study

First Author: Divya **SINGH**
Co-Author(s): Mukesh **PATIL**, Radhika **TANDON**, Murugesan **VANATHI**, Shikha **YADAV**

Purpose: To quantitatively assess the parameters of anterior chamber and angle dimensions with anterior segment optical coherence tomography (AS-OCT) after implantable collamer lens (ICL) implantation.

Methods: In 32 eyes of 16 patients with high myopia scheduled for ICL implantation AS-OCT iridocorneal angle measurements were performed before and 3 months after the surgery. The anterior chamber angle (ACA) angle opening distance (AOD) at 500 and 750 μm from the scleral spur trabecular-iris space area (TISA) at 500 and 750 μm and the scleral spur angle (SSA) were compared.

Results: Preoperative ACA was 34.684 ± 2.344 and at 3 months it was 31.944 ± 2.529 degrees, showing a narrowing of $7.9 \pm 2.69\%$. In the preoperative period AOD500, AOD750, TISA500, TISA750, and SSA were 0.349 ± 0.061 , 0.521 ± 0.159 , 0.098 ± 0.023 , 0.202 ± 0.044 mm, and 34.278 ± 4.617 degrees, which correspondingly fell to 0.321 ± 0.061 , 0.476 ± 0.132 , 0.085 ± 0.021 , 0.174 ± 0.053 mm, and 32.403 ± 4.664 degrees at 3 months with a significant difference ($P < 0.001$).

Conclusions: Considerable angle narrowing was detected 3 months after ICL V4c implantation. Therefore factors predictive of angle dimensions could help in identifying suitable candidates for ICL implantation.

Poster No.: EX2-219
Panel No.: 219, Session EX2

Comparing Visual Outcome of Laser In Situ Keratomileusis and Implantable Collamer Lens in Moderate Myopia

First Author: Sudarshan **KHOKHAR**
Co-Author(s): Manish **MAHABIR**

Purpose: Studies conducted until now favor the implantable collamer lens (ICL) as a better option for myopia than laser in situ keratomileusis (LASIK). However, all the studies were conducted on US and Japanese populations. There is a difference in morphology of Indian eyes compared to those populations. This study intends to compare results in an Indian population.

Methods: Prospective comparative interventional clinical study. Inclusion criteria were as follows: myopia [4-7 diopters (D)], age 21-30 years, stable refraction for



a period of 2 years, central corneal thickness 500 μm or more, predicted postoperative residual stromal bed 300 μm or more, normal intraocular pressure (IOP). At 6-month follow-up, related investigations were performed: UCVA and BSCVA by Snellen chart, final PMT, autorefraction, tear film break-up time, Schirmer test, FACT for contrast sensitivity, USG pachymetry for corneal thickness, slit lamp examination, noncontact tonometer for IOP measurement, indirect ophthalmoscopy for fundus examination, iTrace for higher order aberrations, specular microscopy for endothelial count.

Results: Immediate postoperative refraction of within 1 D of refractive error was achieved in 99% in the ICL group, while in the LASIK group only 85% achieved this. There was no difference in the preoperative as well as postoperative higher order aberrations in the ICL group, while in the LASIK group, higher order aberrations were induced. FACT and contrast were better in the ICL group compared to LASIK.

Conclusions: Final visual acuity at 6 months was equal in the 2 groups with no regression; hence, both the procedures can be used based on surgeon preference.

Poster No.: EX2-220

Panel No.: 220, Session EX2

Comparison of Orbscan II and Galilei G4 for Assessment of Corneal Curvature and Thickness

First Author: Daniel **CHUA**

Purpose: To determine the limits of agreement of the Orbscan II and Galilei G4 in evaluation of the corneal profile.

Methods: Charts of refractive surgery candidates who were examined with both topography systems on the same day at Singapore National Eye Centre from July to August 2015 were reviewed for patient demographics and ocular examination. Patients were included if they had no ocular abnormality besides refractive error and were between 18 and 45 years old. The keratometry (K) and pachymetry measurements were compared using Bland-Altman analysis.

Results: A total of 136 eyes of 68 patients were eligible. Mean age of the patients was 31.0 years [standard deviation (SD) ± 7.3]. Majority were Chinese (51, 75%) and female (39, 57%). The mean (\pm SD) of the steep K, flat K, keratometric astigmatism, central corneal thickness, and thinnest corneal pachymetry of the Galilei and Orbscan were 44.21 ± 1.5 D, 44.08 ± 1.52 D, 42.88 ± 1.25 D, 42.78 ± 1.29 D, 1.33 ± 0.87 D, 1.31 ± 0.87 D, 572.14 ± 30.67 mm, 558.96 ± 34.33 mm, 570.28 ± 30.77 mm, and 551.81 ± 34.94 mm, respectively. The mean of the difference between the Galilei and Orbscan ± 2 SD for steep K, flat K, keratometric astigmatism,

central corneal thickness, and thinnest corneal pachymetry were 0.13 ± 0.67 D, 0.10 ± 0.43 D, 0.02 ± 0.43 D, 13.18 ± 23.35 mm, and 18.48 ± 24.13 mm, respectively.

Conclusions: There was excellent agreement between the 2 topographers with the Galilei tending to give minimally higher readings than the Orbscan.

Poster No.: EX2-221

Panel No.: 221, Session EX2

Comparison of ReLEx SMILE and PRK in Terms of Visual and Refractive Outcomes and Quality of Vision for Correction of Low Myopia

First Author: Sanjana **SRIVATSA**

Co-Author(s): Sheetal **BRAR**, Sri **GANESH**

Purpose: To compare the visual and refractive outcomes, aberrations, contrast sensitivity, and postoperative dry eye following 2 flapless procedures: refractive lenticule extraction small incision lenticule extraction (ReLEx SMILE) and photorefractive keratectomy (PRK) for correction of low myopia (SE < -4 D).

Methods: In this prospective, non-randomized study, a total of 60 eligible patients undergoing bilateral correction of myopic refractive error were included and divided into 2 groups with 30 patients each. Group 1 underwent alcohol-assisted PRK with MEL 90 excimer laser platform and group 2 underwent ReLEx SMILE with Visumax FS Laser. Data was analyzed and compared at 3 months for uncorrected visual acuity (UCVA), corrected visual acuity (CDVA), aberrations, contrast sensitivity, and dry eye.

Results: At 3 months postoperative, there was no statistically significant difference between the 2 groups in terms of mean SE, -0.21 ± 0.25 D in PRK vs -0.19 ± 0.23 D in SMILE ($P = 0.72$). However, mean UCVA and mean CDVA were significantly better in SMILE compared to PRK ($P = 0.001$). Higher order aberrations increased in both groups postoperatively, but the aberrations were significantly higher in the PRK compared to SMILE group ($P = 0.02$). Contrast sensitivity at 15 days and 3 months was comparable ($P > 0.05$ at all spatial frequencies). Schirmer 1, Schirmer 2, and TBUT scores were also not significantly different ($P > 0.5$). In the PRK group, 4 eyes had loss of CDVA by 1 line at 3 months due to development of mild interface haze, while no eye in the SMILE group lost lines of CDVA.

Conclusions: Both PRK and SMILE resulted in accurate correction of refractive error. However, SMILE appeared to score more than PRK in terms of better safety, uncorrected visual acuity, and lesser induction of aberrations.



Poster No.: EX2-222

Panel No.: 222, Session EX2

Frequency of TGFBI Corneal Dystrophies in Chinese Refractive Surgery Candidates: Primary Analysis of 2234 Cases in a Multicenter Study in China

First Author: Fengju **ZHANG**

Co-Author(s): Yueguo **CHEN**, Yingping **DENG**, Qinmei **WANG**, Ningli **WANG**, Xingtao **ZHOU**

Purpose: To establish the frequency of TGFBI corneal dystrophies in China and to investigate the different types of corneal dystrophies in Chinese refractive surgery candidates.

Methods: The subjects were refractive surgery candidates and outpatients with corneal disorders from 5 preselected eye hospitals in China. TGFBI corneal dystrophies were identified in these subjects by genetic analyses using a non-invasive method. Patients with corneal opacities underwent ophthalmological examinations by slit lamp biomicroscopy, anterior segment optical coherence tomography (AS-OCT), and in vivo confocal microscopy (IVCM).

Results: A total of 2234 subjects were analyzed, including 1908 refractive surgery candidates as group 1 and 326 clinical outpatients as group 2. It is estimated that the frequency of TGFBI corneal dystrophies among Chinese refractive surgery candidates was about 0.26% in group 1 subjects. Corneal deposits were found in 99 of the group 2 subjects. All 5 types of TGFBI corneal dystrophies were found in the clinical outpatients, with the most common type being GCD2 heterozygous. The corneal deposit exacerbations were found in some postoperative patients after corneal refractive surgery.

Conclusions: The frequency of patients with TGFBI corneal dystrophies was higher than we had anticipated. The non-invasive genetic analysis for the diagnosis of TGFBI corneal dystrophies used in our study should be included as one of the components of the preoperative evaluation of corneal refractive surgery candidates and the definitive diagnosis of clinical outpatients with TGFBI corneal dystrophies. Patients with GCD2 and other TGFBI corneal dystrophies should not be recommended for corneal refractive surgery.

Poster No.: EX2-223

Panel No.: 223, Session EX2

Outcomes of Consecutive LASIK and Accelerated Collagen Cross-Linking in Myopic Patients

First Author: Bhupesh **SINGH**

Co-Author(s): Sudhank **BHARTI**

Purpose: After creating a laser in situ keratomileusis

(LASIK) flap and ablating stromal tissue, the biomechanical strength and corneal rigidity may decrease, making the cornea prone to develop ectasia. Studies have demonstrated that corneal biomechanical strengthening with cross-linking stops progression of diseases that cause corneal ectasia. This procedure particularly helps high myopic correction, borderline corneal thickness cases, very steep corneas, or cases with topographic irregularity or asymmetry.

Methods: LASIK Xtra was performed in 50 eyes of 50 patients. In all cases standard procedure protocol was followed. Patient were followed up for 2 years. All the cases were evaluated for safety, efficacy, refractive stability, rate of ectasia, and corneal haze.

Results: All cases had excellent refractive stability in the postoperative period. None of the patients showed any postoperative complication. There was no incidence of any infection. None of the patient developed post-LASIK ectasia over the period.

Conclusions: This combination of procedures proves safe and effective in myopic eyes. Patients with low pachymetry and high refractive error are cases where it can be used to ensure no post-LASIK ectasia.

Poster No.: EX2-224

Panel No.: 224, Session EX2

Post PRK Haze in Low Myopes: Molecular Mechanism and Management Algorithm

First Author: Roshan **T**

Co-Author(s): Arkasubhra **GHOSH**, Natasha **P K**, Rushad **SHROFF**, Rohit **SHETTY**

Purpose: To investigate the underlying cause of haze in low myopes post PRK (photorefractive keratectomy) by evaluation of biomarkers and inflammatory pathways involved in its development by gene expression analysis of corneal epithelium.

Methods: Three hundred eyes of 156 patients who were treated for PRK 1 year ago were screened. All patients with low myopia with mean refractive spherical equivalent (MRSE) of -3 diopters (D) or less and/or ablation not more than 40 μm were included. Eyes in which mitomycin C was used were excluded. Four eyes of 2 patients were found to have developed haze. The epithelium of these 4 eyes who developed haze postoperatively and that of 6 eyes of 3 age-matched controls (without haze) were analyzed. Quantitative real-time polymerase chain reaction (PCR) was performed for inflammatory markers, corneal structure genes, fibrosis associated genes, and regulators of signaling cascades.

Results: Gene expression analysis showed that collagen I and IV were reduced in haze patients. Tissue inhibitor of metalloproteinase (TIMP1) showed a reducing trend

along with matrix metalloproteinase (MMP) 2 and 14. Inflammatory factors TNF α (tumor necrosis factor) and IL 6 (interleukin) were elevated and gene expression of WNT3a and epidermal growth factor receptor (EGFR) was found to be reduced in these patients.

Conclusions: Predisposition to and subsequent development of haze is a multifactorial process that depends on the molecular status of corneal epithelium prior to surgery. Hence pre-screening of patients based on their corneal biomarker status may help identify patients prone to develop haze and help us have a targeted approach to prevention.

Poster No.: EX2-225

Panel No.: 225, Session EX2

Safety and Efficacy of Indigenously Made Phakic Intraocular Lens for Refractive Correction

First Author: Gitansha **SACHDEV**

Co-Author(s): Ramamurthy **DANDAPANI**, Shreyas **RAMAMURTHY**

Purpose: To evaluate the safety and efficacy of an indigenous posterior chamber phakic implantable collamer lens (EYE PCL) for refractive correction.

Methods: Patients with refractive errors not suitable for keratoablative procedures and keratoconic patients were enrolled. Important pre-operative parameters included best corrected spectacle visual acuity (BCSVA), anterior chamber depth, specular microscopy, and horizontal white to white diameter.

Results: A total of 108 eyes of 61 patients were analyzed. Mean pre-operative spherical equivalent was 9.82 diopters (D). A total of 100% of eyes achieved pre-operative BCSVA ($P < 0.001$). Residual refractive error was noted in only 12 eyes (mean, 1.2 D). Complications included raised intraocular pressure in 4 eyes, cataract in 2 eyes, and 3 eyes required re-alignment.

Conclusions: Implantation of EYE PCL is a safe and effective procedure for refractive correction.

Poster No.: EX2-226

Panel No.: 226, Session EX2

Small Incision Lenticule Extraction for Myopic Astigmatism: Analysis of Changes in Corneal Front and Back Aberrations After 12 Months

First Author: Iben **PEDERSEN**

Co-Author(s): Jesper **HJORTDAL**, Anders **IVARSEN**

Purpose: To evaluate corneal aberrations after small incision lenticule extraction (SMILE), with respect to changes in the corneal front and back.

Methods: The prospective study included 101 myopic

astigmatic patients treated with SMILE [101 eyes with cylinder from -4.0 diopters (D) to -0.75 D]. Preoperative, 1-week, and 3, 6, 9, and 12-month examinations included uncorrected (UDVA) and corrected (CDVA) distance visual acuity, subjective refraction, slit-lamp examination, and Pentacam HR measurements. Root-mean-square (RMS) of astigmatism, RMS of spherical aberration, RMS of coma, and RMS of higher-order aberrations (HOA, from third up to eighth order) were calculated in corneal front, corneal back, and for the combined corneal surfaces. Kruskal-Wallis test was used for comparison.

Results: Mean preoperative refraction averaged $-5.87 \text{ D} \pm 2.13 \text{ D}$ in sphere and $-1.82 \pm 1.00 \text{ D}$ in cylinder. LogMAR UDVA remained stable in the postoperative period ($P = 0.19$, average of 0.03 ± 0.16 at 12 months). LogMAR CDVA improved from 1 week to 12 months, with an average of -0.08 ± 0.09 after 12 months ($P < 0.001$). RMS of astigmatism decreased significantly from preoperative to 3 months and remained stable during the postoperative period. RMS of coma and RMS of HOA significantly increased from preoperative to 3 months and remained stable in the postoperative period. The same conclusions were reached when evaluating the corneal front. No significant changes were observed in the corneal back.

Conclusions: Postoperative changes in aberrations are due to alterations in the corneal front. It may be noticed that the spherical aberration did not change significantly in this study, which is in contrast to earlier reports of excimer laser refractive surgery.

Poster No.: EX2-227

Panel No.: 227, Session EX2

Toric Implantable Collamer Lens (V4c) in Keratoconus Patients

First Author: Madhusmita **DAS**

Purpose: To report the outcome of Visian toric implantable collamer lens (ICL; V4c) in 3 cases of keratoconus.

Methods: Dry refraction, ORBSCAN IIz (Bausch & Lomb), and slit lamp examination were done preoperatively in all cases. A 32-year-old female had undergone collagen cross linking (C3R) in both eyes (OU) for keratoconus 4 years previously elsewhere and keratoconus was stable, as confirmed from her previous ORBSCAN and recent ORBSCAN report. Uncorrected visual acuity (UCVA) was 6/36 OU. Dry refraction values were -8.00 Dsph/-4.00 DCyl at 50 degrees improving to 6/12, N6 in the right eye (OD) and -8.00 Dsph/-2.00 DCyl at 140 degrees improving to 6/12p, N6 in the left (OS). OU toric ICL implantation was done under topical anesthesia with a temporal clear corneal incision. A gap of 10 days was maintained between OD and OS ICL implantation in the same patient. A 30-year-old male with kerato-



conus had UCVA counting fingers (CF) at 3 meters OU. OD improved to 6/6p with -8.00 Dph/-2.00 Dcyl at 40 degrees and OS had apical corneal scarring. OD toric ICL implantation was performed successfully and OS optical penetrating keratoplasty was performed.

Results: In first patient, unaided vision was 6/9p, N6 OU on the first postoperative day after ICL implantation. The second patient had UCVA 6/6(-1), N6 OD on the first postoperative day. There were no intraocular pressure (IOP) spikes noted in either case. Both patients were extremely happy and have been doing well. The first patient has a follow-up of 2.5 years and the second patient has a follow-up of 1 year; both have maintained good visual acuity.

Conclusions: Toric ICL (Visian V4c) implantation is a good modality for visual rehabilitation in patients with stable keratoconus.

Retina (Medical)

Poster No.: EX2-228

Panel No.: 228, Session EX2

2-Year Outcomes of Aflibercept for Exudative Age-Related Macular Degeneration

First Author: Kanako **ITAGAKI**

Co-Author(s): Akihito **KASAI**, Masashi **OGASAWARA**, Yukinori **SUGANO**, Masaaki **SAITO**, Tetsujiy **SEKIRYU**

Purpose: To present 2-year outcomes of intravitreal aflibercept injection (IAI) in eyes with neovascular age-related macular degeneration (AMD).

Methods: Prospective interventional study. Thirty-three eyes of 32 patients with treatment-naïve neovascular AMD were included, 19 eyes (57%) with typical AMD and 14 (43%) eyes with polypoidal choroidal vasculopathy (PCV). All patients were treated with 3 consecutive monthly IAI and following bimonthly injections until 12 months. After 12 months, the eyes received IAI on a treat and extend regimen (TAE).

Results: LogMAR mean best corrected visual acuity (BCVA) was 0.459 at baseline. LogMAR mean BCVA improved to 0.221 at 12 months ($P < 0.001$) and to 0.222 at 24 months ($P < 0.001$). There was no significant difference between mean logMAR BCVA at 12 months and that at 24 months ($P = 0.97$). Central foveal thickness (CRT) was 333 μm at baseline, 158 μm at 12 months ($P < 0.001$), and 152 μm at 24 months ($P < 0.001$). There was no significant difference in CRT at 12 months and that at 24 months ($P = 0.39$).

Conclusions: TAE for neovascular AMD after 1 year bimonthly IAI could maintain the improvement in visual acuity and CRT at 12 months. No adverse event was seen during follow-up.

Poster No.: EX2-229

Panel No.: 229, Session EX2

7-Year Trends of Anti-Vascular Endothelial Growth Factor Use for Diabetic Macular Edema Patients in Singapore

First Author: Se Ji Angel **JUNG**

Co-Author(s): Wei Yan **NG**, Gavin **TAN**, Daniel **TING**, Tien **WONG**

Purpose: To evaluate the use of intravitreal anti-vascular endothelial growth factor (VEGF) injections in patients with diabetic macular edema (DME) in a tertiary center in Singapore over a 7-year period.

Methods: We collected electronic medical records for all anti-VEGF injections performed in patients with DME from 2008 to 2014. Data retrieved included the annual treatment load in terms of number of new patients and total treatment episodes, and treatment burden for patients was studied in terms of number of injections per calendar year. Treatment was given on an as needed basis according to the treating clinician.

Results: Over 7 years, 1479 patients had 5254 injections. The number of new DME cases receiving anti-VEGF injections increased from 77 patients in 2008 to 312 patients in 2014. The mean age (standard deviation) of patients was 60.0 (12.0) years, with male predominance (57.6%). The mean number of injections that new cases with DME received in the first year increased from 1.29 ± 0.74 in 2008 to 2.77 ± 2.28 in 2014. The mean number of injections each patient received in the first, second, and third year of treatment was 2.21 ± 1.80 , 3.07 ± 2.45 , and 2.89 ± 2.11 , respectively. Among the injections, the most common agent was bevacizumab (90.6%, $n = 4762$), followed by ranibizumab (8.07%, $n = 424$) and aflibercept (1.30%, $n = 68$).

Conclusions: The use of anti-VEGF for the treatment of DME increased over a 7-year period. The total number of injections was lower compared to those published in the Diabetic Retinopathy Clinical Research Network (DRCR.net) due to financial constraints and lack of compliance with follow-up. The data demonstrate that undertreatment is a significant concern in real-world clinical settings.

Poster No.: EX2-230

Panel No.: 230, Session EX2

A Rare Case of Bilateral Purtscher-Like Retinopathy in Systemic Lupus Erythematosus

First Author: She **FONG**

Purpose: To report a rare case of bilateral Purtscher-like retinopathy in systemic lupus erythematosus.

Methods: Case report.

Results: A 32-year-old postpartum Malay woman with no known medical illness presented with a painless bilateral rapid decrease in vision for 1 month. It was preceded with a facial rash, hair loss, and oral ulcers. At presentation, visual acuity in the right eye was light projection while the left eye was counting fingers. The pupils were regular and reactive, with no afferent pupillary defect in both eyes. Examination of anterior segment in both eyes was normal. Fundus examination revealed both optic disc pallor with presence of Purtscher flecken in posterior pole, multiple cotton wool spots, and ghost vessels. Optical coherence tomography displayed bilateral cystoid macular edema. Hematologic workup revealed antinuclear antibody titer levels of 1:1280 with speckled pattern, anti-Sm, Anti-Ro positive. Complement factors C3 and C4 reduced. A diagnosis of Purtscher-like retinopathy in systemic lupus erythematosus was made. The patient was co-managed by the rheumatologist and dermatologist for lupus nephritis, cerebral lupus, and acute discoid lupus. She was promptly treated with systemic immunosuppressive medications. Two months later the patient developed retinal neovascularization in both eyes. Thus both eyes were treated with pan-retinal photocoagulation. Vision slightly improved to counting fingers in the right eye and 6/60 in the left eye.

Conclusions: Purtscher-like retinopathy is a rare and severe ophthalmic complication of systemic lupus erythematosus. It is frequently associated with cerebral lupus and highly active disease.

Poster No.: EX2-231

Panel No.: 231, Session EX2

A Rare Case of Choroidal Osteoma

First Author: Hannah PRASANTH

Purpose: To describe a rare and classical presentation of choroidal osteoma in a young woman.

Methods: A 22-year-old female patient was from Pondicherry. In 2011, she experienced sudden diminution of vision in the right eye and temporal field defect. She was diagnosed to have macular edema and symptoms resolved with treatment. Routine examination done in 2016 showed that macular edema had subsided completely with evidence of residual macular atrophy, suggestive of previous choroidal neovascularization. There was a yellow uniformly raised lesion just superior to the disc. Optical coherence tomography (OCT) was ordered.

Results: OCT showed a lattice pattern in a calcified tumor similar in appearance to cancellous bone just below the retinal pigment epithelium, confirming the diagnosis of choroidal osteoma.

Conclusions: Choroidal osteoma should be considered

in a differential diagnosis of choroidal neovascularization in young adults.

Poster No.: EX2-232

Panel No.: 232, Session EX2

Angiographic Factors Affecting Long-Term Visual Prognosis for Polypoidal Choroidal Vasculopathy

First Author: Colin TAN

Co-Author(s): Tock-Han LIM, Louis LIM, Wei Kiong NGO

Purpose: Polypoidal choroidal vasculopathy (PCV) has high prevalence among Asians, with variable clinical course and visual prognosis, suggesting the existence of clinical subtypes. We describe a novel classification system for PCV and correlate it with long-term visual outcomes.

Methods: Interventional longitudinal study of 107 consecutive patients with PCV presenting to a retina subspecialty clinic over a 24-month period. Patients were imaged using confocal scanning laser ophthalmoscopy fluorescein angiography (FA) and indocyanine green angiography (ICGA). Color fundus photographs and angiograms were graded independently by 2 ophthalmologists. The diagnosis of PCV was made using standardized diagnostic criteria. The angiographic features were used to classify the PCV cases, and this was correlated with clinical presentation and visual acuity (VA) for 5 years.

Results: Of the 107 patients, significant FA leakage was observed in 57 patients (53.3%). Patients with FA leakage had significantly worse logMAR VA at all time points compared to those without leakage (logMAR 1.04 vs 0.32 at 5 years, $P < 0.001$) and experienced higher rates of moderate visual loss (60% vs 0%, $P < 0.001$). Those without FA leakage experienced higher rates of good visual acuity ($\geq 20/40$) (74.4% vs 19.6%, $P < 0.001$) at all follow-up visits.

Conclusions: We have established a novel classification system for PCV using FA and ICGA features. The visual outcomes vary with subtype, demonstrating that PCV consists of distinct, previously unrecognized, clinical subtypes instead of a single disease entity as originally believed. This classification system has potential application in clinical practice and multicenter randomized trials.

Poster No.: EX2-233

Panel No.: 233, Session EX2

Assesment of Morphologic Findings of Diabetic Macular Edema in Nepal

First Author: Arjun SHRESTHA

Purpose: To find out the different morphologic patterns of diabetic macular edema (DME) and association with



presenting best corrected visual acuity (BCVA).

Methods: This was a retrospective study which included all consecutive cases of DME with optical coherence tomographic (OCT) mapping with optimum quality. Basic demographic characteristics, presenting visual acuity, OCT macular morphology, and central macular thickness (CMT) were examined. OCT pictures of DME were classified into diffuse retinal thickening (DRT), cystoid macular edema (CME), subfoveal detachment (SFD), vitreomacular interface abnormalities (VMIA), and a combination of any of these findings. Average CMT was calculated according to ETDRS mapping of macular field with Topcon 3 D spectral domain OCT machine. The exclusion criteria was previous history of retinal laser photocoagulation, intravitreal anti-vascular endothelial growth factors or corticosteroids, or surgical interventions.

Results: There were 28 eyes with DME. Mean patient age was 61.28. Baseline BCVA ranged from 6/9 to 2/60 with a mean of 6/24. OCT revealed 4 morphologic patterns of DME, namely, DRT (57.14%), CME (25.0%), SFD (10.71%), and VMIA (7.14%). Mean retinal thickness varied depending on the morphologic pattern. The mean BCVA also varied between groups. Increasing retinal thickness in all patterns was significantly correlated with worse visual acuity ($P < 0.005$). The OCT patterns containing CME ($P = 0.01$) were also significantly associated with worse vision.

Conclusions: Diabetic macular edema exhibits 4 different morphologic patterns on OCT. There is a significant correlation between central retinal thickness and presenting visual acuity.

Poster No.: EX2-234

Panel No.: 234, Session EX2

Bilateral Choroidal Neovascularization After Pegylated Interferon Therapy

First Author: Pir Salim MAHAR

Purpose: We present a case of bilateral choroidal neovascularization (CNV) that developed in a patient after pegylated interferon therapy.

Methods: A 30-year-old male presented with gradual decrease in vision in both eyes after the use of interferon alpha for hepatitis C. Ocular examination of the patient included best corrected visual acuity (BCVA), fundus photographs, fundus fluorescein angiography (FFA), and optical coherence tomography (OCT). His BCVA was recorded as 6/18 in the right eye and 6/12 in the left eye. The anterior segments were unremarkable, with normal intraocular pressure (IOP) in both eyes. Both fundi revealed the presence of bilateral CNV, confirmed on FFA and OCT.

Results: Bilateral foveal CNV developed after pegylated

interferon therapy.

Conclusions: To the best of the authors' knowledge, simultaneous presence of CNV in both eyes is not reported in the literature.

Poster No.: EX2-235

Panel No.: 235, Session EX2

Bilateral Retinopathy in a Patient with Idiopathic Thrombocytopenic Purpura: A Case Report

First Author: Shih-Hao TZENG

Co-Author(s): Yun-Chuan CHEN, Chan-Wei NIEN

Purpose: To report a case of bilateral severe flame-shaped hemorrhages with idiopathic thrombocytopenic purpura (ITP).

Methods: A case report.

Results: A 29-year-old female suffered from vaginal bleeding for 1 month, associated with shortness of breath, dizziness, facial paleness, and fever up to 38°. There was no animal contact or travel history. The laboratory test showed mild anemia (Hb: 8.4 g/dL) and thrombocytopenia (platelet count: 103/uL). Blurred vision in both eyes was reported after being admitted to the hematology ward for 3 days. Best corrected visual acuity (BCVA) was 0.8 in the right eye and 0.06 in the left eye. Fundoscopy revealed bilateral severe flame-shaped hemorrhage with cotton wool spots and macular star in the left eye. The blood culture was negative. Our patient was managed only by managing ITP and anemia without any invasive procedures.

Conclusions: Retinopathy is a rare finding in anemic and thrombocytopenic patients. For patients with severe anemia and thrombocytopenia, it is recommended that all such patients undergo routine fundus examinations.

Poster No.: EX2-236

Panel No.: 236, Session EX2

Central Retinal Vein Occlusion in Preeclampsia

First Author: Tun Hang YEO

Co-Author(s): Lekha GOPAL, Sanjay SRINIVASAN

Purpose: To report a case of central retinal vein occlusion secondary to preeclampsia.

Methods: Case report.

Results: A 38-year-old primipara presented with a 2-week history of worsening right eye vision, a week following an emergency caesarean section for severe preeclampsia. Her visual acuity was counting fingers in the right eye and 6/6 in the left eye. Her blood pressure was stable at 124/72. Examination revealed

a right grade 1 relative afferent pupillary defect with fundoscopic findings of widespread cotton wool spots, tortuous vessels, retinal hemorrhages, and optic disc hyperemia. These findings were consistent with central retinal vein occlusion. Spectral domain optical coherence tomography demonstrated severe macular edema. The patient subsequently underwent 3 monthly injections of intravitreal ranibizumab. The macular edema resolved with treatment and visual acuity improved to 6/15.

Conclusions: This case highlights preeclampsia as a risk factor for central retinal vein occlusion. There are only a small number of reported cases in current literature. Although the incidence is likely low, patients with similar presentation should undergo early fundus examination.

Poster No.: EX2-237

Panel No.: 237, Session EX2

Challenging Clinical Variation of Familial Exudative Vitreoretinopathy

First Author: Wuttipong **KAEWNAMCHAI**

Co-Author(s): Atchara **AMPHONPHRUET**

Purpose: To describe clinical variations with challenges for diagnosis of patients presenting with familial exudative vitreoretinopathy (FEVR).

Methods: Case series and retrospective review in our hospital, the largest referral center in Bangkok under the Ministry of Public Health. We included 74 eyes from 48 patients. Data was collected from charts including gender, gestational age, birth weight, age at presentation, first diagnosis, clinical presentation, clinical examination, fundus fluorescein angiography (FA), and staging.

Results: Patients were predominantly male (68.6%), with a mean birth weight of 2670 g (range, 1400-4000). Most patients were termed newborn; however, 30.4% of patients were preterm. The mean age at presentation was 24.4 months (range, 1-96). At the first visit, 60.0% were diagnosed with FEVR, with misdiagnosis of PHPV in 20.0%, ROP in 17.1%, and cataract in 2.9%. Most FEVR were found to be bilateral (82.9%); 72.41% were asymmetrical; most were stage 4 (34.3%). Retinal detachment was seen in 75% with radial retinal fold in 83.9%; mostly temporal location was in 61.5%. Findings from clinical examination included misdiagnosis of stage 1 peripheral avascular area (15.6%), confirmed by FA. All cases had negative family screening.

Conclusions: FEVR has a wide range of presentation age and birth weight, including prematurity, with a disease tempo not consistent with retinopathy of prematurity (ROP). It also has asymptomatic course and diversity of signs which are often unrecognized or diagnosed incorrectly. FA is very important to prevent

misdiagnosis especially in early stages and plan of management. Even when there is no family history, it is crucial not to rule out FEVR.

Poster No.: EX2-238

Panel No.: 238, Session EX2

Choroidal Structural Changes in Myopic Choroidal Neovascularization After Treatment with Anti-Vascular Endothelial Growth Factor Over 1 Year

First Author: Wei Yan **NG**

Co-Author(s): Rupesh **AGRAWAL**, Gemmy **CHEUNG**, Shu Yen **LEE**, Daniel **TING**, Tien **WONG**

Purpose: To evaluate choroidal structural changes in eyes with myopic choroidal neovascularization (mCNV) treated with anti-vascular endothelial growth factors (VEGF) over 12 months.

Methods: We prospectively evaluated subfoveal choroidal thickness (SFCT) and choroidal vascularity index (CVI) using spectral domain optical coherence tomography (SD-OCT) at baseline, 6 months, and 12 months in both eyes in patients presenting with unilateral choroidal neovascularization secondary to pathologic myopia. CVI was defined as the ratio of luminal area to total choroidal area after SD-OCT images were binarized.

Results: We included 20 patients (20 eyes with mCNV and 20 fellow eyes without CNV) with mean age of 60.35 ± 10.85 years. At baseline, the mean SFCT was similar between eyes with mCNV and contralateral eyes ($69.20 \pm 63.04 \mu\text{m}$ vs $67.10 \pm 65.74 \mu\text{m}$, $P = 0.713$); CVI was also similar between mCNV eyes and contralateral eyes ($59.44 \pm 3.92\%$ vs $59.03 \pm 5.58\%$, $P = 0.958$). The SFCT decreased significantly in the mCNV eyes to $54.75 \pm 45.43 \mu\text{m}$ ($P = 0.017$) at 12 months after initiation of anti-VEGF therapy, whereas SFCT in the contralateral eyes did not change significantly. There was no significant change in CVI in mCNV eyes or contralateral eyes from baseline to 12 months. Thinning of SFCT did not influence final BCVA.

Conclusions: Thinning of subfoveal choroid without alteration in choroidal vascular index was noted in eyes with mCNV treated with anti-VEGF over 12 months. This finding may be explained by mechanical stretching in response to globe expansion.



Poster No.: EX2-239

Panel No.: 239, Session EX2

Clinical Course of the Cases Once Stabilized by Treat-and-Extend Aflibercept Therapy for Neovascular Age-Related Macular Degeneration and Polypoidal Choroidal Neovascuopathy

First Author: Jinhee **LEE**

Co-Author(s): Keiko **AZUMA**, Tatsuya **INOUE**, Aya **MATSUDA**, Ryo **OBATA**

Purpose: To investigate the background characteristics and clinical course of the cases once stabilized by treat-and-extend (TAE) aflibercept therapy for neovascular age-related macular degeneration (nAMD) and polypoidal choroidal neovascuopathy (PCV).

Methods: We retrospectively reviewed the charts of the patients with nAMD or PCV who had been unresponsive to ranibizumab and switched to aflibercept for more than 2 years. Aflibercept was given following a TAE protocol. The cases who kept showing dry macula so that the treatment interval could be extended to 12 weeks ("stabilization") were included in the study. Background characteristics, recurrence, visual prognosis, and central retinal thickness (CRT) were analyzed.

Results: Twenty-nine eyes of 29 patients were included. Among them, 10 eyes (9 PCV and 1 typical AMD) of 10 patients recurred after stabilization in 2 years. Neither age, sex, PCV/typical AMD, nor the number of treatments was associated with recurrence. Best corrected visual acuity did not significantly change in 3 months after the recurrence. Maximum CRT increase before the recurrence was significantly larger than that of the cases who never showed recurrence during 2 years ($P = 0.003$).

Conclusions: Background characteristics and clinical course in aflibercept treat-and-extend therapy were analyzed. After stabilization, cases with increased CRT may be more likely to show recurrence in 2 years.

Poster No.: EX2-240

Panel No.: 240, Session EX2

Combined Ranibizumab and Photodynamic Therapy for Polypoidal Choroidal Vasculopathy: One-Year Results

First Author: Yi-Ting **HSIEH**

Co-Author(s): Chang-Hao **YANG**, Chung-May **YANG**

Purpose: To investigate the 1-year outcomes of combined ranibizumab and photodynamic therapy (PDT) for polypoidal choroidal vasculopathy (PCV).

Methods: A total of 36 eyes from 36 patients with PCV treated with combined ranibizumab and PDT were retrospectively collected. All eyes received intravitreal

ranibizumab (IVR) followed by PDT 1 week later and second IVR 1 month later as the initial therapy. From month 2, additional ranibizumab or PDT was administered according to the doctor's decision. Best-corrected visual acuity (BCVA) and optical coherence tomography (OCT) at baseline, 3 months, 6 months, and 1 year were measured, and the associating factors for visual improvement at 1 year were analyzed by regression analysis.

Results: The mean total numbers of ranibizumab and PDT within 1 year were 3.4 ± 1.4 and 1.4 ± 0.6 , respectively. Complete regression of polyps was achieved in 58% and partial regression was achieved in 37% of cases at month 3. The mean logarithm of the minimum angle of resolution (logMAR) of BCVA improved from 0.66 ± 0.35 at baseline to 0.51 ± 0.37 at month 3 ($P = 0.002$), but then deteriorated again to 0.60 ± 0.43 at month 6 ($P = 0.24$) and 0.59 ± 0.45 at month 12 ($P = 0.22$). Recurrent hemorrhage occurred in 19% of cases and was significantly associated with poor visual improvement at month 12 ($P = 0.023$).

Conclusions: Combined ranibizumab and PDT was effective for PCV in polyp regression and short-term visual improvement. Recurrent hemorrhage might impede long-term visual improvement.

Poster No.: EX2-241

Panel No.: 241, Session EX2

Comparative Efficacy of Bevacizumab and Ranibizumab for Patients with Diabetic Macular Edema

First Author: Ahmed **NEGIDA**

Co-Author(s): Doaa **ATTIA**

Purpose: The aim of this meta-analysis is to compare the efficacy of bevacizumab and ranibizumab, 2 intravitreally administered anti-vascular endothelial growth factor drugs, for diabetic macular edema (DME).

Methods: A computer literature search of PubMed was performed using relevant keywords. We selected randomized controlled trials (RCTs) assessing the efficacy of bevacizumab (IVB) and ranibizumab (IVR) for DME. The change in best corrected visual acuity (BCVA) and central subfield thickness (CST) were pooled as mean difference (MD) between the 2 groups from baseline to end point. The overall effect size was calculated using the DerSimonian and Laird random effect model meta-analysis. Heterogeneity was assessed by visual inspection of the forest plots and measured by Chi-square and I-square tests. An alpha level below 0.05 was considered statistically significant.

Results: Three RCTs with a total of 596 patients (bevacizumab: $n = 300$ and ranibizumab: $n = 296$) were pooled in the final analysis. The monthly doses of both drugs

were as follows: bevacizumab: 1.25 mg in 268 patients and 1.25 mg in 32 patients; ranibizumab: 0.3 mg in 268 patients and 0.5 mg in 28 patients. The follow-up period ranged from 36 weeks to 1 year. The overall mean difference favored ranibizumab over bevacizumab in terms of change in BCVA [MD -1.51, 95% confidence interval (CI) (-3.00 to -0.02)] and CST [MD 43.16, 95% CI (23.78 to 62.54)]. No significant heterogeneity was found.

Conclusions: Our meta-analysis showed a small but statistically significant difference in the improvement of BCVA and CST favoring ranibizumab over bevacizumab in patients with diabetic macular edema.

Poster No.: EX2-242

Panel No.: 242, Session EX2

Comparison Between Intravitreal Bevacizumab and Posterior Subtenon Injection of Triamcinolone Acetonide in Macular Edema Secondary to Retinal Vein Occlusion

First Author: Meng-Ju **TSAI**

Co-Author(s): Yi-Ting **HSIEH**, Wei-Cherng **HSU**, Yi-Jie **PENG**

Purpose: To compare the efficacy and safety between posterior subtenon injection of triamcinolone acetonide (PSTA) and intravitreal injection of bevacizumab (Avastin) (IVIA) in the treatment of macular edema (ME) secondary to retinal vein occlusion (RVO).

Methods: A total of 45 eyes, with 23 eyes in the IVIA and 22 eyes in the PSTA groups, were retrospectively recruited. Main endpoints included logarithm of the minimum angle of resolution (logMAR) of best-corrected visual acuity (BCVA), central macular thickness (CMT), and intraocular pressure (IOP) before and after treatment.

Results: Mean logMAR BCVA improved from 0.78 to 0.56 at 6 months for IVIA ($P = 0.001$) and from 0.91 to 0.79 and 0.87 at 3 and 6 months ($P = 0.038$ and 0.13), respectively, for PSTA. Final visual outcomes were significantly better in the IVIA group ($P = 0.02$). Visual gain was not different at any time point (all $P > 0.05$). Mean central macular thickness both significantly improved at 6 months, from 478 to 295 ($P < 0.001$) in IVIA and 419 to 350 ($P = 0.012$) in PSTA, but was not significant between groups ($P = 0.065$). Worse final visual outcomes were associated with worse baseline BCVA and diagnosis of CRVO after adjustment for age and sex ($P < 0.001$ and 0.012 , respectively), regardless of treatment modality. Recurrence of ME was not significant ($P = 0.08$). Significant IOP elevation was noted at 3 months in the PSTA group but declined at 6 months ($P = 0.002$ and 0.41 , respectively).

Conclusions: PSTA can result in comparable visual gain to IVIA in the short term. IVIA has greater CMT reduction. PSTA still results in transient IOP elevation.

Poster No.: EX2-243

Panel No.: 243, Session EX2

Comparison of Focal and Conventional Verteporfin Photodynamic Therapy for Chronic Central Serous Chorioretinopathy

First Author: Seul Ki **BANG**

Co-Author(s): Eung-Suk **KIM**, Seung Young **YU**

Purpose: To evaluate the efficacy of focal verteporfin photodynamic therapy (PDT) in patients with chronic central serous chorioretinopathy (CSC).

Methods: Fifty-two eyes of 52 patients with chronic CSC who had received verteporfin PDT were enrolled. The laser spot size of 26 eyes to cover only the localized hyperfluorescent area on indocyanine green angiography (ICGA) was classified as focal PDT. The PDT spot size of the other 26 eyes to cover the total area of retinal pigment epithelial detachment (PED) including leaking point was conventional PDT. The foveal thickness and the subfoveal choroidal thickness were measured using Heidelberg Spectralis optical coherence tomography (OCT) before PDT at baseline and months 1, 3, 6, and 12.

Results: The mean spot size for PDT was $1995.00 \mu\text{m}$ in the focal group and $2995.00 \mu\text{m}$ in the conventional group. The foveal thickness steadily decreased in both groups. The mean baseline subfoveal choroidal thickness was $334.95 \mu\text{m}$ and $348.35 \mu\text{m}$ in each group and there were no significant differences between the 2 groups ($P = 0.602$). The mean subfoveal choroidal thickness decreased significantly to $304.20 \mu\text{m}$, $284.85 \mu\text{m}$, $271.60 \mu\text{m}$, and $265.95 \mu\text{m}$ at 1, 3, 6, and 12 months in the focal group. In the conventional group, it decreased significantly to $318.75 \mu\text{m}$, $300.00 \mu\text{m}$, $284.00 \mu\text{m}$, and $272.00 \mu\text{m}$ at 1, 3, 6, and 12 months. There were no significant differences between the 2 groups with regard to the subfoveal choroidal thickness according to PDT spot size at 1, 3, 6, and 12 months ($P = 0.602$, $P = 0.565$, $P = 0.659$, and $P = 0.640$).

Conclusions: Focal verteporfin PDT for CSC significantly resulted in decreasing subretinal fluid and subfoveal choroidal thickness as well as conventional PDT.



Poster No.: EX2-244

Panel No.: 244, Session EX2

Comparison of Posterior Subtenon Injection of Triamcinolone with Intravitreal Injection for Treatment of Cystoid Diabetic Macular Edema

First Author: Anurag **NARULA**

Co-Author(s): Shilpa **SINGH**, Shilpa **SINGH**

Purpose: To evaluate the efficacy of posterior subtenon injection as an alternate, cheaper, and relatively safer method of managing diabetic macular edema (DME).

Methods: Eyes with clinically significant DME were included in the study. Complete ophthalmic examination with fluorescein angiography (FA) and optical coherence tomography (OCT) were performed before and in the first and third month of treatment. The intravitreal (IVT) group received 4 mg/0.1 mL and the posterior subtenon (PSTT) group received 20 mg/0.5 mL triamcinolone injection.

Results: There were 50 eyes of 30 patients in the PSTT group and 40 eyes of 30 patients in IVT group. Mean follow-up time was 4 months in both groups. In the PSTT group, the mean visual acuity increased from 6/36 to 6/12 and the mean central foveal thickness decreased from 405 to 302 μm during the first 3 months. In the IVT group, the mean visual acuity and central foveal thickness were found to be 6/36 and 434 μm before treatment and 6/12 and 298 μm 3 months after treatment. There was no significant difference with respect to the decrease in central foveal thickness and increase in visual acuity between the 2 groups. Significant intraocular pressure increase was found in 10% of the PSTT group and in 20% of IVT injections.

Conclusions: Posterior subtenon injection is a cheaper and relatively safer method of managing diabetic macular edema in developing countries where expensive anti-VEGF injections are hard to get. It also has an advantage over intravitreal injection, as it is easier and less demanding to administer.

Poster No.: EX2-245

Panel No.: 245, Session EX2

Deep Learning Computer Model in Reading Diabetic Retinopathy and Normal Images

First Author: Sriram **SONTY**

Co-Author(s): Visweswararao **DURGA**

Purpose: To study a deep learning model based computer solution as a supplement to the reading function of the diabetic retinopathy database fundus images.

Methods: A standard dataset of images of both normal and diabetic retinopathy (MESSIDOR Base 12) eyes were used to see how well the model performed in a

binary classification scenario in comparison to a retina specialist, a general ophthalmologist, and the readings provided by the database providers (Ground Truth Group).

Results: The accuracy rates were 91% (group A: model vs image provider), 92% vs retina specialist (group B), and 86% vs general ophthalmologist (group C). Precision rates were 92.75% (A), 95.65% (B), and 85.5% (C). Sensitivity was 94% (A), 92.9% (B), and 93.6% (C), with specificity of 84.3% (A), 89.6% (B), and 72.9% (C). Kappa readings were 0.79 (group A), 0.80 (group B), and 0.69 (group C).

Conclusions: The deep learning computer model compared well in both normal and retinopathy fundus images with our retina specialist and with the Ground Truth image providers.

Poster No.: EX2-246

Panel No.: 246, Session EX2

Effect of Dexamethasone Intravitreal Implant for the Treatment of Resistant Diabetic Macular Edema

First Author: Prabhjot Kaur **MULTANI**

Co-Author(s): Manabjyoti **BARMAN**, Harsha **BHAT-TACHARJEE**, Satyen **DEKA**, Diva **MISRA**, Ronel **SOIBAM**

Purpose: To investigate the efficacy and safety profile of intravitreal dexamethasone implant in patients with resistant diabetic macular edema (DME).

Methods: Thirty-six eyes of 27 patients were included in this 6-month prospective interventional clinical study. Main observed outcomes were the changes between initial and monthly (1, 3, 6 months) visits with respect to best corrected visual acuity (BCVA), central macular thickness, and intraocular pressure (IOP). Patients included were >30 years of age with BCVA better than 20/200, had central foveal thickness of 0.300 mm, and were nonresponsive to previously administered 2 consecutive monthly intravitreal injections of 1.25 mg bevacizumab. Administration of intravitreal dexamethasone implant was performed at baseline, and patients were followed up at 1, 3, and 6 months.

Results: Thirty-six eyes of 27 patients affected by DME were enrolled in the study. The mean logarithm of the minimum angle of resolution (logMAR) went from 0.797 ± 0.175 to 0.369 ± 0.18 ($P = 0.001$), 0.347 ± 0.159 ($P = 0.06$), and 0.408 ± 0.173 ($P = 0.001$) at post-operative month 1, 3, and 6, respectively. The mean central macular thickness improved from $486.19 \pm 102.9 \mu\text{m}$ to $262.08 \pm 93.8 \mu\text{m}$ ($P = 0.03$), $300.36 \pm 107.3 \mu\text{m}$ ($P = 0.001$), and $378.72 \pm 133.7 \mu\text{m}$ ($P = 0.001$) at 1, 3, and 6 months, respectively. When compared to baseline IOP of $13.17 \pm 2.05 \text{ mm Hg}$, IOP increased significantly to $15.18 \pm 2.96 \text{ mm Hg}$ ($P = 0.001$), 15.42 ± 2.52 ($P <$

0.001), and 16.42 ± 3.48 mm Hg ($P = 0.03$) at 1, 3, and 6 months, respectively.

Conclusions: Dexamethasone intravitreal implant can serve as an effective option for the treatment of resistant DME, where anti-VEGF injections are not able to produce desired effects.

Poster No.: EX2-247

Panel No.: 247, Session EX2

Effect of Varying Levels of Active Matrix Metalloproteinase 2 on the Hydraulic Conductivity of Aged Bruch Membrane

First Author: Ling Zhi **HENG**

Co-Author(s): Aly **HUSSAIN**, John **MARSHALL**

Purpose: Both sequestration and a reduction in the free levels for activation of matrix metalloproteinase 2 (MMP-2) have been demonstrated in Bruch membrane from age-related macular degeneration (AMD) donor eyes. In-vitro laser activation of retinal pigment epithelium (RPE) explants has shown energy-dependent increase in the release of activated MMP-2. The aim of the present study was to determine if graded increases in the level of activated MMP-2 have corresponding effects (if any) on the hydraulic conductivity of Bruch membrane from aged eyes.

Methods: Macular samples of human Bruch-choroid were obtained from 19 donors in the age range of 50-80 years. These samples were mounted in open-type Ussing chambers and basal hydraulic conductivity determined.

Results: Samples were then incubated with varying levels of activated MMP-2 (1.5-30 nM) followed by re-assessment of hydraulic conductivity.

Conclusions: Active MMP increases hydraulic conductivity across aged Bruch in a concentration dependent manner. Hence, modulations of laser parameters which increase levels of active MMP-2 release can improve the function of Bruch membrane and must be considered when designing future clinical protocols.

Poster No.: EX2-248

Panel No.: 248, Session EX2

Effectiveness of Topical 0.5% Tetracaine with 2.5% Phenylephrine for Intravitreal Injection

First Author: Prae **PHIMPHO**

Co-Author(s): Kitikul **LEELAWONGS**

Purpose: To study the anesthetic effectiveness and safety of topical 0.5% tetracaine with 2.5% phenylephrine used for intravitreal injection.

Methods: A prospective, randomized, doubled-blind interventional study in patients receiving intravitreal

injection. One hundred thirty patients were included who individually received 2 intravitreal injections using 2 types of anesthesia: 0.5% tetracaine with 2.5% phenylephrine (regimen 1) and 0.5% tetracaine only (regimen 2). Each patient was asked to rate the pain using a visual analog scale (VAS) immediately after the injection, at 15 minutes, and at 60 minutes afterward. Overall pain score was graded using a verbal rating scale (VRS). The average pain score was considered as primary outcome, while the surgeon recorded other clinical data and complications as secondary outcomes.

Results: The pain score collected immediately after topical 0.5% tetracaine with 2.5% phenylephrine injection (regimen 1) was 3.90 ± 1.62 and 4.41 ± 1.87 after topical 0.5% tetracaine (regimen 2) ($P = 0.001$), 15 minutes after the injection was 1.83 ± 1.50 and 2.62 ± 1.48 ($P = 0.032$), and 60 minutes after the injection was 0.38 ± 0.81 and 0.40 ± 0.88 ($P = 0.975$), respectively. Verbal rating pain scale of regimen 1 was significantly lower than regimen 2 ($P = 0.036$). There was no clinically significant difference in pain score between the 2 regimens ($P = 0.069$). There was no anesthesia-related pain and no anesthesia-related complication, whereas conjunctival injection was less in regimen 1 ($P = 0.032$).

Conclusions: Topical 0.5% tetracaine with 2.5% phenylephrine was more effective in preventing pain and is safe for intravitreal injection procedures.

Poster No.: EX2-249

Panel No.: 249, Session EX2

Efficacy and Safety of Retinal Rejuvenation Using Ellex 2RT Laser in Age-Related Maculopathy (RETILASE Trial)

First Author: Ling Zhi **HENG**

Co-Author(s): Robin **HAMILTON**, John **MARSHALL**, Sobha **SIVAPRASAD**

Purpose: It was hypothesized that increasing matrix metalloproteinase (MMP) activity rejuvenates transportation across the Bruch membrane (BrM) and prevents age-related processes in the macula. Previous studies demonstrated an increase in MMP release secondary to retinal pigment epithelium (RPE) migration initiated by deliberate injury using lasers. However, conventional lasers cause collateral photoreceptor cell damage. The 2RT laser is a nanosecond, doubled-frequency Nd:Yag laser with a speckled beam configuration within a 400 μm spot size. The main objectives of this pilot study were to determine the efficacy and safety of this novel laser as a viable therapeutic intervention to retard the onset of age-related macular degeneration (AMD).

Methods: Twenty-three patients diagnosed with bilateral early AMD (AREDS 2 and 3) were recruited with 1 eye randomized to either 2RT laser or sham laser. Visual function was measured at 6 and 12 months (pri-



mary outcome). Safety outcomes were determined by perimetric changes and gross morphological changes on fundus autofluorescence and optical coherence tomography (OCT).

Results: Eleven patients underwent 2RT laser with energy ranging from 0.1 to 0.3 mJ and 52 to 102 laser spots. At 6 and 12 months, the change in visual acuity (VA) for cases compared to controls were $+5.0 \pm 5.67$ versus -0.33 ± 3.28 EDTRS letters and $+1.73 \pm 5.00$ versus -0.25 ± 4.29 letters, respectively. Perimetric changes were equivocal in both arms at both time points. Hyperfluorescent laser changes were noted on autofluorescence, which showed corresponding disruption limited to the outer segment layer on OCT.

Conclusions: The current study provides evidence that the 2RT laser is safer than the current millisecond laser. However, further well-powered studies would be required to better evaluate its efficacy as a prophylactic therapy for AMD.

Poster No.: EX2-250

Panel No.: 250, Session EX2

Electrophysiological Characteristics of the Diffuse-Trickling Subtype of Geographic Atrophy in Age-Related Macular Degeneration

First Author: Tetsuju **SEKIRYU**

Co-Author(s): Hiroaki **SHINTAKE**, Urara **SUGIYAMA**

Purpose: To present electrophysiological characteristics of the diffuse-trickling subtype of geographic atrophy in age-related macular degeneration (AMD).

Methods: Observational case study. Twelve eyes of 6 patients with the diffuse-trickling subtype of geographic atrophy were examined. The diagnosis was made by precise funduscopy using slit lamp, optical coherence tomography (OCT), and fundus autofluorescence (FAF). Electroretinograms (ERGs) were recorded by using a ERG recording system (LE-2000, Tomey, Nagoya, Japan).

Results: Amplitude of a-wave and b-wave in dark-adapted bright-flash ERGs was $195.0-279.3 \mu\text{V}$ (range) and $215.0-380.8 \mu\text{V}$ (range), respectively. Amplitude of b-wave in rod and cone response was $83.3-229.0 \mu\text{V}$ (range) and $60.3-95.0 \mu\text{V}$ (range), respectively. Amplitude of flicker ERG was $58.0-104.8 \mu\text{V}$ (range). The amplitude of all types of ERGs decreased. We could not find specific abnormal ERG response in all eyes.

Conclusions: Eyes with the diffuse-trickling subtype of geographic atrophy in AMD did not show a specific electrophysiological abnormality.

Poster No.: EX2-251

Panel No.: 251, Session EX2

Evaluation of Novel Retinal Loci for Low Vision Care

First Author: Tomoko **MASE**

Co-Author(s): Satoshi **ISHIKO**, Eiichi **SATO**, Kazuhiro **SUGAWARA**, Akitoshi **YOSHIDA**

Purpose: To study the relationship between preferred retinal loci (PRL) and novel retinal loci (NRL) using a brighter background and study the difference in the NRL evaluation based on the fixation target.

Methods: Fifteen eyes of 14 patients with macular disease were included. Microperimetry (MP-3, Nidek, Aichi, Japan) was performed. We developed a new device that projects any shape on the retina under a brighter background of 650 cd/m^2 . To evaluate the PRL, we asked patients to fixate on a cross target. We then put the cross in several different areas and asked the patients to evaluate the NRL. If the distance between the cross targets was less than 4 degrees of the visual axis, we considered it to be the same position. We also studied the NRL difference between using a cross and using a character.

Results: Five patients had central fixation. In the patients without central fixation, the PRL and NRL differed in 70%. The NRL using a cross and the NRL using a character differed in 70%. When the NRL and the most sensitive lesion evaluated by microperimetry were compared, 90% of patients using a cross and 70% of patients using a character had different positions.

Conclusions: The NRL differs from the most sensitive lesion evaluated by conventional perimetry. This might be caused by the change in retinal sensitivities depending on the background brightness. It is helpful to evaluate the NRL under brighter conditions to manage patients with low vision.

Poster No.: EX2-252

Panel No.: 252, Session EX2

Factors Affecting Long-Term Clinical Outcomes of Polypoidal Choroidal Vasculopathy in an Asian Population

First Author: Louis **LIM**

Co-Author(s): Tock-Han **LIM**, Wei Kiong **NGO**, Colin **TAN**

Purpose: Polypoidal choroidal vasculopathy (PCV) has variable visual outcomes and occurs more commonly in Asians. However, not much is known about its long-term clinical course and factors affecting prognosis. We thus aimed to describe the epidemiology, clinical course, and factors affecting the long-term clinical outcomes of PCV in an Asian population.

Methods: A 5-year interventional longitudinal study of



112 eyes of 102 consecutive patients with PCV seen at Tan Tock Seng Hospital, Singapore. PCV was diagnosed by 2 retinal specialists using standardized diagnostic criteria. Risk factors affecting visual outcomes were analyzed using multivariate logistic regression.

Results: The mean age was 66.4 ± 9.8 years, with 87.5% Chinese, 8.9% Malay, and 3.6% Indian. PCV was located predominantly at the macula (86.0%). Good visual outcomes (visual acuity [VA] $\geq 20/40$) were achieved in 41.1% of patients, while moderate visual loss (loss of ≥ 3 lines) occurred in 25% of patients. Factors affecting good visual outcome were younger age [odds ratio (OR) = 3.52, $P < 0.05$], good VA at presentation (OR = 8.68, $P < 0.001$), and smaller lesion size on indocyanine green (ICG) (4.37 mm^2 vs 11.11 mm^2 , $P = 0.007$). Poor initial VA at start (OR = 6.06, $P < 0.05$) and the presence of significant leakage on angiography (30.8% vs 3.8%, $P = 0.024$) predicted poor visual outcomes (VA $\leq 20/200$).

Conclusions: PCV has a moderate clinical course in an Asian population. The factors for good visual outcome were younger age, good presenting VA, and smaller lesion size, while leakage on angiography and poor presenting VA conferred a higher risk for poor visual outcome.

Poster No.: EX2-253

Panel No.: 253, Session EX2

Higher Order Aberrations Following Scleral Buckling Surgery in Patients with Rhegmatogenous Retinal Detachment

First Author: Chia-Yi **LEE**

Co-Author(s): Hung-Chi **CHEN**, Chi-Chun **LAI**, Wei-Chi **WU**, Ling **YEUNG**

Purpose: To evaluate ocular higher order aberrations (HOAs, third to sixth orders) induced by scleral buckling (SB) for the treatment of rhegmatogenous retinal detachment (RRD).

Methods: A prospective study including 16 patients with RRD who underwent SB more than 1 month prior was conducted. Three patients received encircling type, while another 13 patients received segmental type SB. The fellow eyes served as a control group. Hartmann-Shack wavefront analysis was performed to determine HOAs. Visual acuity, spherical equivalence, cylindrical equivalence, axial length, and intraocular pressure (IOP) were also recorded.

Results: Visual acuity in the study group significantly deteriorated ($P = 0.001$), but not the spherical equivalence, cylindrical equivalence, axial length, and IOP ($P = 0.234, 0.624, 0.858, 0.964$ sequentially). Except for spherical aberration ($P = 0.052$), HOAs including tilt, defocus, and coma in the study group were elevated ($P = 0.017, 0.022, 0.003$ sequentially). Root-mean-square

(RMS)-3, RMS-4, and total RMS in the study group were also elevated ($P \leq 0.01, 0.03, 0.02$ sequentially). Moreover, tilt, defocus, and coma were higher in the segmental group ($P = 0.02, 0.04, 0.02$ sequentially) while spherical aberration was higher in the encircling group ($P = 0.04$). RMS-4 was increased in the segmental group ($P = 0.01$) but not RMS-3 and total RMS. Analysis of third and fourth Zernike terms revealed only significant elevation of vertical coma in the study group ($P = 0.03$).

Conclusions: SB significantly enhances HOAs, which may lead to guarded postoperative visual outcomes. The different types and extents in enhancement of HOAs between segmental and encircling groups suggest distinct mechanical effects between these 2 procedures.

Poster No.: EX2-254

Panel No.: 254, Session EX2

HtrA1 and ARMS2 Gene Polymorphisms Related to Age-Related Macular Degeneration: Case Series in Yogyakarta, Indonesia

First Author: Dewi **ROMDHONIYAH**

Co-Author(s): Angela Nurini **AGNI**, Anindya **RAHMAWATI**, Deamon **SAKARAGA**, Supanji **SUPANJI**, Tri Wahyu **WIDAYANTI**

Purpose: To demonstrate the risk of single nucleotide polymorphisms (SNPs) of the HtrA1 and ARMS2 genes related to age-related macular degeneration (AMD) especially in the Indonesia population.

Methods: The subjects of this study were from Sardjito General Hospital in Yogyakarta. A total of 10 subjects were examined by the vitreo-retinal specialist with ophthalmoscopy, fundus photograph, and optical coherence tomography (OCT) examination for diagnosis of AMD. The blood samples taken were about 2 cc. Then, PCR of blood samples was carried out in Terpadu Laboratory, Faculty of Medicine, University of Gadjah Mada.

Results: Of the 10 patients, the age range was 50-65 years. They all were diagnosed as wet AMD. PCR results showed that 6 subjects were risk-allele and 4 subjects were heterozygous, both on the HtrA1 and ARMS2 genes. There were no wild-type (non-risk) in all 10 patients.

Conclusions: A larger sample is needed in the development of this research in the future to represent the proportion of 1% SNPs in the population. The results of the HtrA1 gene are directly proportional to ARMS2. HTRA1 gene polymorphisms are associated with the risk of developing AMD as well as ARMS2.



Poster No.: EX2-255
Panel No.: 255, Session EX2

In Vitro Retinal Angiogenesis Assays for Novel Anti-Angiogenic Drug Discovery

First Author: Wei **CHENG**
Co-Author(s): Bhav Harshad **PARIKH**, Raj **PATIL**, Queenie Shu Woon **TAN**

Purpose: Age-related macular degeneration (AMD) and proliferative diabetic retinopathy are the leading causes of blindness worldwide. Pathological angiogenesis of the retina is an important process involved in these eye diseases. Cell-based experimental models of retinal angiogenesis remain crucial for investigating novel anti-angiogenic therapies. However, most widely used in vitro assays for the angiogenesis use HUVEC cells. The goal of this project is to establish various angiogenesis assays for screening potential anti-angiogenic molecules using more relevant primary human retinal cells.

Methods: Primary human retinal endothelial, epithelial, and pericytes were used to establish and validate proliferation, migration, tube formation assays using literature compounds. Vascular endothelial growth factor (VEGF) and linifanib, a potent inhibitor of RTK, were used as the reference compounds.

Results: We established proliferation, migration, tube formation assays using human retinal cells. Our results showed that VEGF induced the cell proliferation, migration, and tube formation in a dose-dependent manner and 5 nM of linifanib completely inhibited the VEGF-induced proliferation, migration, and tube formation. The efficacy of different potential compounds were evaluated using these validated assays. Among them, SIPRAD-0279, a natural marine product that inhibits the expression of a wide range of proteins involved in angiogenesis, showed a VEGF-dependent anti-angiogenic effect at 1 nM.

Conclusions: The cell-based angiogenesis assays using primary human retinal cells provide a simple, reproducible, and sensitive measurement that allow robust assessment of anti-angiogenic compounds in vitro. These assays would be valuable tools for the identification of novel compounds/targets as well as genes involved in retinal angiogenesis.

Poster No.: EX2-256
Panel No.: 256, Session EX2

Low-Frequency Coding Variants in CETP and CFB Are Associated with Susceptibility of Exudative Age-Related Macular Degeneration in the Japanese Population

First Author: Masato **AKIYAMA**
Co-Author(s): Tatsuro **ISHIBASHI**, Yoichiro **KAMATANI**, Michiaki **KUBO**, Yukihide **MOMOZAWA**, Koh-Hei **SONODA**

Purpose: To identify the role of low-frequency coding variants on age-related macular degeneration (AMD) susceptibility in the Japanese population.

Methods: We sequenced coding regions of 34 AMD candidate genes by next generation sequencing using 827 exudative AMD cases and 3,323 controls and evaluated the associations (first stage). Genes and variants which showed association ($P < 0.05$) in the first stage were also sequenced and evaluated in an independent set of 2,152 AMD cases and 6,655 controls (second stage).

Results: In total, 2,886 (first: 827, second: 2,059) exudative AMD cases and 9,337 (first: 3,247, second: 6,090) controls were analyzed in this study. Gene-based analysis found significant association of low-frequency variants (minor allele frequency < 0.05) in CETP, C2, and CFB. The association of CETP remained after conditioning with all known variants identified by genome-wide association study (GWAS). In addition, when we included only disruptive variants, enrichment of rare variants was also observed after conditioning with all GWAS associated variants ($P = 1.03 \times 10^{-6}$, odds ratio = 2.48). Haplotype and conditional analysis of the C2-CFB-SKIV2L locus showed a low-frequency variant (R74H) in CFB would be individually associated with AMD susceptibility independent of the GWAS-associated variants.

Conclusions: Our findings highlight the importance of target sequencing to reveal the impact of rare or low-frequency coding variants on AMD susceptibility in different ethnic populations.

Poster No.: EX2-257
Panel No.: 257, Session EX2

Macular Dystrophy in Kabuki Syndrome: A Rare Ocular Association

First Author: Jirawadee **KITTIPONGHANSA**
Co-Author(s): Tharikarn **SUJIRAKUL**, Objoon **TRACHOO**, Wadakarn **WUTHISIRI**

Purpose: To report a patient with macular dystrophy associated with Kabuki syndrome (KS).

Methods: Retrospective case report.



Results: KS is a rare congenital multi-systemic disorder with characteristic facial features. Associated ophthalmic anomaly of posterior segment is very rare in this syndrome. A 20-year-old Thai girl diagnosed with typical facial features of KS was sent to screen for associated ocular abnormality. Her best corrected visual acuity (BCVA) was 20/40 in both eyes. Long horizontal palpebral fissures with eversion of the outer part of inferior eyelids were found. Anterior segment examination was normal. Her fundus examination revealed foveal hypopigmentation corresponding with area of hyperautofluorescence from fundus autofluorescence imaging. SD-OCT revealed loss of ellipsoid line with thinning of outer nuclear layer at the fovea. Visual field testing and multifocal electroretinogram showed decreased sensitivity in the central area. Full-field electroretinogram was normal in both eyes. The diagnosis of macular dystrophy associated with KS was made. Exome sequencing was done, confirming C deletion at c.1871 causing frame shift deletion of KMT2D gene. KS associated maculopathy in our patient was confirmed by both structural and functional testing. Fundus abnormalities that were described in KS included coat-type retinal telangiectasia, tortuous retinal vessels with irregular foveal pigmentation, and tilted disc. We were able to find only one case with macular dystrophy similar to our patient.

Conclusions: We question if macular dystrophy is a truly rare associated anomaly in KS or merely present the under diagnostics of more common ocular associations due to a subtle change in vision and clinical findings which allow us to detect the abnormality with the use of multimodal imaging techniques.

Poster No.: EX2-258

Panel No.: 258, Session EX2

Monotherapy with Intravitreal Avastin and Combination Therapy with Intravitreal Avastin and Ozurdex for Treatment of Macular Edema Following Central Retinal Vein Occlusion

First Author: Nilutpal **BORAH**

Purpose: A retrospective study comparing (1) long term efficacy and (2) complications of intravitreal Avastin monotherapy (IVB) with combination therapy (intravitreal Avastin + Ozurdex) in non-ischemic central retinal vein occlusion (CRVO) with recurrent macular edema (ME).

Methods: Study period was from June 2012 to December 2015. Pre- and post-treatment best corrected visual acuity (BCVA), intraocular pressure (IOP), slit lamp, fundus examinations, fundus fluorescein angiography (FFA), and optical coherence tomography (OCT) were done. Follow-up was 1 week after IVB and intravitreal

Ozurdex; then 2 monthly. When ME persisted/worsened even after mean 3.5 IVB (CMT > 280 μ m), patients were divided into 2 groups. Group A patients continued to receive IVB, and group B received IVB + Ozurdex.

Results: Thirty-seven patients (37 eyes) in group A and 27 patients (27 eyes) in group B were studied for a mean 24 months. Group A included 30 males and 7 females with a mean age of 56.9. Group B included 14 males and 13 females with a mean age of 56.2. Pre- and post-treatment vision (logMAR) in group A were 1.04 and 0.68 ($P = 3.46$) and in group B were 1.06 and 0.82 ($P = 0.013$). Group A mean pre-treatment CMT was 621.19 μ m and final was 336.92 μ m ($P = 0.001$). Group B mean pre-treatment CMT was 685.74 μ m and final was 329.33 μ m ($P = 0.0001$). In 2 years the number of IVB required in group A was 9.8 (± 3.9); in group B IVB + Ozurdex required was 7.9 (± 1.9). Cataract developed in 6 eyes in group A and 8 eyes in group B ($P = 0.23$). Increased IOP was present in 2 eyes in group A and 10 eyes in group B ($P = 0.002$). RPE atrophy and macular scar were seen in 8 group A eyes and 6 group B eyes.

Conclusions: This long-term study showed that both monotherapy (IVB) and combination therapy (Avastin + Ozurdex) result in resolution of ME following non-ischemic CRVO and improve vision. Combination therapy is relatively more effective and requires fewer injections but may lead to cataract (16.2%) formation and IOP (37%) rise.

Poster No.: EX2-259

Panel No.: 259, Session EX2

Optic Disc Pit Maculopathy Treated with Latanoprost: A Case Report

First Author: Joseph Gan **SAY SEONG**

Co-Author(s): Roslin **ABDUL AZIZ**, Hanizasurana **HASHIM**, Nazri **OMAR**

Purpose: To report a case of successful medical treatment of optic disc pit maculopathy with topical latanoprost.

Methods: Case report.

Results: A 41-year-old Indian woman, a health professional, was referred for right eye blurring of vision. She presented with 1-week history of sudden onset central scotoma of the right eye (RE). There were no other associated symptoms. History was unremarkable. Examination revealed RE vision of 6/9 with RAPD negative. Intraocular pressure in the RE was 22 mm Hg. Anterior segment examination was unremarkable. Posterior segment examination of RE revealed optic disc pit, with serous elevation of the maculopapular bundle. Optic disc was pink, with CDR of 0.3. Optical coherence tomography (OCT) of the RE showed subretinal fluids connecting to the optic disc. The patient was diagnosed



with central serous retinopathy secondary to optic disc pit. Latanoprost was started following 1 report that showed successful results with the said treatment. At 1-month follow-up, her symptoms improved. Intraocular pressure in the RE was 13 mm Hg. There was total resolution of serous elevation at the macula on fundus examination with complete dryness of subretinal fluids on OCT.

Conclusions: Latanoprost could be a choice of medical treatment for optic disc pit maculopathy.

Poster No.: EX2-260

Panel No.: 260, Session EX2

Optical Coherence Tomography Angiography Features of Polypoidal Choroidal Vasculopathy

First Author: Colin **TAN**

Co-Author(s): Isaac **CHAY**, Tock-Han **LIM**, Louis **LIM**

Purpose: Polypoidal choroidal vasculopathy (PCV) occurs more commonly in Asian populations and currently requires indocyanine green angiography (ICGA) to confirm the diagnosis. Though the ICGA features of PCV have been described, there is little information on its characteristics seen on optical coherence tomography angiography (OCTA). We aimed to describe the OCTA features of PCV.

Methods: In a study of 24 consecutive patients diagnosed with PCV seen at a tertiary eye center, OCTA scans were performed using standardized protocols. The diagnosis of PCV was confirmed using standardized diagnostic criteria on ICGA. The OCTA images of these patients were reviewed by retinal specialists and then correlated with the ICGA images.

Results: The mean age of the 24 patients was 68.5 years. Of these, 87.5% were male and 12.5% female. Using OCTA, a branching vascular network (BVN) was seen in 90.5% of eyes. In contrast, polyps were seen on OCTA only in 75% of eyes. The polyps had a variety of patterns on OCTA and did not always correlate with the appearance on ICGA. The BVN was seen in the choriocapillaris.

Conclusions: We have described novel and distinct OCTA features of PCV that correlate well with ICGA features. OCTA provides a non-invasive means to image and diagnose patients where ICGA is contraindicated and may aid in the diagnosis of PCV in the future.

Poster No.: EX2-261

Panel No.: 261, Session EX2

Peripheral Choroidal Features in Eyes with Age-Related Macular Degeneration Imaged with Enhanced Depth Optical Coherence Tomography

First Author: Andrew **TSAI**

Co-Author(s): Bailey **FREUND**, Anna **TAN**

Purpose: To study the differences in peripheral choroidal features of eyes with age-related macular degeneration (AMD) with and without peripheral drusen (PD) versus normal controls.

Methods: Standardized 55-degree enhanced depth imaging optical coherence tomography radial scans were performed in 3 groups of eyes: Group 1, 45 eyes with AMD and PD; Group 2, 21 eyes with AMD and no PD; and Group 3, 34 eyes of normal controls. The peripheral choroidal thickness and largest choroidal vessel diameter was measured at a locus of 6 mm from the fovea at 8 locations.

Results: The mean peripheral choroidal thickness was thinner in eyes with AMD with or without PD versus normal controls [Group 1: $172.7 \pm 62.4 \mu\text{m}$ and Group 2: $168.1 \pm 63.6 \mu\text{m}$ versus Group 3: $206.6 \pm 71.4 \mu\text{m}$ ($P < 0.001$ and $P < 0.001$, respectively)]. The mean subfoveal choroidal thickness was also thinner in eyes with AMD with and without PD versus normal controls [Group 1: $243.0 \pm 80.0 \mu\text{m}$ and Group 2: $266.4 \pm 156.0 \mu\text{m}$ versus Group 3: $295.6 \pm 62.5 \mu\text{m}$ ($P < 0.05$ and $P > 0.05$, respectively)]. The mean peripheral largest choroidal vessel diameter was less in eyes with AMD with or without PD versus controls [Group 1: $499.0 \pm 119.4 \mu\text{m}$ and Group 2: $99.9 \pm 150.2 \mu\text{m}$ versus Group 3: $743.2 \pm 134.9 \mu\text{m}$ ($P < 0.001$ and $P < 0.05$, respectively)]. No statistically significant differences in choroidal features were found between AMD eyes with or without PD. The inferonasal peripheral choroid was the thinnest in all 3 groups.

Conclusions: Despite AMD being a disease that predominantly affects the macula, peripheral choroidal thinning with smaller caliber choroidal vessels was observed to occur in AMD eyes with and without PD. Consistent topographical choroidal variations between different peripheral areas were noted in all eyes.

Poster No.: EX2-262

Panel No.: 262, Session EX2

Peripheral Vascular Endothelial Dysfunction in Central Serous Chorioretinopathy

First Author: Yu-Chuan **KANG**

Co-Author(s): Yun **FU**, Wan-Jing **HO**, Chi-Chun **LAI**, Nan-Kai **WANG**, Wei-Chi **WU**

Purpose: To explore the pathophysiology of central

serous chorioretinopathy (CSC) by comparing patients with CSC and control subjects.

Methods: Thirty-four patients with CSC and 34 healthy age- and gender-matched normal control subjects were enrolled in the study. Endothelium-dependent flow-mediated vasodilation (FMD) and endothelium-independent nitroglycerin-mediated vasodilation (NMD) were measured by using high-resolution, 2-dimensional (2-D) ultrasonographic imaging of the brachial artery. Blood sampling for biochemistry, lipid profile, and high-sensitivity C-reactive protein (hsCRP) were analyzed as well.

Results: The mean age was 44.0 years (SD \pm 8.10) in patients with CSC and 46.1 years (\pm 9.94) in control subjects ($P = 0.352$). There was no statistical significance in biochemistry, lipid profile, and hsCRP. FMD was significantly impaired in patients with CSC in comparison to control subjects (CSC: 4.21 ± 0.59 , control: 4.31 ± 0.55 , $P < 0.001$). NMD revealed no significant difference between the 2 groups (CSC: 16.31 ± 5.60 , control: 16.22 ± 5.56 , $P = 0.95$).

Conclusions: Endothelium-dependent flow-mediated vasodilation dysfunction can be one of the etiologies of CSC, and this finding suggests that CSC might be an ocular presentation of systemic diseases associated with endothelium dysfunction. Although patients with CSC present eye symptoms initially, they should be aware of developing other endothelium dysfunction in the future.

Poster No.: EX2-263

Panel No.: 263, Session EX2

Preferred Retinal Loci Under Different Background Brightnesses

First Author: Satoshi **ISHIKO**

Co-Author(s): Tomoko **MASE**, Eiichi **SATO**, Kazuhiro **SUGAWARA**, Akitoshi **YOSHIDA**

Purpose: To study preferred retinal loci (PRL) under different background brightnesses in patients with macular diseases.

Methods: The study included 15 eyes of 14 patients (5 women, 9 men; mean age, 69.2 ± 26.9 years) with macular diseases, such as age-related maculopathy and high myopic chorioretinal atrophy, and visual acuity levels of 0.3 or lower. Microperimetry (MP-3, Nidek, Aichi, Japan) was performed to evaluate PRL under the conventional background brightness of 10 cd/m². We developed a new device to evaluate PRL under a higher background brightness of 650 cd/m². A cross-shaped fixation target was used; in both instruments, the length was set to 3 degrees and the width to 0.3 degrees.

Results: In patients without a central scotoma, the PRL

were the same under both conditions. In patients with a central scotoma, the PRL under the different brightnesses differed in 7 (70%) of 10 eyes. The PRL shifted toward and away from the center with the bright background in 2 and 4 eyes, respectively. Some patients had a PRL with the bright background within the deep scotoma area evaluated by microperimetry.

Conclusions: Inconsistencies in the PRL between the 2 lighting conditions might occur depending on the residual macular function. Based on the degree of macular impairment, functional improvement following an increase in brightness can be observed at the macula or the surrounding area. It might be more beneficial to evaluate PRL with a brighter background compared with the conventional perimetric condition when managing patients with low vision.

Poster No.: EX2-264

Panel No.: 264, Session EX2

Relationship Between Macular Ischemia and Visual Acuity in Type 2 Diabetic Patients

First Author: Mahmoud **RABIE**

Purpose: Diabetic macular ischemia (DMI) is an important factor which determines the visual outcome in diabetic retinopathy patients. DMI appears on fundus fluorescein angiography (FFA) as an enlarged foveal avascular zone (FAZ) with areas of capillary dropout in the macular area. This study investigated the state of DMI in diabetic retinopathy patients using FFA and examined its relationship with visual acuity (VA) at the time of presentation.

Methods: Seventy-four eyes of 37 type 2 diabetic patients with retinal ischemia were retrospectively identified over a 2-year period and their FFA were identified. DMI severity was assessed according to ETDRS protocol and VA was studied in relation to the state and severity of DMI. The independent-sample median test was used to statistically analyze the data.

Results: DMI was graded into 5 groups according to severity as was described by ETDRS regardless severity of diabetic macular edema. There was no significant visual impairment in neither the first group "no DMI" with median FAZ area of 0.18 mm² (0.13-0.21) nor the second group "query DMI" with median FAZ area of 0.28 mm² (0.18-0.34) ($P = 0.669$). Statistically significant visual disturbance was observed in "mild" ($P = 0.021$), "moderate" ($P = 0.002$), and "severe" ($P = 0.007$) groups with median FAZ of 0.32 mm² (0.24-0.50), 0.37 mm² (0.28-0.65), and 0.9 mm² (0.70-1.30), respectively. VA in affected groups was found to be significantly related to the grade of ischemia and FAZ enlargement ($P = 0.003$).

Conclusions: VA is closely related to the macular state of perfusion in type 2 diabetics with DMI regardless



of macular edema severity. VA is more impaired in patients with disrupted FAZ and/or evident areas of capillary dropout on FFA. Visual impairment severity is proportional to ETDRS classification of DMI.

Poster No.: EX2-265

Panel No.: 265, Session EX2

Retinal Artery Occlusion as a Late Complication of Radiotherapy in Nasopharyngeal Carcinoma

First Author: Ju Chuan **CHENG**

Purpose: To report 2 patients who experienced visual loss due to central and branch retinal artery occlusion as a late complication of radiotherapy for nasopharyngeal carcinoma (NPC).

Methods: Interventional case series.

Results: Two patients suffered from symptoms of severe carotid stenosis 1 decade after radiotherapy for NPC. Acute visual loss and subtle neurologic symptoms related to thromboembolisms of retinal arteries served as an initial presentation. Both patients underwent carotid artery work up, which revealed different degrees of occlusion. The first patient suffered from repeated thromboembolism of retinal arteries and eventually developed complete occlusion of the central retinal artery, resulting in a poor visual outcome. The second patient was diagnosed with branch retinal arterial occlusion; he had a self-limited course and good visual recovery.

Conclusions: External radiotherapy is a conventional standard treatment for both early and advanced stages of NPC. The carotid artery is always included in the radiation field owing to the high incidence of occult neck nodal metastasis. Post-radiation vasculopathy is a well-known long-term sequel of cervical radiotherapy, with predilection to medium and small sized vessels, such as carotid artery and its branches, including retinal arteries. Acute visual loss might serve as an initial presenting symptom for patients with carotid stenosis. Neurologist consultation for complete carotid artery work up should be considered, especially in patients who received radiotherapy to the neck region and developed retinal artery occlusion, to prevent severe systemic consequences and poor visual outcomes.

Poster No.: EX2-266

Panel No.: 266, Session EX2

Serum Cystatin C Levels Are Associated with Diabetic Macular Edema: A Population-Based Case-Control Study

First Author: Sieh Yean **KIEW**

Co-Author(s): Ching-Yu **CHENG**, Ecosse **LAMOUREUX**, Charumathi **SABANAYAGAM**, Wong Chee **WAI**, Tien **WONG**

Purpose: Serum cystatin C, an alternative marker of kidney function, has been associated with diabetic microvascular complications including nephropathy and retinopathy. We examined the associations of cystatin C and other kidney function markers with diabetic macular edema (DME).

Methods: We examined 851 Indian adults with diabetes, aged 40-80 years, who participated in the Singapore Indian Eye Study (2007-2009). DME was defined as macular edema involving or within 500 μm of the fovea, or if macular focal photocoagulation scars were present. The associations of serum cystatin C, estimated glomerular filtration rate based on creatinine (eGFRcr), cystatin C (eGFRcys), and urine albumin-to-creatinine ratio (UACR) with DME were examined using logistic regression models adjusted for age, gender, duration of diabetes, HbA1c, systolic blood pressure, and low-density lipoprotein cholesterol.

Results: The prevalence of DME was 5.9%. Persons with DME had significantly higher levels of serum cystatin C ($P = 0.02$) but not serum creatinine ($P = 0.28$) or UACR ($P = 0.17$), compared to those without. Logistic regression analysis revealed an independent association of serum cystatin C with DME [odds ratio (OR) per standard deviation (SD) increase: 1.29, 95% confidence interval (CI) 1.04-1.60, $P = 0.02$]. Odds ratios for DME per SD decrease were 4.32 (95% CI 1.47-12.68, $P = 0.008$) for eGFRcys, 1.35 (95% CI 0.97-1.86, $P = 0.07$) for eGFRcr, and 1.04 (95% CI 0.89-1.22, $P = 0.64$) per SD increase in UACR.

Conclusions: Serum cystatin C was independently associated with DME. Prospective studies are needed to determine if cystatin C is a better marker of microvascular disease than creatinine or albuminuria in persons with diabetes.

Poster No.: EX2-267

Panel No.: 267, Session EX2

Subretinal Macular Hemorrhage Associated with Burkitt Lymphoma: A Case Report

First Author: Cheng-Chao **CHING**

Co-Author(s): Pei-Tzu **KUAN**

Purpose: To report a case of subretinal macular hemor-

rhage associated with Burkitt lymphoma.

Methods: Case report.

Results: A 24-year-old man with a history of Burkitt lymphoma with initial presentation of intestinal obstruction due to ileocecal valve tumors was admitted due to chemotherapy treatment and neutropenia. During admission, the patient complained of floaters in the right eye for about 1 day. Initial dilated fundoscopic examination did not reveal visible retinal abnormalities. Myodesopsia was impressed, and the patient was instructed to follow-up. The patient returned to our clinic 1 week after discharge from the hospital with persistent complaint of floaters as well as more prominent blurred vision in the left eye. Visual acuity of the right eye was 0.1. A well-defined submacular hemorrhage was observed upon retinal examination. Fluorescein angiography was arranged, which showed stark subretinal hemorrhage without active vascular leakage. Fundoscopy follow-up at 2 months showed resolution of hemorrhage; however, a well-defined metallic colored lesion was observed, and final diagnosis of submacular fibrosis was made.

Conclusions: Patients with non-endemic form of Burkitt lymphoma present with rapidly growing tumor masses usually involving the gastrointestinal tract. There is limited data regarding ocular involvement associated with systemic Burkitt lymphoma. Clinicians should keep the possibility of retinal and choroidal involvement in mind in the presence of visual symptoms and perform thorough funduscopy examination as well as close follow-up to ensure early treatment and a favorable prognosis.

Poster No.: EX2-268

Panel No.: 268, Session EX2

Thinning of the Retinal Nerve Fiber Layer, Ganglion Cell Layer, and Fovea of Patients with Diabetes Mellitus Type 2 With No or Minimal Retinal Findings on Fundoscopy Using Spectral Domain Optical Coherence Tomography

*First Author: Maria Clarissa **SOBRIO***

*Co-Author(s): Joseph Manuel **CRUZ***

Purpose: This study aims to establish thinning of the retinal nerve fiber layer, ganglion cell layer, and fovea in patients with diabetes mellitus with no or minimal retinal findings.

Methods: Thirty patients with diabetes mellitus (DM) with no, mild, or moderate DM retinopathy were included. Best corrected visual acuity, slit lamp examination, and indirect ophthalmoscopy were done before spectral domain optical coherence tomography of the retinal nerve fiber layer, ganglion cell layer, and macula

were done.

Results: Patients were from 48 years old to 74 years old (mean age, 50 years old). There were more females (N = 18, 60%) than males (N = 12, 40%). There were more patients with diabetes mellitus with no observable DM retinopathy seen on fundoscopy (N = 22, 73%). A decrease in thickness of the retinal nerve fiber layer, ganglion cell layer, and fovea were detected in patients with diabetes mellitus with no, mild, or moderate DM retinopathy compared with the normative database using spectral domain optical coherence tomography (OCT). Cirrus HD OCT showed retinal nerve fiber layer thinning of the optic nerve head in 13 participants (43.33%), decrease in ganglion cell layer thickness in 19 participants (63.33%), and decrease in macular thickness in 23 participants (76.67%) (52.17% of the 23 participants showed involvement of the fovea). Thinning of the fovea was seen in 12 participants (40%).

Conclusions: Thickness of the retinal nerve fiber layer, ganglion cell layer, and fovea were decreased in patients diagnosed with diabetes mellitus even if they did not have ophthalmologic manifestations yet.

Poster No.: EX2-269

Panel No.: 269, Session EX2

Twelve-Month Outcomes of Intravitreal Ranibizumab Treatment for Diabetic Macular Edema in a Real-World Clinical Setting

*First Author: Sentaro **KUSUHARA***

*Co-Author(s): Shigeru **HONDA**, Hisanori **IMAI**, Akiko **MIKI**, Takayuki **NAGAI**, Makoto **NAKAMURA***

Purpose: To verify 12-month outcomes of intravitreal ranibizumab injection (IVR) for diabetic macular edema (DME) in a real-world clinical setting.

Methods: This is a retrospective study based on medical records. Included were 41 eyes of 32 DME patients (25 males and 7 females) who received initial IVR in Kobe University Hospital between March 2014 and May 2015. The mean \pm standard deviation age was 65.7 ± 10.4 years. Four eyes were avitreous. IVR was performed as needed based on the presence of macular edema on optical coherence tomography (OCT). The changes of best-corrected visual acuity (BCVA) and central retinal thickness (CRT) measured by OCT from baseline to 12 months were analyzed.

Results: The mean number of IVR at 12 months was 2.0 ± 1.2 . Thirty-five (85%) eyes required other treatments for DME during the follow-up period: focal laser for microaneurysms (20 eyes [57%]), pars plana vitrectomy (7 eyes [20%]), sub-Tenon injection of triamcinolone acetonide (5 eyes [14%]), intravitreal aflibercept injection (3 eyes [9%]), and macular grid laser (1 eye [3%]). The mean CRT significantly decreased from $439.0 \pm$



104.7 μm at baseline to $351.0 \pm 112.3 \mu\text{m}$ at 12 months ($P = 0.0002$) (the difference was $-88.0 \pm 139.9 \mu\text{m}$). The mean BCVA (converted to ETDRS letter scores) improved significantly from 66.1 ± 15.6 letters at baseline to 70.5 ± 14.4 letters at 12 months ($P = 0.0059$) (the difference was 4.4 ± 9.5 letters).

Conclusions: IVR with an as-needed regimen for DME may decrease CRT and improve BCVA at 12 months if combined with other treatment options.

Poster No.: EX2-270

Panel No.: 270, Session EX2

Two-Year Prognostic Factors of Aflibercept for Ranibizumab-Resistant Neovascular Age-Related Macular Degeneration and Polypoidal Choroidal Vasculopathy

First Author: Keiko **AZUMA**

Co-Author(s): Tatsuya **INOUE**, Jinhee **LEE**, Aya **MATSUDA**, Ryo **OBATA**

Purpose: To elucidate the factors associated with 2-year outcomes of aflibercept therapy for patients with neovascular age-related macular degeneration (nAMD) or polypoidal choroidal vasculopathy (PCV) who showed insufficient response to ranibizumab and were switched to aflibercept.

Methods: We retrospectively reviewed the charts of consecutive cases with AMD or PCV refractory to ranibizumab and switched to aflibercept treat-and-extend therapy for at least 2 years. Multivariate analyses were performed regarding demographics, visual acuity (VA), and anatomic characteristics at baseline and month 3 to investigate the association (that were associated) with 2-year visual acuity or the number of treatments in 2 years.

Results: Sixty-six eyes of 66 patients were included in this study. Thirty-five eyes had PCV. VA and VA change at month 3 were positively associated with VA and VA change at year 2 ($P < 0.0001$ and $P < 0.003$, respectively), and persistent intra- or subretinal fluid at month 3 was associated with poor VA and worse VA change at year 2 ($P = 0.003$ and $P = 0.004$, respectively) with an increased number of treatments in 2 years ($P = 0.002$).

Conclusions: The present analysis suggests that visual acuity and persistent exudative change 3 months after switching to aflibercept were the predictors of visual outcomes or the number of treatments in 2 years of treat-and-extend therapy.

Poster No.: EX2-271

Panel No.: 271, Session EX2

Ultra-Wide Field Fundus Autofluorescence Imaging in Cytomegalovirus Retinitis

First Author: Sameeksha **TADEPALLI**

Co-Author(s): Mangat **DOGRA**, Mohit **DOGRA**, Vishali **GUPTA**, Aman **SHARMA**, Ramandeep **SINGH**

Purpose: To describe the findings and evaluate the utility of ultra-wide field (UWF) fundus autofluorescence (FAF) in the management of active cytomegalovirus retinitis on serial follow-up as compared with ultra-wide field fundus photo.

Methods: Prospectively, we included treatment-naive active cytomegalovirus retinitis patients. They underwent ultra-wide field imaging (fundus photograph and FAF) on Optomap imaging system at presentation and every 2 weeks while they were being treated. Serial photographs and FAF images were compared to see if the autofluorescence images yielded any additional information over the fundus photos.

Results: We recruited 24 eyes of 17 patients. In 19 of 24 eyes, FAF gave additional information. Lesion borders were better delineated in 7 eyes (29.1%). Larger extent of lesions was seen in 8 eyes (33.3%). FAF recognized recurrence in 6 eyes (total 7 eyes with recurrence) (85.7%). It helped differentiate a cotton-wool spot from active lesion in 1 eye. It was found to be of limited use for peripheral lesions (zone 3 lesions), edematous lesions with associated hemorrhage, and frosted branch angitis.

Conclusions: UWF FAF imaging is useful in monitoring disease activity in granular CMVR lesions especially in zone 1 and 2, helps gauge the true extent of the lesions, and aids in recognizing recurrences. UWF FAF and fundus together help in better management of patients with cytomegalovirus retinitis.

Poster No.: EX2-272

Panel No.: 272, Session EX2

Validation of Novel Therapeutic Targets for Diabetic Retinopathy

First Author: Beiyong **QIU**

Co-Author(s): Ning (Danny) **CHEUNG**, Xiaomeng **WANG**, Tien **WONG**, Lei **ZHOU**

Purpose: Proliferative diabetic retinopathy (PDR) is the leading cause of blindness in the working-age population. Previous studies indicated vascular endothelial growth factor (VEGF) in PDR pathogenesis. Despite huge clinical benefit, 50% of PDR patients do not respond to anti-VEGF treatment. The proteomics profile was performed in the vitreous collected from patients with PDR against non-PDR control patients. The aim

of this study was to validate the vitreous proteins that are differentially expressed between PDR and non-PDR control patients.

Methods: Western blot analysis was used to confirm the expression of 3 novel targets (SIPRAD targets 31-33) identified from the proteomics study. The expression level and pattern of SIPRAD targets 31-33 in retinal vasculature was studied in mice at different ages by real-time qRT-PCR, Western blot analysis, and immunofluorescent staining. The association of SIPRAD targets 31-33 with pathological angiogenesis was studied by immunofluorescent staining in a mouse model of oxygen-induced retinopathy (OIR).

Results: There was an increased expression of SIPRAD targets 31-33 with increased vessel density in mouse retina. SIPRAD targets 31 and 32 are specifically expressed in the retinal vasculature during developmental angiogenesis. SIPRAD target 32 is expressed in both quiescent and pathological blood vessels, whereas the expression of SIPRAD target 31 is specifically associated with pathological neovascular tufts in retina of OIR mice.

Conclusions: Our study provided further validation of 3 promising targets that are differentially expressed in vitreous of human PDR patients. SIPRAD target 31 is intimately associated with pathological neovascularization in the retina and may serve as a potential therapeutic target for PDR.

Poster No.: EX2-273
Panel No.: 273, Session EX2

Various Manifestations of Ocular Leptospirosis: Report of Three Cases

First Author: Wan Norliza WAN MUDA

Purpose: To report the clinical features and outcome of 3 cases of ocular leptospirosis.

Methods: A case series.

Results: Case 1: A 68-year-old female had left eye blurring of vision of 1-week duration. She travelled to Taiwan a month previously and was admitted and treated for leptospirosis. Her best corrected visual acuity (BCVA) was 6/12 in the right eye (OD) and 6/18 in the left eye (OS). There were AC cells 4+ with 360-degree posterior synechiae and vitritis in the left eye. Her leptospiral IgM was positive. Doxycycline was commenced with intensive topical steroid therapy and showed resolution of vitritis with improvement of vision. Case 2: A 37-year-old female presented with bilateral reduced vision after an episode of fever with diarrhea. She had gone swimming in a river a week prior to illness. Her vision was OD 6/36 and OS 6/18. Fundus showed bilateral neuroretinitis with right eye subretinal fluid on optical coherence tomography (OCT). The blood cul-

ture was positive for leptospirosis and she responded well to doxycycline and prednisolone. Case 3: A 20-year-old female complained of right eye sudden reduction in vision for a week. Her BCVA was OD 6/36 and OS 6/9. There was right eye optic disc swelling with macula star and dilated/tortuous vessel. All infective screenings were negative except for leptospirosis IgM and burkholderia Ig M. She responded well to a combination of doxycycline and Bactrim.

Conclusions: Ocular leptospirosis is commonly underdiagnosed and needs to be ruled out in all infective cases with posterior segment findings.

Poster No.: EX2-274
Panel No.: 274, Session EX2

Wide-Field Angiography in Diagnosis and Management of Eales Disease in a Tertiary Eye Care Center in South India

First Author: Jyotirmay BISWAS

Purpose: Eales disease is an idiopathic occlusive venous disease. In our study we described the wide-field angiography (WFA) findings and their clinical significance in diagnosing and managing Eales disease.

Methods: Retrospective case series in which case records and wide-field fluorescein angiograms of 61 eyes of 35 patients with Eales disease were reviewed and treatment before and after WFA was compared. Analysis was done using SPSS 14.

Results: Mean age was 37.9 ± 11.99 years. Out of 25 eyes which had neovascularization on WFA, 23 eyes had mean capillary nonperfusion (CNP) area of 4.18 clock hours and 2 eyes had patchy CNP areas. Posteriorly located CNP areas and vasculitis were significantly associated with posterior neovascularization. Vasculitis and retinal neovascularization were more evident on WFA than clinically ($P < 0.005$). Significant correlation between clinically detected retinal hemorrhages and neovascularization detected on WFA was noted. Change in treatment was done in 32 eyes (52.46%) based on WFA.

Conclusions: WFA is a very important and reliable diagnostic modality to detect active vasculitis and neovascularization in Eales disease, which could be missed clinically, and thereby helps in planning the management options.



Retina (Surgical)

Poster No.: EX2-275

Panel No.: 275, Session EX2

25-Gauge Vitrectomy and Air Tamponade with Low IOP for the Treatment of Stage 2 Macular Hole

First Author: Yuanfei **ZHU**

Co-Author(s): Hongbo **CHEN**, Tie Ying **ZHAO**

Purpose: A retrospective consecutive case series to evaluate the safety and efficacy of 25-gauge pars plana vitrectomy, air tamponade with low intraocular pressure (IOP), and strict posturing for the treatment of stage 2 macular hole.

Methods: We report the results of 33 consecutive eyes that underwent standard 25-gauge pars plana vitrectomy, fluid:air exchange with IOP 25 mm Hg, and strict posturing for 3 days. All patients were followed up at 1 week, 1 month, 3 months, and 6 months postoperatively. The anatomical outcome of the procedure was evaluated by fundus examination and optical coherence tomography. Spectral domain optical coherence tomography was used to study the restoration of the outer retinal layer integrity in the postoperative period. The preoperative and postoperative best-corrected visual acuities in logMAR units were compared to evaluate functional outcome.

Results: Thirty-three patients with mean age 55.8 ± 7.3 years, preoperative median best-corrected visual acuity of logMAR 0.7, and a mean base diameter of $212.8 \pm 57 \mu\text{m}$ underwent surgery to close macular holes without gas tamponade. Twenty-five patients (75.6%) were phakic. The macular hole was closed in 33/33 eyes postoperatively (100%). Mean visual acuity improved from logMAR 0.7 preoperatively to logMAR 0.18 postoperatively. No major intraoperative or postoperative complications were observed.

Conclusions: 25-gauge pars plana vitrectomy combined with room air tamponade with low IOP and 3-day face-down posturing is safe and highly effective for the treatment of stage 2 macular holes.

Poster No.: EX2-276

Panel No.: 276, Session EX2

An Audit of Diabetic Vitrectomy Surgery in Hospital Sultanah Bahiyah for 2015

First Author: Ahmad Marwan **ABDUL AZIZ**

Purpose: To retrospectively audit the outcomes of diabetic vitrectomy for advanced diabetic retinopathy and to identify the type of vitrectomy that may influence the visual outcomes and decisions for the surgery.

Methods: A total of 193 eyes of 175 patients undergoing vitrectomy for diabetic retinopathy in the ophthalmology department of Hospital Sultanah Bahiyah in 2015 are included in this audit.

Results: The mean age of diabetic vitrectomy patients was 58.6 ± 18.0 years. The main indication for vitrectomy in our audit was tractional retinal detachment (TRD) affecting the macula (30.0%, $n = 58$) followed by combined tractional rhegmatogenous retinal detachment (TRRD) (25.9%, $n = 50$), persistent vitreous hemorrhage (VH) (15.5%, $n = 30$), epiretinal membrane (ERM) (9.3%, $n = 18$), TRD threatening the macula (8.3%, $n = 16$), postoperative retinal detachment (6.2%, $n = 12$), and postoperative VH (4.7%, $n = 9$). A total of 65.8% ($n = 127$) of cases required intraoperative desegmentation or delamination. Silicone oil 5000 cs (35.2%, $n = 68$) was the most commonly used intraocular tamponade agent, followed by air (18.1%, $n = 35$), C3F8 (10.9%, $n = 21$), and heavy silicone oil (4.1%, $n = 8$). In addition, 31.6% of the cases ($n = 61$) did not require any tamponade. The visual function from severe impairment (logMAR 1 or worse) to moderate impairment (logMAR 0.78 or better) of 54.0% ($n = 88$) before surgery dropped to 46.0% ($n = 75$) 6 months after surgery. The visual acuity improved in 70.0% of eyes ($n = 114$), remained unchanged in 15.3% ($n = 25$), and worsened in 14.7% of eyes ($n = 24$).

Conclusions: Diabetic vitrectomy improved or stabilized vision in 85.3% of cases. Diabetic vitrectomy in Hospital Sultanah Bahiyah has an appreciable visual outcome for all types of surgical indications.

Poster No.: EX2-277

Panel No.: 277, Session EX2

Anterior Chamber Migration of Intravitreal Dexamethasone Implant: A Case Report

First Author: Cheng-Chao **CHING**

Co-Author(s): Yun-Chuan **CHEN**, Anthony **LIN**

Purpose: To report a case of anterior chamber migration of intravitreal dexamethasone implant.

Methods: A case report.

Results: A 41-year-old female had previous vitrectomy surgery for macular pucker with aphakic status. She had intravitreal implantation of dexamethasone implant (Ozurdex) for cystoid macular edema. Migration of the implant was noted 3 days after intravitreal implantation. During 6 months of follow-up, the intraocular pressure remained stable and the dexamethasone degraded at the fourth month. There was no corneal edema or endothelium loss during the follow-up period.

Conclusions: The risk of anterior chamber migration of the dexamethasone implant is increased with previous



vitrectomy surgery. Some case reports suggest that removal or repositioning of the Ozurdex implant into the posterior segment must be performed. However, there are still some cases well tolerated after the migration. We report a case of anterior chamber migration of intravitreal dexamethasone implant that remained calm and degraded at the fourth month.

Poster No.: EX2-278
Panel No.: 278, Session EX2

Choroidal Vascularity Change in Central Serous Chorioretinopathy After Verteporfin Photodynamic Therapy Quantified Using Swept-Source Optical Coherence Tomography

First Author: Daejoong **MA**
Co-Author(s): Hyeong Gon **YU**

Purpose: To evaluate the choroidal vascular structural changes after photodynamic therapy (PDT) with verteporfin in central serous chorioretinopathy (CSC) by using swept-source optical coherence tomography (SS-OCT) en face imaging.

Methods: We retrospectively reviewed the en face SS-OCT images of 20 eyes with CSC who underwent PDT. En face images of the microvasculature of the choriocapillaris layer, the Sattler layer, and the Haller layer in areas of 3.0 mm diameter centered at the fovea were converted to binary images. Choroidal vascular areas in each level were analyzed quantitatively using the binary image before PDT and 6 weeks, 6 months, and 12 months after PDT.

Results: Choroidal vascular area in the choriocapillaris layer decreased significantly 6 weeks after PDT ($P = 0.004$). Choroidal vascular area in the Sattler layer decreased significantly 12 months after PDT ($P = 0.005$) but did not show a significant decrease at 6 weeks and 6 months after PDT ($P = 0.075$ and 0.176 , respectively). Choroidal vascular area in the Haller layer decreased significantly 6 months after PDT ($P = 0.002$) but did not show significant decrease at 6 weeks after PDT ($P = 0.534$).

Conclusions: After PDT, choroidal vascular areas were decreased in all layers. The choriocapillaris layer showed the earliest decrease of the microvasculature, and the Sattler layer showed the latest decrease of the microvasculature.

Poster No.: EX2-279
Panel No.: 279, Session EX2

Comparative Study of Pars Plana Vitrectomy with and Without Encircling Band in Primary Rhegmatogenous Retinal Detachment

First Author: Ulka **PANKAR**
Co-Author(s): Guruprasad **AYACHIT**, Purnima **ARBHANAD**, Srinivas **JOSHI**

Purpose: To study the outcomes of pars plana vitrectomy (PPV) alone with PPV combined with encircling band in the treatment of rhegmatogenous retinal detachment (RRD) in terms of anatomical success, visual acuity, and complications.

Methods: Randomized prospective interventional study. Group A included 60 eyes treated with PPV alone; group B included 60 eyes treated with PPV with encircling band. The main outcomes for comparison were single surgery anatomic success (SSAS) and visual acuity. SSAS was defined as reattachment with 1 surgical procedure until the end of 6 months. Primary failure was defined as redetachment observed within 8 weeks and late failure as redetachment after 8 weeks.

Results: Preoperatively 41 were phakic in group A and 37 in group B ($P = 0.4424$). The status of PVR in the 2 groups was comparable and not statistically significant ($P = 0.342$). SSAS in group A was 90% whereas in group B was 86.67% ($P = 0.5703$), which also remained statistically insignificant in further subgroup analysis based on the lens status ($P = 0.7325$). The mean visual acuity in group A was 1.88 logMAR and in group B was 1.93; postoperatively it was 0.93 in group A and 0.98 in group B ($P = 0.997$). In group A the primary failure and the late failure rates were 5% and 3% as compared with 13.3% and 0% in group B, respectively ($P = 0.487$). The rate of progression of cataract ($P = 0.2$) and incidence of glaucoma ($P = 0.3$) in the 2 groups was also not statistically significant.

Conclusions: Primary PPV with encircling does not offer potential advantages over PPV alone in terms of anatomical and functional outcomes and complication rates.

Poster No.: EX2-280
Panel No.: 280, Session EX2

Comparison of Visual Outcome and Morphologic Change Between Different Surgical Techniques in Idiopathic Epiretinal Membrane Surgery

First Author: Wen-Chuan **WU**
Co-Author(s): Yo-Chen **CHANG**

Purpose: To investigate the morphological and functional outcomes of macular pucker surgery between 3



different surgical techniques.

Methods: We retrospectively reviewed the patients with epiretinal membrane (ERM) scheduled for surgery between January 2012 and December 2014. All patients underwent a transconjunctival 25-gauge vitrectomy and triamcinolone-assisted ERM peeling. ICG-assisted internal limiting membrane (ILM) peeling as a whole piece was performed after ERM peeling between July 2012 and July 2013. Surgeries performed after July 2013 were done with the newly developed maculorrhesis ILM peeling technique. The surgical outcome was evaluated by visual acuity change and central macular thickness (CFT) measured by optical coherence tomography (OCT) preoperatively through 6 months postoperatively.

Results: There were 18, 17, and 22 patients in the ERM peeling, whole-piece ILM peeling, and maculorrhesis groups, respectively. Mean best corrected visual acuity (BCVA) improved significantly in all 3 groups at 6 months postoperatively ($P < 0.05$). Visual acuity in the maculorrhesis group improved significantly more than the ERM group at 1 month and 3 months postoperatively and also significantly more than the whole-piece ILM peeling group at 3 months postoperatively. There were significant CFT reductions at 1 month postoperatively in the ERM peeling and maculorrhesis groups but not the whole-piece ILM peeling group. Comparison of CFT reduction between the 3 groups revealed significantly more reduction in the maculorrhesis group than the whole-piece ILM peeling group at 1 month, 3 months, but not 6 months postoperatively ($P = 0.005, 0.03, 0.12$).

Conclusions: All 3 techniques used in ERM surgery resulted in visual acuity improvement and macular thickness reduction. Maculorrhesis results in better visual outcome within 3 months postoperatively. Macular edema recovery is slower with whole-piece ILM peeling but not maculorrhesis technique.

Poster No.: EX2-281

Panel No.: 281, Session EX2

Effect of 0.05% Difluprednate Ophthalmic Emulsion on Levels of Proinflammatory Cytokines After Retinal Laser Photocoagulation in Rabbits

First Author: Kakimoto **HIROSHI**

Co-Author(s): Shogo **ARIMURA**, Masaru **INATANI**, Takehiro **MATSUMURA**, Seiji **MIYAKE**, Yoshihiro **TAKAMURA**

Purpose: To evaluate the changes in inflammatory and angiogenic cytokine levels in aqueous humor and vitreous body with topical application of difluprednate 0.05% or betamethasone 0.1% sodium phosphate, as well as sub-Tenon injection of triamcinolone (STTA) after retinal laser photocoagulation in rabbits.

Methods: Pigmented rabbits were treated with retinal laser photocoagulation and divided into 4 groups, namely, control (no additional treatment), difluprednate, betamethasone, or STTA accordingly. Difluprednate 0.1% (STEROP) and 0.1% betamethasone (Rinderon) were topically administered fourth daily after laser. Samples of vitreous and aqueous humor were collected on post-treatment days 0, 1, 7, and 14. The levels of intraocular vascular endothelial growth factor (VEGF), interleukin-6 (IL-6), intercellular adhesion molecule-1 (ICAM-1), and monocyte chemoattractant protein-1 (MCP-1) were measured using an immunoassay. Intraocular pressure (IOP) was monitored in each group.

Results: The levels of VEGF, IL-6, ICAM-1, and MCP-1 were significantly elevated 1 day after laser treatment. Eye drops of difluprednate and STTA significantly reduced the increase in the levels of VEGF, IL-6, ICAM-1, and MCP-1 in both vitreous and aqueous humor. The application of betamethasone reduced their levels only in aqueous humor but not in vitreous body. Significant increase of IOP was noticed with difluprednate on day 7 and thereafter, but on day 10 with STTA and on day 14 with betamethasone.

Conclusions: Difluprednate reduced the levels of inflammatory cytokines after laser more effectively than STTA and betamethasone. Although the elevation of IOP is a promising side effect, difluprednate has a potent efficacy in preventing inflammation after laser.

Poster No.: EX2-282

Panel No.: 282, Session EX2

Electroretinography and Histology After Long-Term Implantation of Wireless Photovoltaic Subretinal Prostheses in Minipig

First Author: Po-Kang **LIN**

Purpose: To explore the electroretinography (ERG) and histology of minipig eyes after long-term implantation of wireless photovoltaic subretinal prostheses.

Methods: Photovoltaic subretinal prostheses were implanted into minipigs. The prostheses included an 8 x 8 pixel and a 16 x 16 pixel array. Each pixel was fabricated with parallel microphotodiodes, equipped with pairs of an independent output electrode and an adjacent return electrode. The prostheses were powered by on-chip solar cells and embedded with a unique circuit, ie, division-power-supply-scheme (DPSS), inspired by flicker fusion. The prostheses were further packed with hermetic packaging. The packaged prostheses were examined through a series of biosafety and biocompatibility tests. Then the implantation was performed through choroid approach. ERG was performed with different protocols (Roland, Germany). Histological examination was done after enucleation.

Results: The prostheses had been implanted for 2 years with the 8 x 8 pixel array and 7 months with the 16 x 16 pixel array. The prostheses stayed well in the subretinal space of the posterior fundus. Neither retinal detachment nor retinal fibrosis was noted. ERG showed significant b-wave responses after bleaching in the implanted eye, whereas the control eye showed flat response. The histological examination showed relatively preserved inner layer of the retina.

Conclusions: The electrophysiology and biocompatibility of novel 64 pixel and 256 pixel photovoltaic subretinal prosthesis with DPSS are primarily verified through long-term implantation.

Poster No.: EX2-283

Panel No.: 283, Session EX2

ILM Peeling for Macular Edema Secondary to Branch Retinal Vein Occlusion

First Author: Hussain KHAQAN

Purpose: To evaluate anatomic and functional outcomes in patients with macular edema secondary to branch retinal vein occlusion (BRVO) treated with pars plana vitrectomy (PPV) and internal limiting membrane (ILM) peeling.

Methods: A total of 55 eyes underwent PPV with ILM peeling. Visual acuity, fluorescein angiography, and optical coherence tomography were performed preoperatively and postoperatively every 4 weeks for 1 year. Study was conducted from January 2011 to June 2016.

Results: In 46 (83.6%) eyes the central macular thickness improved from $465 \pm 91 \mu\text{m}$ at baseline to $295 \pm 103 \mu\text{m}$ ($P < 0.003$). In 9 (16.3%) eyes central macular thickness did not decrease. In 43 (78.1%) eyes best corrected visual acuity (BCVA) improved ($P < 0.05$). In 37 (86%) eyes BCVA improved by a mean of 3.6 Snellen lines, while in 6 (13.9%) eyes BCVA improved 2.4 Snellen lines. In 12 eyes (21.8%) BCVA did not improve. No statistically significant difference in visual acuity improvement in ischemic or non-ischemic BRVO ($P > 0.05$) was found.

Conclusions: Pars plana vitrectomy with internal limiting membrane peel is beneficial for macular edema secondary to BRVO and improves visual acuity in ischemic and non-ischemic BRVO.

Poster No.: EX2-284

Panel No.: 284, Session EX2

Intravitreal Bevacizumab for the Treatment of Chronic Central Serous Chorioretinopathy

First Author: Aliagha ALISHIRI

Co-Author(s): Seyed MOSA

Purpose: To evaluate the efficacy of intravitreal injection

of bevacizumab in patients with chronic central serous chorioretinopathy (CSC).

Methods: In a clinical interventional case series, 22 patients with unresolved CSC lasting more than 3 months received intravitreal bevacizumab (IVB, 1.25 mg) injection. All patients underwent a thorough ophthalmic examination 1 day, 1 week, and 1 and 2 months after the injection. The visual acuity, central macular thickness, subretinal space volume (SSV), and contrast sensitivity were compared before and after treatment.

Results: Mean best corrected visual acuity (BCVA) improved significantly ($P = 0.000$) from 0.70 ± 0.22 to 0.19 ± 0.24 logMAR. Central macular thickness decreased significantly ($P = 0.000$) from 557.36 ± 129.12 to $259.50 \pm 116.73 \mu\text{m}$. Subretinal space volume decreased significantly ($P = 0.03$) from 10.53 ± 2.03 to 6.63 ± 1.80 . Contrast sensitivity also increased significantly ($P = 0.000$) from 2.64820 ± 13.8182 decibels (dB) to 1.80967 ± 17.6818 dB at last follow-up.

Conclusions: Intravitreal bevacizumab can be an alternative treatment in patients with chronic central serous chorioretinopathy, as it leads to better objective visual acuity, contrast sensitivity, and foveal thickness.

Poster No.: EX2-285

Panel No.: 285, Session EX2

Panretinal Photocoagulation Using Short-Pulse Laser Induces Less Inflammation and Macular Thickening in Patients with Diabetic Retinopathy

First Author: Yoshihiro TAKAMURA

Co-Author(s): Shogo ARIMURA, Makoto GOZAWA, Masaru INATANI, Takehiro MATSUMURA, Seiji MIYAKE

Purpose: To compare the effect of panretinal photocoagulation (PRP) using short-pulse laser (SPL) and conventional laser, regardless of the number of spots, in terms of their effect on the progression of diabetic macular edema (DME) and anterior flare intensity (AFI), and the induction of inflammatory cytokines, in patients with high-risk non-proliferative diabetic retinopathy (non-PDR).

Methods: Forty-two eyes of 42 patients were subjected to PRP using the conventional argon laser (Conv group) or SPL (SPL group). AFI and central retinal thickness (CRT) were measured at 2, 4, 6, 10, 18, and 30 weeks after PRP. Eyes of rabbits were photocoagulated using conventional laser with 500 spots, SPL with 500 spots (SPL 500s), or 1000 spots (SPL 1000s). Vascular endothelial growth factor (VEGF), interleukin-6 (IL-6), intercellular adhesion molecule-1 (ICAM-1), and monocyte chemoattractant protein-1 (MCP-1) levels in vitreous humor were measured using an immunoassay.

Results: The mean number of laser spots placed were



1203 ± 59 and 2925 ± 125 in the Conv group and SPL group, respectively. CRT and AFI levels in the SPL group were significantly lower than those in the Conv group (CRT at 4, 6, and 10 weeks; AFI at 6, 10, and 18 weeks). Compared to conventional laser, VEGF, IL-6, and MCP-1 levels were significantly lower in the SPL 1000s and SPL 500s groups.

Conclusions: In patients with high-risk non-PDR, SPL after PRP has a greater preventive effect on the progression of DME and AFI and produced less inflammatory cytokines than conventional lasers.

Poster No.: EX2-286

Panel No.: 286, Session EX2

Safety and Efficacy of 25-Gauge Chandelier-Assisted Scleral Buckling Surgery: Our Experience

First Author: Sameera **V V**

Co-Author(s): Guruprasad **AYACHIT**, Srinivas **JOSHI**

Purpose: To assess the safety and efficacy of the 25-gauge (G) chandelier endoillumination system (CES) in scleral buckling (SB) surgery in primary rhegmatogenous retinal detachment (RRD).

Methods: The study was designed as a prospective interventional case series. Fourteen eyes of 14 patients with recent primary RRD and proliferative vitreoretinopathy (PVR) ≤ C2 were treated with SB using the 25G CES and noncontact viewing system. Successful break localization was followed by cryopexy, standard SB, and subretinal fluid drainage (SRFD). Primary and secondary objectives were change in best corrected visual acuity (BCVA) and anatomical success at the end of 3 months, respectively.

Results: This study included 10 males and 4 females. Median age was 45 years (range, 18-65). Twelve eyes were phakic and 2 pseudophakic. Twelve eyes had macula-off RDs. Intraoperatively a new break was localized in 4 (28%) eyes. Successful SRFD occurred in all cases and vitreous prolapse with suturing of 25G port was noted in 2 cases. Air and C3F8 were injected in 8 and 4 eyes, respectively. Ten eyes on the first day (71%) showed attached retina, and 4 eyes had minimal subretinal fluid. Twelve eyes remained attached at 1 month. Post 2 months, 2 eyes had recurrent retinal detachment due to PVR and underwent vitrectomy. BCVA improved from 1.680 ± 0.570 (logMAR) to 1.0475 ± 0.330 (logMAR) at 3 months (P < 0.003).

Conclusions: CES allows excellent visualization and treatment of retinal breaks and safety during SRFD. It can be considered an effective alternative to vitreoretinal surgery in simple retinal detachment cases and aids in teaching purposes as well as allowing better ergonomics for the surgeon.

Poster No.: EX2-287

Panel No.: 287, Session EX2

Short-Term Outcome of 23-Gauge Pars Plana Vitrectomy in Vitreous Hemorrhage

First Author: Arjun **SHRESTHA**

Purpose: To determine the visual outcome after 23-gauge pars plana vitrectomy (PPV) in various causes of vitreous hemorrhage (VH) and also to find out the perioperative complications.

Methods: This was a retrospective study of VH patients who underwent 23-gauge PPV from April 2016 to August 2016. The study included any causes of non-clearing VH and also fresh VH in 1-eyed and visually demanding patients. Basic demographic characteristics and causes of VH were noted. Exclusion criteria included history of prior vitrectomy, glaucoma filtration surgery, or administration of gas at expansile concentrations or silicone oil. Main outcome measures included best-corrected Snellen visual acuity (VA), intraocular pressure (IOP), intraoperative complications, and postoperative complications.

Results: Mean age of the patients was 42 years and the study enrolled 23 males and 19 females. The causes of VH were diabetic retinopathy (33.3%), retinal vasculitis (33.3%), trauma (14.28%), veno-occlusive disorders (14.28%), and terson syndrome (4.76%). Mean overall acuity improved from 3/60 at baseline to 6/24 (P < 0.0001). Intraoperatively, 7.14% of eyes had lens touch and 2.38% of eyes had retinal break which were corrected with endolaser. Postoperative hypotony and persistent VH were each noted in 4.76% of eyes which resolved in 1 week. There was no choroidal effusion, postoperative endophthalmitis, and retinal detachment.

Conclusions: Hypotony and recurrent VH were the postoperative complications which resolved in a week. Intraoperative and postoperative complications were not so common in this series of 23-gauge vitrectomy.

Poster No.: EX2-288

Panel No.: 288, Session EX2

Two Cases of Vitrectomy with Inner Limiting Membrane Repositioning and Autologous Blood Technique for Macular Hole Retinal Detachment

First Author: Mihoko **OSADA**

Co-Author(s): Yusuke **ICHIYAMA**, Masashi **KAKINOKI**, Masahito **OHJI**, Yoshitsugu **SAISHIN**, Osamu **SAWADA**

Purpose: To evaluate the efficacy of vitrectomy combined with inverted inner limiting membrane repositioning (ILMR) and autologous blood clot (ABC) for macular hole retinal detachment (MHRD) in highly

myopic eyes, a technique which was developed by Dr Lai (Lai CC, 2016 Ophthalmology).

Methods: Two cases of MHRD in highly myopic eyes that underwent vitrectomy combined with ILMR, ABC, and gas tamponade were reviewed.

Results: Case 1: A 63-year-old female had bullous retinal detachment due to macular hole with axial length of 29.4 mm and preoperative visual acuity (VA) of 0.01. After the first surgery, the retina was reattached and macular hole was closed. The postoperative VA improved to 0.05. Case 2: A 66-year-old female had retinal detachment due to macular hole with axial length of 30.1 mm and preoperative VA of 0.5. After the first surgery, the macular hole did not close. A second surgery with the same technique was performed. After the second vitrectomy, the retina was attached and MH was closed. The postoperative VA improved to 0.1.

Conclusions: Vitrectomy with ILMR combined with ABC and gas tamponade would be an effective treatment for MHRD in highly myopic eyes.

Poster No.: EX2-289

Panel No.: 289, Session EX2

Visual and Anatomical Success of Giant Retinal Tear Patients over a 10-Year Period in a Large Tertiary Asian Eye Center

First Author: Nicole **SIE**

Co-Author(s): Shu Yen **LEE**, Daniel **TING**, Doric **WONG**, Edmund **WONG**, Ian **YEO**

Purpose: To report the 10-year visual and anatomical outcomes of giant retinal tears (GRT) in a tertiary eye center.

Methods: Retrospective review was undertaken of all patients with giant retinal tears (defined as a tear of ≥ 3 clock hours) collected over a 10-year period (January 1, 2006 to December 31, 2015). Analysis of data included patients' demographics, preoperative refractive status, intraoperative surgical and adjunctive procedures, number and size of tears, presence of proliferative vitreoretinopathy (PVR), and postoperative visual and anatomical complications.

Results: Of 65 cases with GRT, 13 were excluded due to missing data. The mean age was 43.8 years (± 15.4) with male (83.7%) and Chinese predominance (69.4%). Thirty-one affected eyes (59.6%) were myopic, of which 19 (36.5%) were classified as high myopes [≥ -10.0 diopters (D)]. Mean myopic distribution was $-7.97 \text{ D} \pm 5.24$. Most cases were unilateral (86.5%, $n = 45$), of which 50% ($n = 26$) had multiple tears. For the retinal detachment surgery, most common method was combined scleral buckling and vitrectomy (71.2%, $n = 37$), followed by vitrectomy alone (26.9%, $n = 14$) and scleral buckle alone (1.9%, $n = 1$). Heavy liquid was commonly

used intraoperatively and 16 cases required silicone oil as endotamponade. At 1 year, the anatomical success was 96.2% ($n = 50$). For best-corrected visual acuity (BCVA), 38.5% were 6/12 or better and 30% were 6/60 or worse.

Conclusions: The anatomical success for GRT was high at 1 year, with a third achieving vision required for driving (6/12 or better).

Poster No.: EX2-290

Panel No.: 290, Session EX2

Vitelliform Macular Dystrophy Associated Macular Hole Repair

First Author: Justin **GALVIN**

Co-Author(s): Brian **CHUA**, Adrian **FUNG**, Michael **ZHANG**

Purpose: Vitelliform macular dystrophy is rarely associated with development of full thickness macular hole. There have been even fewer reports describing successful surgical closure. Some reports have described vitrectomy surgery with silicone oil tamponade. However, silicone oil requires subsequent removal and may be complicated by emulsification. We present 2 patients with full thickness macular hole secondary to vitelliform macular dystrophy that underwent successful closure with vitrectomy and gas tamponade.

Methods: Two patients with bilateral macular vitelliform deposits developed symptomatic full thickness macular holes. Each patient underwent 25-gauge pars plana vitrectomy with internal limiting membrane peeling, 26% sulphur hexafluoride gas, and face-down positioning for 3 days.

Results: Both patients had successful closure of their macular holes, as confirmed by optical coherence tomography scans. Neither patient developed macular hole recurrence and both patients had improved visual acuity.

Conclusions: Vitrectomy surgery, internal limiting membrane peeling, gas tamponade, and face-down positioning can successfully repair full thickness macular holes associated with vitelliform macular dystrophy.



Visual Sciences

Poster No.: EX2-291
Panel No.: 291, Session EX2

All-Trans Retinoic Acid Suppresses the Adhering Ability of ARPE-19 Cells via Mitogen-Activated Protein Kinase and Focal Adhesion Kinase

First Author: Yo-Chen **CHANG**
Co-Author(s): Wen-Chuan **WU**

Purpose: All-trans retinoic acid (ATRA) has been previously demonstrated to suppress proliferation, migration, and contraction of retinal pigment epithelial (RPE) cells in vitro. This study aimed to elucidate the signaling mechanism underlying the anti-adhesive effect of ATRA.

Methods: ARPE-19 cells were treated with ATRA and the adhesion kinetics following cell seeding on different extracellular matrix (ECM) proteins were profiled by adhesion assay. Western blot and immunofluorescent staining were performed to characterize the adhesion-induced signaling effects and to visualize the subcellular distribution of focal adhesion kinase (FAK) and F-actin, respectively.

Results: Surface coating with type IV collagen, fibronectin (FN), and laminin (LM), but not type I collagen, significantly enhanced adhesion and spreading of ARPE-19 cells, while ATRA at subtoxic doses (ranging from 10^{-7} to 10^{-6} M) profoundly suppressed the ECM-enhanced adhesion ability. Cell attachment activated PI3K/Akt and MAPK cascades, whereas ATRA pretreatment blunted the early phosphorylation of Akt and MAPK signaling mediators including p38 MAPK, JNK1/2, and ERK1/2. Mechanistically, signaling blockade with selective kinase inhibitors demonstrated that all MAPK pathways were involved in the anti-adhesive effect of ATRA, whereas the PI3K inhibitor treatment significantly potentiated the ATRA-suppressed RPE cell adhesion. Moreover, ATRA treatment did not affect intracellular F-actin distribution but remarkably reduced FAK expression in both membranous and nuclear compartments during ARPE-19 cell attachment.

Conclusions: ATRA suppresses the adhering ability of ARPE-19 cells at least in part through MAPK and FAK pathways. Signaling blockade with PI3K inhibitor could be regarded as an alternative modality for treating proliferative vitreoretinopathy.

Poster No.: EX2-292
Panel No.: 292, Session EX2

Association of SPARC and Hevin T Cells with Increased TH2 Cytokine Expression in the Wounded Conjunctiva

First Author: Li Fong **SEET**
Co-Author(s): Li Zhen **TOH**, Tina **WONG**

Purpose: Little is known about the involvement of SPARC and its family member, Hevin, in the molecular aspects of inflammation in vivo. In this study, we investigated the expression of the Th2 cytokines, IL4 and IL5, in the postoperative conjunctiva deficient in either SPARC or Hevin.

Methods: Wild-type (WT), SPARC-null, and Hevin-null mice were subjected to experimental surgery as described in the mouse model of glaucoma filtration surgery. Conjunctival tissues, harvested on day 2 post-surgery, were analyzed for IL4 and IL5 expression by real-time polymerase chain reaction. Conjunctival T cells were measured by flow cytometry. Splenic CD4+ or CD8a+ T cells from WT or knockouts were isolated using the MACS T cell separation kit and injected into severe combined immunodeficiency (SCID) mice.

Results: The wounded SPARC-null conjunctiva expressed increased IL4 and IL5 by 3.70- and 2.59-fold, respectively, compared to WT. The postoperative Hevin-null conjunctiva also expressed increased IL5 by 1.82-fold. CD45+/CD4+ numbers were not significantly different, while CD45+/CD8a+ cells were significantly higher in SPARC-null wounded conjunctiva by 1.03%. Knockout CD4+ cells did not affect IL4 and IL5 mRNAs in the SCID conjunctiva but SPARC-null CD8a+ cells increased IL4 and IL5 mRNAs by 2.09- and 1.72-fold, respectively. Hevin-null CD8a+ cells also increased IL5 mRNA levels by 1.70-fold compared to WT.

Conclusions: SPARC- or Hevin-deficient CD8a+ cells have the capacity to induce more IL4 and IL5 mRNAs in the wounded conjunctiva. Hence, deficiency in either SPARC or Hevin may induce a greater Th2 response in the injured conjunctiva.

Poster No.: EX2-293
Panel No.: 293, Session EX2

Cavin-2 as a Target for Retinal Angiogenic Diseases

First Author: Boopathy Gandhi **THEERTHAGIRI KUPPU-SAMY**
Co-Author(s): Veluchamy Amutha **BARATHI**, Tom **CARNEY**, Wanjin **HONG**, Xiaomeng **WANG**

Purpose: To find novel targets for anti-angiogenic therapy for treating retinal angiogenic diseases (RAD).

Methods: Using Tg(fli1a:eGFP)y1 transgenic zebraf-



ish, we performed genetic screening to identify the genes required for angiogenesis. From the screening, we identified that Cavin-2 is a critical factor for blood vessel formation. Using an oxygen-induced retinopathy (OIR) model, we found that Cavin-2 is specifically expressed in the angiogenic neovascular tufts that resemble pathologic neovascularizations. Loss of Cavin-2 in HUVEC cells, using siRNA mediated knockdown, showed that Cavin-2 is required for in vitro angiogenesis. Interestingly, we found that antibodies against Cavin-2 inhibit angiogenesis in in vitro, ex vivo (mouse aortic ring assay, choroid sprouting assay, and metatarsal angiogenesis assay), and in vivo (laser-induced CNV model in mice) assays.

Results: We identified that Cavin-2 is a regulator of endothelial nitric oxide synthase (eNOS). We also found that Cavin-2 is highly secreted in endothelial microparticles upon vascular endothelial growth factor (VEGF) stimulation. Interestingly, the antibody against Cavin-2 inhibits angiogenesis in in vitro, ex vivo, and in vivo assays but is not toxic to endothelial or other cell types. The anti-angiogenic efficacy and stability of α -Cavin-2 antibody is comparable to α -VEGF antibody.

Conclusions: This novel, non-VEGF related strategy could be used alternatively or in combination with anti-VEGF treatments for enhancing the treatment of multiple retinal angiogenic diseases such as diabetic retinopathy, diabetic macular edema, and age-related macular degeneration.

Poster No.: EX2-294

Panel No.: 294, Session EX2

Clec14a Expression in a Rat Model of Laser-Induced Choroidal Neovascularization

First Author: Joonho **PARK**

Co-Author(s): In Hwan **CHO**, Taek-Keun **KIM**, Sukmook **LEE**, Hyeong Gon **YU**

Purpose: Clec14a is a type I transmembrane protein which is endothelial cell-specific and has a key role in cell-cell contact in angiogenesis. The purpose of present study was to investigate the expression of Clec14a on laser-induced choroidal neovascularization (CNV) in a rat model.

Methods: Experimental CNV was induced by laser photocoagulation (577 nm wavelength, 0.05 seconds duration, 100 mm spot size, 150 mW power) in Brown Norway rats. At 3, 7, and 14 days after laser injury, the whole retinal pigment epithelium (RPE)-choroidal tissues were separated and subjected to assays. We evaluated the mRNA and protein levels of Clec14a in the RPE-choroid by using real-time PCR and Western blot at each time point.

Results: Real-time PCR of the RPE-choroidal tissue revealed that mRNA levels of Clec14a were highly

increased at day 7 after laser injury and gradually decreased to baseline over 14 days. Similarly, Western blotting of the RPE-choroidal tissue at day 7 showed that the amount of Clec14a protein was markedly increased and decreased thereafter.

Conclusions: Clec14a is expressed on laser-induced CNV in the rat model. Clec14a is a promising target for treatment of age-related macular degeneration.

Poster No.: EX2-295

Panel No.: 295, Session EX2

Decreased TIM-3 Expression on CD4+ T Cell Subsets Contributes to Orbitopathy in Patients with Graves Disease

First Author: Jing **ZHAO**

Co-Author(s): Danping **HUANG**

Purpose: Thyroid-associated orbitopathy (TAO) is one of the most common orbital diseases in adults. Patients with Graves disease (GD) are more prone to develop orbitopathy than healthy adults. Previous studies have reported the important role of CD4+ T cells in both orbital and systemic inflammatory activities of GD and TAO patients. T cell immunoglobulin and mucin domain 3 (TIM-3) is an important immune regulator expressed on activated CD4+ T cells and inhibits immune activity by inducing apoptosis or exhaustion. The aim of this study is to investigate the frequencies of CD4+ T cell subsets in GD and TAO patients and explore the regulatory role of TIM-3 in the development of TAO.

Methods: Peripheral blood samples were obtained from 74 patients with TAO, 24 GD patients without orbitopathy, and 32 healthy controls. The frequencies of CD4+ T cells subsets and their expression of TIM-3 were examined by flow cytometry.

Results: The frequencies of Th1, Th2, and Th17 decreased significantly ($P = 0.000, 0.000, \text{ and } 0.005$, respectively), while higher amounts of TIM-3 expression were tested in the GD group ($P = 0.041, 0.044, \text{ and } 0.434$, respectively) in comparison with the TAO group. TIM-3 expression negatively correlates with the frequencies of Th1, Th2, and Th17 cells. No significant difference was observed in regulatory T cells in the TAO and GD groups.

Conclusions: TIM-3 negatively regulates the frequencies of Th1, Th2, and Th17 cells. Reduction in TIM-3 expression observed in TAO patients might contribute to abnormal immune activities in the pathogenesis of TAO.



Poster No.: EX2-296

Panel No.: 296, Session EX2

Evaluating the Angiogenic Potential of Natural or Synthetic Polyphenolic Compounds

First Author: Beiyang QIU

Co-Author(s): Shou Ping LIU, Xiaomeng WANG

Purpose: Polyphenolic compounds have been indicated in endothelial cell function and angiogenesis in both in vitro and in vivo angiogenesis models. The purpose of this study was to evaluate the impact of a panel of natural or synthetic polyphenolic compounds on vascular cell function and angiogenesis in the eye.

Methods: The impact of 15 polyphenolic compounds on ocular-specific vascular cell function and angiogenesis was studied using cell proliferation assay, migration assay, Matrigel tube formation assays, and choroid angiogenesis assays. The molecular mechanisms of polyphenolic compound-mediated anti-angiogenic effects were assessed by real-time qRT-PCR and Western blot analysis.

Results: Our studies showed that SIPRAD compounds 4, 5, and 6 inhibit vascular cell function and angiogenesis in a dose-dependent manner.

Conclusions: This study demonstrated potential roles of polyphenolic compounds in ocular angiogenesis. SIPRAD compounds 4, 5, and 6 may be used as alternative or complementary treatment strategies to current anti-vascular endothelial growth factor (anti-VEGF) therapy for vasoproliferative diseases in the eye.

Poster No.: EX2-297

Panel No.: 297, Session EX2

Fibronectin Promotes Cell Migration via Focal Adhesion Kinase Pathway in Human Lens Epithelial Cells

First Author: Jie LIU

Co-Author(s): Jingming LI, Cheng PEI, Dan XU

Purpose: Regulation of integrin-focal adhesion kinase (FAK) signaling is essential for cell adhesion and migration. Here, we investigate how it acts in transforming growth factor (TGF- β 2) induced cell migration.

Methods: The HLE-B3 cells, a human lens epithelial cell line, were incubated with TGF- β 2. The expression of fibronectin, p-FAK, and FAK were determined by Western blot analysis and integrin α 5 β 1 on the cell surface were detected by flow cytometry. Cells were seeded on culture surface coated with or without fibronectin. Cell adhesion was quantified by crystal violet staining. Cell migration capacities were measured by wound-healing assay and transwell migration assay in presence or absence of RGD, which inhibits interaction of integrin and

fibronectin or fibronectin siRNA or a FAK inhibitor.

Results: TGF- β 2 promoted HLE-B3 cell migration in a dose-dependent manner. TGF- β 2 upregulated fibronectin expression, which was followed by increased phosphorylation of FAK. Suppression of FAK by siRNA or its inhibitor attenuated TGF- β 2-induced HLE-B3 migration. Meanwhile, we found that integrin α 5 β 1 was abundantly expressed on cell surface. Disrupting integrin-fibronectin interaction by RGD or fibronectin siRNA also reduced TGF- β 2-induced cell migration. Moreover, cell adhesion, migration, and p-FAK expression were markedly increased on a fibronectin-coated surface, which was abolished by RGD treatment.

Conclusions: Collectively, our data suggested that fibronectin can promote migration of HLE-B3 via subsequently activating integrin-FAK signaling pathway. It may provide new evidence to assign fibronectin-integrin-FAK as a valuable target to fight posterior capsular opacification.

Poster No.: EX2-298

Panel No.: 298, Session EX2

Nicotine and Cotinine Influence Human Retinal Pigment Epithelial Cell Viability, Migration, and Angiogenic Factor Secretion Properties

First Author: Tsz-Kin NG

Co-Author(s): Marten BRELEN, Sun On CHAN, Calvin PANG, Xiao-Yu ZHANG

Purpose: Cigarette smoking is one of the strongest and most consistent risk factors for age-related macular degeneration (AMD), in which retinal pigment epithelial (RPE) cell loss is the key pathophysiological mechanism. This study aimed to investigate the effect of nicotine, a major constituent in cigarette smoke, and its metabolite, cotinine, on the survival, migration, and angiogenic factor secretion properties of human RPE cell line (ARPE-19).

Methods: ARPE-19 cells were treated with 1 or 2 μ M nicotine and/or cotinine continuously for 7 days. Cell viability was evaluated by MTT assay, whereas cell migration was assessed by wound scratch assay. The cell integrity of nicotine and cotinine-treated RPE cells was examined by immunofluorescence analysis of tight junction marker. Angiogenic factor secretion by the nicotine and/or cotinine-treated cells was determined using ELISA assay.

Results: The integrity of RPE cells was not altered with the continuous treatment of nicotine and cotinine as shown by the immunofluorescence analysis of ZO-1. Both nicotine and cotinine treatment showed significant reduction in RPE cell viability from 9–30% compared to the vehicle control at day 7. Moreover, both

nicotine and cotinine also attenuated the migration properties of RPE cells by 14–38%. In addition, cotinine treatment, but not nicotine, significantly demonstrated lower vascular endothelial growth factor (VEGF) secretion of RPE cells by 2.45 fold compared to the control group.

Conclusions: Continuous exposure of physiological levels of nicotine and cotinine alters human RPE cell viability, migration, and VEGF secretion properties.

Poster No.: EX2-299

Panel No.: 299, Session EX2

Role of Corneal Tissue Rigidity of Mesenchymal Stem Cells in Regulating Corneal Wound Healing

First Author: Yun-Hsiang **YANG**

Co-Author(s): Hui-Chun **HO**

Purpose: To investigate the effects and mechanism of different matrix rigidity with physiological rigidity of eye tissue in regulating behavior of mesenchymal stem cells (MSCs) in corneal wound healing.

Methods: In the transwell culture system, a linear wound was created on HCE-T monolayer cells by using 200- μ L pipette tips. MSCs were grown on a matrix with the rigidity of the physiological human vitreous (1 kPa), corneal epithelium (8 kPa), or corneal stroma (25 kPa) for investigating the role of corneal tissue rigidity in MSC functions regarding re-epithelialization promotion.

Results: MSC growth on a 25-kPa dish significantly promoted the wound healing of HCE-T cells. Among growth factors contributing to corneal epithelial wound healing, corneal stromal rigidity selectively enhanced transforming growth factor-beta (TGF- β) secretion from MSCs.

Conclusions: Corneal stromal rigidity is a critical factor for MSC-induced promotion of corneal re-epithelialization. The activation of the TGF- β signaling pathway, which maintains the balance between integrin and MMP expression, in HCE-T cells is the major pathway responsible for MSC-mediated wound healing.

Poster No.: EX2-300

Panel No.: 300, Session EX2

Use of a Human Organotypic Conjunctiva Model to Assess the Effects of Tear Fluid Proteins in Modulating Cellular Responses

First Author: Hiroyuki **NAWASE**

Co-Author(s): Takao **SATO**, Makoto **YAWATA**, Nobuyo **YAWATA**

Purpose: Protein deposition on contact lenses has been considered to induce inflammatory responses, including allergic conjunctivitis and giant papillary conjunctivitis. Lysozyme and albumin, the main protein constituents of tear fluid, are the major proteins deposited on contact lenses. However, the direct effects of the proteins on conjunctiva are not yet understood. We aimed to evaluate the effects of these proteins by developing human organotypic conjunctival 3-dimensional (3D) models and comparing them with monolayer models.

Methods: Human conjunctival primary epithelial cells were cultured on fibroblast containing collagen scaffold and stratified epithelium was generated under air-lift culture. The 3D models and monolayer models were stimulated with different concentrations of human albumin and lysozyme. After 24 hours, cell viability was evaluated with MTS assay and the dose response of the tissue against the proteins was evaluated by quantifying the levels of 27 soluble factors in the culture supernatant.

Results: At higher concentrations comparable to those deposited on contact lens, lysozyme induced significant upregulation of proinflammatory cytokines and chemokines in 3D models but not in monolayer models. No such changes were observed with albumin stimulation. The cell viability was decreased upon stimulation with high concentrations of lysozyme in both models.

Conclusions: We found that higher lysozyme concentrations induce significant upregulation of soluble factors that trigger inflammatory processes and lower cell viability of epithelial tissue. This implies that concentration of lysozyme as a deposition at the contact lens surface may trigger conjunctivitis. Our results also highlight the advantages of organotypic tissue models over monolayer models for compound testing.



Cataract

Case Series: Repositioning Dislocated Hard PMMA and Foldable IOLs in Cases of Complicated Pseudophakia

First Author: Mirza **SAJID ALI**
Co-Author(s): Zia **MAZHRY**

Purpose: To evaluate the management of complicated pseudophakia by repositioning dislocated hard polymethylmethacrylate (PMMA) or acrylic foldable intraocular lenses (IOLs).

Methods: Eight eyes of 7 patients who underwent in situ repositioning of dislocated hard PMMA and foldable IOLs in cases of complicated pseudophakia were included in this case series. Procedures varied from simple redialing with anterior vitrectomy to ab externo scleral fixation/haptic externalization of PCIOLs. Pre- and postoperative best corrected visual acuity (BCVA), operative procedure, IOL position, and postoperative complications were the main outcome measures.

Results: The mean age was 55 years. The mean follow-up was 15 months. The IOLs involved were Alcon AcrSof Multipiece (2 eyes) and PMMA single-piece (2 eyes), Rayner S/C flex (3 eyes), and hydrophobic single-piece (1 eye). The procedures performed were simple IOL dialing in 2 eyes, I/A with anterior vitrectomy and dialing in 1 eye, haptic externalization and scleral fixation of both haptics in 4 eyes, and single haptic fixation in 1 eye. Average preoperative BCVA was 6/48, and it was 6/12 postoperatively. All the IOLs are well centered to date. No significant complication was noted.

Conclusions: In situ repositioning of dislocated hard PMMA or acrylic foldable IOLs to manage complicated pseudophakia is a viable and safe option. However, the IOL needs to be in good shape and of the proper size for this purpose. Trauma caused by IOL exchange may be avoided by using in situ repositioning techniques where applicable.

Clinical Factors for Successful Opening of Femtosecond Clear Corneal Incisions

First Author: Pik Sha **CHAN**
Co-Author(s): Sunil **SHAH**, Harvey **UY**

Purpose: To determine the effects of different clinical parameters on the success rate of laser-created clear corneal incisions (LCCI) among eyes undergoing femtosecond cataract surgery (FCS).

Methods: Prospective, interventional case series of 52 eyes that underwent FCS. Preoperative parameters included patient age, horizontal white-to-white measurement (WTW) as measured by optical biometry,

surgeon-graded arcus senilis (1, none; 2, visible iris; 3, blocked view of iris), and distance of LCCI entrance wound from surgical limbus as estimated from a digital photograph. All eyes underwent creation of a temporal 3-plane LCCI using the same femtosecond laser settings and wound dimensions. The preoperative parameters were correlated to surgeon-graded ease of opening of the LCCI (1, unable to open; 2, opened with more than one pass; 3, opened with single pass of a lens hook).

Results: LCCIs were successfully opened in 46 of 52 eyes (88.5%). Four of 6 unopenable LCCIs were ascribed to opaque arcus senilis and 2 were attributable to excessively peripheral wound location. The correlation coefficients (r) of the surgical parameters with ease of opening were age = 0.08 (P = 0.57), WTW = 0.37 (P = 0.006), arcus grade = -0.02 (P = 0.11), and wound distance = 0.7 (P < 0.00001). The mean wound-to-limbus distance was 0.71 (SD 0.33) mm (range, 0.18 to 1.4).

Conclusions: Successful opening of LCCI is achievable in a majority of cases. Placement of the wound further away from the surgical limbus and more anteriorly into clear cornea increases the ease and likelihood of successful wound opening. Careful preoperative planning is needed for optimizing wound opening success rates for LCCI.

Comparative Analysis to Evaluate Visual Performance of Two Multifocal Intraocular Lenses: Acrysof IQ Restor +3.0 D and AT LISA tri 839MP

First Author: Jorge **ALIO**
Co-Author(s): Antonio **RENNA**, Pilar **YEBANA**

Purpose: The aim of this study is to assess clinical outcomes of patients that underwent standard cataract surgery implanted with 2 different intraocular lenses (IOLs).

Methods: In this prospective and retrospective study we included 56 eyes of 28 bilateral cataract patients aged between 49 and 72. According to the IOL implanted, 2 groups were differentiated: group A, implanted with Acrysof IQ Restor +3.0 D IOL and group B, AT LISA tri 839MP IOL. Distance, intermediate, and near uncorrected visual acuity (VA) under mesopic and photopic conditions; contrast sensitivity under mesopic and photopic conditions; and defocus curve were tested for each IOL. The examination visit was performed 6 months to 2 years after surgery. All patients completed a satisfaction questionnaire.

Results: Distance uncorrected VA improved significantly in both groups postoperatively (P < 0.01). Statistically significant differences were observed between groups for near uncorrected VA in photopic conditions, with better values for group A (P < 0.05). No statistically

significant differences were found for distance and intermediate uncorrected VA, but a tendency of better values in group B was observed for intermediate VA. Similar results for defocus curve and contrast sensitivity were found between groups.

Conclusions: The AT LISA tri and Acrysof IQ Restor +3.0 D IOLs provided good visual performance in distance, intermediate, and near VA as well as good results for defocus curve and contrast sensitivity. High satisfaction was reported in the questionnaire by all patients.

Comparison of Cataract Surgery Outcomes for Outreach Surgery vs Surgery at the National Eye Centre in Timor-Leste

First Author: Manoj **SHARMA**

Co-Author(s): Marcelino **CORREIA**, Sameer **DABRAL**, Rosie **DAWKINS**, Nitin **VERMA**, Sushant **WAGLEY**

Purpose: There is currently a global debate about whether cataract surgery should be performed on an "outreach" basis. Important factors in this debate include quality and safety of the surgery. This study from Timor-Leste aims to compare cataract surgery performed at the National Eye Centre (NEC) with that performed on outreach visits. The NEC is located in Dili, the capital city, and serves the population of Dili as well as being a referral center. For those who cannot access the capital, the NEC conducts outreach surgical visits throughout Timor-Leste on a rotating basis.

Methods: Data was prospectively collected for cataract patients treated at the NEC and on outreach visits over the year 2014. Demographic information, surgery type, complications, and pre/postoperative visual acuity were collected.

Results: A total of 409 cataract surgeries were performed at the NEC and 402 on outreach. The most common cataract surgery was manual small incision cataract surgery: 93.90% at the NEC and 100% on outreach. No significant difference in intraoperative complications was found between the NEC (12.94%) and outreach (13.21%) ($P = 0.91$). Postoperative average best corrected visual acuity at last follow-up at NEC (6/12.9) was slightly better than on outreach (6/18) ($P < 0.001$). Average time for final follow-up was not significantly different: outreach (36 days) and NEC (41 days) ($P = 0.18$).

Conclusions: While there was a small difference in visual acuity outcome between surgery performed at the NEC and on outreach, patient demand for outreach surgery remains high. It is important that ongoing monitoring and evaluation continues.

Comparison of Two Online Toric Calculators in Predicting Outcomes After Toric Intraocular Lens Implantation

First Author: Rushad **SHROFF**

Co-Author(s): Tushar **GROVER**, Mathew **KURIAN**, Rohit **SHETTY**

Purpose: To compare the predicted residual cylinder from 2 different online toric calculators with the achieved postoperative refractive outcome.

Methods: Group I and II included 34 eyes having with-the-rule astigmatism (WTR) and 36 eyes having against-the-rule astigmatism (ATR), respectively. In both groups, the residual astigmatism and axis were calculated using Barrett online toric intraocular lens (IOL) calculator and Tecnis toric calculator. True net power from Pentacam was used for calculation. The residual astigmatism obtained was compared with final postoperative refraction. Centroids were plotted for each set of WTR and ATR patients using residual astigmatism and were compared with the centroid of final postoperative refraction.

Results: In cases of ATR astigmatism, the centroid obtained using Barrett toric IOL calculator (mean astigmatism -1.44 D @ 90.9 degrees) was closest to that of final postoperative refraction (mean astigmatism -1.04 D @ 99.5 degrees). In cases of WTR astigmatism, the centroid obtained using Tecnis toric IOL calculator with net corneal power (mean astigmatism -1.08 D @ 172.1 degrees) was closest to that of final postoperative refraction (mean astigmatism -1.30 D @ 175.7 degrees).

Conclusions: Barrett toric calculator appears to be better than Tecnis toric calculator for ATR cases and vice versa is true for WTR cases, using true net power. This can be due to under correction in the Barrett calculator to compensate for age-related conversion from WTR to ATR.

Effect of Eyelid Margin Cleaning on Conjunctival and Eyelid Bacterial Flora in Patients Undergoing Ocular Surgery

First Author: Rawipaparas **PULNITIPORN**

Purpose: To compare the bacterial cultures between traditional ocular irrigation with and without eyelid margin cleaning before intraocular surgery.

Methods: A prospective study included 102 eyes from 51 patients undergoing intraocular surgery. In each patient, the surgical eye received traditional ocular irrigation (group 1) and the fellow eye received traditional ocular irrigation with eyelid margin cleaning (group 2). In each group, samples from the lower eyelid margin and lower fornix were cultured before and after the 2 methods.

Results: There was no statistically significant difference



of positive cultures between group 1 and group 2 from both the lower eyelid margin ($P = 0.7744$, McNemar test) and lower fornix ($P = 1.000$, McNemar test).

Conclusions: Eyelid margin cleaning may not be required in ocular cleaning before intraocular surgery.

Effectiveness of Diclofenac Sodium Eye Drops to Maintain Macular Thickness After Phacoemulsification

First Author: Ady PRAKOSA

Co-Author(s): Wimbo SASONO

Purpose: Experimental research to compare the increase of macular thickness on day 1 and week 1 postoperatively after phacoemulsification between the control group and the treatment group that received diclofenac sodium eye drops.

Methods: This study involved 34 eyes of 34 subjects who underwent phacoemulsification. They were divided into 2 groups: the control group and the treatment group that was given diclofenac sodium eye drops. Diclofenac sodium was administered 3 days before surgery. Macular thickness was examined with optical coherence tomography (OCT) before surgery, day 1 postoperatively, and 1 week postoperatively.

Results: There were no differences in the changes of macular thickness between the control and treatment groups after cataract extraction at day 1 and week 1 follow-up ($P > 0.05$).

Conclusions: Administration of diclofenac sodium eye drops cannot prevent the natural increase of macular thickness after cataract extraction in subjects that have no predisposition to CME.

Evaluation of Stereopsis for Blended Vision Variants with Refractive MIOL Compared to Phakic Eyes

First Author: Detlev BREYER

Co-Author(s): Gerd AUFFARTH, Philipp HAGEN, Hakan KAYMAK, Karsten KLABE, Florian KRETZ

Purpose: In order to improve near vision, bifocal or EDOF intraocular lenses (IOLs) with good far and intermediate vision can be implanted in a blended vision variant, where the target refraction in the nondominant eye is set to approximately -1.5 diopters (D). The aim of this retrospective quality management investigation was to assess the question whether patients also benefit from this variant with regard to stereoscopic vision.

Methods: All considered patients underwent bilateral implantation of refractive MIOLs from the following list: Comfort (bifocal, 1.5 D addition, Oculentis), Mplus (bifocal, 2.0 D addition, Oculentis), MiniWell (EDOF, Sifi), and WIOL-CF (EDOF, Medicem). The target refraction was emmetropia in the dominant eye and in the

nondominant eye it was either approximately -1.5 D (blended vision, 30 patients) or emmetropia (emmetropic vision, 30 patients). As a third group we considered phakic eyes (60 patients). Stereopsis was tested using the Stereo Fly Test (Precision Vision), which was positioned at a distance of 16 inches. Analog to logMAR values for visual acuity, we calculated the logarithm of the minimum angle of stereopsis (logMAS) and compared the mean values of all groups. In addition, we analyzed binocular defocus curves and compared the area under these curves (MIOL-capacity).

Results: The minimum angle of stereopsis was 0.29 logMAS, 0.05 logMAS, and -0.05 logMAS in the groups with emmetropic vision, blended vision, and phakic eyes, respectively. Blended vision with Comfort MIOLs achieved the highest binocular defocus capacity of 101%.

Conclusions: Stereoscopic vision is significantly better for blended vision than for emmetropic vision implantation variants, whereby phakic eyes outperform both groups.

Evaluation of Tear Film Stability and Tear Secretion After Manual SICS with PCIOL and Phacoemulsification with PCIOL: A Comparative Study

First Author: Mohammed Arifur AKONJEE

Purpose: To evaluate the changes of tear film stability and tear secretion after manual SICS with PCIOL and phacoemulsification with PCIOL.

Methods: This prospective, interventional study involved 96 consecutive patients with age-related cataract that underwent manual SICS with PCIOL or phacoemulsification with PCIOL. Tear film break-up time (TFBUT) and Schirmer I test (SIT) were measured preoperatively and at days 7, 30, and 90 postoperatively.

Results: Preoperative mean value of SIT showed statistically significant differences with all the postoperative follow-up mean values in both the manual SICS and phaco groups. A total of 14.6% of phaco patients had SIT value < 10 mm in comparison with 22.9% of the manual SICS group at day 7 and the trend continued in the subsequent follow-up. Day 7 follow-up revealed 16.7% of the phaco patients and 29.2% of manual SICS patients had TFBUT < 10 s. Preoperative mean TFBUT value showed statistically significant differences with all the postoperative follow-up mean values with the corresponding manual SICS and phaco groups.

Conclusions: Both manual SICS and phacoemulsification are capable of aggravating dry eye and affecting dry eye test values, but after 6 months the condition becomes normal. Regarding postoperative aggravation of dry eye symptoms and changes of tear film test val-

ues, phacoemulsification is a better surgical technique than manual SICS.

Experience with a Novel Polyurethane, Hinged Pupil Expansion Device for the Management of Small Pupils During Cataract Surgery

First Author: Harvey **UY**

Co-Author(s): Kenneth **KENYON**

Purpose: To report the efficacy and safety of a new pupil expansion device for enlarging small pupils during phacoemulsification cataract surgery.

Methods: Interventional case series. Ten eyes of 10 patients with small (<4.0 mm), non-dilating pupils underwent phacoemulsification cataract surgery and/or posterior chamber intraocular lens implantation. The pupil was expanded using a novel, single-use, hinged, polyurethane device (I-ring, Beaver Visitec International, Waltham, MA) designed to provide 6.3 mm pupil diameter. The following data were obtained: pre- and postoperative undilated pupil diameter (PD), pre- and postoperative dilated PD, rate of successful deployment of I-ring, adverse events (eg, pupil irregularity, sphincter tears, bleeding).

Results: The I-ring was successfully deployed in all eyes. All eyes underwent pupil expansion to 6.0 mm and completion of the planned procedure. The mean pre- and postoperative undilated PD was 2.0 mm and 2.8 mm, respectively ($P = 0.01$). Cataract surgery was successfully performed in all eyes. All pupils had varying amounts of postoperative pupil irregularity but less than 180 degrees. There were no cases of iris sphincter rupture, bleeding, or postoperative iris atrophy.

Conclusions: The I-ring is an effective and safe device for expanding the pupil diameter during cataract surgery in eyes with small pupils. Use of the I-ring causes a permanent but asymptomatic increase in undilated and dilated PD.

Femtosecond Laser-Assisted Implantation of Toric MIOL Based on Automated Corneal Shape Analysis in Comparison with the Manual Technique

First Author: Philipp **HAGEN**

Co-Author(s): Gerd **AUFFARTH**, Detlev **BREYER**, Hakan **KAYMAK**, Karsten **KLABE**, Florian **KRETZ**

Purpose: By corneal shape analysis combined with iris detection, the preoperatively measured steep corneal axis can be marked during cataract surgery by a femtosecond laser in a way that compensates cyclorotation. Using these landmarks in aligning the toric intraocular lens (IOL), this new technique aims for a better correction of astigmatism during femtosecond laser-assisted

cataract surgery (FLACS). The aim of this retrospective analysis was to compare the astigmatic outcome of this new approach with a manual technique.

Methods: All considered eyes underwent cataract surgery or refractive lens exchange with the bifocal toric Comfort IOL [+1.5 diopter (D) addition, Oculentis]. We compared the results of 2 groups, namely, eyes that underwent FLACS with the implantation axis aligned by corneal shape analysis combined with automated iris registration using the wireless streamline data link between Cassini (i-Optics) and LensAR (Topcon) (group A; 35 eyes) and eyes treated with the manual technique (group B; 30 eyes). We measured manifest refraction and evaluated the reduction of astigmatism using the vector-based Alpíns method. Results for magnitude of error, angle of error, correction index, and index of success were compared.

Results: The correction index in group A and B was 1.0 ± 0.3 and 1.1 ± 0.3 and the index of success was 0.3 ± 0.3 and 0.3 ± 0.4 , respectively.

Conclusions: From our data analysis we see only slight advantages in the reduction of astigmatism in the group with FLACS and automated compensation of cyclorotation. The differences between both groups were not significant.

Immediate Sequential Bilateral Cataract Surgery

First Author: Rohit **SREENATH**

Co-Author(s): Sheetal **BRAR**, Sri **GANESH**

Purpose: To evaluate the safety and benefits of immediate sequential bilateral cataract surgery (ISBCS).

Methods: Retrospective data analysis of patients who underwent immediate sequential bilateral phacoemulsification with foldable intraocular lens (IOL) implantation under topical anesthesia from January 2011 to January 2016. Inclusion criteria were visually significant bilateral cataract and axial length of 21.0 to 26.5 mm. The exclusion criteria can be broadly divided into conditions that may predispose to increased intraoperative complications like posterior capsule rent and vitreous loss, postoperative complications like infections, corneal decompensation, retinal detachment (RD), cystoid macular edema (CME), and inaccurate IOL power calculation. Any intraoperative and postoperative complications were noted.

Results: There were a total of 2614 eyes. Best corrected visual acuity improved from 0.42 ± 0.16 to 0.87 ± 0.10 . Targeted postoperative refraction of ± 0.5 diopters (D) was achieved in 92.05% of patients. Complications were 11 (0.42%) posterior capsular tears, 1.83% ($n = 48$) postoperative rise in intraocular pressure (IOP), 1.18% ($n = 31$) prolonged postoperative inflammation, and 0.08% (2) unilateral CME. There were no

sight-threatening complications like endophthalmitis, retinal detachment, corneal edema, or intraocular hemorrhages. Seventeen patients (32 eyes; 1.22%) underwent bilateral femtosecond laser-assisted cataract surgery (FLACS), out of which 4 patients (8 eyes; 0.3%) underwent multifocal IOL. One patient with Down syndrome underwent bilateral cataract surgery under IV sedation.

Conclusions: Bilateral cataract surgery can be a preferred practice in the hands of an experienced surgeon. A low complication rate, proven accuracy of biometry measurement, strict operating room sterilization protocol, and well-trained support staff are a few criteria to perform successful ISBCS and achieve its proven advantages.

Individualized Patient Care: Comparison of Different Variants of Blended Vision with Rotational Asymmetric Multifocal Intraocular Lenses

First Author: Philipp HAGEN

Co-Author(s): Gerd AUFFARTH, Detlev BREYER, Hakan KAYMAK, Karsten KLABE, Florian KRETZ

Purpose: The aim of this retrospective quality management investigation was to compare binocular visual outcomes between different variants of bilaterally implanted segmental multifocal intraocular lenses (MIOLs, Oculentis). Thereby we compared emmetropic vision with blended vision variants.

Methods: The 4 variants were as follows (MIOL in the non-dominant eye): a, Comfort with 1.5 diopter (D) addition (200 patients); b, Comfort with 1.5 D addition and -1.5 D target refraction (75 patients); c, Comfort with 2.0 D addition and -1.0 D target refraction (25 patients); and d, MplusX with 3.0 D addition (25 patients). Results for subjective refraction and visual acuity were evaluated. Additionally, we analyzed binocular defocus curves and compared the area under these curves (MIOL-capacity) to those of phakic patients. Furthermore, we correlated monocular defocus curves to MTF-focus-through curves. Halo and glare were assessed with a computer-based system. Contrast sensitivity was measured with the Ginsburg box.

Results: Compared to phakic juvenile eyes, all 4 MIOL variants showed binocular defocus capacities above 85% with variant b achieving the highest value: 104%. Mean binocular UDVA was <0.05 logMAR in all groups. After 3 months, photopsia were either absent or described as undisturbing. Contrast vision was better than in other bi- or trifocal MIOLs.

Conclusions: MIOL-capacity showed results competitive to trifocal IOLs. The mixed implantation of 2 different refractive MIOLs creates blended vision and seems to provide a new alternative to a diffractive trifocal IOL.

Investigation of the Difference in the Torsional Phaco Oscillation Between a Balanced Tip and a Mini Tip Using an Ultra-High-Speed Video Camera

First Author: Santaro NOGUCHI

Purpose: To investigate the behavior of 2 types of torsional phaco tips, the newly developed balanced tip (BT) and the current mini tip (MT), using an ultra-high-speed video camera.

Methods: The HPV-X2 (10 million frames per second), an ultra-high-speed video camera, was used to capture how the 2 types of tips with torsional oscillation behave in the artificial aqueous humor. Five points on the tips, ie, the tip end (point 1) and distances of 1325 μm (point 2), 2650 μm (point 3), 3975 μm (point 4), and 5035 μm (point 5) from the tip end, were tracked to compare their behaviors.

Results: The amplitude times for the balanced tip and the mini tip were $16.29 \mu\text{sec} \pm 1.11$ and $15.86 \pm 1.21 \mu\text{sec}$, respectively ($P = 0.54$). The amplitude ranges for the balanced tip and the mini tip were $189.69 \pm 4.12 \mu\text{m}$ and $132.89 \pm 7.90 \mu\text{m}$ ($P = 0.002$) at point 1 and $46.40 \pm 9.12 \mu\text{m}$ ($P = 0.002$) at point 5, respectively. The oscillation range of MT in 100 power was almost equal to that of BT in 34-40 power.

Conclusions: Our results suggest that the balanced tip can greatly increase the amplitude range at the tip end and reduce shaft movement compared to the mini tip, resulting in less damage to the wound and surrounding tissue.

Modified Acrylic IOL: A New Hope for Microphthalmos and Microcornea with Cataract

First Author: Chandra SAHOO

Purpose: To explain a procedure with modification of the acrylic intraocular lens (IOL) for implantation in a case of microphthalmos and microcornea.

Methods: A patient aged 18 years presented with microphthalmos and cataract in the left eye and blindness in the right eye. Vision was no perception of light in the right eye (OD) and hand motions in the left eye (OS). The patient was taken for cataract extraction and corneal diameter was found to be 7 mm on the operating table. Therefore, a regular 12.5-mm acrylic IOL was modified by trimming both haptics and was then implanted into the eye.

Results: The postoperative vision in the operated eye was 5/60 and the IOL was well centered in the capsular bag. There was presence of mild striate keratopathy but details were clear. The patient was doing well through 6 months of follow-up.

Conclusions: This method of modifying the IOL gives a new hope to all those patients with microphthalmos/microcornea in whom IOL implantation seems impossible.

Moxifloxacin Eluting Intraocular Lens

First Author: Helena FILIPE

Co-Author(s): Andreia OLIVEIRA, Andreia PIMENTA, Ana Paula SERRO, Ana TOPETE

Purpose: To develop a moxifloxacin (MXF) eluting intraocular lens (IOL) that could be used not only as a substitute for the eye lens in cataract surgery but also as a postoperative prophylaxis for endophthalmitis.

Methods: An acrylic and a silicone-based hydrogel were drug loaded with MXF by soaking. MXF release profiles from both materials in saline solution at 37°C were compared, and the most promising material was chosen for further studies. MXF-loaded material was sterilized by steam heat and stored in MXF solution for 1, 2, or 3 months. The activity against *Staphylococcus aureus* and *S. epidermidis* of the released MXF was accessed, after storage. Transmittance and topography of the loaded material were also evaluated.

Results: MXF was completely released from the silicone material after 1 day, whereas release from the hydrophilic acrylic was sustainably maintained for more than 1 month. Thus, the acrylic loaded with MXF was sterilized and stored. MXF release profiles showed that drug loading equilibrium was attained after 2 months of storage. The stability of the antibiotic was not compromised and its activity against the studied bacteria was preserved. A mathematical model was applied to predict the in vivo drug release behavior. Transmittance and surface properties did not change significantly after MXF loading into the material.

Conclusions: An acrylic IOL material was successfully loaded with an antibiotic (MXF) and promising release kinetics were obtained. By adjusting the amount of drug loaded, a sustained release may be achieved for an adequate period.

Multifocal Intraocular Lens on Visual Function of the Lens

First Author: Asuka NOGUCHI

Co-Author(s): Santaro NOGUCHI

Purpose: To compare the clinical results of presbyopia correction with multifocal intraocular lens (IOL).

Methods: Patients who underwent cataract surgery and were implanted with multifocal intraocular lens from 2014 to 2016 were studied. The preoperative biometry was performed with the IOL-Master (500, Carl Zeiss Meditech). All IOL powers were calculated with the SRK/T formula closed to emmetropia from the

myopic side. Subjective refraction, CDVA, UDVA, UIVA, DCIVA, UNVA, and DCNVA, monocular and binocular (logMAR), were evaluated. Additionally, contrast sensitivity and defocus curve analysis and a questionnaire on the presence of side effects of multifocal optics were performed.

Results: The multifocal IOL implanted was FineVision in 26 eyes, ZKB00 in 43 eyes, ZMB00 in 80 eyes, and LentisMplus X in 65 eyes. At 3 months postoperatively the mean monocular UDVA was 0. LMX showed the best visual acuity in UIVA and UNVA. The LMX was good and the ZMB was poor in contrast sensitivity. However, with LMX strong monocular diplopia symptoms were observed. The halo symptoms were strong in ZMB. The blight symptoms were strong in ZKB.

Conclusions: It is very important to know and understand the characteristics of multifocal IOLs to satisfy patients.

Orbital Compartment Syndrome After Peribulbar Anesthesia: Ruptured Frontoethmoidal Mucocele

First Author: Kiran KODANDARAMA

Co-Author(s): Shreays TEMKAR, Pradeep SAGAR

Purpose: Peribulbar anesthesia is a safe technique with a very low risk of sight-threatening complications. We report a rare case of orbital compartment syndrome due to block-related needle perforation of previously undiagnosed frontoethmoidal mucocele.

Methods: Case presentation. A 50-year-old female patient underwent phacoemulsification under standard 2-site peribulbar block. The following morning, the patient presented with poor visual acuity and inability to close the lids. On examination, her best corrected visual acuity was 1/200 Snellen equivalent. The eyelids were tense and could not be apposed. An abaxial proptosis with inferotemporal dystopia was noted. Extraocular movements were restricted in all directions and intraocular pressure was 48 mm Hg, suggestive of orbital compartment syndrome.

Results: The patient was managed successfully with prompt canthotomy and cantholysis. In view of delayed presentation, computed tomography (CT) of orbits was sought and the CT features were suggestive of ruptured frontoethmoidal mucocele. The patient was managed with intravenous antibiotics and transnasal drainage of sinuses.

Conclusions: Orbital abscess following needle perforation of mucocele is a rare complication of peribulbar block. Such a possibility should be kept in mind in cases of delayed onset orbital compartment syndrome with progressive proptosis after peribulbar block, especially in such cases in which supero-nasal injection is given.



Outcome of Tecnis Multifocal Toric Intraocular Lenses at a Tertiary Eye Care Hospital in Southern India

First Author: Mohan **RAJAN**

Co-Author(s): Divyaa **DHINGRA**, Sujatha **MOHAN**

Purpose: To analyze the subjective and objective visual outcomes of AMO Tecnis multifocal toric intraocular lenses (IOL) for distance and near vision after implantation.

Methods: Patients with significant cataract and 1-3 diopters (D) of corneal astigmatism, who wanted to be spectacle free for distance and near vision, underwent phacoemulsification with implantation of AMO Tecnis multifocal toric IOL. All patients underwent a full ophthalmological examination including uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), and corrected near visual acuity (CNVA). IOL power and alignment was calculated on manufacturer's web-based program. Suitable lenses were selected to neutralize both sphere and cylinder. Postoperatively, UDVA, CDVA, uncorrected near visual acuity (UNVA), CNVA, contrast sensitivity, IOL position, any complications, and patient satisfaction using a validated questionnaire were analyzed at 1 month.

Results: Preoperative refractive sphere ranged from -8.75 D to +3.25 D and refractive cylinder was 1.41 ± 0.91 D. Postoperative UDVA was 0.045 ± 0.08 D and UNVA was 0.305 ± 0.02 D. Postoperative refractive sphere was 0.05 ± 0.22 D and cylinder was 0.15 ± 0.27 D. Residual refractive astigmatism was -1 D or less in 100% of eyes. Contrast sensitivity levels were 80% or more in 100% of eyes. Spectacle independence for distance and near was achieved in 100% of eyes. All eyes were within ± 5 degrees of intended axis, and no IOL required secondary repositioning. There were no intra- and postoperative complications.

Conclusions: Implantation of multifocal toric intraocular lenses in patients with significant preoperative astigmatism provided excellent uncorrected distance and near vision, rotational stability, safety, and predictability allowing patients to achieve spectacle independence.

Pars Plana Lensectomy with Iris-Claw Intraocular Lens Implantation in Subluxated Lens Due to Marfan Syndrome

First Author: Ribkah **PANDIE**

Purpose: To report a patient with subluxated lens due to Marfan syndrome.

Methods: A case report of a 15-year-old female who presented to the ophthalmology department of our hospital, with diagnosed Marfan syndrome and bilateral painless diminution of distance vision. She had the

following history of cardiac and ophthalmologic complications including lens subluxation, high myopia, aortic root dilation, and mitral valve prolapse. She underwent pars plana lensectomy and implantation of an Artisan iris-claw intraocular lens. Best spectacle-corrected visual acuity, intraocular pressure, and complications were the key elements of follow-up examinations.

Results: The Artisan iris-claw intraocular lens implantation was carried out uneventfully. In the postoperative period the intraocular lens was stable and correctly centered. There were no signs of excessive or prolonged inflammation or any other complications. Preoperative visual acuity was counting fingers at 1 meter which significantly improved to 20/25. Her under-corrected visual acuity was 20/40 on postoperative day 1 and 20/25 by 1 month. Intraocular pressure was normal.

Conclusions: The Artisan iris-claw intraocular lens implantation is a very attractive alternative in cases with a subluxated lens due to Marfan syndrome. It provides safe and functional results since visual acuity was significantly improved in this patient.

Piggyback Intraocular Lens Implantation for Eyes with Extremely Short Axial Length and an Eye with Refractive Error After the First Intraocular Lens Implantation

First Author: Yukako **FURUTA**

Co-Author(s): Rie **HOSHIKAWA**, Yoshihiko **IIDA**, Akira **ISHIDA**, Nobuyuki **SATO**, Nobuyuki **SHOJI**

Purpose: To evaluate the efficacy of piggyback intraocular lens (IOL) implantation for eyes with cataract and extremely short axial length and an eye with refractive error after the first IOL implantation.

Methods: Case 1: A 52-year-old male with a spherical equivalent refraction (SE) of +16.00 diopters (D) in both eyes. Keratometric refractive power was 48.34 D and 48.36 D in the right eye (RE) and the left eye (LE), respectively. The axial length of the RE and LE was 16.26 mm and 16.13 mm, respectively. We performed cataract surgery followed by piggyback IOL implantation in both eyes. The first IOL was AQ110NV (STAAR surgical) +26.0 D, and the second was AU6KA (KOWA) +26.0 D. Case 2: A 73-year-old female who had undergone cataract surgery in another hospital 9 years ago. After surgery, she felt discomfort in the LE. SE was -0.25 D and +1.50 D in the RE and LE, respectively. Keratometric refractive power was 44.09 D and 44.10 D, respectively, and the axial lengths were 23.41 mm and 24.26 mm, respectively, in the RE and LE. Her discomfort disappeared by wearing a contact lens of +2.5 D in the LE. We performed secondary piggyback IOL with MA60MA (Alcon) +4.0 D.

Results: In case 1, SE improved to -1.00 D in both eyes.

In case 2, SE improved to $-0.75D$ in the LE, and her discomfort resolved.

Conclusions: Primary piggyback IOL implantation is useful for eyes with extremely short axial lengths. Secondary piggyback IOL implantation is effective for correction of postoperative refractive errors.

Postoperative Outcomes After Femtosecond Laser-Assisted Cataract Surgery and Manual Phacoemulsification in Eyes with Shallow Anterior Chamber

First Author: Lajja SHASTRI

Co-Author(s): Abhay VASAVADA, Shail VASAVADA, Viraj VASAVADA

Purpose: To compare the postoperative outcomes in eyes undergoing femtosecond laser-assisted cataract surgery (FLACS) versus manual phacoemulsification in eyes having shallow anterior chamber depth (ACD).

Methods: In a prospective, randomized clinical trial, patients with age-related cataracts and shallow anterior chamber were assigned to either FLACS as group 1 ($n = 91$ eyes) or to manual phacoemulsification as group 2 ($n = 91$ eyes). Outcome measures were central corneal thickness (CCT), corneal clarity, and anterior chamber cells and flare on day 1, week 1, and 1 month and change in endothelial cell density at 3 months postoperatively.

Results: Preoperative ACD was 2.30 ± 0.13 mm and 2.27 ± 0.15 mm in groups 1 and 2 ($P = 0.60$). On postoperative day 1, mean CCT in groups 1 and 2 was 565 ± 35 μ m and 589 ± 28 μ m ($P = 0.03$) and at week 1 was 535 ± 44 μ m and 551 ± 40 μ m ($P = 0.05$). The percentage change in CCT from baseline was significantly more in group 2 ($P = 0.04$). Corneal clarity was significantly better in group 1 on day 1 and at 1 week ($P < 0.05$). The number of eyes with $>$ grade 2 cells in the anterior chamber was significantly higher in group 2 on day 1 (23% vs 30%) and 1 week (20% vs 27%) ($P < 0.05$). However, there was no statistically significant difference between the 2 groups, for all parameters, at 1 month. Change in endothelial cell density was more in group 2, but the difference was not statistically significant.

Conclusions: Femtosecond laser-assisted cataract surgery seems to lead to clearer cornea and less anterior chamber inflammation on postoperative day 1 and 1 week in eyes with shallow anterior chamber.

Pseudoexfoliation, Small Pupil, and Cataracta Protracta: Preoperative Considerations, Sine Qua Non

First Author: Andreas BORKENSTEIN

Purpose: To evaluate in a retrospective analysis of 32 eyes with pseudoexfoliation (PXF), small pupils and

advanced cataract where preoperative consideration and preparation should be done to achieve the best intraoperative performance and postoperative outcome. To compare different injector systems and intraocular lenses (IOLs) available in the market.

Methods: Preoperative exams including visual acuity (ETDRS), slit lamp, photo imaging of the lens, biometry (IOL Master 500, Zeiss, Germany), and Scheimpflug corneal topography (Pentacam AXL, Oculus, Germany) were performed. Lens analysis with the Pentacam staging system and measurement of the maximum pupil dilatation after mydriatic eye drops was performed. Postoperative control exams took place 24 hours, 1 week, 4 weeks, and 3 months after surgery. Results were analyzed regarding IOL used (IOL material, design, overall diameter) and injector system used.

Results: The use of a preloaded injector system can enhance operating room workflow, and good intraoperative handling is crucial for the implantation process in small pupils and Malyugin ring. Hydrophobic acrylic IOLs with a large diameter performed best regarding IOL stability and lens position.

Conclusions: A preloaded injector system with a hydrophobic acrylic IOL that unfolds in a slow and controllable manner directly in the capsular bag guarantees best intraoperative and postoperative results. Less manipulation in the anterior chamber and less zonular stress yield better postoperative results.

Real-Time Dynamic IOP During Phacoemulsification Using 2 Systems: Randomized Clinical Trial

First Author: Viraj VASAVADA

Co-Author(s): Samaresh SRIVASTAVA, Abhay VASAVADA, Shail VASAVADA, Vaishali VASAVADA

Purpose: To record real-time dynamic intraocular pressure (IOP) changes during phacoemulsification using an IOP-based fluidic system, and to compare it with a gravity-based fluidics system.

Methods: Prospective, randomized clinical trial. Fifty eyes undergoing phacoemulsification were randomized to Centurion Vision System, Alcon (group 1, $n = 25$) or Infiniti Vision System, Alcon (group 2, $n = 25$). Fluidic parameters were standardized. Centurion works on active fluidics with the ability to preset IOP during surgery; in group 1 it was set at 50 mm Hg [65 cm bottle height (BH)] and BH in Group 2 was set at 80 cm. Real-time IOP was recorded. Maximum and minimum IOP and percent reduction from maximum during fragment removal were compared.

Results: Minimum and maximum IOP in the Centurion group were 40 ± 4.0 and 55.5 ± 6.8 mm Hg ($P < 0.05$). Minimum and maximum IOP in the Infiniti group were 30 ± 3.0 and 60 ± 1.2 mm Hg ($P < 0.002$). Mean reduc-



tion from maximum was 59% in Group 2 compared to 35% in Group 1, which was statistically significant ($P < 0.002$). Fluctuations in IOP were much less in the Centurion group.

Conclusions: Absolute IOP rise and fluctuations in IOP were much less with the IOP-based (Centurion Vision) fluidics system with active fluidics compared to the gravity-based fluidics system (Infiniti Vision System).

Results of Management of Post Vitrectomy Complicated Cataract

First Author: Widya ANANDITA

Co-Author(s): Syska WIDYAWATI

Purpose: To evaluate visual outcomes and complication rates of phacoemulsification in post vitrectomy eyes.

Methods: Retrospective descriptive study.

Results: Data from 75 eyes was analyzed. Postoperative best corrected visual acuity (BCVA) improved in 66.7% of patients. Mean BCVA improved from 1.8 logMAR (0.2-2.5) to 1.3 logMAR (0-2.5) postoperatively, with the biggest improvement of 0.57 logMAR in patients with preoperative BCVA of <1.8 logMAR. Only 1.3% of patients had intraoperative complications, and 52% of patients had postoperative complications, of which 27.9% had PCO. Patients with silicone oil who underwent combined phacoemulsification and silicone oil extraction had higher redetachment rates (33%) compared to patients who only underwent phacoemulsification (20%).

Conclusions: Phacoemulsification improves BCVA in most patients, and intraoperative complication rates were low. There was evidence of correlation between higher redetachment rate and combination of phacoemulsification with silicone oil extraction.

Retained Intralenticular Foreign Body Managed Surgically: A Case Report

First Author: Pragati GAUTAM

Purpose: Case report.

Methods: Case report.

Results: A 22-year-old male patient, a carpenter by profession, presented 7 months after an initial injury to the left eye. The injury, which happened upon grinding a metal object for sharpening on a roller blade, showed the presence of a tangential corneal linear opacity site along with sphincter tear at 10 o'clock pupillary margin. The work was done without protective eyewear. The presence of a small metal foreign body (FB) embedded inside the lens with a sealed capsule was noted only after pupillary dilatation with mydriatics. The presence of FB was confirmed to be metallic by X-ray of the orbit as well as with ultrasonography. On ultrasonography

intact posterior capsule was also confirmed. The technique of removing the foreign body out of the lens was Kelman-Mcpherson after capsulotomy, and the lens was aspirated out gently with simcoe cannula. The implantation of intraocular lens (IOL) was done on intact posterior capsule. On the first postoperative day there were few signs of inflammation, with best uncorrected visual acuity of 6/12. The best corrected vision at the first week and six weeks postoperatively was 6/6.

Conclusions: Intraocular as well as intralenticular foreign bodies (ILFB) are not uncommon in the setting of open globe injuries. Use of protective eyewear may reduce such work-related trauma. Though the timing of intervention may vary, use of forceps in removal of ILFB seems safer, and in an intact posterior capsule IOL implantation can be done after lens extraction in the same setting.

Safety First: Your Sight Depends on It!

First Author: Andreas BORKENSTEIN

Purpose: To evaluate in long-term observation the safety and manageability of the new 2-component autoloading system Safeloader by HumanOptics, Germany.

Methods: In this prospective study, a total of 67 eyes of 42 patients were enrolled. Phacoemulsification was performed and the new Safeloader (HumanOptics, Germany) was used in all cases for implanting the intraocular lens (IOL). Total surgery time, IOL preparation time, and IOL implantation time were measured. A questionnaire concerning work flow, operating room atmosphere, handling, and sense of security was answered by the surgeon and the scrub nurse.

Results: The Safeloader worked in all cases (incision size 2.0 mm) without complications. Work flow and handling during the process was excellent. IOL preparation time was similar to fully preloaded systems.

Conclusions: This study demonstrates the safety and effectiveness of the 2-component autoloading system. The separate sterilization process and the first contact of the IOL with the cartridge coating immediately before insertion combine the advantages of fully preloaded and nonpreloaded systems without any time loss and with the highest safety level.

Safety of Intracameral Levofloxacin 0.5% (Cravit) Injection on Corneal Endothelial Cell Counts Following Cataract Surgery (Phase II)

First Author: Purit PETPIROON

Co-Author(s): Pornchai SIMAROJ

Purpose: To determine the safety of prophylactic intracameral levofloxacin 0.5% ophthalmic solution (Cravit) on endothelial cell density in patients undergoing

phacoemulsification.

Methods: One hundred fifty-two eyes of 133 patients were randomized to receive 0.1 mL intracameral levofloxacin 0.5% or an equal volume of balanced salt solution during the last step of phacoemulsification with intraocular lens implantation for endophthalmitis prophylaxis. Safety parameters, including best-corrected visual acuity (BCVA) and endothelial cell density (EDC), were evaluated preoperatively and 1 month postoperatively. Intraoperative parameters, including grading of cataract, cumulative dissipated energy (CDE), and duration of the operation for each case, were collected. A P value less than 0.05 was considered significant.

Results: One hundred thirty eyes completed the study. At 1 month, mean EDC loss was 14.8% in the intracameral levofloxacin group and 13.6% in the balanced salt solution group ($P = 0.56$). The mean EDC loss was not statistically significant between groups. The mean visual acuity improvement following cataract surgery in the intracameral levofloxacin group and control group were 0.27 logMAR and 0.25 logMAR, respectively, with no statistical significance ($P = 0.715$). No postoperative endophthalmitis was observed in either group during the study.

Conclusions: Intracameral levofloxacin 0.5% (Cravit) appeared to be nontoxic in terms of corneal endothelial cell loss and visual rehabilitation following phacoemulsification. The administration of 0.1 mL intracameral levofloxacin 0.5% may be used as a prophylaxis for endophthalmitis in terms of safety.

Small Incision Cataract Surgery in Difficult Situations

First Author: Anurag NARULA
Co-Author(s): Shilpa SINGH

Purpose: To study challenging scenarios and their management in cases of small incision cataract surgery (SICS).

Methods: A discussion of SICS in cases of cataract, posterior polar cataract, small pupil, pseudoexfoliation, traumatic cataract, complicated cataract, and subluxated cataract.

Results: A poster discussion was done regarding challenges faced and their management.

Conclusions: Preoperative knowledge and how to manage starting preoperatively are essential parts of such cases.

Statin Therapy and Risk of Cataract: A Nationwide Population-Based Cohort Study

First Author: Chien-Chi TSENG

Purpose: Statin has potential protective effects against

cataract. The purpose of this study was to investigate if different statin types or cumulative doses of statin use could predict statin efficacy in cataract prevention.

Methods: Patients aged ≥ 55 years were identified from the Taiwan National Health Insurance Research Database. After propensity-score matching, a total of 29,206 patients were included in this study. Risk of new-onset cataract in statin users and non-users was estimated.

Results: During the 7-year follow-up period, 2,390 patients experienced new-onset cataract and received operation for the disease. Overall, statin therapy reduced the risk of cataract by 30% (adjusted hazard ratio [HR], 0.70; 95% confidence interval (CI), 0.64 to 0.76; $P < 0.001$). There was a dose-response relationship between statin use and the risk of cataract. The adjusted HRs for cataract were 0.89, 0.80, and 0.50 when cumulative doses ranged from 28 to 89, 90 to 364, and more than 365, respectively. Patients gained obvious cataract preventive effects from 5 types of statins (simvastatin, pravastatin, fluvastatin, atorvastatin, rosuvastatin), but not lovastatin (adjusted HR, 1.01; 95% CI, 0.81-1.25; $P = 0.963$).

Conclusions: Statin therapy reduces the risk of new-onset cataract in the Taiwanese population. The efficacy of statin in reducing the risk of new-onset cataract is dose- and type-dependent.

Surgically Induced Astigmatism Following Phacoemulsification Using Clear Corneal Incisions in Patients with Different Corneal Diameters

First Author: Rohit SREENATH
Co-Author(s): Sheetal BRAR, Sri GANESH

Purpose: From a structural point of view, it is known that incisions for cataract surgery will induce a flattening effect when made on (or near) the steep axis of the cornea. This is termed surgically induced astigmatism (SIA).

Methods: To evaluate the influence of corneal diameter on SIA in patients undergoing phacoemulsification surgery with foldable intraocular lens (IOL) implantation and also to find the correlation of corneal diameter with SIA.

Results: This prospective study included 100 eyes of patients with corneal diameter between 11 and 12 mm, who underwent uncomplicated phacoemulsification with foldable IOL implantation. Group 1 included 50 eyes with corneal diameter between 11 and 11.5 mm and group 2 had 50 eyes between 11.6 and 12 mm. Preoperatively Auto K, Orbscan, and IOLMaster 500 were done for the eyes receiving surgery. Patients were followed up on day 1, day 15, and at 3 months. Both the study groups were comparable in terms of age, central corneal thickness (CCT), and mean ker-



atometry. However, the differences in corneal diameter and axial length between the 2 groups were statistically significant ($P < 0.01$ and 0.02 , respectively). The mean SIA in group 1 at 15 days and 3 months were 0.40 ± 0.06 and 0.35 ± 0.05 , respectively, and in group 2, they were 0.38 ± 0.05 and 0.34 ± 0.04 , respectively.

Conclusions: A statistically significant difference in SIA was observed between group 1 and group 2 15 days after surgery ($P = 0.037$), whereas the difference was not statistically significant between the 2 groups after 3 months.

Technique for Refixation of a Dislocated Scleral-Fixated Intraocular Lens

First Author: Shaheeda MOHAMED

Co-Author(s): Chi-Wai TSANG

Purpose: To report an alternative technique for refixation of a dislocated scleral-fixated intraocular lens (SFIOL) with one free-floating haptic in the vitreous cavity by threading the eyelet of the dangling haptic without requiring removal of the SFIOL.

Methods: Case report.

Results: After performing 23-gauge (G) pars plana vitrectomy, 25G forceps were inserted via a 25G sclerotomy 1.5 mm posterior to the limbus. A 9/0 prolene needle introduced 2 mm adjacent to the sclerotomy was cut, and the cut end of the prolene thread was carried by the 25G forceps into the vitreous cavity, where it was threaded through the eyelet of the free-floating haptic. The prolene was then retrieved out through the 25G sclerotomy, and a knot was made to refixate the haptic.

Conclusions: This technique allows for refixation of a SFIOL hanging by a single suture, without the need to remove the entire SFIOL.

Comprehensive Ophthalmology

Dengue-Related Ophthalmic Complications: A Case Series

First Author: Rupini YOGESVARAN

Co-Author(s): Hanizaturana HASHIM

Purpose: To report 4 cases of dengue-related ophthalmic complications.

Methods: Case series.

Results: We report 4 cases with ocular complaints and underlying dengue infection. Patients were between 26 and 65 years of age. All patients had either positive dengue IgM or NS 1 antigen blood results. Onset of symptoms was 1 week from onset of fever. All patients had thrombocytopenia with the lowest documented

platelets between $9-68 \times 10^9/L$. Presenting symptoms were central blurring of vision, distorted vision, eye redness, and pain. Examination showed congested conjunctiva with presence of anterior chamber inflammatory cells of 3+ in 1 patient; the other 3 had unremarkable anterior segment. Dilated fundi examination showed macular hemorrhages in 2 patients and submacular deposits in 1 patient. Three patients had macular edema, seen as subretinal fluid on optical coherence tomography (OCT). One patient had thickened sclera. Two patients underwent fundus fluorescence angiogram showing perfoveal vasculitis. Vision at presentation ranged between 6/9 and counting fingers at 2 feet. Three out of 4 patients were treated with either topical dexamethasone, oral prednisolone, or intravenous methylprednisolone followed by oral prednisolone. One patient was conservatively treated in view of positive Mantoux test. Treatment outcomes were evaluated based on reduction in anterior chamber activity, resolution of subretinal fluid on OCT, and improvement in visual acuity. All patients showed improvement with good visual outcome.

Conclusions: Ophthalmic complications, although rare, may present with anterior segment or commonly posterior segment involvement. Patients with ocular symptoms should be referred early to the ophthalmologist and prompt treatment is imperative.

Making the Case for Sarcoidosis

First Author: Claude COWAN

Purpose: To provide an overview of nonophthalmic findings useful in establishing a presumptive diagnosis of sarcoidosis.

Methods: Literature review.

Results: Sarcoidosis is primarily a disease of young and middle aged adults, and pulmonary manifestations, such as dry cough and shortness of breath, are common. Wheezing caused by endobronchial disease is often attributed to more common disorders leading to delayed diagnosis. Asymptomatic bilateral hilar adenopathy supports a diagnosis of sarcoidosis, but asymmetric adenopathy, fever, or anemia should prompt further investigation. Skin involvement mimics a variety of conditions but violaceous papules and plaques involving the face suggest lupus pernio, a sign of chronic sarcoidosis. Neurosarcoidosis is not common, but Bell palsy should raise suspicions. Elevated angiotensin converting enzyme levels are suggestive, but sensitivity is only moderate. Use of ACE inhibitors and genetic polymorphisms also compromise test usefulness. Lymphopenia, hypercalcemia, and abnormal liver enzymes are non-specific findings, and although supportive of the diagnosis, other causes should be considered. Abdominal ultrasound or CT scanning can identify hypodense nodular lesions of the liver or spleen that

may be suitable for biopsy. Ability to recall antigens is characteristic of sarcoidosis, but its usefulness depends on knowledge of prior exposure. In areas endemic for TB or where BCG vaccination is common, a negative tuberculin skin test raises suspicion for sarcoidosis and should prompt an interferon gamma release assay. Finally, occupational and other environmental exposures should be investigated, as disorders such as berylliosis and brucellosis can produce findings indistinguishable from sarcoidosis.

Conclusions: Diagnosing sarcoidosis requires a systematic approach and targeted testing.

Post-Traumatic Stress Disorder in Adults Following Ocular Injury: Bangladesh Experience

First Author: Nahid FERDAUSI

Purpose: Post-traumatic stress disorder (PTSD) has been recognized as a severe and often chronic disorder following traumatic events. The purpose of the study was to assess and predict PTSD of ocular injuries in Bangladesh.

Methods: A hospital-based cross-sectional research design was adopted for this study. Participants were from an apex public eye institute. Seventy-two patients of ≥ 18 years admitted for ocular injury with visual acuity $< 6/18$ were enrolled for this study between January and June 2016. The 17-item PTSD check list, civilian version (PCL-C) was used to assess PTSD. Possible scores range from 17 to 85, with a cut-off of 50 on the PCL-C taken as a predictor of PTSD diagnosis.

Results: The mean age of the participants was 45.5 years with male-female ratio of 2.8:1. Cronbach alpha was 0.89 for PCL-C. This study revealed that 24 participants (33%) met PTSD diagnosis. They were grouped as severely impaired vision or blindness and moderately impaired vision. PTSD was significantly ($P < 0.001$) associated with severely impaired vision and blindness. It was also significantly high ($P < 0.001$) for those who experienced physical assault. No significant difference of PTSD between males and females was noticed.

Conclusions: PTSD is a common mental health problem that has a substantial impact on individuals and society. Ocular injury is associated with varying degrees of loss of vision with socioeconomic and psychological consequences. This is an area for further research to develop and evaluate new interventions for prevention and management of all types of eye injuries.

Sensitivity and Specificity of the Robotic Slit Lamp Version II (RoboEye II) for Detecting Anterior Segment Findings

First Author: Sunisa SINTUWONG

Co-Author(s): Somkiat ASAWAPHUREEKORN, Pished BUNNAN, Noppakhun PANYAYINGYONG, Rangsarit VANIJIRATTIKHAN, Arpha PORNSETH

Purpose: To study the sensitivity and specificity of the Robotic Slit Lamp Version II (RoboEye II) for anterior segment eye examination.

Methods: Volunteers who met the criteria were recruited by a convenient method. One eye from each volunteer was chosen to be examined. Eighty-three anterior segment findings ranging from eyelid to posterior surface of the lens were listed in the case record form. Each volunteer was examined for anterior segment findings by 2 examiners: an experienced ophthalmologist (gold standard) with a standard slit lamp and a young ophthalmologist or a third-year resident with the RoboEye II system. The sensitivity and specificity for detecting anterior segment findings between the 2 examiners were calculated.

Results: There were 98 volunteers with the mean age of 44.3 (SD, 13.9) years old. Most of them were females (71.4%). Left eye was the most common side (54.1%). The sensitivity for detecting anterior segment findings were as follows: dacryocystitis (100%), band keratopathy (100%), posterior synerchia (100%), the presence of intraocular lens (IOL) (100%), and eyelid mass (75%). The specificity for detecting anterior segment findings were 100% in most instances. The mean time for examination with the standard slit lamp system and the RoboEye II system were 2.8 (SD, 1.7) and 4.9 (SD, 2.2) minutes, respectively.

Conclusions: The RoboEye II system had a comparable sensitivity for screening some anterior segment findings with smaller size, greater comfort for volunteers, and less time for examination compared to version I.

The Role of Low Vision Aids in a High Myopia Patient with Chorioretinal Atrophy: A Case Report

First Author: Perlita KAMILIA

Co-Author(s): Yudisani KAMAL

Purpose: To show ophthalmologists the importance of consulting low vision services to improve visual acuity for better quality of life, especially in high myopia cases.

Methods: A 59-year-old woman came to the hospital with slowly blurred vision of both eyes. There was metamorphopsia and a black spot in the right eye. At the first visit to the cornea and refractive surgery polyclinic, she was assessed as having immature senile cat-



aract, high myopia, corneal cicatrix, and chorioretinal atrophy of both eyes. Optical coherence tomography (OCT) images also supported the diagnosis of chorioretinal atrophy in both eyes. Furthermore, because of the retinometry examination results, the patient was recommended to undergo cataract surgery in the right eye.

Results: After cataract surgery, she still had difficulty in reading Al-Quran. We thus referred this patient to low vision services to allow for sufficient reading ability. In low vision services, the patient received a hand magnifier, so that near visual acuity improved.

Conclusions: Low vision aids can help people to use their best residual visual function and reduce the impact of disease on patient quality of life.

Cornea, External Eye Diseases & Eye Bank

Calcium Oxide Desiccant-Induced Ocular Chemical Burn

First Author: Chew Yong TAN
Co-Author(s): Azura RAMLEE

Purpose: To report a case of chemical injury to the eyes following exposure to calcium oxide (lime) obtained from a desiccant packet found in dried seaweed.

Methods: Case report.

Results: A 10-year-old boy presented to the emergency department 5 hours after both his eyes were accidentally splashed with a chemical solution at school. The patient and his friends were “experimenting” with the reaction of the granules obtained from a desiccant packet taken from dried seaweed when mixed with tap water. The bottle of water exploded after being shaken and the heated chemicals splashed into his eyes. The granules in the desiccant packet were later proven to be calcium oxide. The pH in the eyes was 8.0 at presentation. Assessment after irrigation revealed Roper-Hall grade I alkaline injury in the right eye and Roper-Hall grade III in the left eye. His right vision was counting fingers at 3 feet, which improved to 6/24 with pinhole, and left vision was counting fingers at 3 feet. He also had a second degree burn on his face. He was treated with topical steroids, antibiotics, and artificial tears, as well as oral doxycycline and vitamin C. He gradually improved and at 6 months post injury his best corrected visual acuity in each eye was 6/6, with only a faint paracentral corneal scar in the left eye remaining.

Conclusions: Desiccant packets are commonly found in food products. The public should be made aware of the danger of calcium oxide desiccant, and these products should be strictly kept away from children.

Changes in Visual Acuity and Anterior Cornea Curvature in Post Corneal Collagen Cross Linking Eyes

First Author: Ahmad AKHTARALI
Co-Author(s): Aidila Jesmin JABBARI, Khairidzan MOHD KAMAL, Zulhilmi RAZAK, Adzura SALAM

Purpose: To measure the changes in refractive status and anterior curvature of the cornea in post corneal collagen cross linking (CXL) eyes.

Methods: A prospective study of 55 eyes from 42 keratoconic patients who underwent CXL. CXL was performed by a single surgeon using Dresden protocol. Pre- and postoperative anterior curvature of the cornea were measured using placido-based corneal topography (Atlas 9000, Carl Zeiss Meditec). The eyes were classified based on Collaborative Longitudinal Evaluation of Keratoconus (CLEK). Mean difference of best corrected vision (BCVA), total corneal astigmatism, steep K, mean K, flat K, and posterior elevation pre-operatively and 6 months postoperatively were compared.

Results: Twenty-five eyes were classified as mild, 17 were moderate, and 13 were severe keratoconic eyes. Significant improvement in BCVA (logMAR) was noted in all patients with mean increment of 0.06 ($z = -2.200$, $P < 0.05$) after 6 months. The severe group showed significant mean improvement of steep K and astigmatism post CXL [1.18 ± 1.60 D ($t = 2.667$, $P < 0.05$); 1.05 ± 1.67 D ($t = 2.274$, $P < 0.05$)], while statistically insignificant results showed in the mild and moderate groups ($P > 0.05$). Mean K, flat K, and posterior elevation were found to be statistically insignificant in all groups ($P > 0.05$). There was no significant keratonic progression noted in all eyes after CXL.

Conclusions: Stabilization of the cornea was achieved post CXL with significant flattening effect of steep K in the severe group. Improvement of BCVA was an additional value, though the said advantage may not be experienced by many patients.

Clinical Outcome of Therapeutic Penetrating Keratoplasty in a Tertiary Eye Center of Northeast India

First Author: Balmukund AGARWAL
Co-Author(s): Kalyan DAS, Krishna GOGOI, Jnanankar MEDHI, Diva MISRA

Purpose: To evaluate the anatomical success, graft clarity, and the visual outcome of therapeutic penetrating keratoplasty (TPK) in refractory microbial keratitis (RMK).

Methods: A prospective study was conducted and 140 cases selected from the patients attending the cornea services from March 2010 to February 2014. RMK cases

were included and viral keratitis was excluded from the study. After slit lamp examination and specular microscopy, donor buttons were graded accordingly. Postoperative follow-up was done at regular intervals.

Results: In our study, mean age was 45.68 years. Eighty-eight cases were male and 52 cases were female. Fungal keratitis cases totaled 64 followed by 52 cases of bacterial keratitis and 24 cases of mixed etiology. *Staphylococcus aureus* and *Fusarium* spp. were the most common organisms. Overall anatomical success was achieved in 120 cases of TPK. Success rate was 92.3% in bacterial keratitis cases and 87.5% in fungal keratitis cases. The overall graft clarity was 14.2%. Three grafts in bacterial keratitis and 8 grafts in fungal keratitis remained clear until last follow-up.

Conclusions: TPK has a definite role in management of refractory microbial keratitis. Judicious patient selection before surgery, careful planning of surgical techniques, and appropriate follow-up care may enhance the chance of successful outcome.

Combined Surgical Resection, Mitomycin C, and Amniotic Membrane Transplantation as a Treatment for Refractory Giant Papillae in Vernal Keratoconjunctivitis

First Author: Tisha STANZEL

Co-Author(s): Jodhbir MEHTA, Sharita SIREGAR

Purpose: To evaluate the outcome of combined surgical resection, mitomycin C (MMC), and amniotic membrane transplantation (AMT) for refractory vernal keratoconjunctivitis (VKC) related-giant papillae.

Methods: Three patients (4 eyes) with refractory giant papillae with persistent punctate corneal erosion with corneal shield ulcer and/or steroid-related ocular hypertension who underwent combined papillae resection, MMC, and AMT were retrospectively reviewed.

Results: All patients were male, and mean age at presentation was 8 years (range, 6-11; n = 3). Indication for surgery was persistent punctate corneal erosion (100%) with shield ulcer (50%) and/or steroid-related ocular hypertension (75%). One patient required bilateral surgery. Mean duration from presentation to combined surgery was 4.5 years (range, 2-8; n = 4). Mean total number of surgeries was 2.25 times, including isolated papillae resection with MMC with or without AMT. Repeat surgery was required in 1 eye. Flat superior tarsal surface was achieved in all eyes, including resolution of GPC-related cornea conditions. No complication was observed in any eye. VKC symptoms were stabilized. Visual acuity (logMAR) improved from 0.6 (20/80) during flare-up to 0.15 (20/30). Mean follow-up was 11.5 months (range, 6-15).

Conclusions: Combined surgical resection of papillae with MMC and AMT can effectively resolve refractory

GPC-related cornea surface problems in medically controlled VKC.

Comparison of Morphological and Functional Endothelial Cell Changes After Cataract Surgery: Phacoemulsification versus Manual Small-Incision Cataract Surgery

First Author: K V Satyamurthy KODUR

Co-Author(s): Sunil GANEKAL

Purpose: To compare the morphological (cell density, coefficient of variation, and standard deviation) and functional (central corneal thickness) endothelial changes after phacoemulsification versus manual small-incision cataract surgery (MSICS).

Methods: Patients were randomly allocated to undergo phacoemulsification (Group 1, n = 100) or MSICS (Group 2, n = 100) using a random number table. Both groups of patients underwent complete ophthalmic evaluation and specular microscopy preoperatively and at 1 and 6 weeks postoperatively. Functional and morphological endothelial evaluation was done using specular microscopy. Phacoemulsification was performed using the direct chop technique and MSICS by the viscoexpression technique.

Results: The mean difference in central corneal thickness at baseline and 1 week between Group 1 and Group 2 was found to be statistically significant (P = 0.027). However, this difference at baseline with 6 weeks and 1 week with 6 weeks was not statistically significant. The difference in mean endothelial cell density between the 2 groups at 1 week and 6 weeks was found to be statistically significant (P = 0.016). The mean coefficient of variation and mean values of standard deviation between the 2 groups were not statistically significant.

Conclusions: Postoperatively there was a statistically significant decrease in the cell density loss in MSICS compared to phacoemulsification. However, the central corneal thickness, coefficient of variation, and standard deviation were maintained in both groups, indicating that the function and morphology of endothelial cells was not affected despite a reduction in cell number in MSICS compared to phacoemulsification.

Comparison of Tumor Necrosis Factor and Interleukin-8 Levels in Tear Film Cytokines of Allergic Rhinitis Patients and Controls

First Author: Matthew TONG

Co-Author(s): Adil H, Jiunn Loong LING, Madhusudhan P, Evelyn TAI

Purpose: To compare the tear cytokine levels between patients with allergic rhinitis and controls.

Methods: Patients with allergic rhinitis attending the



otorhinolaryngology clinic from January to February 2016 were included. Group 1 had allergic rhinitis (AR) without allergic conjunctivitis; group 2 was the control group. After instillation of topical anesthetic, tears were collected using a Schirmer strip. The strip was then placed in a plain tube and frozen to -80°C . Enzyme linked immunosorbent assay was performed on these tear samples using cytokine detection kits for human tumor necrosis factor (TNF) and interleukin 8 (IL-8). Data analysis was performed using Statistical Package for the Social Science version 22.0.

Results: There were 23 patients in group 1 and 20 in group 2. Group 1 was older, with a mean age of 41.83 years compared to 29.75 years in group 2. Kruskal-Wallis H test showed that there was a statistically significant difference in mean TNF level between the groups, $\chi^2(1) = 5.053$, $P = 0.025$, with a mean score of 26.00 in group 1 and 17.40 in group 2. Likewise, the IL-8 level also differed significantly, $\chi^2(1) = 14.9973$, $P < 0.001$, the mean score being 28.91 in group 1 and 14.05 in group 2.

Conclusions: The concentration of tear film cytokines in patients with allergic rhinitis is significantly higher than that of the normal population. This suggests that the inflammatory process in patients with allergic rhinitis may affect the conjunctiva, even in the absence of eye symptoms.

Comparison of Wound Healing After Pterygium Excision Combined with Conjunctival Autograft Transplantation with or Without Subconjunctival Bevacizumab

First Author: Elisa **TAURISIA**

Purpose: To compare early postoperative wound healing in patients with primary pterygium excision combined with conjunctival autograft transplantation with or without subconjunctival bevacizumab.

Methods: In this single-blind, randomized clinical trial, the patients were randomized into 2 groups. Group 1 received no injection and group 2 received 2.5 mg/0.1 mL subconjunctival bevacizumab immediately after surgery. Postoperatively, patients were examined at 1 day, 3 days, 7 days, 14 days, 21 days, and 30 days. The following parameters were evaluated: conjunctival erythema, conjunctival graft gap, and horizontal length of the corneal epithelial defect. Each parameter was scored. Total score of each parameter represents postoperative wound healing. Any recurrence of pterygia were recorded.

Results: Statistically significant differences were observed between the groups for conjunctival graft gap and horizontal length of the corneal epithelial defect at 7 days and 14 days, whereas for conjunctival erythema at 3 days, 7 days, 14 days, and 21 days. Postoperative

wound healing showed statistically significant differences until 21 days. At the end of the study, pterygium recurrences were observed only in group 1 but the difference was not statistically significant.

Conclusions: Statistically significant differences were observed between the groups for postoperative wound healing and conjunctival erythema until 21 days.

Contact Lens-Related *Elizabethkingia meningoseptica* Keratitis: The First Reported Case in Southeast Asia

First Author: Ang **WEN-JEAT**

Co-Author(s): Raja-Norliza **RAJA-OMAR**, Embong **ZU-NAINA**

Purpose: This report describes a rare case of keratitis caused by *Elizabethkingia meningoseptica* in a healthy immunocompetent 20-year-old female using extended wear silicone hydrogel contact lenses.

Methods: Case report.

Results: A 20-year-old woman presented with pain and blurring of vision in the right eye for 3 days. On presentation, slit lamp examination revealed anterior stromal infiltrates with an overlying epithelial defect. Microbiological cultures from corneal scrapings, contact lens, and its casing were positive for *E. meningoseptica*. The high likelihood of contact lens contamination leading to keratitis prompted administration of fortified gentamicin 0.9% and ceftazidime 5%. Later on, we added vancomycin 5% tailoring to the culture and sensitivity of the organism. After treatment, the corneal epithelial defect was completely healed, leaving some residual corneal opacity.

Conclusions: *E. meningoseptica* is a non-fermenting gram-negative bacillus that has an increasing prevalence in health care settings, especially in intensive care environments. While it has long been recognized as a rare but serious cause of neonatal meningitis and sepsis in immunocompromised patients, its role as a cause of ocular pathology is not well known. We conclude that despite primarily affecting immunocompromised patients, *E. meningoseptica* should be considered as a potential and emerging pathogen for contact lens-related keratitis in a healthy host.

Corneal Dystrophies in a Tertiary Eye Care Center of Northeast India: Incidence Pattern

First Author: Balmukund **AGARWAL**

Co-Author(s): Dipankar **DAS**, Kalyan **DAS**, Jnanankar **MEDHI**, Diva **MISRA**

Purpose: To find out the incidence pattern of corneal dystrophies in northeast India.

Methods: We retrospectively studied 396 eyes of 238 subjects attending a cornea clinic between July 2003



and June 2014. Complete history and thorough ocular examination including slit lamp documentation of all cases was done. Specular microscopy was done as and when required.

Results: Age of the subjects ranged between 8 and 72 years with a male:female ratio of 70:49. Sixty-six percent of cases had bilateral presentation. Granular dystrophy was the most common occurrence (31%) followed by macular dystrophy (21%) and posterior polymorphous dystrophy (PPMD) (17%). A positive family history was obtained in 26 cases, with the highest in granular dystrophy. Mostly it was an incidental finding. In a few cases penetrating keratoplasty was done with excellent results.

Conclusions: Proper clinical diagnosis, symptomatic treatment, and regular follow-up were adequate in most of the cases.

Corneal Reinnervation Surgery

First Author: Sunil MOREKER

Co-Author(s): Harshvardhan GHORPADE

Purpose: To report the results of corneal reinnervation surgery.

Methods: A local nerve transfer was used to reinnervate a neurotrophic opaque cornea of a diabetic patient who had ocular ischemic syndrome, thyroid eye disease, and glaucoma. This was combined with glaucoma surgery.

Results: The corneal sensations returned and the opacity cleared. The patient's vision recovered from 6/60 to 6/18 and intraocular pressure returned to 14 mm Hg. The transparency was maintained for over a month and the corneal sensations were maintained.

Conclusions: Corneal reinnervation surgery is a promising new innovation for neurotrophic corneas.

Cystoid Macular Edema in a Patient with Iridocorneal Endothelial Syndrome

First Author: Chew Yong TAN

Co-Author(s): Fazliana ISMAIL, Visvaraja SUBRAYAN

Purpose: To report a case of cystoid macular edema (CME) in a patient with iridocorneal endothelial (ICE) syndrome.

Methods: Case report.

Results: A 26-year-old female presented with a 2-week history of blurred vision in the right eye. Her best corrected vision at presentation was 6/18 in the right eye and 6/6 in the left eye. Examination of the right eye showed features of ICE syndrome of the progressive iris atrophy subtype with cystoid macular edema and hyperemic optic disc. Topical nepafenac was commenced and the patient responded well with improvement of

right eye vision to 6/6 after 3 months of treatment.

Conclusions: In patients with ICE syndrome presenting with reduced vision, CME can be a cause.

Descemet Stripping Automated Endothelial Keratoplasty and Tube Shortening for Corneal Decompensation Due to Aurolab Aqueous Drainage Implant

First Author: Mano DAS

Co-Author(s): Venkatesh PRAJNA, George PUTHURAN, Naveen RADHAKRISHNAN

Purpose: To report the outcome of Descemet stripping automated endothelial keratoplasty (DSAEK) and tube shortening for corneal decompensation due to Aurolab aqueous drainage implant (AADI).

Methods: Case report.

Results: A 50-year-old 1-eyed patient with AADI tube implant for refractive glaucoma post trauma in the left eye (LE) presented to us with signs of endothelial decompensation like corneal edema, bullae, and Descemet membrane folds. Preoperative best corrected visual acuity was 5/60 by Snellen chart. The rest of the anterior chamber was normal. View of the posterior segment was hazy due to corneal edema. Patient underwent DSAEK with shortening of the tube of the glaucoma drainage device. Intraoperative period was uneventful. There was no postoperative complication. At 1 month postoperatively, the best corrected visual acuity in LE was 6/36 by Snellen chart with a quiet eye, absence of corneal edema, and the DSAEK lenticule was well attached.

Conclusions: DSAEK with or without AADI tube shortening is a better alternative to penetrating keratoplasty in corneal decompensation in refractive glaucomatous patients, as it avoids an open-globe procedure and the risks associated with it.

Dry Eye in Primary Sjogren Syndrome Is More Than Aqueous Deficiency and Meibomian Gland Dysfunction

First Author: Abdelsattar FARRAG

Co-Author(s): Louis TONG

Purpose: Sjogren syndrome, an autoimmune disease, can induce damage to lacrimal and meibomian glands and result in dry eye. We determine the relationship of aqueous deficiency, meibomian gland dysfunction (MGD), and tear instability in Sjogren syndrome.

Methods: We evaluated tertiary referral center-based patients diagnosed with primary Sjogren syndrome from a prospective dry eye database (2007-2016). Data analysis included meibomian gland expression scores, Schirmer I test, and tear break-up times (TBUT).



Results: Of 61 patients evaluated (95% female, 92% Chinese), age was 56.7 ± 11.7 years. The most frequent symptom experienced was grittiness, followed by blurring of vision and burning. The TBUT was 2.67 ± 1.89 s overall; only 29.3% had reduced meibomian gland expressivity. Corneal fluorescein staining was most severe in the inferior region, followed by nasal, temporal, central, and superior regions. The Schirmer I test was 5.2 ± 6.9 mm, and 67.2% had aqueous deficiency (Schirmer < 5 mm). A total of 28.9% of patients with reduced Schirmer had viscous or non-expressed meibum and this association was not significant ($P = 0.38$). Overall 88.5% of patients had reduced TBUT (<5 s), but only 77.8% of these were patients with low Schirmer or poor meibomian gland expressivity. TBUT was not significantly associated with reduced meibomian gland expressivity ($P = 0.66$) nor correlated to Schirmer ($r = 0.00$).

Conclusions: Dry eye in Sjogren syndrome is independently linked to aqueous deficiency and MGD. Up to 22% of tear instability may be due to factors not evaluated here, such as poor corneal wettability from goblet cell and mucin dysfunction.

How Ophthalmologists Deal with Patients with High Central Corneal Thickness in Barcelona, Spain

First Author: Jaime Pablo KELLY-RIGOLLET

Purpose: To evaluate how many patients are treated with intraocular antihypertensive drops, with central corneal thickness of 600 μm or more. We also evaluated the records of ocular fundus, campimetry, arterial hypertension, diabetes, and refractive disorders in the medical history.

Methods: From 1263 cases of pachymetries of 600 μm or more, we took a random sample of 295 cases. We reviewed all the medical histories and did a statistical analysis of age, gender, treatments, ocular fundus, campimetry, refractive aberrations, diabetes, family history, and arterial hypertension with SPSS statistics program.

Results: The mean age of the patients was 58.8 years old (min 16, max 94). The gender distribution was 54.6% men and 45.4% women. Pachymetry average was 621.54 μm (601 μm min and 704 μm max). The percentage of cases treated was 32.6% with 67.4% untreated. We found records of ocular fundus in 82.1% of the cases, campimetry in 92.8%, hyperopia in 13.8%, myopia in 12.1%, diabetes mellitus in 26.5%, and arterial hypertension in 40.7% of the cases. The family history of the presence of ocular hypertension (OHT) or glaucoma was recorded in 32.6% of the cases; in these, 16.8% had positive family history, and 15.8% did not. In 67.4% of the sample, the family background was not recorded in the clinic history.

Conclusions: In our medium, our ophthalmologists do not treat most of the thick corneas. They use ocular fundus and campimetry in most cases to decide the treatment.

Impression Cytology of Conjunctival Epithelial Cells in Patients with Graves Orbitopathy

First Author: Malgorzata MRUGACZ

Purpose: Graves orbitopathy (GO) is rare in pediatric patients; however, it is the most common extrathyroid manifestation of Graves disease (GD), being present in 30-67% of patients. GO is an autoimmune inflammatory disorder involving orbital connective and fatty tissues as well as the extraocular muscles. In children, GO is less common and less severe than in adults. The most common symptoms are upper eyelid retraction, conjunctival injection, proptosis, and periorbital edema. Severe complications include optic neuropathy, corneal ulceration, and eyeball subluxation. The aim of this study was evaluating goblet cell population and conjunctival epithelial morphology in patients with GO.

Methods: Twenty GO patients and 20 controls underwent ophthalmic examination including dry eye tests and conjunctival impression cytology.

Results: Impression cytology showed conjunctival squamous metaplasia and goblet cell loss in patients with GO.

Conclusions: Reduced goblet cell numbers and squamous metaplasia may be indicative of a higher degree of epithelial damage of conjunctival epithelial cells in GO patients, and the presence of lymphocytes and neutrophils is a strong sign for an inflammatory background of this disease. In view of the simple, noninvasive nature of impression cytology, this technique may prove to be an important tool for the diagnosis and monitoring of dry eye changes in GO patients.

In Vitro Antimicrobial Activity of Multipurpose Contact Lens Solutions Against Standard Strains of Common Ocular Pathogens: The Effect of Duration from First Use

First Author: Eleonore IGUBAN

Purpose: This study aims to determine the in vitro antimicrobial efficacy of opened multipurpose contact lens solutions on common contact lens-related ocular pathogens. Specifically, this study intends to compare the log reduction in microbial concentration when exposed to newly opened, 5-month-old, and 10-month-old multipurpose contact lens solutions.

Methods: This is a single-blind controlled experiment that evaluated 5 locally available multipurpose contact

lens solutions (MPS) in terms of their antimicrobial efficacy towards common contact lens-related ocular pathogens using standalone criteria. Newly opened, 5-month-old, and 10-month-old multipurpose contact lens solutions were compared based on their effect in reducing microbial concentration at 6 hours of exposure.

Results: MPS containing polyquaternium-1 and myristamidopropyl dimethylamine (MAPD) as well as polyhexamide reduced the bacterial concentrations by 3 log and fungal concentrations by 1 log, enabling them to fulfill the standalone criteria for disinfecting solutions. This antimicrobial efficacy was most evident with newly opened contact lens solutions, followed by those opened for 5 months. Those which were opened for 10 months showed limited antimicrobial activity for both bacteria and fungi.

Conclusions: Multipurpose contact lens solutions demonstrated variability in their antimicrobial activity. MPS containing polyquaternium and MAPD are preferred due to their broad spectrum efficacy and effectiveness. They must be utilized before their expiration date since results have shown a decrease in antimicrobial activity with an increase in duration from first use. This is to prevent contact-lens related ocular infections brought about by exposure to humid climate.

Kaposi Sarcoma of Lid in HIV Patient: A Case Report

First Author: M Manjunath KAMATH
Co-Author(s): Susan DSOUZA, Ajay KAMATH, Gurudutt Mulky KAMATH, Rajesh NAYAK

Purpose: Kaposi sarcoma is a tumor caused by infection with human herpes virus 8 (HHV8) and is more widely known as one of the AIDS-defining illnesses. We are presenting a case of Kaposi sarcoma of the lid.

Methods: A case of lid swelling in an AIDS patient, which was diffuse uniform black in color, presented with a duration of 6 months. Diagnosis of AIDS was confirmed and confirmation of tumor pathology was done with an excision biopsy and histopathology.

Results: The histopathology confirmed the diagnosis of Kaposi sarcoma of the lid.

Conclusions: Kaposi sarcoma of the lid is a rare occurrence and we are presenting a case with clinical photographs and histopathology reports.

Limbal Dermoid Treated with DALK Techniques Using Fresh Anterior Buttons of DSAEK Donors as Patch Grafts: Two Case Reports

First Author: Jiunn-Liang CHEN

Purpose: To report 2 cases of limbal dermoid who were

treated with deep anterior lamellar keratoplasty (DALK) and patch grafting by using fresh anterior corneal buttons of Descemet stripping automated endothelial keratoplasty (DSAEK).

Methods: Case report and literature review.

Results: Case 1 was a 6-year-old female. A whitish nodule at the limbal area of her left eye had been noted since she was born. Case 2 was a 15-year-old male with myopia and astigmatism of both eyes. A pinkish nodule at the limbal area of his right eye had been noted since he was born with mild enlargement as he grew older. In both cases, we performed anterior segment optical coherence tomography to evaluate the depth of the tumors. Tumors and the hosts' cornea were trephined with 7.25 mm Hesseberg-Barron trephine in case 1 and 7.0 mm trephine in case 2. Excisions of the tumors with DALK big bubble techniques were performed. The donor lamellar grafts were placed on the opening and sutured with 10-0 nylon. At 1 month postoperatively, vision improved to 20/25 in the treated eyes of both patients.

Conclusions: Split corneal transplantation that uses 1 donor cornea for 2 recipients via DSAEK and lamellar keratoplasty was scheduled simultaneously. We reported 2 cases of limbal dermoid that were evaluated by anterior segment optical coherence tomography before surgery and were successfully treated with DALK big bubble technique.

Novel Use of Intraoperative AS-OCT in Post Descemet Stripping Automated Endothelial Keratoplasty Cataract Surgery

First Author: Divya SINGH
Co-Author(s): Noopur GUPTA, Mukesh PATIL, Radhika TANDON, Murugesan VANATHI

Purpose: To demonstrate the role of intraoperative anterior segment optical coherence tomography (AS-OCT) in preventing graft detachment during cataract surgery in a patient previously treated with Descemet stripping automated endothelial keratoplasty (DSAEK).

Methods: A 54-year-old male patient underwent DSAEK for Fuchs dystrophy with corneal decompensation. A year after keratoplasty surgery the patient had graft clarity of 4+ with total cataract and 9 clock hours of posterior synechiae. Visual acuity was HMCF with PR accurate in all the quadrants. Central corneal thickness as measured with AS-OCT was 603 μm with graft thickness of 152 μm and a specular count of 2183 cells/ mm^2 . The decision was made to perform cataract surgery. Phacoemulsification with posterior chamber intraocular lens implantation was carried out. During hydration of the wound graft detachment was noted with the use of intraoperative OCT which was managed with intraoperative air injection. In the immediate



postoperative period the patient had visual acuity of 6/12. No graft edema or detachment was noted and the cornea remained clear.

Results: Intraoperative AS-OCT is an important tool to detect graft detachment during cataract surgery in a patient previously treated with DSAEK.

Conclusions: Post DSAEK cataract surgery is slightly challenging and complications such as graft detachment might be seen, which if managed with intraoperative air injection can result in good postoperative visual outcomes and anatomical success of the graft. Intraoperative AS-OCT is an important tool to detect graft detachment during surgery which can easily be missed otherwise. Appropriate manoeuvres can be done intraoperatively, thus ensuring successful functional and anatomical outcomes of the surgery.

Outcomes of DALK in Advanced Keratoconus with Different Graft Size

First Author: Prasoon PANDEY

Purpose: To compare the surgical and refractive outcome in 6 cases of advanced keratoconus who underwent DALK (big bubble technique) with 2 cases each of equal size (Group A), 0.25 mm larger (Group B), and 0.5 mm larger (Group C) donor grafts compared to recipient.

Methods: Six cases of advanced keratoconus were divided into 3 groups (A, B, C) of 2 patients each. Mean corneal thickness of $320 \pm 50 \mu\text{m}$, age of 21 ± 5 years, and mean with the rule astigmatism of 4.5 ± 1 diopters (D) were comparable. In Group A donor graft was of the same size as recipient bed, Group B donor graft was 0.25 mm larger, and in Group C it was 0.5 mm larger than the recipient bed. Follow-up period was 18 ± 4 months. Postoperative complications, best corrected visual acuity (BCVA), sim k, and corneal irregularity index were assessed at each and last follow-up.

Results: One case had double AC and later stromal rejection in Group C but recovered with medical management. All 6 patients after suture removal achieved a BCVA ranging from 20/60 to 20/30. There was no significant myopic shift in Group C compared to Groups B or A, as was expected ($P > 0.05$). Sim K and corneal irregularity index did not show any statistically significant variation ($P > 0.05$) at the end of 18 months.

Conclusions: Donor graft size in a range of 0-0.5 mm larger than recipient has no significant influence on the outcomes of DALK in terms of surgical outcomes, BCVA, and surface irregularity in advanced keratoconus.

Prevalence of Dry Eye in Diabetics and Its Association with Glycemic Control and Diabetic Retinopathy in a Developing Country

First Author: Meenu CHAUDHARY

Purpose: The aim of this study was to assess the prevalence of dry eye syndrome and its correlation with duration of diabetes, glycemic control, and diabetic retinopathy (DR) in type II diabetic patients.

Methods: Two hundred thirteen patients attending the eye outpatient department (OPD), retina clinic, and diabetes clinic of the medical OPD were selected. Patients were given a 16-point questionnaire and prevalence of dry eye syndrome was assessed with tear film break up time, Schirmer test, and lissamine stain. Fundus examination was done in all diabetic patients. Association of symptoms of dry eye as per the questionnaire and correlation of each test with duration of diabetes, glycemic control, and diabetic retinopathy was done.

Results: Of 213 subjects, 109 patients were diabetic and 104 were normal. The prevalence of dry eye syndrome in diabetic patients was 44.3%. The prevalence of dry eye syndrome was seen in both males and females and the association was not statistically significant. Statistically significant association was seen between dry eye syndrome and duration of diabetes ($P = 0.03$). Dry eye syndrome was more frequent in diabetic patients with DR ($P = 0.02$). DR was found in 56 patients (50.46%). There was a significant relationship between glycemic control and duration of diabetes, dry eye, and DR.

Conclusions: Duration of diabetes and poor control of glycosylated hemoglobin (HbA1C) were found to have statistically significant ($P < 0.05$) associations with dry eye. Hence, examination for dry eye to prevent ocular surface and blinding complications should become an integral part of assessment for diabetic eye disease.

Raman Spectroscopy: A Non-Invasive Tool for Diagnosis of Microbial Keratitis

First Author: Arti MISHRA

Co-Author(s): Roger Wilmer BEUERMAN, Keren CHEN, Quan LIU

Purpose: Microbial keratitis is a vision-impairing infection of the cornea. The risk factors are contact lens wear, trauma, and corneal surgery. The diagnosis and identification are established using corneal scrapings and aqueous and vitreous smear samples and subjecting them to cytological, culture, and molecular methods. However, only about 50% of samples yield useful information. In addition, it may require from 2 days to 4 weeks to identify a pathogen, with fungi taking lon-

ger. Thus, a rapid diagnostic procedure is needed which can be directly used in the clinic. We describe a proof-of-concept study for in vivo identification of infective pathogens so that optimal antimicrobial treatment can be initiated.

Methods: The Raman spectra for different bacterial and fungal corneal pathogens including *P. aeruginosa*, *S. aureus*, MRSA, *Candida albicans*, *Fusarium solani*, and *Aspergillus* species (108 CFU/mL; 10 μ l suspensions) were acquired using InnoRaman system (NIR laser excitation, 785 nm; power, 50 mW). Mouse corneas were infected with *P. aeruginosa* and *S. aureus* and after 3 days Raman spectra were acquired from harvested corneas.

Results: Raman spectroscopy (RS) easily differentiated between different bacterial pathogens, fungal pathogens, normal healthy corneas, and infected corneas with a simple scan requiring 10-20 seconds.

Conclusions: RS offers a potential tool for the rapid in vivo identification and discrimination of ocular pathogens. The scanning conditions are also compatible and safe for human eyes.

Rational Design of Antimicrobial Peptides for Combating Antimicrobial Resistance

First Author: Lakshminarayanan **RAJAMANI**
Co-Author(s): Roger **BEUERMAN**, Eunice Tze Leng **GOH**, Navin Kumar **VERMAN**

Purpose: The continued emergence of antibiotic resistance by bacteria and fungus with the potential to cause fatal infections poses a catastrophic threat worldwide. Decline of new antibiotic pipeline and a sharp decrease in the number of companies investing in antibiotic research has exacerbated the problem. Bottlenecks in the development of new antibiotic pipelines, unfavorable economic profits, and stringent regulatory guidelines complicate the problem further. The purpose of this work is to highlight the design principles in enhancing therapeutic potential of host defense peptides (HDPs) that were once discarded for their cytotoxic effect on mammalian cells.

Methods: Minimum inhibitory concentrations (MICs) of the peptides were determined in accordance with CLSI protocol. We determined the time-kill kinetics, interaction of the peptides with microbial and mammalian model membranes, cytotoxicity for fibroblasts, and immunogenicity for blood T-cell lymphocytes.

Results: HDPs displayed potent antimicrobial activity against a panel of Gram-positive ($n = 30$), Gram-negative ($n = 29$), and yeast ($n = 5$) strains with MIC values ranging from 0.5-32 μ g/mL. These peptides are, however, cytotoxic to mammalian cells (at 1-2x MIC), thus reducing their therapeutic potential. On the other hand site-specific modification of key amino acid resi-

dues dramatically altered the cytotoxic properties. The modified peptides displayed slightly higher MIC values (2-16x higher than HDPs) and are non-cytotoxic for mammalian cells even at elevated concentration (100x MIC). The modified peptides were non-immunogenic for PBTL.

Conclusions: We have improved the therapeutic potential of HDPs by appropriate modifications in the amino acid sequence, and the modified peptides represent potent therapeutic options for combating drug-resistant pathogens.

Role of Anterior Segment OCT in Diagnosing Inverted Lenticule Following Descemet Stripping Automated Endothelial Keratoplasty

First Author: Pragnya **DONTHINENI**
Co-Author(s): Somasheila **MURTHY**

Purpose: To report the importance of anterior segment optical coherence tomography (ASOCT) in diagnosing inverted lenticule following Descemet stripping automated endothelial keratoplasty (DSAEK).

Methods: Two patients underwent DSAEK (1 patient with congenital glaucoma with corneal edema and another with pseudophakic bullous keratopathy). On the first postoperative day, both patients showed partly attached edematous grafts. ASOCT was done with high resolution corneal quad mode using the Visante ASOCT machine (Carl Zeiss, Jena, Germany) to study the graft thickness, apposition and morphology of the lenticule, and presence of any fluid pockets.

Results: Both cases showed inverted mushroom pattern on ASOCT, suggesting an inverted lenticule. Large area of detachment was also confirmed. Both cases underwent surgical intervention the following day and inverted lenticule was confirmed on the table by demonstration of the Descemet membrane on the side opposed to residual stroma. In case 1, the lenticule was reversed within the anterior chamber and repositioned. In case 2, the lenticule was removed and repeat DSAEK was done. Both the patients had markedly improved vision postoperatively. The first patient had a clear graft and a vision of 20/25 for 1 year and was lost to follow-up.

Conclusions: ASOCT has a high value in diagnosing DSAEK complications postoperatively. Based on the morphology of the graft, an inverted lenticule can be identified, thus allowing for early surgical intervention even if the lenticule is attached.



Symblepharon Management with Fornix Reconstruction Using Buccal Mucous Membrane Transplant in Stevens-Johnson Syndrome

First Author: Zia **MAZHRY**
Co-Author(s): Mirza **SAJID ALI**

Purpose: To demonstrate symblepharon management with fornix reconstruction using buccal mucous membrane transplant in Stevens-Johnson syndrome (SJS).

Methods: A 75-year-old man developed SJS secondary to ciprofloxacin intake. He presented to us with symblepharon and conjunctivalization of cornea in the right more than the left eye. There was a history of repeated surgeries with amniotic membrane transplantation at Moorfields Hospital in the UK. Mucous membrane graft from lip/buccal mucosa was planned. Symblepharon was released, and the available conjunctiva was conferred to fornices. The bare area was measured to estimate the size of needed buccal graft. The patient was counseled about the procedure before surgery, and the anesthetist was informed about the need of a throat pack and placement of the endotracheal tube to one side of the mouth. The donor site was injected with xylocaine and adrenaline. Mucous membrane graft was marked and dissected from the lower lip. The buccal mucosa was transferred to the eyeball. Under-surface was trimmed and cleaned. Central window was created for the cornea. Buccal mucosa was secured on the limbal and fornicial side using 10/0 nylon sutures. Symblepharon shell was applied, and the lids were closed with replaced silk suture.

Results: Successful ocular surface stabilization was achieved. Time to complete ocular surface epithelialization was about 3-4 weeks in this situation. The lower lid defect also healed in the same time.

Conclusions: Ocular surface stability can be successfully achieved by use of buccal mucosal grafting techniques. Prolonged postoperative topical lubricant and anti-inflammatory therapy are mandatory.

Visual Outcome of Corneal Blind Patients Following Penetrating Keratoplasty Followed by Cataract Surgery with Posterior Chamber Intraocular Lens versus PK and Cataract Surgery with PCIOL as a Single Procedure

First Author: Deepak **CHOUDHURY**
Co-Author(s): Jayashree **DORA**, Pramod **SHARMA**

Purpose: To compare visual outcome of corneal blind patients following penetrating keratoplasty (PK) followed by small incision cataract surgery (SICS) with posterior chamber intraocular lens (PCIOL) versus PK and SICS with PCIOL as a single procedure.

Methods: Retrospective interventional case series.

Study duration was 3 years (January 2013 to December 2015). Twenty-five eyes of 25 patients with corneal blindness in whom PK was done along with cataract surgery were included. Fifteen were male. Age ranged from 23-60 years. Patients were examined using Snellen chart and slit lamp biomicroscopy. IOL power was calculated with A scan biometry. In 14 patients PK was done along with SICS and PCIOL as a single procedure. In 11 patients PK was followed by SICS and PCIOL after an interval. Follow-up was done monthly up to 6 months.

Results: Mostly elderly patients > 40 years of age underwent PK with SICS + PCIOL in a single sitting. Due to inadvertent damage to the lens capsule, 3 patients underwent surgeries in a single sitting. In younger patients with clear crystalline lens SICS was done following PK after an interval. PK sutures were removed periodically to tackle astigmatism. Older patients who were operated on in a single sitting had better visual acuity at the end of 6 months. Younger patients who were operated on in a single sitting had lost accommodation that was very cumbersome to them. Younger patients also showed greater incidence of posterior capsular opacity (PCO).

Conclusions: In older patients it is better to do PK and SICS with PCIOL in a single sitting. However, in younger patients care should be taken not to injure the crystalline lens during PK.

Glaucoma

A Case Report on Spontaneous Aqueous Misdirection After Blunt Trauma

First Author: Mariel Angelou **PARULAN**

Purpose: To report a case of spontaneous aqueous misdirection in a Filipino male with a history of trauma and no previous incisional ocular surgery. Aqueous misdirection commonly occurs in patients with primary angle closure glaucoma with previous filtering surgery, but spontaneous events are rarely reported.

Methods: The data of this case were documented from the outpatient department of the ophthalmology clinic of a tertiary government hospital in the Philippines.

Results: A 66-year-old male Filipino had a history of trauma with no penetrating or perforating injury. He initially presented with shallow anterior chamber but with normal intraocular pressure (IOP). Two weeks later, the patient presented with severe eye pain, with findings of raised IOP of 70 mm Hg. Ultrasound biomicroscopy findings showed flat anterior chamber (AC) with iridocorneal touch. IOP-lowering medications were given but IOP decreased only to 46 mm Hg. Pars plana vitrectomy was done and on attempt to do cata-

ract removal, almost 360-degree zonolysis was noted. Posterior phacofragmentation was done and postoperative IOP was 20 mm Hg, which increased to 42 mm Hg after 2 weeks. The patient is currently being controlled with combined topical IOP-lowering medication.

Conclusions: A case of spontaneous aqueous misdirection from trauma may be due to induced zonular laxity. Management involves surgical pars plana vitrectomy. However, postoperative IOP may remain unpredictable, necessitating a second procedure.

A New Surgical Technique of Intra-Scleral Tube Fixation in Ahmed Glaucoma Valve Implantation to Prevent Postoperative Tube-Related Complications: "Scleral Sleeve Method"

First Author: Charudutt **KALAMKAR**

Co-Author(s): Amrita **MUKHERJEE**, Nishant **RADKE**, Snehal **RADKE**

Purpose: To present a new surgical technique, "scleral sleeve method," which would reduce the risk of Ahmed glaucoma valve (AGV) tube exposure, extrusion, and retraction in patients undergoing AGV FP7 model for refractory glaucoma.

Methods: Sixteen eyes of adult patients with refractory glaucoma underwent AGV implantation with intra-scleral tube fixation by "scleral sleeve method." Instead of using sutures to fix the AGV tube to sclera, which carries risk of breakage or getting loose, we devised a novel method of intra-scleral tube fixation by creating a scleral tunnel.

Results: There was no case of tube exposure or extrusion in our series. Scleral tunnel fashioned in the form of a sleeve allows proper tube fixation within the sclera.

Conclusions: Use of the scleral sleeve method will reduce the risk of tube-related complications like exposure, extrusion, and endophthalmitis. It will also re-suture related complications. Larger studies and longer follow-up periods are required to confirm our findings regarding this new technique.

A Prospective Ultrasound Biomicroscopic Evaluation of Changes in Anterior Segment Morphology After Laser Peripheral Iridotomy to Prevent Primary Angle Closure Glaucoma

First Author: Nguyen **HIEN**

Co-Author(s): Vu **ANH**, Thi-Van **BUI**, Pham **THANH**

Purpose: To evaluate changes in the anterior segment after laser peripheral iridotomy (LPI) to prevent primary angle closure glaucoma (PACG).

Methods: Cross-sectional study. Participants included

72 fellow eyes of patients diagnosed with latent angle closure glaucoma (LACG). The fellow eyes of patients diagnosed with LACG were examined with biomicroscopy (UBM) before and 2 days after LPI. UBM images were analyzed using UBM Pro 2000 software.

Results: Seventy-two fellow eyes of patients were examined. AOD250, AOD500, and ARA all significantly increased after segmental laser iridotomy. Other measures of anterior segment morphology such as iris roof deep (ID1), iris curve, trabecular ciliary process distance (TCPD), and iris ciliary process distance (ICPD) all increased. In contrast, anterior chamber depth and lens thickness almost did not change.

Conclusions: LPI produced a significant widening of the anterior chamber angle without deepening the anterior chamber centrally. It also caused changes in iris morphology.

Analysis of Anterior Chamber Parameters After Laser Iridotomy in Eyes with Narrow Angles Using Optical Coherence Tomography

First Author: Andrzej **SAWICKI**

Co-Author(s): Agnieszka **WILKOS-KUC**, Tomasz **ZARNOWSKI**

Purpose: To estimate changes of anterior chamber parameters in eyes of Caucasian patients with narrow angles after laser peripheral iridotomy (LI).

Methods: Included were 33 eyes with narrow angles (25 patients, average age 63 years old) which underwent LI. Seven patients presented subacute syndromes of angle closure, 6 eyes with mild cataract, 3 eyes with glaucomatous damage, and 1 eye with PEX. Gonioscopy was performed and iridocorneal angles were assessed using Shaffer classification. Anterior chamber parameters were analyzed using anterior segment optical coherence tomography (AS OCT) SS-100 Casia and intraocular pressure (IOP) was measured before and 7 days after LI. In the temporal part of the iridocorneal angle the following parameters were assessed: AOD500, AOD750, TIA500, TIA750, ARA500, ARA750, ACD, and LV.

Results: Increases of average values of AOD500, AOD750, TIA500, TIA750, ARA500, ARA750, and LV were observed 7 days after LI. AOD500 in the temporal part increased from 0.16 ± 0.05 to 0.23 ± 0.08 ($P < 0.05$), AOD750 in the temporal part increased from 0.21 ± 0.08 to 0.31 ± 0.1 ($P < 0.05$), TIA500 from 16.72 ± 4.33 to 23.56 ± 7.2 ($P < 0.05$), and TIA750 from 14.92 ± 5.42 to 21.83 ± 6.9 ($P < 0.05$), respectively. Furthermore, there was an increase of ARA500 from 0.09 ± 0.03 to 0.1 ± 0.03 ($P < 0.05$) and ARA750 from 0.15 ± 0.15 to 0.17 ± 0.05 ($P < 0.05$). IOP decreased and LV and ACD increased, but these changes were not statistically significant.



Conclusions: Laser iridotomy increased the average values of the following anterior chamber parameters in patients with narrow angles: AOD500, AOD750, TIA500, TIA750, ARA500, and ARA750. IOP, ACD, and LV did not change significantly.

Argon Laser Iridoplasty as an Adjunctive Treatment for Acute Angle Closure Glaucoma with Ciliary Block

First Author: Ju Chuan CHENG

Purpose: To report the use of argon laser iridoplasty (ALPI) in the management of acute angle closure glaucoma (AACG) with ciliary block.

Methods: We present 3 interventional cases of AACG. They received ALPI because of intractable elevated intraocular pressure (IOP) after full antiglaucoma medications and complete iridotomies.

Results: Three Taiwanese patients presented with severe unilateral headache and blurry vision. The IOP was only partially lowered by systemic hypotensive treatment and laser peripheral iridotomy (LPI). Despite the patent LPs and full antiglaucoma medications, the IOP remained high and symptoms of AACG persisted in all 3 patients. Possible mechanisms other than pupillary block should be considered. On gonioscopy, the angles were 360-degree closed and not openable with indentation. Ciliary processes were visible through the mirror on gonioscopy, which indicated some element of ciliary block in these 3 cases. ALPI was attempted in the mid-peripheral iris on 3 patients at different times. The IOP dropped after ALPI, which was related to the relief of peripheral appositional angle closure and possibly a release of peripheral anterior synechiae.

Conclusions: AACG with elements of ciliary block remains a tough case in the glaucoma clinic. Especially when less than 1/4 of the angle circumference is opened, the IOP may remain high even when the LPI is patent and full antiglaucoma medications are given. Ophthalmologists should remember that ALPI is an efficient first-line intervention in cases of AACG when IOP remains high despite full antiglaucoma medications and patent LPs. Further studies with longer follow-up will be necessary to assess the long-term efficacy.

Ciliary Block Glaucoma Due to Exudative Retinal Detachment in a Pediatric Patient: A Case Report

First Author: Rani SARI

Co-Author(s): Virna ASRORY, Julie Dewi Barliana WINARTO

Purpose: The aim of this report is to demonstrate a rare case of ciliary block glaucoma due to serous retinal detachment and its management.

Methods: Case report. A 3-year-old boy came to the emergency room with the complaint of headache on the left side, redness, and severe pain of the left eye for 1 week before admission. The visual acuity of the left eye was no light perception; intraocular pressure (IOP) was 64 mm Hg with shallow anterior chamber. One month before admission, the patient came to the pediatric ophthalmology division with leukocoria of the left eye. He had ultrasound examination and was assessed as exudative retinal detachment of the left eye with suspected Schwartz-Matsuo syndrome, differential diagnosis with Coats disease.

Results: The patient underwent peripheral iridectomy but the anterior chamber remained shallow. We decided to perform posterior sclerotomy to reduce trapped aqueous in the vitreous body in order to reduce the elevated IOP. One day after surgery, IOP became 16 mm Hg, anterior chamber was deep, and the symptoms were relieved. Some ancillary tests and follow-up were still needed in order to know what caused the retinal detachment and ciliary block glaucoma.

Conclusions: Early diagnosis and prompt treatment are greatly needed in managing ciliary block glaucoma to immediately reduce IOP and relieve the complaint.

Clinical Outcomes of Laser Peripheral Iridotomy for Primary Angle Closure Suspect, Primary Angle Closure, and Primary Angle Closure Glaucoma: One-Year Follow-Up

First Author: Nuriadara SAMIRA

Co-Author(s): Virna ASRORY

Purpose: To evaluate the outcomes of laser peripheral iridotomy (LPI) as the initial management of primary angle closure suspect (PACS), primary angle closure (PAC), and primary angle closure glaucoma (PACG).

Methods: One hundred two patients (122 eyes) diagnosed with closed angle who underwent LPI as the initial management were included. Intraocular pressure (IOP), success rate, glaucomatous progression, and additional treatments were evaluated.

Results: Twenty-three eyes (22.5%) were diagnosed as PACS, 22 eyes (21.6%) as PAC, and 57 eyes (55.9%) as PACG. The lowest IOP was achieved 6 months afterward in the PACS group (13.74 ± 3.07 mm Hg), 12 months afterward in the PAC group (13.1 ± 1.69 mm Hg), and 6 and 12 months afterward in the PACG group (13.81 ± 3.74 mm Hg and 13.77 ± 3.30 mm Hg, respectively). Four of 7 (57.13%) PAC eyes were successfully treated with laser peripheral iridotomy alone in 1 year of follow-up and only 13 of 32 eyes in PACG (40.63%). The proportion of eyes not requiring medical treatment post iridotomy increased from 39% to 70% in the PAC group and from 41% to 50% in the PACG group. In PAC, 2 eyes underwent phacoemulsification and 3 eyes

underwent filtering surgery, compared with 8 and 3 eyes in PACG.

Conclusions: Eyes that underwent LPI required less intervention for either IOP lowering or surgery. Filtering surgery after LPI was mostly done in PACG eyes. Laser peripheral iridotomy is recommended as an initial treatment for glaucoma associated with angle closure.

Clinical Outcomes, Acceptability, and Cost Comparison of Ologen versus Mitomycin C in Trabeculectomy in a Developing Muslim Country: A Prospective Randomized Study

First Author: Bipul **SARKER**

Co-Author(s): Zafrul **HASSAN**

Purpose: To assess the efficacy, safety, cost, and patient acceptability of Ologen (OLO) implant as adjuvant compared with mitomycin-C (MMC) in trabeculectomy.

Methods: In this prospective, randomized, comparative study, 78 eyes of 66 patients with primary glaucoma were allocated for trabeculectomy either with Ologen implant (38 eyes) or with MMC (40 eyes). The patients were followed up for 1 year and evaluated for success, with parameters including intraocular pressure (IOP), status of the bleb, and adverse events. Complete success was defined as an IOP \leq 21 mm Hg with no additional glaucoma medications. Additionally, all patients who fulfilled the inclusion criteria but did not consent to participate in the study after learning the source of Ologen (the porcine source) were documented. The cost burden of the 2 procedures was also calculated.

Results: The IOP was significantly reduced in both groups. The rate of complete success in the Ologen group was similar to that in the MMC group. The bleb height achieved with the Ologen implant was higher than the MMC group. There was no significant difference in postoperative complications. Eighty-five percent of patients fulfilling selection criteria did not accept Ologen as adjuvant due to religious beliefs. Additionally, Ologen cost 3 times more (US\$200) than MMC for the procedure.

Conclusions: The success of trabeculectomy and complications were similar in both Ologen and MMC groups but the acceptability of Ologen among the Muslim population was very low. Additionally, this places a cost burden on the patient in a developing country where health insurance facilities are not widely available.

Comparing the Efficacy of Xalatan and a Similar Latanoprost (Drenatan) in Open Angle Glaucoma Patients

First Author: Bernardo **SOARES**

Purpose: To compare the efficacy of the brand Xalatan and a similar latanoprost (Drenatan) in monotherapy

in intraocular pressure (IOP) reduction in patients with primary open angle glaucoma (POAG).

Methods: One hundred nineteen eyes were enrolled in this observational, retrospective study. In the first visit the patient presented using the brand Xalatan and at the second visit 12 weeks later received a similar latanoprost (Drenatan). A complete ophthalmologic exam including slit lamp examination, Goldmann applanation tonometry, stereoscopic fundus examination, gonioscopy, ultrasound pachymetry, and automated visual field testing was performed in each visit.

Results: The mean IOP was 12.30 ± 2.02 and 12.38 ± 2.05 using Xalatan and Drenatan, respectively. Out of the eyes enrolled, 38 (31.93%) had an IOP value that increased and 51 (42.86%) had an IOP value that decreased. Thirty eyes (25.21%) maintained the same IOP in both measures. Thirteen eyes showed an IOP rise of above 2 mm Hg or more (10.92%) and 7 reduced over 2 mm Hg (5.88%). The difference in IOP reduction between the 2 drugs showed no statistical significant difference. $P = 0.558936$ demonstrates this relation. In fact, a correlation between the groups of $R = 0.986774$ shows the remarkable resemblance of both groups.

Conclusions: Both Drenatan and Xalatan have similar efficacy in reducing IOP.

Doppler Imaging of Internal Carotid Artery in Asymmetrical Primary Open Angle Glaucoma

First Author: Sonal **DANGDA**

Co-Author(s): Mainak **BHATTACHARYYA**, Kirti **JAISINGH**, Usha **YADAVA**

Purpose: To assess the significance of Doppler imaging of the internal carotid artery (ICA) in asymmetrical primary open angle (POAG) and normal tension glaucoma (NTG).

Methods: Patients presenting with asymmetrical glaucomatous changes and open angles on gonioscopy were evaluated for ICA Doppler imaging. The peak systolic velocity (PSV), end diastolic velocity (EDV), mean velocity (MV), resistance index (RI), and pulsatility index (PI) were compared between the 2 eyes. ICA was also evaluated for any gross luminal narrowing or plaque on the affected side.

Results: Fifteen patients, 40-65 years, with 0.7-0.9 optic cupping and mean intraocular pressure (IOP) of 34.6 ± 12.8 mm Hg in the worse eye were studied. The fellow eye showed 0.2-0.5 cupping and mean IOP of 23.71 ± 3.98 mm Hg. The mean PSV and EDV on the affected side of 56.87 ± 22.66 (range, 16-106) cm/sec and 20.03 ± 9.82 (range, 6-38) cm/sec were found to be lower, although not statistically significant ($P = 0.84$, $P = 0.39$), than 59.13 ± 20.85 (range, 24-98) cm/sec and 22.8 ± 9.3 (range, 10-35) cm/sec, respectively, on the opposite side. The resistance to flow was higher on the



affected side, although not statistically significant, with mean RI being 0.64 ± 0.11 and 0.61 ± 0.05 ($P = 0.43$) and mean PI of 0.96 ± 0.24 and 0.89 ± 0.12 ($P = 0.47$), respectively. Ipsilateral atherosclerotic plaques were evident in 3 subjects.

Conclusions: Although higher RI and PI on the affected side hint at subtle differences in blood flow patterns, these parameters were not found to be statistically significant. An increased resistance higher up in the vascular tree might need to be looked at. Thus, Doppler study of only ICA might not suffice and a greater in-depth analysis with a larger sample needs to be considered.

Effect of Adjuvant Selective Laser Trabeculoplasty in the Treatment of Primary Open-Angle Glaucoma

First Author: Wei-Yang LU

Co-Author(s): Shin-Lin CHIU, San-Ni CHEN

Purpose: To evaluate the efficacy of selective laser trabeculoplasty (SLT) on intraocular pressure (IOP) for the treatment of primary open angle glaucoma (POAG).

Methods: Forty-two subjects with bilateral medically treated POAG were included. All patients underwent adjuvant 180 or 270 degrees of SLT on only 1 eye between 2010 and 2015 and continued the current medication. IOP of both eyes was measured before and 2 weeks, 1, 3, 6, and 12 months after SLT.

Results: Before SLT, there was no significant difference between the mean IOP of both eyes (15.4 ± 2.6 mm Hg vs 15.2 ± 2.5 mm Hg, $P = 0.22$), and good correlation of pre-SLT IOP in both eyes was observed. After SLT, IOP increased mildly to 16.3 ± 2.7 mm Hg by the first 2 weeks ($P = 0.53$) in the SLT eye. However, mean IOP in the SLT eye decreased to 12.5 ± 2.9 mm Hg at 1 month ($P \leq 0.001$). There was a sustained and statistically significant ($P < 0.001$) decrease in IOP in that eye at 3, 6, and 12 months. In contrast, the IOP in the fellow eye (non-SLT) remained unchanged.

Conclusions: There is a sustained decrease in IOP after SLT in POAG eyes. Both 180 and 270 degrees of SLT are effective and safe supplemental treatment for patients with medically treated POAG in further lowering IOP. Transient IOP spikes usually resolve quickly with or without anti-glaucoma treatment. The effect of IOP decrease after SLT is unilateral and does not affect the fellow eye.

Effects of Phacoemulsification and Intraocular Lens Implantation on Intraocular Pressure in Chronic Angle Closure Glaucoma

First Author: Wei-Yang LU

Co-Author(s): Shin-Lin CHIU

Purpose: To evaluate the effects of phacoemulsification and posterior chamber intraocular lens (PCIOL) implantation in patients with chronic angle closure glaucoma (CACG).

Methods: Patients of CACG with co-existing visually significant cataracts were included in this retrospective chart review. After obtaining informed consent, clear cornea phacoemulsification and foldable PCIOL implantation was performed. Patients were followed for at least 6 months. Outcome measures included intraocular pressure (IOP) and number of glaucoma medications.

Results: Fifty-seven eyes of 57 patients with CACG including 15 male and 42 female subjects were evaluated. Mean age was 68.8 ± 11.1 years. Mean number of glaucoma medications was 1.6 ± 0.7 preoperatively and was reduced to 0.6 ± 0.6 at 6 months after surgery ($P < 0.001$). All patients used glaucoma medications before surgery, but 23 patients (40.4%) did not need any glaucoma medications at final follow-up. The mean IOP significantly decreased from 20.3 ± 4.8 to 14.2 ± 2.7 mm Hg at 6 months after surgery ($P < 0.001$).

Conclusions: In CACG patients with co-existing cataracts, phacoemulsification and PCIOL implantation can significantly reduce IOP and the number of glaucoma medications. However, we should take the intraoperative conditions into consideration such as poor mydriasis, a shallow anterior chamber, and zonular weakness.

Evaluating the Effect of the Reliability Indices on Mean Deviation and Pattern Standard Deviation in Humphrey Automated Static Perimetry

First Author: Nicholas TAN

Co-Author(s): Ching-Yu CHENG, Victor KOH, Yuan SHI, Yih-Chung THAM, Tien WONG

Purpose: To evaluate the effect of false negatives (FN), false positives (FP), and fixation losses (FL) on the mean deviation (MD) and pattern standard deviation (PSD) in normal eyes on Humphrey automated static perimetry.

Methods: Adults aged from 40-80 years were recruited from the population-based Singapore Chinese Eye Study, where the SITA-Standard 24-2 automated static perimetry on the Humphrey Field Analyser was performed as part of the assessment. The effects of the reliability indices on the MD and PSD were examined using linear regression.

Results: A total of 722 visual fields from normal eyes of 722 patients were included in the analysis. The mean (\pm SD) age was 44.5 ± 6.15 years, and 48.6% were males. The mean (\pm SD) best corrected (logMAR) visual acuity (BCVA) was $0.03 (\pm 0.05)$. The mean (\pm SD, range) of the FN, FP, and FL responses in percentages were $4.29 (\pm 7.47, 0-73)$, $3.61 (\pm 5.94, 0-59)$, and $10.98 (\pm 14.76, 0-93)$, respectively. In multiple linear regression adjusted for age, gender, and BCVA, the MD was found to be associated with FN ($\beta = -0.210$, $P < 0.001$) and FP ($\beta = 0.110$, $P < 0.001$), and the PSD was associated with FN ($\beta = 0.161$, $P < 0.001$) and FL ($\beta = 1.091$, $P = 0.003$).

Conclusions: The MD is affected significantly by the FN and FP responses, and the PSD by the FN and FL responses, with FN having the greatest impact. Thus, a stricter cutoff for FNs may be prudent in the interpretation of the visual fields.

Glycopyrrolate Induced Bilateral Angle Closure Glaucoma After Urological Surgery: A Case Report

First Author: Shu-Chun **KUO**

Co-Author(s): Hsin-Ying **LIN**, Yu-Shiuan **LIN**

Purpose: To report a case of bilateral acute angle closure glaucoma after urological surgery with the use of glycopyrrolate.

Methods: A case report.

Results: A 74-year-old male patient presented with bitemporal headache and nausea/vomiting that started hours postextubation from a urological surgery. The neurologic image study and gastrointestinal examination revealed negative findings. Bilateral acute visual loss and eye fullness sensation and pain developed gradually. Traced back to his recent medication history, neostigmine (3 mg) and glycopyrrolate (0.6 mg) were used as muscle relaxant reversals at the end of the surgery. Ophthalmic examination revealed acute angle closure glaucoma with plateau iris configuration and thick lens that was treated medically along with laser iridotomy. The patient's visual acuity recovered and intraocular pressure returned to normal range after medical treatment and laser intervention. He did not complain of further headache, vomiting, or eye discomfort.

Conclusions: Glycopyrrolate is a common medication combined with neostigmine to reverse neuromuscular block during the end of general anesthesia. However, the anticholinergic effect of glycopyrrolate might result in bilateral glaucoma in patients who have high risk factors, such as thick lens and shallow anterior chamber and plateau iris configuration. These parameters should be taken into account while making arrangements for surgery with general anesthesia.

Influence of Gender on Mean Deviation in Humphrey Automated Static Perimetry

First Author: Nicholas **TAN**

Co-Author(s): Ching-Yu **CHENG**, Victor **KOH**, Yuan **SHI**, Yih-Chung **THAM**, Tien **WONG**

Purpose: To determine the difference in the mean deviation (MD) between males and females in normal eyes on Humphrey automated static perimetry.

Methods: Adults ranging in age from 40 to 80 years were recruited from the population-based Singapore Chinese Eye Study, where the SITA-Standard 24-2 automated static perimetry on the Humphrey Field Analyser was performed as part of the assessment. The effect of gender on the MD was examined using independent t test, followed by multiple linear regression, with analysis adjusted for potential confounders.

Results: A total of 604 reliable visual fields from normal eyes of 604 patients were included in the analysis. A total of 50.3% were males and 49.7% females with mean ages (\pm SD) of $53.6 (\pm 6.5)$ and $53.2 (\pm 5.8)$, respectively. The mean (\pm SD) best corrected (logMAR) visual acuity (BCVA) was $0.03 (\pm 0.05)$. The mean MD (\pm SD) was $-1.19 (\pm 1.86)$ in males and $-1.72 (\pm 2.11)$ in females ($P = 0.01$). In multiple linear regression adjusted for age, FN, FP, and FL, the female gender was associated with lower MD values ($\beta = -0.389$, $P = 0.005$). There was no significant difference in PSD between males and females.

Conclusions: In eyes with otherwise normal and reliable visual fields, the MD was found to be in generally lower in females compared to males. Consequently, the current normative database to which the mean sensitivity of an individual visual field is compared should also take patient gender into account.

Initial Clinical Experience with Ahmed Glaucoma Valve Implants with Autologous Partial Thickness Scleral Flap Method in a Rural Population of Central India

First Author: Charudutt **KALAMKAR**

Co-Author(s): Amrita **MUKHERJEE**, Nishant **RADKE**, Snehal **RADKE**

Purpose: To report initial experience and outcomes of patients of a economically backward community in rural and tribal Central India who presented to us with refractory glaucoma.

Methods: Retrospective, consecutive, hospital-based case series of 23 adult refractory glaucoma patients undergoing Ahmed glaucoma valve (AGV) implantation from October 2012 onwards. Minimum follow-up of 6 months. Autologous partial thickness scleral flap method was used in all cases.

Results: AGV implantation with scleral flap method was done for all patients (neovascular glaucoma, 11; uve-



itic glaucoma, 3; failed trabeculectomy primary angle closure glaucoma, 5; advanced primary angle closure glaucoma, 3; post-traumatic glaucoma, 1). Average pretreatment intraocular pressure (IOP) reduced from 49.48 ± 4.75 mm to 16.78 ± 2.04 mm postoperatively at last follow-up ($P < 0.01$). IOP was controlled in 19 patients (82.61%). Failure occurred in 4 of the 23 cases (defined as IOP < 5 mm or > 21 mm). Immediate complications encountered were hyphema in 2 patients (8.69%), tube endothelial touch in 1 patient (4.35%), and tube opening plugged by iris in 1 patient (4.35%). All 4 patients subsequently recovered.

Conclusions: Ahmed glaucoma valve implant with autologous partial thickness scleral flap is a good and reliable method in managing our subgroup of adult refractory glaucoma. Our results were comparable with previously published reports with low complication and failure rates. Popularity of glaucoma drainage devices is still low in our region, which is preferable in this subgroup of refractory glaucoma patients, where conventional glaucoma surgery is likely to fail. Randomized clinical studies with long-term follow-up and larger sample size would be beneficial for us to confirm these initial outcomes.

Knowledge and Attitude Towards Glaucoma Among Health Cadre

First Author: Rima OCTAVIANI

Purpose: To determine the degree of knowledge and attitude towards glaucoma among health cadre in Semarang.

Methods: A questionnaire was circulated among health cadre in the Public Health Service of Gunungpati Semarang. The questionnaire was designed to collect data on statements including basic knowledge about glaucoma, its complications, people's attitudes, and sources of information about the disease. The questionnaires were distributed randomly to 20 persons in September 2016. Data were analyzed in a descriptive fashion.

Results: The majority of respondents had never heard the term "glaucoma" (60%) nor "silent thief of sight" (80%). The basic knowledge about glaucoma was poor; 60% did not know about glaucoma nor its complications (90%). However, the attitudes towards glaucoma were fair after adequate information. Furthermore, the results indicate that the contribution of health providers was limited in providing the health cadre with adequate information about this health problem.

Conclusions: The outcomes of this study indicate a low level of knowledge about glaucoma among health cadre. This should be recognized by professional health care providers and utilized in future campaigns. Health education is important and required for early detection to prevent irreversible blindness from glaucoma.

Low Concentration Mitomycin C Augmented Trabeculectomy in Advanced Glaucoma

First Author: Rakshya PANTA SITOULA

Purpose: The purpose of this study was to analyze the efficacy and safety of low dose (0.2 mg/mL for 2 minutes) intraoperative mitomycin C (MMC) in primary trabeculectomy in patients with advanced glaucoma.

Methods: Retrospective analysis of prospectively collected data from December 2013 to December 2015 was done. All patients with advanced primary glaucoma [cupping ≥ 0.9 with visual field defects and elevated intraocular pressure (IOP)] who underwent primary trabeculectomy with low dose MMC (0.2 mg/mL) with minimum follow-up of 1 year were included in the study. The patients were followed up postoperatively with IOP measurements at day 1, 2 weeks, 6 weeks, 6 months, and 1 year. The outcome was defined based on postoperative IOP: hypotony (< 6), good (7-15), satisfactory (16-21), and poor (> 21).

Results: Thirty eyes of 26 patients (19 males and 7 females) met the inclusion criteria. Mean age was 41.4 years (range, 20 to 80 years). Mean preoperative IOP was 31.3 ± 13.5 mm Hg. Following trabeculectomy with 0.2% MMC, mean IOP decreased to 11.2 ± 4.2 mm Hg at 6 months and 11.4 ± 4 mm Hg at 1 year. Significant improvement was seen in IOP reduction (paired sample t test, $P < 0.001$). At 1-year follow-up, IOP was < 6 in 2 patients (6.7%), 7-15 in 23 (76.7%), 16-21 in 4 (13.3%), and > 21 in 1 (6.3%).

Conclusions: Low concentration MMC (0.2 mg/mL) in primary trabeculectomy was found to be safe and effective for the treatment of patients with advanced glaucoma.

Micropulse Transscleral Cyclophotocoagulation in the Management of Different Glaucomas

First Author: Zbigniew ZAGÓRSKI

Co-Author(s): Katarzyna MOŁĘDA-GŁADYSZ

Purpose: To evaluate the safety and hypotensive effect of micropulse cyclophotocoagulation (CPC) in selected patients with different kinds of glaucoma.

Methods: Between July and August 2016, micropulse CPC was applied in 22 eyes of 20 patients, 12 males and 8 females with mean age of 54.3 years (range, 8-90), with the following glaucomas: 4 primary open-angle glaucoma, 1 ocular hypertension, 2 narrow angle, 15 secondary. In all patients after peribulbar anesthesia, a Cyclo G6 laser (Iridex) was used with the standard settings: 2 x 80 sec, 2000 mW, and 31.3% duty cycle. After laser application, patients received antibiotic/steroid drops for 5 days and continued antiglaucoma medications, which were tapered during the follow-up

according to intraocular pressure (IOP) measurements.

Results: Mean preoperative pressure was 32 mm Hg (range, 20–58). Mean pressure after CPC was 22 mm Hg (range, 12–40). Significant IOP reduction (>30%) was achieved in 14 eyes, no reduction or increase (Sturge-Weber syndrome) in 5 eyes, and in 3 eyes IOP reduced by 15–20%. In 14 patients the number of topical medications was reduced from mean 2.4 to 1.8 after 4 to 8 weeks. All patients were pain free and inflammation free during follow-up.

Conclusions: Micropulse CPC is a promising new technology that can be safely applied in different forms of glaucoma. It has a significant effect in about 2/3 of patients after the first application and, if indicated, can be repeated.

Mutational Spectrum of the CYP1B1 Gene in Pakistani Patients with Primary Congenital Glaucoma: Novel Variants and Genotype-Phenotype Correlations

First Author: Ashok KUMAR

Purpose: This study aimed to investigate the role of CYP1B1 mutations in primary congenital glaucoma (PCG) in Pakistani patients.

Methods: After consent was received, 20 families with more than 1 member affected with primary congenital glaucoma were enrolled in the study. The disease was confirmed with standard ophthalmological investigations. Genomic DNA was extracted from whole blood for localization of linkage and sequencing. Bioinformatics tools were used to assess the predicted pathological role of novel variants.

Results: Ten out of 20 families (50%, 10/20) showed homozygosity with CYP1B1-linked short tandem repeat (STR) markers. On direct sequencing of the CYP1B1 gene in the linked families, 6 mutations, including 2 novel pathogenic variants, were identified. p.R390H was the most frequently found mutation in 5 families (50%, 5/10), whereas c.868_869insC, p.E229K, and p.A115P were found once in 3 families. Two novel mutations, a missense mutation (p.G36D) and an in-frame deletion mutation (p.G67-A70del), were segregated with disease phenotype in 2 families. Age of disease onset was congenital in all mutations; however, disease severity and response to clinical interventions varied among the mutations and families. Haplotype analysis using 5 polymorphisms revealed a distinct haplotype for a common mutation.

Conclusions: This is the largest cohort of Pakistani patients with PCG to be genetically screened for CYP1B1 mutations. Identifying common mutation and genotype-phenotype correlations may help in genetic testing and better prognosis for the disease. Novel mutations identified in the study may help in better un-

derstanding the pathophysiology of CYP1B1-associated glaucoma.

Outcome of Laser Peripheral Iridectomy

First Author: Deepanee WEWALWALA

Purpose: The study was done to evaluate the intraocular pressure (IOP) and angle opening response following laser peripheral iridectomy (YAG PI) in patients with glaucoma or ocular hypertension (OHT).

Methods: Records of 63 patients (aged 51–82) who underwent YAG PI during a period of 13 months were reviewed. The gonioscopic opening of the angle, pattern of IOP change, and change of medication were analyzed.

Results: Grade III opening of all or 3 quadrants occurred in 54 out of 110 (49%) eyes. Some opening compared to previous angle was seen in another 38% of eyes. There was no change in 13% of eyes. The proportion of eyes with IOP less than 21 mm Hg to eyes with more than 22 before PI (treated or not) was 1.34:1. Two to 4 weeks after PI, this proportion was 1.58:1. At the last recorded review (3 to 12 months after), it was 5.63:1. An IOP spike of 30–54 was seen in 31 eyes between 2/52–6/12. Twenty-eight out of 114 eyes (25%) achieved stable IOP with reduced or absent medication; 33% of eyes needed to be kept on the same, while 23% of eyes needed step up of medication. Few opted to have intraocular lens implant or trabeculectomy (8%). A total of 11% of eyes were untreated before and after PI.

Conclusions: YAG PI was beneficial in these patients by opening the angle and by lowering IOP. Reduction of medication was possible in a small proportion. Significant IOP spikes occurred even months after.

Outcomes of 360-Degree Suture Trabeculectomy Ab Interno for Secondary Glaucoma in Patients with Transthyretin Familial Amyloidotic Polyneuropathy

First Author: Takahiro KAWAJI

Co-Author(s): Tomoki SATO

Purpose: Transthyretin familial amyloidotic polyneuropathy (TTR-FAP), which is characterized by systemic accumulation of mutant amyloidogenic TTR in several organs and peripheral nerves, has several ocular manifestations and secondary glaucoma, especially, is a serious complication. We previously reported that trabeculectomy with mitomycin C may not have a sufficient effect on secondary glaucoma associated with TTR-FAP and that this method has several significant bleb-related complications due to amyloid deposition (PLoS One, 2014). Therefore, we assessed the outcomes of 360-degree suture trabeculectomy ab interno (360iSLOT) for secondary glaucoma associated with TTR-FAP.

Methods: This prospective study included 4 eyes of 4 patients with secondary glaucoma associated with TTR-FAP who underwent 360iSLOT with follow-up of 1 year. The intraocular pressure (IOP), number of anti-glaucoma medications, and operative complications were assessed preoperatively and postoperatively at 1 month, 3 months, 6 months, and 12 months.

Results: Mean IOP, which was 29.5 mm Hg at baseline, showed a significant decrease at each time point, reaching 15.5 mm Hg at 12 months after surgery ($P < 0.001$, paired t test). The mean number of anti-glaucoma medications decreased from 5.0 at baseline to 2.0 at 12 months after surgery ($P = 0.007$, paired t test). IOP spikes > 30 mm Hg were seen in 1 eye, but there were no other serious complications.

Conclusions: 360iSLOT seems to be an effective procedure to treat secondary glaucoma associated with TTR-FAP.

Parapapillary Atrophy in Myopic Patients with Primary Open-Angle Glaucoma

First Author: Szu-Yuan LIN

Purpose: To investigate the parapapillary atrophy of companion eyes in myopic patients with primary open-angle glaucoma.

Methods: Thirty-three myopic patients (mean age, 51 ± 10 years; 12 women) with unilateral glaucomatous-appearing visual field (VF) defects were analyzed. A comparison was performed between the eyes with glaucomatous VF defects and contralateral normal eyes. Beta-zone parapapillary atrophy (PPA) was defined as an inner crescent of chorioretinal atrophy with visible sclera and choroidal vessels. The area of beta-zone PPA was measured using Image J software. Linear regression analyses were performed to investigate various ocular parameters that may be associated with the severity of VF defect.

Results: The degree of myopia (-5.58 ± 3.21 diopters) of VF-affected eyes was statistically less than that of the normal contralateral eyes (-4.94 ± 3.03 diopters; $P = 0.001$). The axial length (26.34 ± 1.29 mm) of VF-affected eyes was statistically greater than that of the normal contralateral eyes (26.13 ± 1.21 mm; $P = 0.01$). There was no difference in the beta-zone PPA between the VF-affected eyes (16340 ± 18972) and normal contralateral eyes (13242 ± 16171 ; $P = 0.19$). In linear regression analysis, only vertical cup-to-disc ratio ($P = 0.006$) was associated significantly with the severity of VF defect.

Conclusions: The beta-zone PPA was not significantly larger in the VF-affected eyes in myopic patients with primary open-angle glaucoma. Evaluating the parapapillary atrophy in myopic patients might not assist in the diagnosis of glaucoma.

Posttraumatic Glaucoma in Children of a Rural Area in Central India: Profile, Management, and Prognosis

First Author: Amrita MUKHERJEE

Co-Author(s): Nishant RADKE, Snehal RADKE, Charudutt KALAMKAR

Purpose: To present findings and evaluate the mode of injuries, management of glaucoma, and final outcome in terms of vision and control of intraocular pressure (IOP) in posttraumatic glaucoma in a pediatric population of a rural area in central India.

Methods: Hospital-based retrospective study of 32 eyes of pediatric patients (younger than 16 years) with posttraumatic glaucoma. Five-year (January 2010 to June 2015) case records were analyzed for demography, cause, and type of injury [open globe (OGI) or closed globe injury (CGI)], Ocular Trauma Score, treatment (medical or surgical), pre/post-treatment best corrected visual acuity (BCVA) and IOP. Minimum follow-up was 6 months.

Results: Out of 205 pediatric eyes with ocular trauma, 32 (15.6%) eyes had glaucoma. Out of these 10 (31.25%) eyes had raised IOP at presentation, 17 (53.1%) eyes developed glaucoma within 1 month, while 5 (15.6%) eyes developed glaucoma after 1 month. Glaucoma was more commonly associated with CGI as compared to OGI (20.7% of CGI vs 8.3% of OGI). Medical management was sufficient to control IOP in 24 (75%) eyes while 8 (25%) eyes required surgical intervention in form of hyphema drainage (2 eyes), trabeculectomy (5 eyes), and Ahmed glaucoma valve implantation (1 eye). Time to presentation varied from 2 hours to 15 days with only 5 (15.7%) patients presenting within 24 hours of trauma. Poorer visual outcomes were associated with OGI and presence of posterior segment abnormalities like vitreous hemorrhage, intraocular foreign body, and traumatic optic neuropathy.

Conclusions: Glaucoma is an important cause of ocular morbidity in pediatric ocular trauma. CGI is a dominant cause of PTG in pediatric patients. OGI is also associated with late-onset glaucoma.

Relationship Between Altitudinal Visual Field Asymmetry and Retinal Oximetry

First Author: Zhu Li YAP

Purpose: This study compares intraocular retinal oximetry in glaucomatous eyes displaying asymmetrically affected hemifields across different subgroups of glaucoma.

Methods: In this prospective cross-sectional study, 99 patients [primary angle closure glaucoma (PACG), $n = 28$; primary open angle glaucoma (POAG), $n = 37$; normal tension glaucoma (NTG), $n = 34$] underwent

retinal oxygenation and vessel caliber measurements using Oxymap T1 Retinal Oximeter, Cirrus OCT, and HVF testing. For comparison between different subtypes of glaucoma, ANOVA with Bonferroni method was performed. Intra-eye differences were compared with paired *t* test. Determination of the more and less affected hemifield was made using the HVF pattern deviation plot.

Results: Following the mean deviation and AGIS score, the visual field defects were milder in NTG as compared to POAG and PACG ($P < 0.05$). Arteriole diameter was smaller in the more affected hemifield compared to the less affected hemifield in patients with PACG and NTG. The more affected hemifield was also shown to have a significantly thinner RNFL than the less affected hemifield in patients across all 3 groups, though this was only significant in PACG ($P = 0.02$) and NTG patients ($P < 0.01$). In all 3 groups, the less affected hemifield tended to have a marginally higher arteriole and venule oxygen saturation than the more affected hemifield but was statistically insignificant. There were no significant differences in arteriovenous (AV) difference between the more and less affected hemifield in all 3 groups.

Conclusions: In our study, localized glaucomatous losses were not associated with changes in retinal oximetry but were associated with narrower retinal arteriolar diameters in PACG and NTG.

Review of the Efficacy of Generic Latanoprost 0.005% in Subjects Newly Diagnosed with OHT, POAG, or NTG

First Author: Sam Yuen Sum **LEE**

Co-Author(s): Akash **RAJ**, Dilraj **SAHOTA**

Purpose: Our aim in this study is to assess the short- to medium-term efficacy of generic latanoprost in subjects newly diagnosed with ocular hypertension (OHT), primary open angle glaucoma (POAG), or normal tension glaucoma (NTG).

Methods: We conducted a single-center retrospective analysis of subjects newly diagnosed with OHT, POAG, or NTG between January 2015 and January 2016. Subjects without any previous glaucoma treatment were included in the study. Exclusion criteria were narrow anterior chamber angle, history of acute angle closure, current use of contact lenses, history of argon laser trabeculoplasty, or any past ocular filtering surgical intervention.

Results: Forty-two patients were enrolled in the study with 76 eyes (34 bilateral and 8 unilateral). Mean age of patients was 63. End point for the study was when subjects changed medications or if any extra treatment including drops or laser was given. Mean intraocular pressure (IOP) at baseline was 22.24 mm Hg (SD, 5.43)

and mean IOP reduction following an average of 8 months' follow-up was 15.22 mm Hg (SD, 3.75). This represents an average of 27.04% reduction in IOP with generic latanoprost as first-line treatment. Almost 20% (15/76) of eyes were non-responders to generic latanoprost by month 6 and were either changed to lumigan (11%), additional drops were added (1%), or changed to combination drops (5%) and argon laser trabeculoplasty offered (3%).

Conclusions: Generic latanoprost 0.005% is effective in reducing baseline IOP by 27.04% in subjects newly diagnosed with OHT, POAH, and NTG. Although not the 30% stated in some literature, its IOP lowering effect is still comparable.

Structure-Function Relationships Between Eye, Brain, and Visual Field in Glaucoma

First Author: Kevin **CHAN**

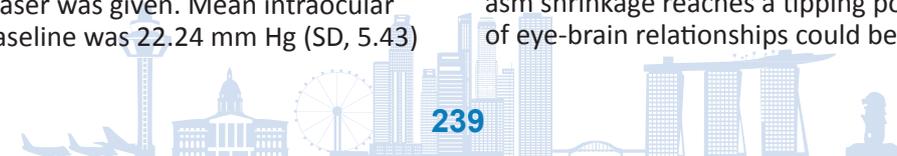
Co-Author(s): Ian **CONNER**, Swarupa **KANCHERLA**, Yun **LING**, Joel **SCHUMAN**, Gadi **WOLLSTEIN**

Purpose: Retinal structure and visual function relationships in glaucoma have been described by a broken-stick model, in which detectable visual field (VF) functional loss emerges after retinal nerve fiber layer (RNFL) thinning reaches a tipping point. In this study, we extended beyond the RNFL and hypothesized that there are strong structure-function relationships between eye, brain, and visual field in glaucoma.

Methods: Fourteen early glaucoma, 17 advanced glaucoma, and 8 healthy controls underwent whole-brain T1-weighted MRI at 3 Tesla. Cross-sectional areas of optic nerve (ON) and optic chiasm (OC) were manually measured and compared to spectral-domain optical coherence tomography and Humphrey VF using linear and broken-stick analyses.

Results: Positive linear correlations were observed between ON area and peripapillary RNFL thickness ($R = 0.48$), macular ganglion cell-inner plexiform layer (GCIPL) thickness ($R = 0.44$), and VF mean deviation ($R = 0.37$) ($P < 0.05$), and between OC area and RNFL thickness ($R = 0.53$), GCIPL thickness ($R = 0.48$), and VF mean deviation ($R = 0.44$) ($P < 0.05$). Negative linear correlations were observed between ON head cup-to-disc ratio and ON area ($R = -0.34$) and OC area ($R = -0.53$) ($P < 0.05$). Broken-stick model analyses showed that VF mean deviation deteriorated at 2 different rates with RNFL thickness ($P < 0.05$), GCIPL thickness ($P < 0.05$), and OC area ($P = 0.07$).

Conclusions: Glaucomatous degeneration in ON and OC appeared associated with retinal morphology. In addition, the rate of VF functional loss may accelerate with disease severity after retinal thinning or optic chiasm shrinkage reaches a tipping point. Determination of eye-brain relationships could be important for un-



derstanding glaucoma as a disease of the visual system and for guiding vision preservation.

Surgical Revision of Dysfunctional Overhanging Bleb with Bleb Excision and Sliding Rotational Conjunctival Flap: A Case Report

First Author: Bipul **SARKER**
Co-Author(s): Zafrul **HASSAN**

Purpose: An overhanging dysesthetic bleb is a late complication of glaucoma filtration surgery, sometimes requiring surgical revision if conservative measures fail. The introduction of anti-metabolite regimens has increased the frequency of dysfunctional blebs. We report a surgical technique for the repair of trabeculectomy blebs using bleb excision and a sliding rotational conjunctival flap.

Methods: A 62-year-old male who had undergone a fornix-based trabeculectomy with an anti-metabolite 7 years prior in the left eye presented to our institution complaining of persistent, disabling discomfort in the region of the bleb despite frequent lubrication. Examination revealed an avascular bleb which measured 9 mm in its largest diameter and intraocular pressure (IOP) was 21 mm Hg with topical medication. During surgery, excision of the bleb was first performed, and a relaxing incision was created to facilitate the extension of the conjunctival flap for the closure of large conjunctival defect. The flap was then advanced and rotated over the gap and secured in place by compression suture.

Results: Postoperatively the patient was followed up to 6 months with no symptoms, and there was well-formed functioning bleb. IOP decreased to 12 mm Hg without medication and vision improved 2 lines on Snellen chart.

Conclusions: Sliding rotational conjunctival flap after relaxing incision can be a successful technique for the treatment of bleb dysfunction where closure of a large gap is needed. The major advantages compared with other techniques are desired IOP control and reduced postoperative complications.

Intraocular Inflammation, Uveitis & Scleritis

***Klebsiella* Endophthalmitis: Endogenous or Exogenous Endophthalmitis**

First Author: Havriza **VITRESIA**
Co-Author(s): Heksan **BAHAR**

Purpose: To report a case with *Klebsiella* endophthalmitis after cataract surgery. While a number of organisms have been implicated in endogenous endophthalmitis, *Klebsiella* spp. have been recognized as

one of the causative organisms in the Asian population. The Endophthalmitis Vitrectomy Study reported that in endophthalmitis after cataract surgery, only 5.9% of culture-positive cases were due to gram-negative organisms, and none were due to *Klebsiella*.

Methods: Case report.

Results: A 55-year-old man had undergone uneventful phacoemulsification in the right eye (RE). There was no history of systemic disease. Two days later, he complained of decreased vision, pain, and palpebral edema. At presentation, visual acuity (VA) was hand movements with corneal edema and hypopyon. USG showed dense vitritis. Diagnosis of exogenous endophthalmitis was made; then vitreous tap and intravitreal injection of vancomycin and ceftazidime were performed. The cultures of aspirated vitreous grew *Klebsiella* spp. The patient underwent pars plana vitrectomy and repeat intravitreal injection. Laboratory investigations showed no abnormalities. Blood and urine cultures showed no organism. After vitrectomy, there was still no clinical improvement, VA was light perception, even anterior and posterior segments were clear. USG was performed again and showed suspected choroidal detachment. The patient was discharged after IV ceftriaxone and oral metronidazole for 3 weeks.

Conclusions: In the majority of patients, *Klebsiella* endophthalmitis is associated with advanced systemic disease and known as endogenous endophthalmitis. Despite treatment with appropriate antibiotics, visual prognosis for *Klebsiella* endophthalmitis is generally poor. In this case, could *Klebsiella* species cause exogenous endophthalmitis in an apparently healthy patient?

Acute Retinal Necrosis: Pattern of Disease in Thailand

First Author: Taweevat **ATTASETH**
Co-Author(s): Rawi **BOONYAOPAS**, Donrudee **SIRINIL**, Somsiri **SUKAVATCHARIN**

Purpose: To report the pattern of acute retinal necrosis (ARN) from a referral eye center in Thailand.

Methods: Retrospective case review in Ramathibodi Hospital, Bangkok, Thailand from January 2011 to August 2016.

Results: Twenty patients (21 eyes) with ARN were included. Only 1 patient had bilateral involvement. Visual acuity of the involved eye range from 20/30 to hand motions. Polymerase chain reaction on aqueous humor sample could identify causative organisms in 15 eyes (71%): herpes simplex virus-2 (HSV-2) in 6 eyes (29%), varicella zoster virus (VZV) in 7 eyes (33%), cytomegalovirus (CMV) in 1 eye (5%), and Epstein-Barr virus (EBV) in 1 eye (5%). One patient in our series had multiple viral infections including VZV, CMV, and EBV. All patients received intravenous acyclovir for 14 days followed by

oral acyclovir for 3 months. Intravitreal gancyclovir was given in 16 eyes (76%) as an adjunctive therapy. Twelve eyes (57%) developed rhegmatogenous retinal detachment. Recurrent episode occurred in 4 eyes (19%). Final visual acuity was 20/200 or worse in 10 eyes (48%) including no light perception in 2 eyes (10%).

Conclusions: ARN carries poor visual prognosis in Thailand.

Application of Revised International Diagnostic Criteria for Diagnosis of Vogt-Koyanagi-Harada Disease

First Author: Pankaj ROY

Purpose: To review applications of revised international diagnostic criteria of Vogt-Koyanagi-Harada (VKH) for the diagnosis and treatment of VKH disease.

Methods: This prospective study was conducted from January 2012 to December 2015. All the bilateral uveitis patients who attended the uvea clinic were scrutinized and revised diagnostic criteria of VKH was applied for diagnosis. A total of 44 patients were included in this study; 24 patients who attended the uvea clinic within 1 month of the appearance of clinical features were regarded as the early group and 20 patients who attended 1 month after the appearance of clinical features were regarded as the late group.

Results: Out of 44 patients 29 (66%) were male and 15 (34%) were female. Mean age was 36 ± 12 years ranging from 16-49 years. After applying the revised international diagnostic criteria 23 patients of the 24 in the early group were diagnosed as incomplete VKH and 1 was diagnosed as probable VKH. During follow-up, 2 patients were finally diagnosed as complete VKH disease. In the late group, all 20 patients were initially diagnosed as incomplete VKH and during follow-up 1 patient was diagnosed as complete VKH. Vitiligo, poliosis, and alopecia appeared after an average of 125 days from the onset of signs and symptoms.

Conclusions: The revised international diagnostic criteria are effective tools for early diagnosis and treatment of VKH disease.

Bilateral Outer Retinal Necrosis Following Mumps Infection in a 9-Year-Old Girl

First Author: Kalpana MURTHY

Co-Author(s): Chitralkha DE, Raju SAMPANGI

Purpose: We report a challenging case of bilateral outer retinal necrosis following mumps infection and its rapid progression to outer retinal atrophy and poor vision, in spite of antivirals and steroids.

Methods: Retrospective case report.

Results: A 9-year-old girl who presented with sudden

loss of vision in both eyes 2 weeks following a history of fever and parotitis was diagnosed to have mumps infection. Her best corrected visual acuity (BCVA) was perception of light (PL)+ in both eyes (OU). Fundus examination showed bilateral outer retinal necrosis. CSF tap confirmed mumps infection based on antibody titers. Aqueous tap was negative for the mumps virus on PCR. The aqueous tap and the CSF tap were negative for HSV, CMV, VZV, toxoplasma, MTb, measles, and the encephalitis profile on PCR. Bacteria and fungi were negative. She received intravenous acyclovir 315 mg 3 times per day. Though the retinal edema cleared in 2 weeks, her vision did not improve and remained perception of light. Subsequent optical coherence tomography (OCT) showed disruption of the IS/OS junction, outer retinal, and foveal atrophy. ERG continued to show unrecordable rod and cone responses at 3-month follow-up.

Conclusions: A unique, never before described presentation of bilateral outer retinal necrosis following mumps infection is outlined in this report. It also highlights the poor visual prognosis and need for mumps vaccination.

Clinical Profile and Etiology of Uveitis in Kelantan: 3-Year Review

First Author: Matthew TONG

Co-Author(s): Zunaina EMBONG

Purpose: To study the clinical profile and etiology of uveitis cases in the Kelantanese population.

Methods: This is a retrospective review of uveitis cases between 2014 and August 2016.

Results: A total of 50 uveitis patients were included in this study. They were 44% male and 56% female. Malay was the majority population at 94% of the total patients, whereas the remaining consisted of 6% Chinese. Age distribution was relatively equal, with age groups of less than 30 consisting of 24%, 31-40 years old consisting of 22%, age 41-50 making up 22%, and the remaining 32% for the age group of 51 and above. Anterior uveitis (40%) was the commonest clinical presentation, followed by panuveitis (38%) and posterior uveitis (22%). The main etiologies of uveitis were infection (46%), autoimmune (18%), and idiopathic (2%). The remaining 34% consisted of various causes. Toxoplasmosis was the main cause in the infectious subgroup, consisting of 22% of the total study population. This was closely followed by tuberculosis and cat scratch disease, each consisting of 10% of the total study population.

Conclusions: Infectious causes remain the main reason for the development of uveitis in the Kelantanese population, likely due to the agriculture lifestyle.



Clinicoetiological Presentation of Posterior Uveitis in Bangladesh

First Author: Pankaj **ROY**

Purpose: To find out the cause of unexplained vision loss in patients attended the uvea and retina clinic and to raise interest in the causation of posterior uveitis by *Mycobacterium tuberculosis* (TB).

Methods: This is a prospective case control study conducted from July 2012 to December 2015. A total of 98 posterior uveitis patients of unknown etiology were included in this study. Sixty patients who were Mantoux test positive (>15 mm) receiving anti-TB drugs and in whom no recurrences were found during the follow-up period were regarded as the study group and 38 MT negative patients were considered the control group of the study.

Results: A total of 60 patients (84 eyes) were affected. Vasculitis with or without retinal hemorrhage was seen in 20 eyes (24%), multifocal choroiditis in 18 eyes (21%), disseminated choroiditis in 17 eyes (20%), vitreous hemorrhage in 8 eyes (10%), single focal choroiditis in 6 eyes (7%), vasculitis with BRVO in 5 eyes (6%), serpiginous choroiditis in 4 eyes (5%), vasculitis with tractional retinal detachment in 3 eyes (4%), and exudative detachment due to choroiditis in 3 eyes (4%).

Conclusions: Sixty patients (61%) of a group of 98 patients with primarily unexplained visual loss due to chronic posterior uveitis had tuberculosis. Posterior uveitis presents as focal, multifocal, or diffuse areas of retinitis or choroiditis, with varying degrees of vitreous cellular activity and/or involvement of the retinal vasculature. Early diagnosis and treatment is needed to reduce mortality and morbidity due to posterior uveitis resulting from *Mycobacterium tuberculosis*.

Cytomegalovirus Papillitis in Acquired Immunodeficiency Syndrome

First Author: Dinda **DEVONA**

Co-Author(s): Made **SUSIYANTI**

Purpose: To demonstrate a rare case of ocular cytomegalovirus (CMV) infection that manifested as CMV papillitis in HIV/AIDS.

Methods: A case report. A 26-year-old male presented with sudden blurred vision in the left eye; scotoma sensation was noted for 2 weeks before admission. His visual acuity was 5/60, with normal intraocular pressure and anterior segment. The posterior segment revealed edematous papilla surrounded by exudates and hemorrhages. Since the patient was immunocompromised due to HIV/AIDS with very low CD4+ count, thus it was considered an ocular HIV-related opportunistic infection. Several ancillary tests revealed elevated titers of HSV antibodies. The patient was diagnosed as secondary active HSV infection and treated with

oral acyclovir. However, during observation the visual acuity worsened and other etiologies were considered. To establish the main diagnosis, PCR examination from humor aqueous tap was performed and revealed DNA-CMV positive.

Results: The patient was treated with oral valganciclovir oral 2 x 900 mg for 2 weeks and clinical signs showed improvement, but unfortunately the visual function was still poor.

Conclusions: It is a challenge to diagnose CMV papillitis due to its rarity as an unusual presentation of CMV retinitis. PCR examination from humor aqueous or vitreous tap should be performed while waiting for serological testing results, especially in doubtful cases where severity progresses rapidly. Earlier diagnosis and proper management can help prevent irreversible visual loss.

Diffuse Chorioretinitis Manifesting as Subretinal Exudation

First Author: Kun-Hsien **LI**

Co-Author(s): San-Ni **CHEN**

Purpose: To report a case of diffuse chorioretinitis manifesting as subretinal exudation.

Methods: We report a case of diffuse chorioretinitis. The disease course, lab examination results, medical and surgical treatment, and response are presented.

Results: A 44-year-old man with monocular diffuse chorioretinitis showed expanding yellow-white subretinal exudation. Routine uveitis survey was negative for syphilis, primary toxoplasmosis, and viral retinitis. Initial impression was endogenous endophthalmitis. Systemic anti-fungal treatment showed poor effect. Ocular lymphoma was also considered. Vitreous biopsy and culture excluded infective disease or lymphoma. We then started steroid and immune-modulation treatment. The condition improved gradually thereafter. The exudation diminished and chorioretinitis remitted gradually, leaving diffuse choroidal scar.

Conclusions: Yellow-white subretinal exudation is an uncommon manifestation of chorioretinitis. After excluding infection and masquerade syndrome, immunomodulation treatment should be given carefully to control the inflammation.

Endophthalmitis Associated with *Purpureocillium lilacinum* During Infliximab Treatment for Surgically Induced Necrotizing Scleritis, Successfully Treated with 27-Gauge Vitrectomy

First Author: Masaaki **YOSHIDA**

Co-Author(s): Hiroshi **KUNIKATA**, Kazuichi **MARUYAMA**, Toru **NAKAZAWA**, Shunji **YOKOKURA**

Purpose: To report a case of endophthalmitis associ-

ated with *Purpureocillium lilacinum* during infliximab treatment for surgically induced necrotizing scleritis, successfully treated with 27-gauge vitrectomy.

Methods: A single case report.

Results: A 71-year-old man who had undergone immunosuppressive therapy, including infliximab, for surgically induced necrotizing scleritis (SINS) in his left eye complained of visual disturbance and eye pain. He had a history of surgery for recurrent pterygium: pterygium excision, amnion transplantation with mitomycin C, and limbal transplantation. Visual acuity in the left eye was counting fingers at 30 cm, and intraocular pressure was 3.0 mm Hg. Slit-lamp examination revealed the presence of anterior chamber cells (3+), and a B-mode ultrasound scan showed a vitreous opacity. We made a diagnosis of endophthalmitis and performed 27-gauge microincision vitrectomy surgery (27GMIVS) with antibiotic perfusion of ceftazidime, vancomycin, and voriconazole. Intraoperative findings included a fungus-like ball-shaped opacity in the vitreous and a close to normal retinal appearance. A vitreous body culture identified the presence of *P. lilacinum*. After 2 months of antibacterial and antifungal therapy, inflammation decreased and visual acuity recovered to 20/100.

Conclusions: Scleral thinning due to necrotizing scleritis, especially during immunosuppressive therapy, is a risk factor for endophthalmitis. We found that 27GMIVS was a useful strategy for such a challenging clinical situation.

Endophthalmitis Following Honeybee Sting

First Author: Rajvardhan AZAD
Co-Author(s): Bhuvan CHANANA

Purpose: The purpose of this study was to report a case of endophthalmitis following honeybee sting.

Methods: This is an interventional case report of a 30-year-old woman who developed endophthalmitis following honeybee sting. The patient presented with diminution of vision to perception of light in her injured eye. Ciliary congestion, corneal edema, severe inflammation of the anterior chamber, and a total cataract were identified. Ultrasonography revealed the presence of exudates in the vitreous cavity and surgical intervention was planned. The patient underwent pars plana vitrectomy with lensectomy and intravitreal antibiotic injection. The main outcome measures include resolution of infection, inflammation, and visual acuity improvement.

Results: One month postoperatively the patient's eye showed total resolution of the infection with regression of inflammation and the best corrected visual acuity improved to 20/80. After 6 months the visual acuity was stabilized at 20/80 with absence of any recurrence.

Conclusions: Ocular bee sting injury, although uncommon,

can cause serious ocular injuries. We are reporting an unusual complication following bee sting, which was managed successfully. A meticulous examination is mandatory to rule out unusual causes like an ocular bee sting.

Epidemic of Post Viral Fever Retinitis: Lessons Learned in a Series of Atypical Cases

First Author: Shravan MASURKAR
Co-Author(s): Apoorva AG, Guruprasad AYACHIT, Srinivas JOSHI, Sameera V V

Purpose: A series of cases to emphasize the importance of finding an etiologic agent in post fever retinitis to ensure timely management.

Methods: Fifty-five eyes of 42 patients presented with features of post fever retinitis (fever 30.6 ± 13.94 days prior). Tailored laboratory investigations were done to rule out common infections in our population. Thirty-eight of 42 were diagnosed with dengue or chikungunya retinitis based on ELISA and PCR. Four of 42 were further tested based on unresponsiveness to therapy and included in this series. All 4 had cotton-wool spots, hemorrhages, and retinitis patches. SD-OCT showed hyperreflective inner layers \pm intra/subretinal fluid.

Results: Patient 1: A 28-year-old male with bilateral retinitis with no response to intravitreal bevacizumab and oral steroids. Urine PCR tested positive for dengue and chikungunya suggesting that co-infection with 2 viruses can present with recalcitrant retinitis. Patient 2: A young female presented with typical post viral retinitis which progressed to ocular neovascularization. Anti ds-DNA tested positive. Patient 3 presented with inflammatory BRVO resistant to anti-VEGFs, antivirals, and oral steroids. The patient was Weil-Felix positive and improved with oral doxycycline. Patient 4 initially had post viral retinitis picture but soon developed icterus, multiple lymph nodes, and septicemia with multi-organ failure. He was seen to have celiac artery occlusion and splenic infarcts suggestive of systemic vasculitis. He was c-ANCA positive.

Conclusions: It is important to look at cases individually and not make the same diagnosis for every patient with post fever retinitis just because they presented during the same epidemic as dengue/chikungunya. It is important to keep looking for an etiology that fits in unresponsive cases.

Evaluation of Subconjunctival Liposomal Steroids for the Treatment of Experimental Uveitis

First Author: Chee Wai WONG
Co-Author(s): Czarny BERTRAND, Si Rui NG, Gert STORM, Tina WONG

Purpose: To evaluate the efficacy of a single subcon-

junctival injection of liposomal steroid [triamcinolone acetonide (LTA) or prednisolone phosphate (LPP)] for the treatment of experimental uveitis.

Methods: Experimental uveitis was induced by unilateral intravitreal injection of *Mycobacterium tuberculosis* H37Ra antigen in preimmunized New Zealand white rabbits. Rabbits were randomized into 1 of 4 intervention groups 3 days after uveitis induction: a single dose of 0.1 mL subconjunctival LTA (4 mg/mL) (n = 6) or 0.1 mL LPP (4 mg/mL) (n = 5), topical PredForte 1% Q3H for 2 weeks (n = 5), or no treatment (n = 5). Fluorescent labelled liposomes were injected subconjunctivally in 4 rabbits to investigate their ocular distribution. An antigen rechallenge was administered 8 days after initial induction to simulate recurrence of uveitis. The eyes were clinically monitored for 30 days and graded for ocular inflammation by 2 masked investigators.

Results: Rabbits that received subconjunctival LTA or LPP had significantly lower mean inflammatory scores than untreated controls on days 4 (P = 0.03) and 8 (P = 0.003) and lower scores than rabbits given topical PredForte 1% on day 8 (P = 0.03). Post antigen rechallenge, the subconjunctival liposomal steroid groups continued to have greater suppression of inflammation than untreated controls at days 11 (P = 0.02) and 24 (P = 0.04). Localization of fluorescent labelled liposomes to the iris and ciliary body were confirmed on histology at 48 hours post injection.

Conclusions: A single dose of subconjunctival liposomal steroid was as effective as intensive topical steroid therapy in suppressing inflammation in the rabbit model of uveitis and provided clinically therapeutic levels that attenuated the inflammatory response even after a rechallenge.

Gnathostomiasis: A Case Series with a Novel Rapid Diagnosis Algorithm for Intraocular Parasites

First Author: Diva MISRA

Co-Author(s): Harsha BHATTACHARJEE, Kasturi BHATTACHARJEE, Dipankar DAS, Nilutparna DEORI, Surpriya HAWAIBAM

Purpose: To describe a case series of intraocular gnathostomiasis and an algorithm for rapid diagnosis of intraocular parasites.

Methods: Gnathostomiasis is a rare parasitic infestation of humans who become incidental hosts after intake of undercooked or raw meat of the definitive host. We describe 3 cases of intraocular gnathostomiasis with detailed documentation. The parasites were fixed in a neutral buffered solution of 1% glutaraldehyde and 4% formaldehyde and sent for pathological examination. This is the first report where electron microscopy and energy-dispersive X-ray (EDX) spectroscopy was

done for detailed examination of the parasite.

Results: EDX spectroscopy of the spine of gnathostomiasis was done, which showed positive spikes for sulphur, copper, and calcium. Eventually the parasite was surgically removed in all cases, which was documented meticulously. Based on our experience with intraocular parasites we propose and describe a novel algorithm for rapid diagnosis of intraocular parasitic infections.

Conclusions: This cases series illustrates the various manifestations of intraocular gnathostomiasis. Therapeutic success depends upon early and complete surgical removal of the parasite in the live form and our novel algorithm helps in rapid diagnosis and treatment.

Intravitreal Anti-VEGF as an Adjunct to Manage Tubercular Choroidal and Optic Disc Granulomas

First Author: Mohit DOGRA

Co-Author(s): Vishali GUPTA, Deeksha KATOCH, Ramandeep SINGH

Purpose: Tubercular choroidal granulomas are conventionally managed with oral steroids and ATT. However, recurrences are common and cause severe ocular morbidity. Anecdotal evidence for anti-vascular endothelial growth factor (VEGF) use in these patients exists, but robust evidence regarding their efficacy is lacking.

Methods: Retrospective review of patients with tubercular choroidal granuloma treated with intravitreal anti-VEGF, with or without ATT and oral steroids.

Results: Nine eyes of 9 patients were included; 8 had choroidal and 1 had optic disc granuloma. All patients were Mantoux positive and had vascularization of granuloma on FFA. All patients showed complete resolution of granuloma and subretinal fluid after 1-3 (mean, 1.67) anti-VEGF injections. Recurrences were seen in 2 patients (22.22%) after 17 and 24 months, respectively. Both were successfully managed with a single intravitreal anti-VEGF injection.

Conclusions: Intravitreal anti-VEGF agents aid in shrinking choroidal granulomas, normalization of choroidal thickness, and resolution of subretinal fluid in patients with tubercular granulomas.

Management of Toxoplasmosis Neuroretinitis with Systemic Antibiotic and High Dose Corticosteroids

First Author: Yenni Poernama SARI

Co-Author(s): Juliari I GUSTI AYU MADE, Niti SUSILA, Anak Agung Mas TRININGRAT

Purpose: To determine the effectiveness of management of toxoplasmosis neuroretinitis with systemic antibiotic and high dose corticosteroids.

Methods: A case report of a 38-year-old man with sudden visual loss who had seen flashes of light for 3 weeks before being admitted to the hospital. Visual acuity in the right eye (RE) was 6/30 with pinhole (PH) 6/6 and left eye (LE) was 6/20 PH with no improvement (NI). Funduscopy examination found optic disc swelling and decreased macular reflex in both eyes. Right eye macula was edematous and left eye had retinal detachment with serous submacular fluid on optical coherence tomography (OCT) examination. Laboratory result for IgG toxo was reactive (266 IU/mL). The patient was diagnosed with RLE neuroretinitis et causa suspect toxoplasmosis and was given cotrimoxazole forte tablet twice daily for 2 months, followed by high dose corticosteroid therapy according to the Optic Neuritis Treatment Trial (ONTT) 3 days after starting the antibiotic.

Results: Visual acuity improved to 6/6 with spectacles in both eyes with decreased swelling of the optic discs and resolution of macular edema and submacular fluid 3 months after therapy.

Conclusions: Detection at the early stage and prompt management with systemic antibiotic and high dose corticosteroid can prevent the progression of the disease and improve visual acuity.

Ocular Manifestations and Visual Outcomes in Patients with Herpes Zoster Ophthalmicus

First Author: Tommy CHAN

Co-Author(s): Simon SZETO

Purpose: To investigate the prevalence of ocular manifestations and visual outcomes in patients with herpes zoster ophthalmicus (HZO).

Methods: Consecutive cases diagnosed with HZO who attended 2 tertiary care hospitals between July 1, 2011 and June 31, 2015 in Hong Kong were retrospectively reviewed. Patient demographics, clinical presentations, and management were reviewed. Logistic regression model was used to estimate the odds ratio of visual loss and various ocular manifestations associated with HZO.

Results: Two hundred fifty-nine patients were included. There were 110 (42.5%) and 149 (57.5%) patients aged <60 and ≥60 years, respectively. None of them had prior zoster vaccination. Ocular manifestation was present in 170 (65.6%) patients with no difference between age groups ($P = 0.101$). Conjunctivitis was most common, followed by anterior uveitis and keratitis. A total of 58.7% of patients had visual acuity of 6/12 or worse after disease resolution. The presence of epithelial keratitis and stromal keratitis were independent risk factors for visual loss after resolution of HZO ($P = 0.003$, $P = 0.004$, respectively). The corresponding odds ratios were 6.59 (95% confidence interval, 1.87 to 23.19) and 7.55 (95% confidence interval, 1.88 to 30.30), respec-

tively. The number of ocular manifestations was also associated with an elevated risk of visual loss with an odds ratio of 1.49 (95% confidence interval, 1.01 to 2.20; $P = 0.043$).

Conclusions: A substantial portion of patients with HZO and ocular manifestation was among the younger age group. Corneal involvement was the main reason for poor visual outcome.

Optimal Management in Panuveitis with Severe Vision Loss with Autologous Mesenchymal Stem Cells and NK Cells as Immunoregulators

First Author: Dyah TRIANGGADEWI

Co-Author(s): Evelyn KOMARATIH, Wimbo SASONO

Purpose: To manage panuveitis and pseudophakic patients with stem cell and NK cell therapy as immunoregulators.

Methods: A case report. A 40-year-old woman presented with pain and blurred vision in the right eye for 5 years and in the left eye for 10 years. The patient had foreign body sensation and redness in both eyes for 14 years. She was diagnosed with uveitis of assumed autoimmune origin. There was secluded pupil with iris bombans on anterior segment examination. Gonioscopy of both eyes showed closed angle. Ocular USG showed the presence of lens opacity in the right eye. Laboratory examination was within normal limits. Right eye visual acuity was 1/300 with 16 mm Hg under antiglaucoma therapy. Phacoemulsification surgery was performed. Atropine and steroid medication were given after surgery. After 3 months, autologous mesenchymal stem cells and autologous NK cells were injected intravenously 4 times in turns.

Results: One month after surgery, right eye visual acuity was 5/40 with intraocular pressure (IOP) of 16 mm Hg. Visual acuity became 5/10 with IOP of 10 mm Hg without antiglaucoma therapy in the next 4 months. Anterior segment was quiet with minimal flare. Posterior segment examination showed chronic retinal inflammation with pale optic nerve.

Conclusions: Phacoemulsification is considered to improve visual impairment in patients with panuveitis with complicated cataract and secondary glaucoma. Autologous mesenchymal stem cell and NK cell therapy may improve the eye condition and immune system.

Outcome of Cataract Surgery in Patients with Uveitis in a Tertiary Hospital

First Author: Timothy TANG LEE SAY

Co-Author(s): Teresita CASTILLO

Purpose: To determine outcomes in cataract surgery among patients with uveitis and what factors affect



these outcomes.

Methods: This is a cross-sectional retrospective study of all uveitic patients who underwent cataract surgery in a tertiary hospital in the Philippines between January 2007 and December 2014. The primary outcome of the study is visual acuity after cataract surgery. Age, sex, underlying etiology, and anatomic location of uveitis as well as the period of quiescence prior to surgery, pre-operative visual acuity (VA), intraocular pressure (IOP), and cellular activity were gathered. Postoperatively, outcomes include postoperative VA, inflammatory activity, IOP, and development of postoperative complications.

Results: Thirty-three patients with uveitis were included in the study. The most common cause of uveitis necessitating cataract surgery was non-granulomatous anterior uveitis. The most common complication of the surgery was recurrence of the disease. Results show that there was significant improvement in vision following cataract surgery with 64% of patients having VA of logMAR 0.3 (20/40) or better. There was an increased risk of developing postoperative complications in panuveitis compared to anterior uveitis. There was no correlation between period of quiescence and visual acuity, IOP, or cell grading at 6 months postoperatively.

Conclusions: In summary, this study shows that uveitic cataracts generally have good visual outcomes after cataract surgery. Recurrence of uveitis is a risk for uveitic patients undergoing cataract surgery. Panuveitis had more complications than anterior uveitis. Period of quiescence was not found to affect visual acuity, IOP, or cellular activity postoperatively.

Preseptal and Orbital Cellulitis in Pansinusitis and Exposed Glaucoma Drainage Tube Implant

First Author: Anna UTAMI

Co-Author(s): Made SUSIYANTI

Purpose: To report a case which showed the importance of recognizing preseptal cellulitis and orbital cellulitis, the source of infection, and proper management to prevent further complications.

Methods: A case report. A 5-year-old boy presented with the chief complaint of swelling and redness of the right eyelid for 1 day before admission. He also had fever and flu symptoms for 3 days before admission. The ocular history was significant, having been diagnosed with advanced glaucoma since 1.5 years of age. The child had a history of 2 dislocated glaucoma drainage implants. The visual acuity was light perception, with proptotic eye and limited ocular movement to all quadrants. There was conjunctival injection, ciliary injection with corneal edema, and exposed glaucoma implant at the temporal part of the cornea. Orbital CT

scan showed preseptal and orbital cellulitis with pansinusitis. USG revealed mild haziness of the anterior vitreous. The child was treated with intravenous cefotaxime, intravenous methylprednisolone, and antibiotic eye drops.

Results: After 10 days, the signs and symptoms improved gradually after the initiation of IV antibiotic treatment. His eye motility improved after 3 days of treatment. After improvement of the infection, the implant was explanted.

Conclusions: Infectious cellulitis is commonly caused by underlying sinusitis. This case report highlights a rare case of an exposed glaucoma implant as a source of infection for orbital cellulitis. Awareness of the source of infection and pathogenesis of the complications is important to prevent poor prognosis.

Quality of Life in Uveitis Patients: Hospital-Based Longitudinal Study

First Author: Namita ANAGOL

Co-Author(s): Rohit SREENATH, Priyanka W

Purpose: The questionnaire created was based on the NEI VFQ-25. It measures self-reported vision health status for patients with chronic eye disease and assesses the effects of visual impairment on both task-oriented visual function and general health domains relevant to the Indian scenario.

Methods: The NEI VFQ-25 was modified as per its relevance to the Indian scenario and was used to assess quality of life (QoL) in patients with anterior uveitis, posterior uveitis, intermediate uveitis, and panuveitis.

Results: The majority of subjects had moderate difficulty in near vision (36.8%). The majority of subjects had moderate difficulty in distant vision (37.8%). In the study 42.1% were currently driving and 21 subjects stopped driving. Seventy percent of the subjects had little to extreme difficulty in driving. A total of 28.7% of subjects were on oral steroids, 97% were on topical steroids, 3.5% were on HCQs, 19.8% were on Foltitax, and 1.5% were on other drugs.

Conclusions: The economic, social, and psychological impact of the disease on the patient's lifestyle was analyzed. Significant association was observed between anatomical diagnoses and near vision, distant vision, economical aspects of disease, worry score, patients on immunosuppressants, and driving difficulty score. Panuveitis affected QoL more significantly than anterior and intermediate uveitis.

Subretinal Neovascularization Secondary to Choroidal Nevus: A Diagnostic Dilemma

First Author: Pritam **BAWANKAR**

Co-Author(s): Manabjyoti **BARMAN**, Satyen **DEKA**, Hemalata **DEKA**, Diva **MISRA**, Ronel **SOIBAM**

Purpose: To report a challenging case of subretinal neovascularization secondary to choroidal nevus.

Methods: Retrospective case report.

Results: A 50-year-old male patient was referred to the vitreo-retina service of our institute with a diagnosis of age-related macular degeneration (ARMD) with macular edema in the left eye. The patient was given 3 doses of intravitreal bevacizumab elsewhere over a period of 1 year without any improvement. His visual acuity at the time of presentation to us was counting fingers at 2 meters. Fundus examination revealed subretinal fluid with exudation at the macula and a pigmented lesion of 1 disc diameter infero-temporal to the macula within the posterior pole. Optical coherence tomography (OCT) and fundus fluorescein angiography (FFA) findings at the time of presentation confirmed choroidal neovascularization (CNV) in the left eye. After thorough examination the pigmented lesion was identified as a choroidal nevus and the case was diagnosed as subretinal neovascularization secondary to choroidal nevus. The patient was given 3 sittings of transpupillary thermo therapy (TTT). After treatment vision improved to 20/200. CNV appeared regressed with complete resolution of subretinal fluid.

Conclusions: In conclusion, CNV could be a secondary manifestation of an underlying choroidal nevus and it should be actively looked for. Further, it can be successfully managed with TTT.

Sympathetic Ophthalmia After Diode Laser Cyclophotocoagulation: Rare Entity or Emerging Threat?

First Author: Shriya **DHAR**

Co-Author(s): Harsha **BHATTACHARJEE**, Dipankar **DAS**, Nilutparna **DEORI**, Diva **MISRA**, Shahinur **TAYAB**

Purpose: To present a case of sympathetic ophthalmia (SO) following diode laser cyclophotocoagulation (DLCP).

Methods: A 12-year-old male patient with a long-standing history of Coats disease and exudative retinal detachment in the right eye for 3 years presented with pain, redness, and intraocular pressure of 45 mm Hg in the right eye. On examination the patient denied perception of light in the right eye. Diagnosis of painful blind eye was made and the patient underwent DLCP in the right eye after informed consent. More than 2 months later, the patient reported sudden diminution of vision (20/125), pain, and photophobia in the

left eye. A working diagnosis of DLCP-induced SO was made supported by the clinical findings of panuveitis and peripheral Dalen-Fuchs nodule in the left fundus.

Results: The patient was administered intravenous methylprednisolone for 3 days and subsequently prescribed azathioprine, cycloplegics, topical, and systemic steroids, following which complete recovery with visual acuity returning to 20/20 in the left eye was noted.

Conclusions: The increasing reports of SO following DLCP draws our attention toward considering it as a serious complication of DLCP.

Sympathetic Ophthalmia: A Case Series

First Author: Cristina **GARCIA**

Purpose: To describe the nature, presentation, and management of patients diagnosed with sympathetic ophthalmia in a tertiary government center.

Methods: This is a retrospective case series of 4 patients diagnosed with sympathetic ophthalmia at our eye center over the period of 2013-2016. Chart review was done for all 4 patients.

Results: Of the 4 patients in our uveitis registry diagnosed with sympathetic ophthalmia, 2 were secondary to open globe injuries while the other 2 were secondary to surgical procedures (ECCE, trabeculectomy). Diagnosis was made clinically, with the aid of ancillary imaging. Patients were managed with oral and IV corticosteroids and eventually shifted to corticosteroid-sparing agents. One patient was lost to follow-up.

Conclusions: Early recognition of signs and symptoms of sympathetic ophthalmia as well as early intervention with corticosteroids and corticosteroid-sparing agents are important in the control of the condition. Patient education is also important because compliance with medication and diligent follow-up go hand in hand with management by the ophthalmologist.

Sympathetic Ophthalmia: Experience in a Tertiary Referral Center

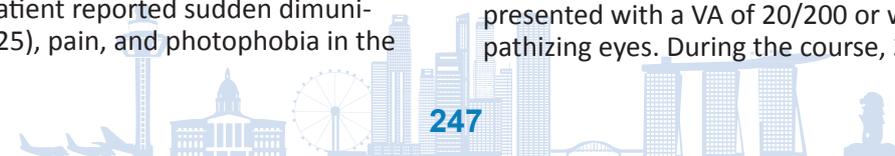
First Author: Kun-Hsien **LI**

Co-Author(s): San-Ni **CHEN**

Purpose: To report the presentation and outcome of sympathetic ophthalmia (SO) in a tertiary referral center.

Methods: This study included 10 patients with SO from 2006 to 2013 in our facility. A review of existing medical records was performed. The main outcome measure was final visual acuity (VA).

Results: SO was incited by trauma in 2 patients and surgery in the other patients. At first visit, 2 patients presented with a VA of 20/200 or worse in their sympathizing eyes. During the course, 3 patients developed



glaucoma, 1 developed choroidal neovascularization, and 1 developed pucker. At final visit, 3 patients had vision below 20/200, while the other 7 patients had vision above 20/40 in their sympathizing eyes.

Conclusions: SO is a rare but devastating condition. Timely diagnosis and prompt treatment is of utmost importance to maintain functional vision in these patients, who often have lost vision in the other eye.

The Pattern of Intermediate Uveitis in Northeast Indian Patients

First Author: Diva MISRA

Co-Author(s): Dipankar DAS, Deepika KAPOOR, Vivek PAULBUDDHE, Samir SERASIYA, Sumegha TOMAR

Purpose: To describe the pattern of intermediate uveitis (IU) in northeast Indian patients.

Methods: Retrospective review of patients with IU with at least 6 months of follow-up from 2006 to 2015.

Results: Three hundred fifty-six patients were identified and the mean follow-up was 45.7 months. The mean age at presentation was 42.5 years. Higher incidence was seen in males (52.2%) as compared to females (47.7%). The majority (33.1%) of IU cases were considered tubercular after investigation. At the last follow-up, 79.6% of eyes retained vision of at least 20/40. Poor visual outcome was significantly associated with poor presenting visual acuity, persistent cystoid macular edema, and increased disease duration.

Conclusions: IU in northeast Indian patients was mainly of tubercular etiology with good visual outcome.

The Rescue Effects of Adalimumab in the Treatment of Refractory Steroid-Responding Pediatric Uveitis: Case Report

First Author: Chun-Ju LIN

Co-Author(s): Wen-Lu CHEN, Wei-Ning KU, Jane-Ming LIN, Peng Tai TIEN, Yi-Yu TSAI

Purpose: To report the rescue effects of adalimumab (HUMIRA) therapy in a pediatric case of refractory steroid-responding panuveitis.

Methods: Interventional case report.

Results: A 13-year-old girl had suffered from blurred vision since 2013 January. Bilateral idiopathic panuveitis with macular edema was diagnosed. She had previously been treated with systemic steroids, methotrexate, cyclosporine, and mycophenolate. All treatment had failed to control the ocular inflammation. Intravitreal dexamethasone implant injections were given in both eyes and macular edema subsided but was complicated with steroid glaucoma and cataract. The macular edema also recurred since the dexamethasone implant absorbed. After subcutaneous adalimumab injections

every 2 weeks, the inflammatory activity was well controlled and the macular edema subsided. Phacoemulsification and posterior intraocular lens implantation were performed in both eyes uneventfully. Menorrhagia and anemia were noted 9 months after adalimumab treatment. Thus, adalimumab was tapered and her anemia improved. Her vision remained 20/20.

Conclusions: Refractory uveitis usually requires more aggressive treatment. Intraocular glucocorticoid-releasing implant could be used to lessen the possible systemic side effects in children. Intravitreal dexamethasone implant is effective in treating inflammatory macular edema but could be complicated with steroid glaucoma and cataract. Tumor necrosis factor-blocking agents have been used to treat chronic, refractory uveitis in adults as well as in children. Adalimumab is a favorable biological agent in a steroid-responding pediatric patient of refractory noninfectious uveitis but could be complicated with menorrhagia. Long-term follow-up and more cases are mandatory.

Miscellaneous

Effect of Warming Eyelids on Eye Symptoms and Quality of Life in Visual Display Terminal Users

First Author: Ching-Hsi HSIAO

Co-Author(s): Yih-Shiou HWANG, Igaki MICHIHITO, Chi-Chin SUN, Kyoko TAGAMI

Purpose: Prolonged use of visual display terminals (VDTs) is a high-risk factor for eye symptoms and it affects quality of life (QoL). The effect of warming eyelids on eye symptoms and its contribution to QoL were clarified in VDT users.

Methods: Fifty-eight Taiwanese participants (35.1 ± 7.6 years old) with eye symptoms caused by prolonged VDT use (≥ 6 hours per day) were screened and allocated into the test group or control group. Warming eyelid treatment with moist heat of 40 degrees for 10 minutes or non-warming eyelid was performed in the test or control group once a day for 2 weeks. Severity of eye symptoms, mental status, and QoL were assessed by visual analog scale and dry eye-related QoL score (DEQS) before and after 2 weeks. Tear break-up time (TBUT), tear flow reflex, and conjunctivocorneal damage were evaluated as the parameters of ocular surface condition.

Results: Dry eyes and gritty eyes were significantly relieved only in the test group ($P < 0.01$). Tired eyes, ocular discomfort, and blurred vision were relieved more in the test group than the control group. As the relaxation and comfortable feeling were enhanced by warming eyelids, DEQS was significantly improved in the test group ($P < 0.01$). In participants with unstable

tear film (TBUT \leq 5 seconds), TBUT was significantly increased in the test group ($P < 0.05$) as corneoconjunctival damage improved ($P < 0.05$). There was a positive correlation between increased TBUT and improved DEQS in the test group but not in the control group.

Conclusions: The daily care of warming eyelids helped maintain QoL in VDT users by relieving eye symptoms and normalizing ocular surface condition.

Extended Pterygium Excision and Inferior Conjunctival Autograft for Primary Pterygium: A Prospective Study

First Author: Bharathi **MEGUR**

Co-Author(s): Deepak **MEGUR**

Purpose: Superior bulbar conjunctiva is commonly used as autograft for pterygium surgery, which may adversely affect the outcomes of future filtration procedures because of subsequent scarring at the donor site. Instead we propose the idea of using the limbus-spared inferior bulbar conjunctiva as the donor for autograft.

Methods: Prospective non-comparative interventional case series involving 195 consecutive eyes of 190 patients treated over a period of 1 year. The technique involved extended removal of pterygium along with excision of adjacent tenon tissue followed by appropriately sized limbal-sparing inferior bulbar conjunctival autograft using glue. Slit lamp photo documentation was done during every follow-up visit over a period of 9 months and postoperative complications were documented.

Results: Mean follow-up duration was 36 weeks. Minimum age was 18 years and maximum was 72 years with an average age of 38.21. The most common intraoperative complication was button holing of the donor graft seen in 40 eyes. Postoperatively no recurrence was noted in any of the patients over a period of 9 months. Excellent cosmesis was documented. Common postoperative complications included scarring at the donor site (33), subconjunctival hemorrhage (88), graft edema (75), dellen (27), and pyogenic granuloma (10). None developed inferior symblepheron.

Conclusions: Extended removal of pterygium followed by limbal-sparing inferior conjunctival autografting is an excellent option for treating primary pterygium. This technique ensures near zero recurrence rates and excellent cosmetic outcomes. More importantly, it helps in maintaining a virgin superior bulbar conjunctiva, which may be required for future glaucoma surgeries if necessary.

Multiple Cysts of the Meibomian Gland: A Rare Presentation

First Author: Saumya **SAXENA**

Purpose: To describe a rare case of multiple bilateral eccrine hydrocystomas with its surgical management.

Methods: A rare case of a hydrocystoma in young male affecting both eyes involving both the eyelids is described. Diagnosis was based on clinical findings and confirmed on pathological examination. A novel surgical technique for removal of cystic tumors of the lids is described, which offers good aesthetic results and low risk of recurrence.

Results: Examination revealed the presence of multiple translucent cysts ranging from 1 mm to 4 mm mostly around the medial canthus and medial one third of both the eyes, suggestive of hydrocystoma. Management consisted of surgical removal with good aesthetic correction.

Conclusions: Eccrine hydrocystoma are retention cysts histologically characterized by a single, partially collapsed cystic cavity in the dermis, with no papillary projections, surrounded by 1 or 2 layers of small cuboid epithelial cells. Complete surgical removal results in resolution with low risk of recurrence.

Ocular Trauma from Insect Stings

First Author: Prasoon **PANDEY**

Purpose: To describe ocular lesions and their management after stings from hymenopteran insects, a common encounter in tropical countries.

Methods: The clinical features, management, and outcome in 4 patients presenting with ocular trauma from wasp/bee stings of varying severity were analyzed.

Results: All 4 cases presented within 3 months in monsoon season. In all cases stings were removed and patients started on oral and topical steroids, along with topical antibiotics, cycloplegics, and anticollagenolytic drugs (oral doxycycline 200 mg BD). Two cases presenting with corneal edema and necrosis were managed with corneal patch grafts and recovered well. One case progressed to corneal decompensation. Case number 4 apart from corneal decompensation developed severe anterior chamber reaction with raised intraocular pressure (IOP) and anterior capsular cataract. This was managed with PKP with trabeculectomy and cataract extraction with PCIOL implantation.

Conclusions: The rare seasonal ocular trauma caused by hymenopteran insects can mimic infective keratitis, and timely removal of the retained sting with requisite medical and surgical management is important for good recovery.



Neuro-Ophthalmology

A Rare Case of Neuromyelitis Optica: A Multiple Sclerosis Masquerade

First Author: Gainathi **KAMBAM**

Purpose: To describe a rare case of neuromyelitis optica: a masquerade of multiple sclerosis.

Methods: An 18-year-old girl presented with profound decrease in vision in the left eye for 2 days, which was sudden in onset. There was a history of similar episodes 3 months prior and of focal seizures. On ocular examination right eye best corrected visual acuity was 6/6 and left eye vision was perception of light with relative afferent papillary defect. The rest of the anterior segment examination was unremarkable. Dilated fundus examination in the left eye showed clear media with temporal pallor of the disc. The rest of the fundus was normal in both eyes. MRI was advised.

Results: MRI of the brain and spinal cord done during the first episode revealed an ill defined hyperintense lesion seen in the right peritrigonal body of corpus callosum on the right side and left middle cerebellar peduncle. There were multiple short segment intramedullary plaques in the cervical spinal cord. IgG ABO to aquaporin 4 was negative at 1:10 dilution by immunofluorescence method. Patient was started on intravenous methylprednisolone and azathioprine 3 months ago. Best corrected visual acuity 2 weeks after initial presentation was 6/18. Despite being on immunosuppressives, the patient continued to have relapses.

Conclusions: Both visual and neurological prognosis in neuromyelitis optica are poorer than in multiple sclerosis. Episodes of visual loss are recurrent with severe visual impairment common in at least 1 eye. Immunosuppressive agents such as corticosteroids remain the mainstay of therapy for acute episodes.

Amiodarone-Induced Optic Neuropathy: A Case Report

First Author: Antonia **KARTIKA**

Purpose: To report a case of amiodarone-induced optic neuropathy.

Methods: A case of 56-year-old man who was referred by an ophthalmologist with optic neuritis in the left eye. He complained of dimming vision in the lower half visual field of the left eye that started 3 weeks previously. He was previously hospitalized for 3 days and received high doses of intravenous methylprednisolone that was followed by oral steroid. From detailed history taking it was revealed that the patient had been taking amiodarone for 1 year. Ophthalmologic examination found visual acuity of both eyes was 1.0. Anterior

segment examination revealed corneal stromal branching-like deposits in both eyes and relative afferent pupillary defect in the left eye. Fundusoscopic examination showed optic disc swelling that was more severe in the left eye. Humphrey test revealed an altitudinal inferior defect in the left eye. Amiodarone-induced optic neuropathy was concluded. A recommendation was made to the cardiologist to replace amiodarone with other anti-arrhythmic medication.

Results: One month after discontinuation of amiodarone, optic disc swelling resolved and visual field defect disappeared.

Conclusions: Amiodarone induced bilateral optic neuropathy that upon discontinuation of it, visual function slowly improved. An ophthalmologist should take a detailed history of the patient including medication history in order to get a proper diagnosis.

Atypical Anterior Optic Neuritis Resembling Anterior Ischemic Optic Neuropathy: A Unique Case Report

First Author: Kristian **GOENAWAN**

Co-Author(s): Tatang **GHANI**, Hartono **HARTONO**, Indra **MAHAYANA**

Purpose: We present a unique case of atypical anterior optic neuritis resembling anterior ischemic optic neuropathy.

Methods: We followed 1 patient from August 2016 to September 2016 diagnosed as anterior ischemic optic neuropathy upon early presentation and discovered that she had anterior optic neuritis. We examined visual acuity, visual field, color vision, intraocular pressure, and ocular anatomy at follow-up.

Results: A female patient aged 54 years old came to the emergency department complaining of sudden blurred vision in both eyes after waking up in the morning without redness and tearing 4 days prior. History of systemic and ocular diseases was denied. Visual acuity of the right eye was 0.5/60 (superior) and 1/60 (superior) in the left eye, which could not be corrected. Relative afferent pupillary defect was observed in the right eye. Biomicroscopic examination and intraocular pressure were normal. Funduscopy revealed ill defined margin at optic nerve head for both eyes suggesting papilledema. We could not examine color vision. Visual field showed inferior altitudinal defect (more severe in the right eye). Complete blood count, lipid profile, blood glucose, and electrocardiogram were done for confirming our diagnosis. We also consulted with the Internal Department. After follow-up for 11 days we questioned our early clinical diagnosis as the course of the disease became more like anterior optic neuritis. Follow-up after 2 months showed normal visual acuity, visual field, and color perception after steroid treat-

ment.

Conclusions: Anterior optic neuritis may have a very similar clinical presentation to anterior ischemic optic neuropathy upon early manifestation.

Causes of Papilledema in Pediatric Age Group: A 6-Year Hospital-Based Study in Northeastern India

First Author: Hiranmoyee **DAS**

Purpose: To study the various causes of papilledema in the pediatric age group (<18 years) in northeastern India, which differs from the mainland in terms of customs, beliefs, and lifestyle.

Methods: One hundred twenty cases having papilledema from January 2009 to December 2015 were studied. A prospective study was done with detailed history (including history of intrauterine infection), clinical examination, and neuro imaging (mostly CT scan) in all cases. Cases were followed up to 3 months.

Results: Cases were divided into 3 age groups: 0-3 years, 4-12 years, and 13-18 years. The majority of cases were in the third group. A total of 46.88% of cases were of infection, 34.38% of space-occupying lesion, 9.37% of otogenic intracranial complication, and 9.37% of pseudotumor cerebri. Among the infective group 26.04% were tuberculosis, 12.5% were viral, 6.25% were bacterial, and 2.08% were of fungal etiology. Among space-occupying lesions 12.5% were tumors, 6.25% intracranial hematoma, 6.25% tuberculoma, and 3.18% neurocysticercosis. In the younger age group the most common etiology was infection and in the older age group it was space-occupying lesion. Earliest regression of papilledema was seen at the end of 1 month and was maximum in the infective group. A total of 15.62% of cases died during the study period due to disease.

Conclusions: Tuberculosis (tubercular meningitis/brain tuberculoma, TB) was found to be the most common cause of papilledema in the pediatric age group. Prevalence of multi-drug resistant TB is very high in northeastern India. Another important finding was 3.18% cases of neurocysticercosis, the incidence of which is very high due to the habit of eating smoked pork in this area.

Clinical Features of Acquired Paralytic Strabismus

First Author: Hae-Ri **YUM**

Purpose: To investigate the clinical courses of acquired third, fourth, and sixth cranial nerve palsy.

Methods: Retrospectively, we reviewed the medical records of 100 eyes of 100 patients who were diagnosed with third, fourth, and sixth nerve palsy from March

2015 to July 2016. The age of onset, risk factors, and recovery rates and times were examined.

Results: The mean age of onset was 58.6 years. Of the 100 patients, there were 18 patients in the third cranial nerve palsy group, 42 patients in the fourth cranial nerve palsy group, 34 patients in the sixth cranial nerve palsy group, and 6 patients in the multiple cranial nerve palsy group. Vascular disease (n = 45) was the most common etiology of cranial nerve palsy, followed by an undetermined cause (n = 35). All of the patients with multiple cranial nerve palsy required neurosurgical or medical treatments. Of the 45 patients with undetermined cause that were followed up for at least 3 months, 38 (84.4%) patients showed a decrease in the angle of deviation. There was no significant difference in recovery rate by cranial nerve palsy.

Conclusions: The most common cause of acquired paralytic strabismus was vascular disease and the overall recovery rate of isolated ischemic third, fourth, and sixth cranial nerve was high. However, if patients show some signs of multiple cranial nerve palsy, it is necessary to undertake imaging studies.

Clinical Features of Optic Nerve Head Avulsion and Optic Nerve Transection

First Author: Ryo **YONEYAMA**

Co-Author(s): Toshiaki **GOSEKI**, Hitoshi **ISHIKAWA**, Nobuyuki **SHOJI**

Purpose: To report the clinical features of optic nerve head avulsion and optic nerve transection.

Methods: Six cases of optic nerve head avulsion (3 cases) and optic nerve transection (3 cases) were diagnosed from 2007 to 2016.

Results: Eyes in 2 of the 3 cases of optic nerve head avulsion had no light perception. In 1 of the cases, visual acuity was limited to hand motions and improved by 0.2 (BCVA; best-corrected decimal visual acuity) after 2 years. All optic nerve head avulsion cases were caused by blunt trauma, and the injured eyes showed hyphema, vitreous hemorrhage, and optic nerve avulsion. Eyes in 2 of the 3 cases of optic nerve transection had no light perception. In 1 of these cases, visual acuity was 0.07 (BCVA), which improved by 0.4 (BCVA) after a few years. All of the nerve transection cases were caused by penetrating trauma and showed intracranial complications such as orbital floor fracture or subarachnoid hemorrhage.

Conclusions: Diagnosing optic nerve head avulsion and optic nerve transection was difficult at first visit because a fundus examination cannot usually identify significant findings in the optic nerve head. In our experience, 2 of the 6 cases had improved visual acuities because there was only partial avulsion of the optic nerve fiber. Although such cases resulting from trauma



are rare, careful observation is necessary.

Correlation Between Electrophysiologic Tests and Optical Coherence Tomography in Patients with Traumatic Optic Neuropathy

First Author: Ungsoo **KIM**

Co-Author(s): Kun Hae **KIM**

Purpose: To study the correlation between electrophysiologic examinations which evaluate visual functions with optical coherence tomography (OCT), an anatomical evaluation, in patients with traumatic optic neuropathy.

Methods: Retrospective, observational case series. Twenty eyes from patients diagnosed with traumatic optic neuropathy were included. Basic ophthalmologic examinations were performed. Pattern ERG (P50 amplitude, N95 amplitude, and N95/P50 ratio) and pattern VEP (P100 amplitude and latency) were analyzed and compared with the thickness of the peripapillary retinal nerve fiber layer (RNFL) and ganglion cell inner plexiform layer complex measured with OCT.

Results: Twenty patients (17 male, 3 female) were evaluated. All parameters including P50 amplitude, N95 amplitude, N95/P50 ratio, P100 amplitude, and P100 latency changed in the traumatic eye. When it comes to pattern ERG with visual acuity, N95/P50 ratio showed a significant correlation ($r = 0.517$, $P = 0.028$). Although temporal RNFL thickness had a significant correlation with P100 amplitude of pattern VEP ($r = -0.930$, $P < 0.001$), pattern ERG did not show a correlation with OCT. In the patients with no detectable pattern VEP, pattern ERG could be obtained in 7 out of 8 patients.

Conclusions: In patients with traumatic optic neuropathy, pattern ERG may be a helpful alternative to pattern VEPs. ERG shows retinal function whereas VEP may reflect any abnormalities that affect the visual pathway including the visual cortex in the brain. In cases of flat VEP signals, results of ERG tend to achieve viable wave forms.

Detected Retinal Ganglion Cell Layer Loss Caused by Retrograde Transneuronal Degeneration in Homonymous Hemianopia Patients Using Optical Coherence Tomography

First Author: Chun Xia **PENG**

Purpose: Detected macular thickness (MT) and macular retinal ganglion cell layer (mRGCL) thickness in homonymous hemianopia patients (HHP) using optical coherence tomography (OCT) offer guidelines for the study of retrograde transneuronal degeneration (TTD).

Methods: Forty HHP (80 eyes) and 48 healthy controls

(HC) (48 eyes) were enrolled this study. HHP were divided into the ipsilateral eyes group and contralateral eyes group according to lesion location in the visual pathway. All the subjects underwent OCT and visual field (VF) examinations.

Results: In contrast to HC, MT and mRGCL thickness in HHP decreased sharply, which mainly involved the temporal half in ipsilateral eyes and nasal half in contralateral eyes. The comparison of ipsilateral eyes and contralateral eyes in HHP demonstrated that temporal MT in the ipsilateral eyes group lost about $6.84 \pm 13.34 \mu\text{m}$ ($P = 0.007$) and nasal MT lost $2.78 \pm 12.84 \mu\text{m}$ ($P = 0.230$). Temporal mRGCL thickness in ipsilateral eyes reduced $4.77 \pm 7.98 \mu\text{m}$ ($P = 0.002$) in contrast to contralateral eyes. Nasal mRGCL thickness in contralateral eyes reduced $5.75 \pm 10.44 \mu\text{m}$ ($P = 0.004$) compared to ipsilateral eyes. The VF loss was related to mRGCL thickness in the ipsilateral eyes group, with stronger correlation to nasal mRGCL thickness ($r = 0.557$, $P = 0.0018$).

Conclusions: Lesions involved in the visual pathway after lateral geniculate body caused MT and mRGCL by TTD. Ipsilateral eyes of HHP presented more serious damage in temporal mRGCL, and contralateral eyes mainly occurred in nasal mRGCL. The mRGCL loss had strong correlations to VF loss. These results could offer guidelines to localize lesions in CNS.

High-Resolution Transbulbar Ultrasonography Helps to Differentiate Intracranial Hypertension in Bilateral Optic Disc Edema Patients

First Author: Qian **CHEN**

Co-Author(s): Xinghuai **SUN**, Guohong **TIAN**, Min **WANG**

Purpose: The enlargement of optic nerve sheath diameter (ONSD) has been proven to be related to increased intracranial pressure (ICP). No observations have focused on utilizing retrobulbar ultrasonography in optic disc edema patients presenting to ophthalmologists.

Methods: High-resolution transbulbar ultrasonography was performed in a cohort of patients presenting with bilateral optic disc edema. The subarachnoid space (SAS) of the optic nerve, the ONSD, and the optic nerve diameter (OND) were measured prior to lumbar puncture. Subjects were classified into an increased ICP (IIP) group and a normal ICP (NIP) group, according to an open cerebrospinal fluid pressure greater than 200 mm H₂O. The SAS, ONSD, and OND were compared between the groups and with the normal controls. The sensitivity of SAS or ONSD changes for predicating intracranial hypertension was assessed.

Results: A total of 20 IIP patients, 25 NIP patients, and 25 normal controls were evaluated. The mean SAS and

ONSD measured in the IIP group were significantly greater than those in the NIP group and controls ($P < 0.001$), whereas the OND showed no statistically significant difference among the groups. The sensitivity of SAS and ONSD for differentiating increased ICP in optic disc edema patients was 0.99 and 0.97, respectively.

Conclusions: The increased SAS and ONSD measured by high-resolution transbulbar sonography are very sensitive parameters for predicting increased ICP in bilateral optic disc edema patients.

Macular Retinal Structure and Choroidal Changes in Non-Endocrine Pituitary Tumor Patients

First Author: Xia **ZHANG**

Co-Author(s): Jin **MA**, Yong **ZHONG**

Purpose: Endocrine functions may affect the structures of the retina and choroid; thus, the changes caused by chiasmal compression can only be evaluated in non-endocrine pituitary tumors. We compared the retinal and choroidal changes in patients with or without visual field defect and normal individuals to evaluate their relation to visual functions and prognosis.

Methods: We collected 40 (74 eyes) non-endocrine pituitary tumor patients (Rantheke cyst, nonfunctioning adenoma) in PUMCH, including 20 bilateral visual field defect patients (group 1) and 20 normal visual field patients (group 2), with 1:1 age- and sex-matched controls (20 individuals, 40 eyes, group 3). We measured subfoveal RCT, choroidal thickness, and 3 x 3 mm of supranasal, supratemporal, inferiotemporal, and inferior nasal RNFL and GCC thickness and compared within the 3 groups. The relations of structural changes with 10-degree visual field (VF) were analyzed.

Results: There were no significant differences among the 3 groups in subfoveal retinal thickness and choroidal thickness. The nasal quadrants of RNFL and GCC thickness in groups 1 and 2 were significantly thinner than controls ($P < 0.01$). Also in RNFL, group 1 was significantly thinner than group 2; however in GCC, no significant difference was detected between group 1 and 2. The logistic regression showed RNFL thickness was related to 10-degree VF but not GCC.

Conclusions: The subfoveal total retinal thickness and choroidal thickness are not affected by chiasmal compression. RNFL thickness is affected by chiasmal compression and related to visual field defect. GCC thickness is also affected but not related to visual function.

Making the Call: Differentiating Between Papilledema and Pseudo-Papilledema in the Outpatient Setting

First Author: Pathmanathan **PATHMARAJ**

Purpose: The ability to distinguish between papilledema and pseudo-papilledema is a challenging but important skill for referrers and ophthalmologists alike. We aimed to describe the proportion of patients diagnosed with pseudo-papilledema in a cohort referred for suspicion of papilledema. We also aimed to assess the efficacy of optical coherence tomography (OCT) and other modalities in distinguishing between pseudo-papilledema and papilledema in the outpatient setting.

Methods: We retrospectively reviewed urgent referrals for papilledema between January 2016 and June 2016 at a private ophthalmic clinic and a public ophthalmology department. Patients were assessed on the basis of clinical history and examination, ultrasound, OCT, and autofluorescence. Referring clinicians were communicated with in all cases to gauge perceived barriers to effectively distinguishing between papilledema and pseudo-papilledema.

Results: The majority of patients referred for papilledema were diagnosed with pseudo-papilledema. OCT represented a valuable investigation in distinguishing between the 2 diagnoses. Communication with referring clinicians suggested that educational and reference material may represent useful tools for future guidance.

Conclusions: Discrimination between pseudo-papilledema and papilledema has significant implications for appropriate patient management and may not be readily apparent. The use of ocular imaging equipment can aid in the differentiation of pseudo-papilledema from papilledema in conjunction with concurrent clinical findings. Our results prompted the development of a clinical guideline for use by clinicians to aid in distinguishing between the diagnoses and to guide referral patterns.

Metastatic Renal Cell Carcinoma Presenting as One-and-a-Half Syndrome

First Author: Mukesh **PATIL**

Co-Author(s): Rohit **SAXENA**, Sanjay **SHARMA**, Divya **SINGH**

Purpose: To report an unusual case of metastatic renal cell carcinoma presenting as one-and-a-half syndrome.

Methods: A 43-year-old male patient presented with the chief complaint of sudden onset, progressively worsening binocular diplopia in right gaze for the preceding month. On ocular examination, best corrected distance visual acuity and near vision in both eyes was



6/6 and N6, respectively. Anterior and posterior ocular segment evaluation was unremarkable. Eyes were aligned in primary position, horizontal gaze palsy was noted with loss of saccades and pursuit movements in levoversion. On attempted dextroversion, right eye was abducting with associated abduction nystagmus in the absence of left eye adduction. Both vertical gaze and convergence were normal.

Results: Based on ocular findings, the diagnosis of ipsilateral one-and-a-half syndrome was made. MR imaging revealed an irregular complex cystic enhancing space occupying lesion measuring 42 × 39 × 35 mm in the region of the fourth ventricle closely abutting the brain stem posteriorly. Radiological findings suggested brain metastasis. Further evaluation was supplemented with 18F-FDG PET/CT imaging to locate the primary pathology. Abdominal CT scans showed a primary neoplastic lesion, arising from the upper pole of the right kidney and another exophytic mass in the lower pole of the left kidney. In addition, metastatic lesions in the right adrenal gland, pancreas, and brain were seen. Palliative radiotherapy was started.

Conclusions: Any motility defects associated with acute diplopia should not be overlooked. Prompt systemic evaluation with imaging in such cases can avoid fatal and irreversible consequences of a hidden disease.

Multiethnic Involvement in Autosomal Dominant Optic Atrophy in Singapore

First Author: Shweta SINGHAL

Purpose: Autosomal dominant optic atrophy (ADOA), often associated with mutations in the OPA1 gene (chromosome 3q28-q29), is rarely reported in Asia. Our aim was to identify and describe this condition in an Asian population in Singapore.

Methods: Preliminary cross-sectional study at Singapore National Eye Centre, including patients with clinical suspicion of ADOA, who subsequently underwent genetic testing by direct sequencing of the OPA1 gene.

Results: Among 12 patients (10 families) with clinically suspected ADOA, 7 patients (5 families) from 3 different ethnic origins (Chinese, Indian, and Malay) carried a heterozygous pathogenic variant in the OPA1 gene. The OPA1 mutations were located on exons 8, 9, 11, and 17: c.869G>A (p.Arg290Glu), c.892A>G (p.Ser298Gly), c.1140G>A (splicing mutation), and c.1669C>T (p.Arg557*), respectively. One splicing mutation (c.871-1G>A) was identified in intron 8. We also identified a novel mutation causing optic atrophy and deafness [c.892A>G (p.Ser298Gly)]. Among the phenotypic features, color pupillometry disclosed a dissociation between low vision and preserved pupillary light reflex in ADOA.

Conclusions: We report the first cases of genetically

confirmed OPA1-related ADOA from Singapore, including a novel mutation causing “ADOA plus” syndrome. Further epidemiological studies are needed in order to determine the prevalence of ADOA in Southeast Asia.

Neuro-Ophthalmologic Presentation of Giant Intracavernous Carotid Artery Aneurysm in a Child

First Author: Bonifacio BUNO

Co-Author(s): Franz-Marie CRUZ

Purpose: To report a pediatric patient with multiple cranial nerve palsies due to a giant intracavernous carotid artery aneurysm.

Methods: This is a case report.

Results: A healthy 11-year-old boy was referred to the ophthalmology clinic for neuro-ophthalmic evaluation. Since 2 years of age, he was noted to have a persistent inward turning of the right eye and a right head turn. He was not brought for eye consult until recently after he suffered a relatively trivial blunt facial trauma, resulting in right periorbital swelling and horizontal binocular diplopia. On examination, he had right abducens nerve palsy, right corneal anesthesia, and right post-ganglionic Horner syndrome. The other cranial nerves were normal. Neuroimaging revealed a large, multi-lobulated, fusiform aneurysm involving the petrous and cavernous segments of the right internal carotid artery.

Conclusions: Giant intracavernous carotid artery aneurysms (ICCAA) are extremely rare in the pediatric population and may present as multiple subtle cranial nerve palsies. A comprehensive neuro-ophthalmic examination is essential.

Novel Equipment for the Diagnosis of Functional Visual Loss with a Head-Mounted Perimeter

First Author: Toshiaki GOSEKI

Co-Author(s): Hitoshi ISHIKAWA, Nobuyuki SHOJI

Purpose: Diagnosis of functional visual loss is often difficult due to the non-responsiveness to visual acuity trick tests and an atypical visual field variation. Head-mounted perimeters have recently been developed, and one of these devices, the imo (CREWT Medical Systems), is now in clinical use in Japan. It allows the simultaneous measurement of bilateral visual fields by randomly showing targets to each eye without the patient being aware of which eye is being tested. Herein, we report a case series for the diagnosis of functional visual loss using imo.

Methods: We conducted regular ophthalmological tests for patients with suspected unilateral functional visual loss at Kitasato University Hospital. Then, we

performed visual field testing using Humphrey Field Analyzer II, Goldmann perimetry, and imo and compared the results.

Results: The results of the existing perimeter revealed a unilateral temporal hemianopia case (11-year-old girl), unilateral cloverleaf visual field (15-year-old boy), and unilateral concentric visual field defect (24-year-old man). The results of the imo were normal in all cases.

Conclusions: The imo is a useful tool for diagnosing functional visual field loss. In future, it may be used as a standard for diagnosis of this type of visual loss.

Pontine Cavernous Malformation Resulting in Eight-and-a-Half Syndrome: A Case Report

First Author: Bryan Vincent **MESINA**

Co-Author(s): Karen **REYES**

Purpose: Eight-and-a-half syndrome is a rare pontine neuro-ophthalmologic syndrome comprised of conjugate horizontal gaze palsy, ipsilateral internuclear ophthalmoplegia, and ipsilateral lower motor neuron-like facial palsy resulting from a lesion affecting the paramedian pontine reticular formation, median longitudinal fasciculus, and facial nerve fascicle on one side. Although it is most commonly caused by an infarction or demyelination, in rare instances, a space-occupying lesion can be the etiology. We present to you a rare case of eight-and-a-half syndrome caused by a pontine cavernoma.

Methods: A 56-year-old male came in for consult due to sudden-onset right-sided facial weakness associated with a 30-year history of limitation of extraocular muscle motion in both eyes. A complete neuro-ophthalmologic examination was done and cranial magnetic resonance imaging was requested.

Results: The patient had good visual acuity and color vision and no relative afferent pupillary defect. He had right horizontal conjugate gaze palsy and limitation of adduction of the right eye with nystagmus of the left eye on left gaze. Also noted was a right peripheral facial nerve palsy demonstrated by lagophthalmos, a shallow nasolabial fold, and corrugator supercilli and procerus muscle weakness. Magnetic resonance imaging revealed a well-defined “popcorn ball”-like lesion with a hemorrhage ring at the level of the pons, resembling a cavernoma.

Conclusions: It is important to recognize the features of the disease to be able to order the proper diagnostic exams, localize the lesion, and determine the proper treatment regimen for each patient.

Sight Threatening in Graves Ophthalmopathy

First Author: Anak Agung Mas **TRININGRAT**

Purpose: To report a case with severe visual loss in

Graves ophthalmopathy due to autoimmune inflammation condition and its management.

Methods: A 57-year-old man complained of visual loss in both eyes for 2 weeks before being admitted to the hospital. The patient had undergone thyroid operation approximately 1 year prior. On ophthalmology examination, visual acuity in the right eye was hand movements and in the left eye was no light perception, with retraction of both eyelids, mid-dilated pupil, and swollen optic disc. The MRI scan showed no abnormalities of extraocular muscles. The patient was administered high dose intravenous injection of steroid 1000 mg per day for 3 days, followed by 1 mg/kgbw oral steroid and tapered off.

Results: After 3 weeks of follow-up, the visual acuity in the right eye improved from hand movements to 6/24 pinhole 6/18 and in the left eye from no light perception to 6/60 with pinhole 6/18.

Conclusions: Sight threatening in Graves ophthalmopathy is very rare (only 10-20%). There can be permanent loss of vision if not treated appropriately. Steroid gives a very good response for these cases.

Sneeze Until You Freeze

First Author: Abirami **SANMUGAM**

Co-Author(s): Hussein **ADIL**, *Mei Fong* **CHONG**, *Wan-Hazabbah* **WAN HITAM**

Purpose: To report a rare case of isolated superior gaze palsy in Parinaud syndrome secondary to valsalva maneuver.

Methods: Case report.

Results: A 69-year-old man with co-morbid hypothyroidism presented with sudden onset binocular diplopia after a sneeze. The diplopia was present on superior gaze. He had nasal congestion and runny nose for 10 days prior to the diplopia. There was no fever, headache, or cough. On examination, visual acuity in both eyes was 6/24. He had bilateral mild lid lag and retraction of lids. Extraocular muscle movement of both eyes was limited in superior gaze. Anterior segments in both eyes were unremarkable except for moderate nucleosclerosis. Fundus findings were normal in both eyes. Other nervous system examination was normal. Plain CT of the brain showed ethmoidal and maxillary sinusitis. MRI of the brain showed hyperintense signal at left dorsal midbrain with mild enhancement suggestive of subacute infarction. He was diagnosed with Parinaud syndrome. He was started on oral cardiprin 100 mg daily. One month after presentation, his diplopia resolved with improvement of superior gaze movement bilaterally.

Conclusions: Superior gaze palsy after valsalva maneuver is a rare presentation. It is even rare to have iso-



lated superior gaze palsy in Parinaud syndrome. Radio imaging plays an important role to confirm the diagnosis in aid of prompt treatment. The key to the patient's outcome lies in the timely diagnosis of Parinaud syndrome.

The Clinical Profile of Optic Neuritis in a Tertiary Government Hospital in the Philippines

First Author: Renato Jr RAYEL

Co-Author(s): Richard KHO

Purpose: Optic neuritis is a common acute demyelinating optic neuropathy affecting young and middle-aged patients. Much of our understanding of the presentation and treatment of this condition comes from the landmark Optic Neuritis Treatment Trial. Recent Asian studies, however, show a difference in presentation and etiology. This study examines the clinical profile of optic neuritis patients seen in a tertiary government hospital from 2011 to 2016.

Methods: A retrospective chart review of optic neuritis patients seen at a tertiary government hospital was done. The clinical presentation was analyzed and compared to data from the Optic Neuritis Treatment Trial as well as other Asian studies on the condition.

Results: Thirty-three patients (40 eyes) were diagnosed as cases of papillitis (30%), retrobulbar neuritis (28%), or neuroretinitis (47%) from 2011 to 2016. Optic disc edema was the most common presentation of the disease among our patients. There was a predilection for the female sex. On average, patients who developed the disease were in their 30s. Most cases of optic neuritis were unilateral. Ocular pain was not a distinguishing characteristic of optic neuritis and was more often seen among cases of retrobulbar neuritis than papillitis or neuroretinitis. RAPD was frequently seen regardless of the type. Most cases were idiopathic. Treatment with intravenous dexamethasone followed by oral prednisone may result in better visual acuity improvement than treatment with oral prednisone alone.

Conclusions: The clinical profile of Filipino optic neuritis patients is similar to that in other Asian countries and contrasts with findings of the landmark Optic Neuritis Treatment Trial.

Ocular Imaging

A Novel Approach to Multimodal Imaging of Central Serous Chorioretinopathy with the Use of Multi-Spectral Imaging and Trans-Scleral Choroidal Imaging

First Author: Nicola GAN

Co-Author(s): Wai-Ching LAM, Ayda SHAHIDI, Cheryl ZIMMER

Purpose: To demonstrate the usefulness of Anndis RHA multi-spectral imaging (MSI) and trans-scleral choroidal imaging (TCI) in capturing retinal and choroidal changes in acute and chronic central serous chorioretinopathy (CSCR). MSI is a novel technology that produces a series of en-face fundus images from the internal limiting membrane to the choroid. The RHA (Anndis Corporation, Ottawa, Canada) acquires data using light-emitting diodes ranging from 520-940 nm in wavelength. Distinctive spectral signatures enhance visualization of specific retinal structures including hemoglobin, melanin, and lipofuscin. Retinal and choroidal (MSI-OH2) oxy-deoxyhemoglobin contrasted maps are also a unique feature that produces images depicting oxygenated and deoxygenated perfusion within the retinal and choroidal vasculature, without the use of intravenous dye.

Methods: Retrospective case series.

Results: The MSI-OH2 images correlate well with the indocyanine green angiogram (ICG), with hyper-reflectance (increased oxygenation) corresponding to choroidal hyperpermeability seen on ICG in acute CSCR. MSI-660 nm images are useful for studying changes in the retinal pigment epithelium (RPE), with findings that are similar to fundus autofluorescence. In the MSI-940 nm series, en-face images of the choroidal vasculature are obtained with simultaneous capturing of overlying melanin stacks, indicating retinal pigment epitheliopathy. Melanin stacking can be seen demarcating the extent of resolved neurosensory detachment as well as over areas of RPE dysfunction, with a diffuse annular pattern seen in chronic CSCR.

Conclusions: The multi-spectral retinal/choroidal images and the choroidal oxy-deoxygenated contrast map are able to provide useful and reproducible en-face images of the RPE and choroidal vascular oxygenation in patients with CSCR.



Assessment of the Choroid Following Cataract Surgery in Diabetic Patients Using Choroidal Thickness and Vascularity Index as Optical Coherence Tomography Parameters

First Author: Augustinus **LAUDE**

Co-Author(s): Rupesh **AGRAWAL**, Vivien **YIP**

Purpose: To study the changes of the choroid in diabetics following cataract surgery using choroidal vascularity index (CVI) and choroidal thickness (CT).

Methods: A prospective study of the choroid in 18 diabetic and 18 non-diabetic patients undergoing cataract surgery. Enhanced depth imaging optical coherence tomography (OCT) was obtained before and after surgery. Image binarization using the Niblack method was used to study the total choroidal area (TCA), luminal area (LA), and stream area (SA) of the choroid. The CVI was obtained from the ratio of the LA and TCA. The independent samples T-test was used to compare the differences of CVI and CT between diabetics and non-diabetics. Pearson correlation coefficient was used to study the association between CVI and CT with age, axial length, spherical equivalence, and diabetic control.

Results: The CVI was smaller in diabetics compared to non-diabetics at baseline for operated and control eyes [mean difference 0.0184, 95% confidence interval (CI) 0.004 to 0.0324, $P = 0.012$; mean difference 0.0145, 95% CI 0.003 to 0.0256, $P = 0.012$]. Choroidal thickness increased following cataract surgery (diabetics: mean difference 12.4, 95% CI 0.70 to 24.00, adjusted $P = 0.036$; non-diabetics: mean difference 21.0, 95% CI 4.39 to 37.6, adjusted $P = 0.011$). There was a negative linear association between CT and axial length ($r = -0.595$, $P = 0.009$) and a positive linear association between CT and CVI with spherical equivalence ($r = 0.521$, $P = 0.038$; $r = 0.597$, $P = 0.015$).

Conclusions: Diabetics have smaller CVI than non-diabetic controls. Choroidal thickness increases following cataract surgery but there were no significant changes in CVI.

Comparison of Choroidal Thickness Measurements Between Swept-Source and Spectral-Domain Optical Coherence Tomography

First Author: Kai Xiong **CHEONG**

Co-Author(s): Louis **LIM**, Srinivas **SADDA**, Colin **TAN**

Purpose: Choroidal thickness (CT) measurements differ between swept-source optical coherence tomography (SS-OCT) and spectral-domain OCT (SD-OCT) devices for point thickness measurements. We aimed to assess the comparability of mean macular CT measurements between SS-OCT and SD-OCT devices.

Methods: In a prospective cohort study of 25 healthy volunteers, OCT scans were performed sequentially with the DRI OCT-1 and Spectralis OCT using standardized imaging protocols. These OCT scans were independently graded by reading center-certified graders to obtain mean CT in the various ETDRS subfields. Paired t tests and intraclass correlation coefficients (ICCs) were used to compare the measurements.

Results: The difference in mean central subfield CT between DRI OCT-1 and Spectralis was 49.3 μm ($P < 0.001$), while differences in CT in various ETDRS subfields varied from 42.1 μm to 67.2 μm . After manual adjustment of the segmentation boundaries for the central subfield in the DRI OCT-1, the mean central subfield CT for DRI OCT-1 increased from 263.1 μm to 293.3 μm ($P < 0.001$), and the resultant difference between DRI OCT-1 and Spectralis decreased from 49.3 μm to 19.1 μm (a decrease of 61.3%; $P < 0.001$). CT between the 3D and radial scanning protocols of the DRI OCT-1 were highly comparable, with differences generally under 10 μm ($P < 0.001$) and ICC of 0.888 for the central subfield.

Conclusions: CT measurements between automated segmentations from the DRI OCT-1 and manual segmentations on the Spectralis OCT may differ by more than 50 μm . This difference can be reduced, but not eliminated, by manual adjustment of segmentation boundaries by trained graders and should be accounted for when comparing results between the 2 devices.

Management of Sequestered Blood Under the ILM After Failed NdYAG Laser Hyaloidotomy: Role of OCT

First Author: Alyscia **CHEEMA**

Purpose: To highlight the importance of optical coherence tomography (OCT) imaging in differentiating the subhyaloid and sub-internal limiting membrane (ILM) space with compartmentalization of premacular hemorrhage.

Methods: This is a case report of a 47-year-old female who had loss of vision 4 weeks previously due to premacular hemorrhage caused by valsalva retinopathy. She underwent NdYAG laser hyaloidotomy which failed to restore vision. OCT showed blood under the ILM. A second NdYAG laser procedure was performed.

Results: The visual recovery was 6/12 from an initial presentation of hand motions. OCT showed the slow release of the sequestered blood on serial examination.

Conclusions: OCT has proven to be an excellent tool in delineating the sub-ILM and subhyaloid space and YAG laser should be done under OCT guidance to produce a better result.



Patient Opinion and Perception Regarding Smart Devices as Cameras for External Ophthalmic Photography

First Author: Suchit **DADIA**

Co-Author(s): Simranjeet **AULAKH**, Akshay **NAIR**

Purpose: To assess patient perception regarding the use of smart devices as cameras for external ophthalmic photography in the clinic.

Methods: A cross-sectional survey was conducted among 280 patients at 2 oculoplastics clinics in Mumbai, India.

Results: Of the 280 patients surveyed, 68% felt that medical photography had an impact on their understanding of the disease and treatment. A total of 72% felt that the use of smartphones for medical photography was acceptable in the clinic. A majority (40%) did not have any preference with regard to the preferred device for photography, 28% preferred a hospital-owned camera, and 22% preferred the doctor's own camera. A total of 68% of the patients had no specific concerns regarding the use of smartphones in clinics.

Conclusions: Smart devices have gained acceptance among patients as devices that can be used for medical photography. However, patient identification and breach of confidentiality remain issues that some patients have with the use of smart devices.

Ocular Oncology & Pathology

A Rare Case of Lens Neovascularization in Retinoblastoma

First Author: Shriya **DHAR**

Co-Author(s): Manabjyoti **BARMAN**, Kasturi **BHATTACHARJEE**, Dipankar **DAS**, Diva **MISRA**, Richa **SHRI-VASTAVA**

Purpose: To present a case of retinoblastoma (RB) with neovascularization of the crystalline lens

Methods: A single observational case.

Results: A 4-month-old female baby with white pupillary reflex in the right eye was diagnosed clinically and radiologically as group E RB. The eye was enucleated with parental consent. Gross and microscopic examination of the eye revealed neovascularization of the crystalline lens. The tumor had other risk factors of focal iris new vessel formation and focal retinal pigment epithelium involvement with the presence of new rosettes described by the group earlier. Further, molecular pathology (immunohistochemistry; IHC) was consistent with neuroblastic origin of RB, but IHC for TGF-beta did not show positivity.

Conclusions: Neovascularization of the lens in RB could

be due to the hypoxic condition of the tumor, and the case was consistent with advancement of the tumor presenting with histopathological high risk factors.

A Rare Case of Primary B-Cell Lymphoma Originating from the Iris

First Author: Wei-Yu **LAI**

Co-Author(s): Shih-Chou **CHEN**, Shwu-Jiuan **SHEU**, Tsung-Tien **WU**

Purpose: To report a rare case of primary intraocular lymphoma originating from the iris.

Methods: Case report and literature review.

Results: A 57-year-old woman presented with corticosteroid-resistant anterior uveitis with a protruding mass in the iris. The bulging mass gradually expanded over three fourths of the iris, eventually occluding the angle of the anterior chamber leading to elevated intraocular pressure. The cytology from anterior chamber irrigation confirmed primary B-cell type non-Hodgkin lymphoma in the iris. Initial lumbar puncture and orbital MRI showed no central nervous system involvement. Therefore, the patient was treated with intravitreal injection of methotrexate and localized orbital radiotherapy. Despite treatment, progression of central nervous system was noted, which further mandated brain radiotherapy and systemic chemotherapy.

Conclusions: Primary lymphoma localized in the iris only is rare. In this case, initial presentation led to the confusion of anterior uveitis. Our case shows that accurate cytologic identification of lymphoma cells is critical for diagnosis.

Analysis of Salvage Rate in Advanced Retinoblastoma: A 5-Year Follow-Up

First Author: Deepika **KAPOOR**

Co-Author(s): Kasturi **BHATTACHARJEE**, Surpriya **HA-WAIBAM**, Prabhjot Kaur **MULTANI**, Samir **SERASIYA**, Prerana **TAHILIANI**

Purpose: To analyze the salvage rate in advanced retinoblastoma (group D and E as per ICRB) over a 5-year follow-up period.

Methods: In this prospective study of patients with retinoblastoma (group D and E), follow-up was done for a 5-year period. All patients were treated with systemic chemotherapy (neoadjuvant, adjuvant, or secondary chemotherapy) and intravitreal topotecan in those with diffuse seeding. With the aim to salvage the globe, additional sequential aggressive local therapy (transpupillary thermo-therapy, cryotherapy) was given. However, in patients not responding to treatment, enucleation was done.

Results: A total of 190 eyes of 160 patients were included in the study. Out of this, 43% (n = 82) were in

group E and 18% (n = 34) in group D. A total of 66% of the eyes in group D received high dose chemoreduction and globe salvage was possible, whereas enucleation was done in 34%. Our study showed that the survival rate was 84% at the end of the study period. Probability of survival (pOS) was assessed using Kaplan-Meier life table analysis. The enucleation rate for the present study was 51.61%, of which eyes with unilateral tumors made up 35% while 16% were bilateral. Rate of globe + vision salvage was 41.93%, only globe salvage was 6.45%, and total eyes salvaged was 48.38%.

Conclusions: Appropriate timely systemic and intravitreal chemoreduction along with focal therapy can achieve reasonable salvage rates even in advanced retinoblastoma cases.

Case Report on Bilateral Orbital Lymphoma

First Author: Amali HIGGODAKANKANAMGE

Co-Author(s): Binara AMARASINGHE

Purpose: Lymphomas of the ocular adnexa constitute approximately 8% of all extranodal lymphomas. They represent one end of the spectrum of lymphoproliferative lesions, at the other end of which lies benign reactive lymphoid hyperplasia. Accurate diagnosis of the type of lymphoma has improved considerably with the introduction of immunological staining methods.

Methods: Case report. A 56-year-old female was referred to the National Eye Hospital, Colombo, with a history of bilateral proptosis of 3 months' duration and a lump appearing in the superior aspect of the globe for 2 months' duration.

Results: Basic serological investigations and contrast enhanced CT scan of the orbit and brain were done. CT revealed a soft tissue mass on the superior aspect of the orbit. Tissue excision biopsy revealed low grade non-Hodgkin B cell lymphoma. Appropriate oncology referral was done.

Conclusions: The presenting history, such as the age of the patient (56 years) and relatively short duration of symptoms (2 months), and the clinical appearance (bilateral subconjunctival pinkish fleshy mass) favored a lymphoproliferative lesion. Tissue biopsy and histochemistry markers revealed the diagnosis.

Challenging Management of Recurrent Orbital Rhabdomyosarcoma: A Case Report

First Author: Ika SUSANTI

Co-Author(s): Rossalyn ANDRISA, Neni ANGGRAINI, Mutmainah MAHYUDDIN, Nurjati Chairani SIREGAR

Purpose: Orbital rhabdomyosarcoma is a highly malignant tumor arising from orbital soft tissue and the most common malignant orbital tumor in childhood with rapid progression of bulging mass, particularly in

the superonasal quadrant of the eyelid with a history of trauma. The aim of this study is to demonstrate a challenge in the management of recurrent orbital rhabdomyosarcoma.

Methods: A 6-year-old boy came with painful proptosis of the right eye for 3 weeks. There was a rapidly progressed mass over the right upper eyelid. The histopathology results established the diagnosis of embryonal rhabdomyosarcoma. A history of trauma was not found.

Results: The patient was treated with 6 cycles of chemotherapy with the regimen of vincristine, dactinomycin, and cyclophosphamide. However, due to poor compliance which required the patient to finish the cycles in 1 year, the response was not adequate. Enucleation and tumor resection were then performed. First recurrence occurred 4 months after the first surgery. The patient then underwent another tumor resection, but he refused to undergo the following chemotherapy. One and a half years after the second surgery, an extensive mass was noticed. Three cycles of chemotherapy with the regimen of iphosphamide, etoposide, and carboplatin were given but the result was unresponsive. The patient passed away before he underwent another partial tumor debulking and chemoradiation.

Conclusions: Advances in chemotherapy, tumor resection, and radiotherapy have improved survival rates of orbital rhabdomyosarcoma patients. However, many factors influence the success of the treatment, including patient compliance and response to chemotherapy regimen, which may further effect the long-term survival rate.

Clinical Experience in Cases of Choroidal Melanoma Treated with Radiation Therapy

First Author: Hamisah ISHAK

Purpose: To report 3 cases of choroidal melanoma which underwent radiation therapy.

Methods: Case series.

Results: Choroidal melanoma is the commonest intraocular malignancy but occurs rarely among Asians. Treatment is aimed at prolonging life, and historically enucleation was the mainstay of treatment. Other treatment modalities which conserve the eye and possible useful vision have been reported to be as effective as enucleation in preventing metastasis. We report 3 cases of choroidal melanoma seen in our center who underwent globe conservation therapy. They were in their third, sixth, and seventh decade of life. All of them had good visual acuity at presentation. There was no evidence of metastasis in all patients at presentation. The tumors were medium to large in size with surrounding subretinal fluid. Two of them had plaque brachytherapy and 1 had stereotactic radiotherapy.



Post procedure, all patients lost at least 4 lines of visual acuity. The tumor shrunk in all cases, but 1 of them developed ischemic radiation retinopathy requiring laser photocoagulation. No recurrence or metastasis was observed in all cases up to 36 months.

Conclusions: Conserving the globe is an advantage of radiation therapy in managing cases of choroidal melanoma. It is an alternative to enucleation, even though all of our patients lost their visual acuity post therapy.

Clinical Presentation and Outcome of Sebaceous Cell Carcinoma: A 10-Year Review

First Author: Emmy LI

Co-Author(s): Stacey LAM, Hunter YUEN

Purpose: To describe the clinical features, management, and prognosis of sebaceous cell carcinoma in a tertiary eye center in Hong Kong.

Methods: This is a single center retrospective case series. Medical records of 18 consecutive patients with sebaceous cell carcinoma of the eyelid were reviewed. Presenting features, location in the eyelid, management, histopathologic findings, incidence of recurrence, metastasis, and mortality were evaluated.

Results: The median age at presentation was 63.9 years old; 67% were female. Left-to-right ratio was 1:1, with 83% on the upper lid. Initial diagnoses were chalazion (61%), suspicious mass for investigation (33%), and recurrent blepharoconjunctivitis (11%). All had pathological confirmed diagnosis of sebaceous cell carcinoma, 17% showed intraepithelial (pagetoid) involvement, and 11% were positive for fat staining. A total of 72% of patients underwent excision with local reconstruction, 11% with orbital exenteration, 6% with radiotherapy, and the rest opted for conservative treatment.

Conclusions: Despite the fact that clinical features of sebaceous cell carcinoma have been widely reported, time lag from presentation to diagnosis is still common.

Clinical Profile of Retinoblastoma in a Tertiary Public Hospital of Bangladesh

First Author: Md Ashiqur AKANDA

Purpose: To report and analyze the characteristics and clinical presentations of retinoblastoma in a series of pediatric patients from a tertiary public hospital in Bangladesh.

Methods: In this retrospective study, profiles of pediatric patients with retinoblastoma archived in a tertiary public hospital in Bangladesh from January to December 2014 (80 patients with 114 eyes) were reviewed. Demographics, as well as the laterality, clinical manifestations, findings of CT scan of orbits and brain, and the types of treatment, were the major endpoints.

Results: There were 46 cases (57.7%) with unilateral and 34 cases (42.5%) with bilateral involvement. The male-to-female ratio was 1.4 to 1 with a mean admitting age of 24.0 ± 11.3 (range, 5-62) months. The mean diagnosis delay was 7.4 ± 9.6 months (range, 10 days to 13 months). The most common presenting sign was leukocoria (72.5%) followed by proptosis (7.5%), strabismus (7.5%), hyphema (5%), orbital cellulitis (5%), and glaucoma (2.5%). Enucleation was performed in 95.7% of the cases with unilateral involvement and at least 1 eye of the patients with bilateral disease.

Conclusions: This is the first study evaluating a series of Bangladeshi children with retinoblastoma. Leukocoria is the most common presentation of retinoblastoma in our study in a tertiary public hospital in Bangladesh. The critical issues in the management of childhood blindness are early diagnosis, timely intervention, and follow-up for a long time.

Efficacy and Safety of Ruthenium 106 Plaque Brachytherapy for Intraocular Tumors in Ramathibodi Hospital in Bangkok, Thailand

First Author: Donrudee SIRINIL

Co-Author(s): Taweewat ATTASETH, Rawi BOONYAOPAS, Pawipon NISARAT, Duangnate ROJANAPORN, Tharikarn SUJIRAKUL

Purpose: To evaluate efficacy and safety of ruthenium 106 (Ru-106) plaque brachytherapy for intraocular tumors.

Methods: Retrospective case series including 21 eyes from 20 patients (1 patient had bilateral retinoblastoma) treated with Ru-106 plaque brachytherapy at Ramathibodi Hospital from April 2013 to June 2016.

Results: Of 21 eyes, 10 (48%) were choroidal melanoma, 7 (33%) were retinoblastoma, 3 (14%) were choroidal metastasis, and 1 (5%) was secondary vasoproliferative tumor from Coats disease. Among choroidal malignant melanoma patients, globe salvage was achieved in all 10 eyes with 4 (40%) eyes requiring additional plaque brachytherapy due to local recurrence of the tumor. The mean recurrence time was 150 days (range, 110-270 days). Of 7 eyes from 6 retinoblastoma patients, globe salvage was achieved in 5 (71%) eyes. Subsequent enucleation was required due to massive vitreous seeding in 1 eye and vitreous hemorrhage in 1 eye. All eyes with choroidal metastasis and Coats disease showed good response to Ru-106 brachytherapy. Radiation retinopathy was found in 48%, radiation maculopathy in 29%, and radiation papillopathy in 19%. No local tumor recurrence or distant metastasis was observed during the mean follow-up time of 24.6 months (range, 4-38 months).

Conclusions: Ruthenium 106 plaque brachytherapy can be used as primary or adjunctive treatment with other

treatment modalities in the treatment of various intra-ocular tumors with promising results. More data and long-term follow-up is required.

Efficacy of Topical Mitomycin C in Cases of Recurrent and Extensive Primary Ocular Surface Squamous Neoplasia

First Author: Shireen **PANDEY**

Purpose: To evaluate the safety and efficacy of topical mitomycin C (MMC) in cases of large primary ocular surface squamous neoplasia (OSSN).

Methods: In 3 cases with recurrent OSSN and 1 case with extensive primary OSSN, after histopathological confirmation with incisional biopsy, topical MMC 0.04% was instilled 4 times/day in weekly cycles after temporary punctal occlusion.

Results: All 4 cases showed immediate regression within 2-4 cycles with no recurrence or side effects in 6 months to 2 years of follow-up.

Conclusions: Topical mitomycin C therapy is an effective alternative to extensive surgery in the management of large primary and recurrent OSSN.

Epidemiology and Pathological Findings of Lacrimal Gland Tumors at a Referral Hospital in Surabaya

First Author: Susy **FATMARIYANTI**

Purpose: Tumors of the lacrimal gland are rare and wide ranging in variability. In this study we evaluate the frequency and distribution of different types of lacrimal gland tumors based on sex, laterality of the affected eye, clinical features, and pathology.

Methods: We collected clinical files on all patients with suspected lacrimal gland tumors who came to the ocular oncology outpatient clinic from 2010-2015. We performed a retrospective review. The final diagnosis was made after histopathological evaluation.

Results: Among 67 cases, most cases were unilateral (right eye less than 1) but only 1 case affected both eyes. Thirty-one patients were female and 36 were male. There was no sex predilection (0.878, $P > 0.05$). We identified the mean age of exposure as 49.40 ± 18.88 years old. Most tumors were in the fifth and sixth decade and the youngest was 5 years old. An ectopic lacrimal gland was an interesting diagnosis. The most frequent lacrimal gland tumors are adenocarcinoma (47.8%), while others were variable from benign to malignant. There was no inflammation process finding.

Conclusions: Almost 50% of lacrimal gland process are malignant of adenocarcinoma type. There was a wide age distribution and there was no correlation between sex with age or laterality of affected eye. The epidemi-

ology and pathological findings give important information about proper treatment.

Hyperostosis Associated with Embryonal Rhabdomyosarcoma of the Orbit

First Author: Paolo Nico **ROGELIO**

Co-Author(s): Mary Rose **PE-YAN**, Felice Katrina **TRIO**

Purpose: Rhabdomyosarcoma is the most common soft tissue sarcoma in pediatric patients. Children with orbital rhabdomyosarcoma, of which the embryonal subtype is the most common, usually present with rapidly progressive proptosis, and imaging studies show a solitary unilateral orbital lesion. There may be accompanying bony changes such as remodelling or bone erosion in up to 40% of cases. We present an unusual case of embryonal rhabdomyosarcoma, with thickening of the adjacent walls of the orbit.

Methods: In a case of a 3-year-old Filipino female who presented with a 2-month history of rapid onset proptosis of the right eye with associated temporal mass, computed tomography (CT) and magnetic resonance (MR) imaging showed radiographic findings of a homogenous, well-delineated, extraconal mass of the right orbit with surrounding hyperostosis of the sphenoid bone. Enucleation of the adjacent ruptured globe and biopsy of the surrounding soft tissue mass and bone was done.

Results: Histopathology of the soft tissue component revealed embryonal rhabdomyosarcoma, while no evidence of malignancy was seen in the bony component. No metastases were found on systemic work-up. The patient underwent chemotherapy and radiotherapy, which decreased the size of the orbital and temporal masses.

Conclusions: To our knowledge, this is the first reported case of hyperostosis associated with rhabdomyosarcoma, and we propose that the mechanism behind this is periosteal reaction. This is a non-specific radiographic finding seen as a response to periosteal irritation and/or infiltration.

Mutation of E2F-1/S375A Gene in Retinoblastoma Patients at Mohammad Hoesin Hospital Palembang, Indonesia

First Author: Nurul **WIDIATI**

Purpose: To find out if there any mutation in the E2F-1/S375 gene in retinoblastoma patients at RSMH Palembang, Indonesia.

Methods: This was a familial observational explorative study. There were 54 samples that underwent PCR technique, whereas 36 samples were followed by direct sequencing to determine mutations in 375 genes that changed from serine (TCC) to alanine (GCC).



Results: This study found the results of the sequences in the form of serine (TCC) for 100%. We did not find any mutations in 36 samples of both children and parents. From the sequence that includes the E2F-1/S332-7A gene, we did not find any mutations either. However, it is becoming important because the wild-type form of retinoblastoma support precisely because the proteins E2F-1 formed in its wild-type genotype have poor binding to the retinoblastoma protein.

Conclusions: The E2F-1 gene generally has an influence on transcription factors in patients with retinoblastoma that has a different effect in each codon. The absence of research on the effects of E2F-1 mutation in the normal population merit further study.

Mystifying Scenario of an Intraocular Tumor

First Author: Surpriya HAWAIBAM
Co-Author(s): Kasturi BHATTACHARJEE

Purpose: To report a case that presented classically with a history of blunt ocular trauma in a child, obscuring an intraocular malignancy.

Methods: We present a classic case of a 4-year-old child who initially presented with complains of redness, watering, and inability to open the left eye following blunt trauma 3 months previously. Clinical examination revealed visual acuity of light perception, raised intraocular pressure, and dilated tortuous conjunctival vessels. An evaluation under anesthesia revealed a pupil obscuring, greyish-white neovascular membrane involving iris with tiny translucent cysts at its temporal border. A pars plana lensectomy, vitreous biopsy, and tissue biopsy were performed.

Results: Cytology and histopathology revealed small round malignant cells. An urgent enucleation without an orbital implant was performed and eyeball specimen defined it as a non-teratoid variety of ciliary body medulloepithelioma. Currently, the child is tumor free and without metastasis at more than 1 year of follow-up.

Conclusions: Ocular trauma often occurs in childhood and generally presents with painful red and watering eye, demanding a challenging examination of a minimally cooperative child. In this critical scenario, a misleading history may shadow some grievous situations like ocular malignancies leading to the delay in proper management. Noncontact modalities like high resolution computed tomography or magnetic resonance imaging can provide vital and pervasive information in an uncooperative child. A clinical tetrad of raised intraocular pressure, localized iris neovascularization, translucent intralesional cysts, and amelanotic ciliary body mass may suggest intraocular medulloepithelioma.

Ocular Surface Squamous Neoplasia, the Masquerading Menace: A Case Report

First Author: Samir SERASIYA
Co-Author(s): Kasturi BHATTACHARJEE, Dipankar DAS, Nilutparna DEORI, Diva MISRA, Prabhjot Kaur MULLETANI

Purpose: To report a double masquerade of invasive ocular surface squamous neoplasia (OSSN) initially mimicking pterygium, which later on mimicked non-resolving anterior uveitis following excision surgery.

Methods: A 36-year-old male presented with redness and pain in the right eye for 2 months. Slit lamp examination showed conjunctival growth encroaching over the cornea and associated temporal limbitis. A probable diagnosis of pterygium was made. The patient underwent a standard pterygium excision with conjunctival autograft. After 2 months, the patient developed anterior uveitis which did not respond to medical treatment. Three months later, he presented with a nodular mass and congestion over the treated area with anterior chamber reaction. Intraocular pressure was 22 mm Hg. A probable diagnosis of OSSN was made and appropriate investigations were performed.

Results: Ultrasound biomicroscopy and anterior segment optical coherence tomography revealed inferotemporal invasion of ciliary body. MRI of the orbit showed a faintly enhancing 5 x 4 mm mass in the ciliary body. Enucleation was performed and histopathological examination confirmed the diagnosis of invasive squamous cell carcinoma with ciliary body involvement of the right eye.

Conclusions: This case scenario shows that OSSN can masquerade as multifaceted clinical situations. The rarity of this case is the double masquerade presentation, initially as pterygium and later as anterior uveitis and ocular hypertension. This highlights that incomplete excision and partial treatment can lead to recurrence with greater invasion into the surrounding ocular structures. Thus, when in doubt, it is mandatory to perform a biopsy and histopathological confirmation of the diagnosis.

Postlaser Increased Exudation Treated Successfully with Cryotherapy in Retinal Angioma

First Author: Prajakta PATIL
Co-Author(s): Sarvesh TIWARI, Gaurav SHAH, Anand SUBRAMANIAM

Purpose: To report a case of postlaser increased exudation treated successfully with cryotherapy in retinal angioma.

Methods: Prospective interventional case study. An 18-year-old male presented with DOV in the left eye

for 1 month; best corrected visual acuity (BCVA) in the right eye (OD) was 6/6, NV N6 and in the left eye (OS) was 6/24, NV N8. Dilated fundus evaluation showed retinal capillary hemangioma of 3DD in size, with exudation surrounding hemangioma in the inferotemporal quadrant with multiple hard exudates in the same quadrant involving inferior macula in the left eye. The patient underwent intravitreal injection of bevacizumab and triamcinolone acetonide (2 mg/0.05 mL). One week after intravitreal injection the patient underwent focal laser. Second session of focal laser was performed 2 weeks after the first. Six weeks after laser therapy BCVA dropped to 6/60, NV N24. Size of angioma increased to 5 DD with increase in exudation. Cryotherapy was performed twice with a gap of 6 weeks.

Results: BCVA was maintained at 6/60, NV N24 at 6 weeks after second cryotherapy with reduction of exudation and shrinkage of angioma.

Conclusions: Postlaser increased exudation (rare occurrence) can be successfully treated with cryotherapy.

Presentation of Retinoblastoma Patients at a Tertiary Health Care Center in Central Java, Indonesia

First Author: Iffah ZULFA
Co-Author(s): Liana EKOWATI

Purpose: To determine demographic and clinical presentations of retinoblastoma patients, treatment patterns, and outcomes at a tertiary health care center in Central Java, Indonesia.

Methods: Data were retrieved from medical records of retinoblastoma patients from October 2014 to August 2016. Data were analyzed in the form of demography, clinical presentation and staging, types of treatment, and outcomes. Clinical features were divided into intraocular and extraocular retinoblastoma. The intraocular type was staged using International Intraocular Retinoblastoma Classification (IIRC).

Results: This study presented 13 patients (14 eyes) diagnosed with retinoblastoma. There were 9 males (69.2%) and 4 females (30.8%). The age ranged from 12 to 48 months, mean 27.3 (± 11.75). Twelve (92.3%) had unilateral and 1 (7.7%) bilateral disease. None of them had family history. Eleven (84.6%) presented with proptosis and 2 (15.4%) with leukocoria. The clinical features were classified as IIRC group E in 4 (30.7%) patients, while 9 (69.3%) patients (10 eyes) had extraocular extension. Twelve patients with unilateral involvement (12 eyes) underwent enucleation, while 1 patient (1 eye) with bilateral had orbital exenteration. Nine (69.2%) patients received chemotherapy, which was given systemically. After 1 day to 22 months of follow-up, 2 patients died.

Conclusions: Patients with retinoblastoma in our hospi-

tal are presenting at a late stage (4 patients with intraocular group E and 9 with extraocular retinoblastoma). As a results, patients require aggressive management such as enucleation. Therefore, early detection methods and reduction in refusal or delay to initiate treatment should be emphasized in order to improve the outcomes of retinoblastoma patients in this region.

Primary Intraocular Malignant Rhabdoid Tumor Mimicking Intraocular Retinoblastoma: A Rare Case Report

First Author: Rawi BOONYAOPAS
Co-Author(s): Rangsim AROONROCH, Taweewat AT-TASETH, Duangnate ROJANAPORN, Donrudee SIRINIL, Tharikarn SUJIRAKUL

Purpose: To report a rare case of histopathologically confirmed primary intraocular malignant rhabdoid tumor that presented with clinical features of intraocular retinoblastoma.

Methods: Case report.

Results: A 2-day-old girl presented with unilateral leukocoria at birth. Right eye examination showed clear cornea, flat anterior chamber, and iris neovascularization. A highly vascularized, yellowish mass was found behind the iris obscuring the view of vitreous and retina. Ultrasonography showed a calcified mass occupying the entire globe. Left eye was normal. Enucleation was performed. Pathological results showed malignant tumor with rhabdoid features involving ciliary body, iris, anterior chamber, and focal subretinal tumor seeding. Immunohistochemistry results showed positivity of cytokeratin (AE1/AE3), EMA (epithelial membrane antigen), CD34, and B-catenin expression, and negativity of desmin, myogenin, CD99, chromogranin A, synaptophysin, NES, CD56, HMB-45, S-100, and INI-1 expression. The histopathological diagnosis was intraocular malignant tumor with rhabdoid features. Systemic work up including brain, chest, upper abdomen, and lower abdomen was normal. There was no evidence of renal tumors. Patient is alive and well without local tumor recurrence or systemic metastasis at the follow-up period of 12 months.

Conclusions: We reported a case of rare primary intraocular malignant rhabdoid tumor presenting with leukocoria and calcified mass at birth mimicking intraocular retinoblastoma. Intraocular malignant rhabdoid tumor should be on the list of differential diagnosis of intraocular retinoblastoma.

Retinoblastoma with Neovascular Glaucoma: Can These Eyes Be Salvaged?

First Author: Raksha RAO
Co-Author(s): Santosh HONAVAR, Vijay Anand REDDY

Purpose: To describe the outcome of advanced retino-



blastoma with neovascular glaucoma following neoadjuvant intravenous chemotherapy.

Methods: Noncomparative case series of 8 eyes in 8 patients.

Results: All 8 group E eyes had neovascularization of iris (NVI), 7 diffuse and 1 focal, at presentation. Associated features were raised intraocular pressure in all (mean, 33 mm Hg) and enlarged cornea (mean, 13.3 mm) with corneal edema in 5 of 8 (63%) eyes. None of the patients had extraocular extension, optic nerve invasion, or systematic metastasis at baseline. Complete resolution of NVI occurred at a mean of 2 cycles of chemotherapy with resolution of glaucoma. Main outcome measures were life salvage (100%) and eye salvage (63%) at a mean follow-up of 9 months after completion of treatment.

Conclusions: Neoadjuvant intravenous chemotherapy achieves a favorable response even in eyes with advanced retinoblastoma with features hitherto considered as clinical risk factors prompting primary enucleation.

Risk Factors of Eyelid Malignancies

First Author: Syeed **KADIR**

Co-Author(s): Golam **HAIDER**, *Md Sayedul* **HOQUE**, *Riffat* **RASHID**, *Shahab* **UDDIN**

Purpose: To assess the risk factors associated with eyelid malignancies in Bangladesh.

Methods: This case control study was done in a tertiary eye institute in Bangladesh during the period of January 2014 to June 2014. Study population was divided into 2 groups: group A was patients with eyelid malignancies and group B was age- and sex-matched controls without eyelid malignancies. One hundred sixteen patients with histological proved eyelid malignancies were in group A and 232 individuals without eyelid malignancies were in group B. We included all patients with or without eyelid malignancies attending ophthalmic plastic services. We excluded lymphoma, conjunctiva, and orbital malignancies involving the eyelid.

Results: Among 116 cases of eyelid malignancies, the frequency of SGC, BCC, SqCC, and malignant melanoma were 49 (42.3%), 44 (37.9%), 19 (16.4%), and 4 (3.4%), respectively. Of the cases, 86.7% were above 45 years of age. The mean age of eyelid malignancies was 59.7 years and mean age of the control group was 57.2 years. Betel leaf and nut chewing had a 6.9 times more risk for eyelid malignancies than control. Among the male patients, smoking had a 5.7 times higher risk for eyelid malignancies than normal people. Outdoor workers had 1.7 times more risk for eyelid malignancies than controls.

Conclusions: Advancing age, betel leaf and nut chew-

ing, smoking, and prolonged sun exposure were commonly associated risk factors for eyelid malignancies in Bangladesh.

The Profile of Primary Orbital Tumor Patients at a Tertiary Hospital in Surabaya

First Author: Wahyu **PRABAWATI**

Co-Author(s): Hendrian **SOEBAGJO**

Purpose: The aim of this study was to investigate the distribution of different types of primary orbital tumors, histopathological diagnosis, and treatment.

Methods: All primary orbital tumor cases from January 2012 to December 2014 at Orbita Oncology outpatient clinic were recorded. The diagnosis of primary orbital tumor was established by a combination of history, clinical examination, radiological imaging, and histopathological examination.

Results: There were 139 patients consisting of 114 (82.01%) patients with malignant tumor, 21 (15.11%) with benign tumor, and 4 (2.88%) patients with inflammatory tumor. Out of 139 cases, retinoblastoma was the most common malignant tumor in 52 (45.61%) patients, while hemangioma was a common benign tumor in 10 (47.61%) patients. The malignant orbital tumor patients consisted of 70 males and 41 females with an average age of 28 years. Benign tumor patients consisted of 7 males and 14 females with an average age of 31 years. Inflammatory tumor patients consisted of 3 males and 1 female with an average age of 49 years. The most common treatment for malignant tumor was exenteration (55.26%), while excision was the most common treatment for benign tumor (37.62%). Excision (50%) and incisional biopsy (50%) were the most common treatments for inflammatory tumor.

Conclusions: The distribution of age, sex, and type of treatment in patients with primary orbital tumor give us important information for the diagnosis of tumor prior to biopsy or tumor resection and for determination of the treatment strategy.

Tri-Weekly Intravitreal Topotecan as Monotherapy for Refractory Vitreous Seeds in Retinoblastoma

First Author: Raksha **RAO**

Co-Author(s): Santosh **HONAVAR**, *Vijay Anand* **REDDY**

Purpose: To evaluate the safety and efficacy of intravitreal topotecan (IVIIT) for refractory vitreous seeds in retinoblastoma.

Methods: IVIIT injection (30 µg in 0.15 mL) was provided by the safety-enhanced technique.

Results: Thirty-six eyes of 35 patients received a mean of 3 (range, 2-7) 3-weekly IVIIT injections. Prior treatment included chemotherapy with focal consolidation

in all, periocular carboplatin in 28, and intravitreal melphalan in 7. Complete regression of vitreous seeds was achieved in 36 of 36 eyes (100%) at a mean follow-up of 11 months. One eye (3%) with a recurrent retinal tumor needed enucleation. No ocular or systemic complications were observed at the last follow-up. Visual acuity remained stable or improved in all.

Conclusions: Spaced-out IViT monotherapy for refractory vitreous seeds in retinoblastoma appears safe and potent.

Trichilemmal Carcinoma of the Upper Eyelid: A Clinical and Pathologic Analysis of One Case

First Author: Ping **ZHANG**

Purpose: To investigate the clinicopathological characteristics of trichilemmal carcinoma to improve the knowledge of this rare tumor.

Methods: Collection and analysis of clinical and pathologic data of a case of trichilemmal carcinoma.

Results: A 56-year-old woman presented with a 1-month history of a firm 2 mm × 1 mm left upper eyelid nodule in our hospital. She had a soft taupe mass on the tarsal plate edge. An incisional biopsy revealed lobulated growth of tumor cells with clear cytoplasm, alien nuclear, prominent nucleoli, and foci of trichilemmal keratinization.

Conclusions: The final diagnosis of trichilemmal carcinoma was made. Considering that the tumor seldom develops metastases or local recurrences, treatment is given priority with clean resection and with no adjuvant therapy.

Unilateral Kimura Disease of the Eyelid and Face

First Author: Muhammad **RONY**

Purpose: To demonstrate management of a rare case of Kimura disease of the eyelid and face.

Methods: Kimura disease is a rare chronic inflammatory disorder involving subcutaneous tissue, predominantly in the head and neck region, and frequently associated with regional lymphadenopathy and/or salivary gland involvement. This condition has a predilection for males of Asian descent and may clinically simulate a neoplasm. A case of Kimura disease affecting the eyelid and face unilaterally on the left side for 5 years was reported in a 64-year-old man. The diagnosis was established by biopsy of the eyelid, which showed a diffuse inflammatory infiltrate with many eosinophils, giant cells, and lymphocytes. Laboratory tests disclosed peripheral eosinophilia and elevated serum immunoglobulin E levels. This case reported an excellent treatment result with conservative management via oral

prednisone. Surgery will be performed if necessary.

Results: Oral prednisone 60 mg/d was given to this patient for 2 months and the swelling on the left upper eyelid and face was decreasing.

Conclusions: Kimura disease may develop in elderly males of Asian descent affecting eyelids bilaterally or unilaterally with elevated serum immunoglobulin E levels. Medical therapy is the first choice in middle-aged or elderly patients with Kimura disease and complete resection can be performed for good prognosis.

Visual Acuity Reduction as the Primary Manifestation of Pulmonary Adenosquamous Cell Carcinoma

First Author: Angeli Christy **YU**

Co-Author(s): Gary **MERCADO**

Purpose: Reduction in visual acuity may be a harbinger of a disseminated malignancy. The aim of this report is to contribute to the clinical awareness of this pathology in order to prevent inadvertent compromise of patients' quality of life by delaying diagnosis and treatment.

Methods: We report a case of a 78-year-old nonsmoker female with painless progressive blurring of vision in the absence of any pulmonary manifestations heralding a histopathologically confirmed orbital metastasis, which presented as the initial manifestation of stage IV lung cancer. Adenosquamous cell carcinoma of the lung is a rare variant of pulmonary cancer.

Results: We review the recent data including the epidemiology, clinical features, current diagnostic methods, and treatment options for orbital metastasis preceding the diagnosis of disseminated lung carcinoma.

Conclusions: This case illustrates a potential diagnostic pitfall and highlights the importance of a high index of suspicion and systemic evaluation to aid in the differential diagnosis of atypical causes of visual acuity reduction such as orbital metastasis from a primary lung neoplasm.

Ophthalmic Education

Recent Advances in the Application of Stem Cell Technologies and Techniques in Ophthalmology

First Author: Min Li **TEY**

Purpose: The eye is an immune-privileged organ that lends itself well to application of stem cell technologies in the modeling and treatment of disease. Breakthroughs were heralded when Masayo Takahashi successfully transplanted iPSC-derived retinal pigment epithelial (RPE) cells into the eye of an age-related



macular degeneration (AMD) patient. Recent applications of stem cell technologies in ophthalmic research and innovation are discussed here.

Methods: Posters presented at the International Society for Stem Cell Research (ISSCR) Annual Meeting 2016, the largest international conference for stem cell science and regenerative medicine, were reviewed. Posters with 1 or more of the keywords relevant to ophthalmology were identified from the conference abstract book, and specific areas of study, stem cell applications, and the institutions of origin were analyzed.

Results: In total, 1374 posters were presented, with 83 poster presentations relevant to ophthalmology. Most work was focused on the retina ($n = 51$), most commonly in areas relating to AMD, the differentiation and generation of iPSC-derived cells, disease modeling, cell therapy, and the generation of retina organoids. The cornea ($n = 13$) was next most commonly studied, with applications mainly focused on the generation of cornea epithelial and endothelial cells. Two presentations discussed the ethical implications of cell therapy in ophthalmology. Most presented work came from the United States ($n = 26$), followed by Japan ($n = 18$).

Conclusions: A large number of studies are focused on the differentiation and generation of RPE cells in AMD, with relatively little attention paid to other cell types, ocular pathologies, or safety and ethical issues.

South-South Skills Transfer: Training an Ophthalmology Workforce for Timor-Leste

First Author: Manoj SHARMA
Co-Author(s): Marcelino CORREIA, Rosie DAWKINS, Nitin VERMA

Purpose: It is often assumed by many in both the “Global North” and the “Global South” that skills transfer is a North-South process. The purpose of this work is to demonstrate that South-South skills transfer can be an efficient and appropriate mechanism to develop an ophthalmology workforce for a developing country. Timor-Leste is in the process of training local ophthalmologists. This seems an ideal opportunity to develop this concept.

Methods: Opportunities were identified for existing and new South-South skills transfer at all levels of ophthalmology: medical students; family medicine doctors; ophthalmology registrars; visiting fellows; and ophthalmic sub-specialization.

Results: An international advisor ophthalmologist (IAO) was recruited from Nepal to teach at all levels. Local teaching of medical students was provided by a Cuban ophthalmologist. Teaching of family medicine doctors was done by a Timorese ophthalmologist and IAO. Ophthalmology registrars spent 3 months in Nepal to hone their small incision cataract surgery (SICS) skills.

Visiting fellows spent 1 month in India to learn SICS. A Timorese ophthalmologist spent time in Indonesia attaining subspecialty experience.

Conclusions: South-South skills transfer can be a powerful mechanism for workforce development in ophthalmology and can be actively supported by North-South partnerships. Our experience in Timor-Leste is that South-South skills transfer is an efficient and appropriate mechanism for the development of a highly skilled workforce. Furthermore, it has a multiplicative effect as local doctors become part of the medical teaching workforce.

Videotape versus Live Demonstration in Enhancing the Technique of Direct Ophthalmoscopy in Undergraduate Medical Education: A Randomized Controlled Trial in a South Asian Medical School

First Author: Madhuwanthi DISSANAYAKE
Co-Author(s): Yasith MATHANGASINGHE, Dasun PRASANNI, Namal WERAKOON

Purpose: Ophthalmoscopy is a core clinical skill. Our objective was to evaluate the effectiveness of teaching methods of direct ophthalmoscopy (DO) in undergraduate medical teaching.

Methods: A randomized controlled trial was conducted among pre-clinical medical students in a Sri Lankan medical school. Students were randomly allocated to 3 groups. Two groups were trained on DO for 20 minutes using a videotape (V) and by a live demonstration (D). A third group (VD) was trained with both methods for 20 minutes. Students were assessed while they performed DO on a simulated patient. Three blinded examiners assessed the recordings individually using the modified Queens University Ophthalmoscopy OSCE checklist. Learning styles were assessed using the VARK questionnaire.

Results: Sample size was 106 (37.7% males). The mean score of DO was $(10.0 \pm 2.5)/14$. Majority were multimodal learners (61.3%, $n = 65$). A 2-way ANOVA showed a statistically significant effect of teaching method on performance score of DO [$F(2,86) = 7.024$, $P = 0.001$, partial $\eta^2 = 0.140$]. Post-hoc comparisons indicated that mean scores for each group were significantly different: Group V ($M = 8.27$, $SD = 2.07$); Group D ($M = 10.15$, $SD = 2.32$), and Group VD ($M = 11.71$, $SD = 1.47$), $P < 0.001$. The main effect for learning styles [$F(4,86) = 0.398$, $P = 0.810$] did not reach a statistically significant level.

Conclusions: The live demonstration showed a better outcome than the videotape demonstration. The combination of videotape and live demonstration was significantly better than the other 2 methods. Student performance was not affected by learning styles. We

recommend a combined approach as the preferred method of teaching DO to medical undergraduates irrespective of their learning styles.

Ophthalmic Epidemiology

Pattern of Ocular Trauma at a Primary Eye Care Center in Bangladesh

First Author: Mohammed Arifur AKONJEE

Purpose: To identify the population at risk, sources of eye injuries, and the common barriers for their early management in a rural area of Bangladesh.

Methods: This prospective study includes a total of 100 eyes in 94 patients with a history of ocular injury. Data were collected by interview and detailed examinations and documented using a preformed data sheet including the demographic data such as age, sex, occupation, the eye affected, sources of injury, types of injury, and the interval between the occurrence and presentation at the center. Overall visual acuity at arrival was also recorded with Snellen chart.

Results: The ages ranged from 1.5 years to 75 years. Males were 78.35% and females were 21.65%. A total of 56% of injuries were accidental occupational injuries. Common sources of eye injury included sharp objects used in occupational activities (43%), blunt objects (23%), chemicals (7%), projectile objects (8%), bird beak (5%), agricultural trauma (3%), and miscellaneous (11%).

Conclusions: Young adult males engaged in industrial, mechanical, agricultural, or domestic works are at particular risk for ocular trauma. Poverty, ignorance, indigenous treatment, remote communications, and lack of supervised and collaborative management seem to be the possible barriers for the early management of ocular injuries. Preventive measures are recommended not only in the workplace but also in domestic, recreational, sports, and transport settings.

Prevalence of Anti-Hepatitis C Virus and Hepatitis B Surface Antigen in Patients Selected for Cataract Surgery who Were Previously Undiagnosed or Unscreened

First Author: Sidrah RIAZ

Purpose: In developing countries hepatitis B and C (HCV) are more prevalent due to poor medical practice and ignorance regarding basic medical principles, but they are preventable if patients are provided with information on safe medical practices.

Methods: Five hundred patients with cataract were selected and after informed consent were tested for anti-HCV and hepatitis B surface antigen (HbsAg) using

immunofluorescent methods (simple kits) used for screening purposes.

Results: Out of 500 patients, 191 were found to be positive either for anti-HCV or HbsAg. A total of 14.4% were hepatitis B positive and 23.8% were positive for hepatitis C.

Conclusions: Prevention is better than the cure, so simple and cheap methods of screening can lead to early detection and can reduce the cost of treatment in poor countries like Pakistan.

Reducing the Number of Invalid Surgical Consents

First Author: Wesley CHONG

Purpose: To reduce the number of invalid surgical consents in Singapore National Eye Centre (SNEC) day surgeries over a period of 6 months.

Methods: A multidisciplinary team involving doctors, nurses, day ward, operating theater, listing, and clinical audit staff looked into the listing process and the root causes of the high number of invalid consents. A Pareto chart detailing the top causes of invalid consents was drawn, and with a prioritization matrix, feasible yet effective changes were identified and effected. Plan-do-check-act (PDSA) cycles included moving consent checks upstream, getting invalid consents amended on the same day, sending e-mails to raise awareness of invalid consents, and posters in clinics to emphasize the correct way to fill in consent forms.

Results: There has been a progressive downtrend in the monthly median percent of invalid consents since the introduction of PDSA cycles, with sustained results as evidenced by 7 consecutive monthly medians below the baseline median of 14.5%.

Conclusions: Errors in the workplace can be reduced with a concerted effort from multiple stakeholders. It is important to have a thorough look at processes with concerned parties, so that different perspectives and skill sets can be harnessed to determine and implement feasible and effective interventions.

The Profile of Glaucoma Patients at a Teaching Hospital in Surabaya

First Author: Yuyun RINDIASTUTI

Co-Author(s): Evelyn KOMARATIH, Yulia PRIMITASARI

Purpose: To determine the profile of first-visit glaucoma patients at a teaching hospital in Surabaya from January 2014 to April 2016.

Methods: Medical records of first-visit glaucoma patients at the glaucoma outpatient clinic from January 2014 to April 2016 were recorded. Diagnosis of glaucoma was based on European Glaucoma Society (EGS)



criteria. Data of age, sex, intraocular pressure, and previous glaucoma medication were recorded. Data including 95% confidence intervals (CI) were calculated.

Results: There were 363 patients consisting of 188 females and 175 males with mean age 52.87 ± 15.99 years. A total of 575 eyes were included with the mean intraocular pressure (IOP) of 23.03 ± 13.09 mm Hg. Absolute glaucoma was the predominant type (19.7%), followed by primary open angle glaucoma (POAG) (16.2%), normotension glaucoma (12.5%), secondary glaucoma (13.6%), primary angle closure glaucoma (PACG) (10.6%), ocular hypertension (9.2%), glaucoma suspect (7.8%), primary angle closure (PAC) (5.2%), nearly absolute glaucoma (3.1%), chronic angle closure glaucoma (1.6%), and juvenile glaucoma (0.5%). Frequent causes of secondary glaucoma were lens factor (30.8%), steroid induced (29.5%), neovascular glaucoma (20.5%), uveitic (15.4%), and surgical complication (3.8%). A total of 109 patients had been on single glaucoma medication (42.20%), whereas 48.62% and 0.08% were on a combination of 2 and 3 glaucoma medications, respectively.

Conclusions: Absolute glaucoma was the predominant type of glaucoma, suggesting that the pattern in our teaching hospital could be quite different with other burden of evidence.

Unnecessary Use of Braille in Presumably Blind People in Special Schools for the Blind

First Author: Ria DENESKA

Co-Author(s): Prillia Tri SURYANI

Purpose: To examine low vision subjects who were students or former students of special schools for the blind and evaluate the possibilities of transferring the subjects to regular school and using print. Currently, the subjects were accustomed to using Braille.

Methods: Low vision assessment was performed in 20 subjects in a special school for the blind. We performed visual acuity tests, near vision, contrast sensitivity, color vision, and daily activities interview.

Results: The subjects were 6 teachers, 9 students, and 5 relatives who were labeled as blind, and all of them had been using Braille, mainly, in their daily lives. However, some of the subjects were familiar with print. Subjects never had routine eye examinations since an early age and were stated as being blind. After the assessment, there were 16 out of 20 subjects who were still able to read print with low vision aids such as a telescope and magnifier; therefore, the use of Braille was unnecessary. Seven of these subjects were students who were able to attend regular school.

Conclusions: The awareness of the government, caregivers, and health care providers toward special schools for the blinds is necessary. Periodic low vision examina-

tions are needed to avoid unnecessary limitations to the students' actual potential.

Orbital and Oculoplastic Surgery

Awareness of Prolapse of the Eye in Babies

First Author: Athi' PURNASARI

Co-Author(s): Ratna DOEMILAH, Ismi ZUHRIA

Purpose: To determine factors that could cause prolapse of the eye in babies and its management.

Methods: A case report. An 11-month-old female presented in the emergency ward with prolapsed right eye. Heteroanamnesis suggested recurrent reddish right eye and whitening of cornea for 3 months. She was diagnosed with right eye descemetocoele. Visual acuity was difficult to evaluate. Anterior segment examination revealed perforated cornea. Ultrasound examination showed vitreous haze and membranous opacity presumed due to inflammation. Based on all examinations we suspected malignancy and performed enucleation; using dermato graft (DFG) from the patient's thigh region an orbital implant for volume replacement was placed postenucleation. Histopathology examination was done to determine definitive diagnosis.

Results: No operative or early complications were observed. There were no complications involving the graft donor site. Histopathology examination showed chronic inflammation process.

Conclusions: Prolapsed eye in infants could be caused by many factors such as infection and malignancy. Consultation with other divisions like pediatrics and histopathology can help to determine definitive diagnosis. Management of prolapsed eye can be performed with enucleation surgery and DFG orbital implant for better cosmetic results.

Behavior of Custom-Designed Lightweight Ocular Prosthesis

First Author: Sidrah RIAZ

Purpose: To assess the behavior of lightweight ocular prosthesis in improving mobility and cosmesis.

Methods: A prospective analysis was performed on custom-designed prosthesis in 44 patients, made of PMMA and methylmethacrylate mixed by heat-initiated polymerization along with glycol dimethacrylate coating.

Results: Good mobility, good cosmesis, and satisfactory weight reduction were achieved with this prosthesis.

Conclusions: Reduced inflammation and discharge added to satisfactory results subjectively in patients. The

low weight of the prosthesis resulted in good cosmesis and better mobility.

Case Report of Eyelid Schwannoma in a Thai Child

First Author: Mantapond **ITTARAT**

Purpose: To report a rare case of solitary eyelid schwannoma in a Thai child without clinical manifestations of neurofibromatosis.

Methods: A retrospective medical chart review including clinical course, surgical interventions, pathology, and immunocytochemistry results.

Results: A 9-year-old Thai boy presented with an isolated painless mass on the left lower eyelid. The mass had gradually grown for 2 years. He denied a history of trauma or previous eyelid surgery. A clinical examination revealed no clinical features of neurofibromatosis. The provisional diagnosis at that time was a sebaceous cyst. However, excisional biopsy showed an encapsulated tumor characterized by interlaced spindle-celled fasciculi with focal palisading of nuclei arranged in Antoni A and Antoni B pattern. The immunocytochemistry was strongly positive for S-100 protein reaction. The diagnosis of schwannoma was made. After 6 months of follow-up, no recurrence was observed.

Conclusions: Schwannoma in ophthalmic cases is interesting by its rarity, especially in children and eyelid origin, of less than 0.1% of eyelid tumors. Only 3 cases of children in the published literature were found. The manifestation could be sporadic or solitary. Neither age of onset, sex preference, nor the location of eyelid was considered. Schwannoma can be a differential diagnosis of any painless well-circumscribed eyelid tumor in children. Schwannoma of the eyelid in children is extremely rare. To best of our knowledge, this is the first case in Southeast Asia and the fourth case worldwide to be reported. These findings may extend the knowledge and experiences of schwannoma in children.

Causes of Enucleation and Evisceration at a Tertiary Care Hospital

First Author: Pirarat **NUROT**

Co-Author(s): Nattapol **POKAWATTANA**, Pornlada **SUNLAKAVISET**

Purpose: To analyze the demographics, indications, and surgical outcomes of anophthalmic surgery (enucleation and evisceration) during a 5-year period.

Methods: We conducted a retrospective chart review of patients who had undergone evisceration or enucleation at the Department of Ophthalmology, Rajavithi Hospital, Thailand between January 2010 and October 2014. The data was collected including demographics, underlying disease, surgical indication, cause of dis-

ease, and postoperative results and complications.

Results: Anophthalmic surgery was performed in 232 eyes of 232 patients. There were 177 eyes (76.3%) that underwent evisceration and 55 eyes (23.7%) had enucleation. One hundred thirty-four patients (57.8%) were men, and 121 eyes (52.2%) were right eyes. Mean age of the subjects was 56.65 ± 1.64 years. Corneal ulcer was the leading cause for anophthalmic surgery in 152 eyes (65.5%), followed by endophthalmitis in 30 eyes (12.9%) and painful blind eye in 14 eyes (6%). The most common pathogens in cases of corneal ulcer and endophthalmitis were *Pseudomonas* spp. and *Streptococcus pneumoniae* (25%), respectively. The most common anophthalmic surgery complication was implant exposure in 10.8% of eyes.

Conclusions: Evisceration was the most common anophthalmic surgery in our series unless contraindicated. Corneal ulcer was the main etiology for evisceration and enucleation in our referral tertiary care center, followed by endophthalmitis and panophthalmitis. Implant exposure remains the leading complication of anophthalmic surgery procedures.

Challenges in Managing Stevens-Johnson Syndrome with Chronic Ocular and Extraocular Sequelae: A Case Report

First Author: Joshua **LUMBANTOBING**

Co-Author(s): Yunia **IRAWATI**

Purpose: To demonstrate complex management of chronic ocular sequelae followed by extraocular sequelae in a patient with Stevens-Johnson syndrome (SJS).

Methods: A 10-year-old girl with a history of SJS came with the chief complaint of difficulty opening both eyes after twice undergoing symblepharon release surgery at a previous hospital. The recurrence of symblepharon still occurred in both eyes, followed by trichiasis and entropion. She was planned for ocular surface restoration with multistep surgical approach.

Results: Symblepharon lysis followed by amnion membrane transplant and addition of conformer shell in both eyes showed a good outcome 1 month after surgery. It was followed by eyelid reconstruction surgery to treat trichiasis and entropion for providing a better ocular surface. Six months after the surgery, the recurrence of symblepharon presented in the left eye.

Conclusions: The management of ocular surface restoration for chronic Stevens-Johnson syndrome sequelae was still challenging due to the risk of recurrence and failure. Multistep approach and good progression after surgery do not guarantee the absence of recurrence possibility. Yet, comprehensive management in treating SJS is still needed, including systemic complication management for every single patient.



Clinical Presentations of Orbital Tuberculosis: A Review of Seven Cases

First Author: Mukti **MITRA**

Co-Author(s): Golam **HAIDER**, Moinul **HOQUE**, Nishat **PARVEEN**

Purpose: To present various clinical presentations of orbital tuberculosis and to correlate these with systemic tuberculosis in endemic areas.

Methods: This is a retrospective analysis of a case series from July 2007 to May 2016 in a tertiary eye referral center. Five male patients and 2 female patients were diagnosed as orbital tuberculosis in this period. Age range was 14 to 80 years.

Results: Two patients presented with unilateral lacrimal gland tumors, 2 patients had unilateral inferior orbital growth, 1 patient had unilateral retrobulbar growth, 1 had upper lid growth, and 1 female patient (80 years) presented with nonhealing wound with a discharging sinus in 1 eye that previously underwent dacryocystectomy for epiphora. All the patients were diagnosed histopathologically without any evidence of systemic tuberculosis (TB) except raised ESR. Patients were treated with anti-TB drugs along with systemic steroid. One patient (28 years) developed multidrug-resistant tuberculosis due to noncompliance and presented with recurrent orbital growth. Thus, further biopsy was done and the patient was treated accordingly.

Conclusions: Orbit and periorbital involvement of tuberculosis is rare even in endemic areas like Southeast Asia. Ocular involvement may be present in absence of systemic tuberculosis. Proper evaluation and diagnosis is essential to reduce morbidity.

Comparative Evaluation of Frontalis Sling and Levator Resection for Correction of Ptosis in Blepharophimosis-Ptosis-Epicanthus Inversus Syndrome

First Author: Mukti **MITRA**

Co-Author(s): Golam **HAIDER**, Mohammed Moinul **HOQUE**

Purpose: To compare the surgical correction and cosmetic outcome of ptosis in blepharophimosis-ptosis-epicanthus inversus syndrome by both frontalis sling with autologous fascia lata and supramaximum levator resection.

Methods: This was a prospective interventional study done from 2008 to 2016. Among 45 patients with blepharophimosis-ptosis-epicanthus inversus syndrome, 40 patients underwent surgical correction. Age range was 6 months to 40 years. Temporary frontalis sling surgery was done in 5 patients (age range, 6 months to 4 years) to combat amblyopia and abnormal chin elevation. After correcting telecanthus and epican-

thus inversus by Y-V plasty, ptosis correction was done. Among 35 patients, frontalis sling with autologous fascia lata was done in 22 patients and supramaximum levator resection in 13 patients.

Results: Outcome was evaluated by lid height and contour, stability of lid crease, and cosmetic acceptability of patients. Satisfactory cosmetic outcome was observed in all patients except 2 patients with frontalis sling surgeries and 2 patients of supramaximum levator surgeries that required revision surgeries. Recurrence of ptosis was found in 1 patient with frontalis sling. Mild contour anomaly was observed in some patients but they remained satisfied.

Conclusions: As levator function is very poor in blepharophimosis-ptosis-epicanthus inversus syndrome, frontalis sling with autologous fascia lata is the treatment of choice for correction of ptosis. However, it requires a second surgery to harvest fascia lata. Supramaximum levator surgery is another option that gives almost equal cosmetic results with the additional advantage of good and symmetrical lid crease formation.

Cosmetic Outcome in Orbitotemporal Neurofibromatosis Type 1

First Author: Indriani **DEWI**

Co-Author(s): Ratna **DOEMILAH**

Purpose: To report cosmetic outcomes of 2 orbitotemporal neurofibromatosis type 1 (NF-1) patients and their increasing confidence in facing life.

Methods: Retrospective case notes and serial photographic review.

Results: Two patients, a 25-year-old male and a 16-year-old female, presented with plexiform type NF-1 at the eyelid region, which frequently involved the lateral area of the upper eyelid and caused an S-shaped contour of the eyelid margin with mechanical ptosis. The male patient also had pulsating proptosis, esotropia, and complete ptosis after 3 prior surgeries done by the plastic surgeon. Patients were given information about the possibility of recurrence, and both patients gave consent to do the procedure with general anesthesia. Both patients underwent surgical debulking, reconstruction of the upper eyelid, lateral canthoplasty, and frontalis suspension to reduce ptosis, but only the male patient had ocular prostheses implantation after surgery for cosmetic purposes due to esotropia and large lecoma on cornea. Postsurgical complications that could have happened were residual ptosis, ptosis overcorrection, poor lid contour, and upper and lower lid entropion/ectropion, but fortunately none were found. Both patients were reported to have satisfactory results after 1 year follow-up.

Conclusions: Both cases demonstrate that periorbital appearance and comfort of patients with orbitotem-

poral NF-1 can be significantly improved through oculoplastic surgery.

Course of IgG4-Related Ophthalmic Disease Following Excisional Biopsy

First Author: Jun OMINATO

Co-Author(s): Hiroyuki CHO, Takeo FUKUCHI, Tokuhide OYAMA

Purpose: To investigate the clinical course of patients diagnosed as IgG4-related ophthalmic disease (IgG4-ROD) by excisional biopsy.

Methods: The subjects included 24 patients (11 men and 13 women) who underwent excisional biopsy at our department and who met the diagnostic criteria for IgG4-ROD. The investigated items were recurrence rate, serum IgG4 and sIL-2R level, presence of lesions in other organs, presence of IgH monoclonality (concurrency of malignant lymphoma), whether oral steroids were being taken, and the number of patients given a definitive diagnosis. We investigated whether these items were related to the clinical course of each patient.

Results: The mean postoperative observation period was 44 months. Eighteen of 24 patients (75%) received regular follow-up observations only. The recurrence after excisional biopsy occurred in 4/18 patients (22%). No significant differences were noted between patients with and without recurrence in any of the investigated items. In addition, there were no significant differences between patients with and without IgH monoclonality in any of the items.

Conclusions: The postexcisional biopsy recurrence rate may be lower than that of taking oral steroids. Therefore excisional biopsy can be one of the potent options in treatment for IgG4-ROD. Predicting a recurrence is difficult at the time of diagnosis of the disease. The concurrency of malignant lymphoma was not associated with a higher recurrence rate of IgG4-ROD.

Cryptophthalmos: Report of 2 Cases

First Author: Wendy WONG

Purpose: Cryptophthalmos is a rare condition. We report 2 patients with cryptophthalmos.

Methods: We review the clinical data of 2 patients with cryptophthalmos.

Results: The first patient was a 10-day-old Malay boy with bilateral abortive cryptophthalmos. In both eyes, the upper lid skin was fused to the superior aspect of the cornea, the posterior lamella were absent, and the fornices were present only laterally. The eyelashes were absent and there was alopecia of the eyebrows. Both globes were otherwise well-developed. Systemic evaluation revealed hypoplasia of the left kidney. There

was a family history of bilateral eyelid colobomas in his older sister and polydactyly in a paternal aunt. Staged bilateral upper lid construction was performed. The second patient was a 29-day-old Vietnamese boy with isolated bilateral complete cryptophthalmos. On examination, the child responded to light shone into his right eye. Ultrasound b-scan revealed that the posterior segment structures and optic nerves were present. Calcification in the anterior chamber was demonstrated on MRI, and the left globe was noted to be larger than the right. The visual evoked potentials were tested and were normal in the right eye, but subnormal in the left eye. Surgical options for partial visual restoration were discussed although guarded prognosis was counselled. The child was managed conservatively.

Conclusions: Reconstructive surgery in patients with cryptophthalmos is challenging. Before attempts to construct eyelids are undertaken, judicious patient selection can be guided by a thorough assessment for concomitant ocular malformations which can affect visual prognosis and evaluation of the electrophysiologic function.

Direct Closure as Management of Ocular Coloboma Associated with Microphthalmos

First Author: Marisca RIZKY

Co-Author(s): Ratna DOEMILAH

Purpose: To demonstrate a rare case and proper management of ocular coloboma associated with microphthalmos.

Methods: A 7-year-old female presented with unilateral congenital lower eyelid, iris, retinal coloboma, and microphthalmos. There was a history of lower eyelid cleft since birth resulting in recurrent irritation of the conjunctiva. Laboratory findings were positive for IgG CMV. Axial length of the left eye was shorter than the right eye. In this patient retinal coloboma was present causing vision problems. The full thickness defect of one third medial eyelid was managed by direct closure. The procedure was performed by creating a pentagonal-shaped incision, followed by sutured tarsus to tarsus, lash line, and gray line. Irrigation test was performed prior and the result was normal.

Results: Direct closure for eyelid coloboma repair was performed; improvement of anatomical function and good aesthetic result was achieved.

Conclusions: Direct closure was sufficient to restore anatomic function and aesthetic in managing one third lower eyelid coloboma. Low vision rehabilitation was managed by the pediatric ophthalmology division.



Efficacy of Botulinum Toxin in Various Age Groups with Benign Essential Blepharospasm and Hemifacial Spasm

First Author: Nishat **PARVEEN**

Co-Author(s): Golam **HAIDER**, *Moinul* **HOQUE**, *Syeed* **KADIR**, *Mukti* **MITRA**

Purpose: To observe the efficacy, desirable, and undesirable effects of botulinum toxin injection in different age groups suffering from benign essential blepharospasm (BEB) and hemifacial spasm (HS).

Methods: Prospective observational study carried out from June 2014 till June 2016. Follow-up of 20 patients of BEB and HS was done over 2 years after injecting Botox. The patients were divided into 2 age groups: younger (28-40) and older (41-85). Informed consent and detailed history was taken. After taking all the standard precautions for Botox injection 5-7 (mean, 6) sites for injecting 1.5 to 2.0 IU of the toxin were selected depending upon the severity and duration of the problem.

Results: The desirable effects of the injection appeared in almost all the patients within 48 hours. Two (10%) patients (1 young and 1 elderly) developed mild ptosis which subsided over 2 weeks. Three (15%) patients (2 young and 1 elderly) developed mild bruising which also subsided over 1.5 weeks. Five (25%) patients (1 young and 4 elderly) felt almost cured after 3 to 4 repetitions of injections.

Conclusions: The study showed a comparatively better result in older patients. Factors like reduced bulk of orbicularis oculi and orbicularis oris muscles and subsequent atrophy may be responsible. In the younger age group, continuous exposure to environmental stimulants might be the cause of reduced efficacy. To reach a conclusion, further large-scale studies with long-term follow-up are essential.

Etiology and Injury Patterns of Orbital Fractures Across Age Groups in a Tertiary Center in Singapore: A Retrospective Study of 599 Patients

First Author: Kailing **YONG**

Co-Author(s): Amy **CHAN**, *Arjunan* **KUMARAN**, *Ian* **LOH**, *Sunny* **SHEN**

Purpose: To investigate the trauma mechanisms and resulting orbital fractures in elderly patients and to compare them with those of younger adults.

Methods: Retrospective study evaluating 599 subjects with radiological confirmation of orbital fractures on computed tomography scans. Subjects were divided into young (≤ 40 years, $n = 214$), middle-aged (41 to 65 years, $n = 191$), and elderly (> 65 years, $n = 194$) groups.

Results: The mean age was 51.9 (21.2) years, and 71.1% were male. Mean number of orbital walls fractured was 1.7 (0.43), with the floor most commonly fractured (74.5%), followed by lateral (42.6%), medial (39.1%), and roof (14.5%). Among all injuries 41% were associated with zygomatico-maxillary complex (ZMC) fracture, and 15.2% had concomitant intracranial hemorrhage. Mechanisms of injury were significantly different across the 3 age groups ($P < 0.001$). The most common cause in elderly was falls (82.5%). In the young group the most common causes were road traffic accident (RTA) (32.7%) and assault (30.8%). For the middle-aged group, falls accounted for 36.6% of the injuries and RTA for 25.7%. There were no significant differences between the age groups and number of walls fractured ($P = 0.70$) and intracranial hemorrhage ($P = 0.06$). The elderly group were more likely to have ZMC fractures ($P = 0.001$). Three patients had globe rupture, 4 had traumatic optic neuropathy, and 5 patients had retrobulbar hemorrhage requiring immediate cantholysis.

Conclusions: Age-related factors predispose elderly patients to falls and subsequent orbital fractures. A significant proportion of patients with orbital fractures were associated with intracranial hemorrhage and morbidity; hence orbital fractures should be strongly suspected in the elderly with a lower threshold for performing scans.

Evaluation of the Refractive Status of Simple Congenital Blepharoptosis in a Tertiary Eye Hospital

First Author: Faruque **GOLAM MOHAMMAD**

Co-Author(s): Moinul **HOQUE**, *Syeed* **KADIR**, *Mukti* **MITRA**, *Nishat* **PARVEEN**

Purpose: The aim of the present study was to evaluate the refractive condition and visual status of simple congenital blepharoptosis.

Methods: This analytical cross-sectional study was carried out in a tertiary-based eye hospital for a period of 6 months from January 2016 to June 2016 on 56 eyes of 50 patients.

Results: Age range was 9-38 years (male 56% and female 44%) with a mean of 17.7 (± 5.939). Unilateral was 88.0% and bilateral 12%. Regarding uncorrected visual acuity, 52.3% had 6/6, 6.8% had 6/9, 13.6% had 6/12, 11.4% had 6/18, 6.8% of eyes each had 6/24 and 6/36, and only 2.3% had less than 6/60. In fellow eyes visual acuity was 6/6 in 86.4% and in 6.8% of eyes was 6/9 and 6/18 ($P = 0.0001$). In this study myopia was more common in the ptotic eye (29.8%) than the normal eye (8.1%). Again myopic astigmatism (16.2%) was greater than hypermetropic astigmatism (5.4%) in the ptotic eye and both were more common in ptotic eyes. Astigmatism was more common in severe cases

(50.0%) than mild (16.7%) and moderate (7.7%) cases ($P = 0.0284$). Among all emmetropic eyes mild ptosis was found in 66.7% of cases and moderate ptosis was detected in 33.3% of cases. Amblyopia was detected in 14.0% of cases of total unilateral ptosis.

Conclusions: Refractive error is commonly detected in simple congenital ptosis depending on its severity.

Exceptional Outcome of One-Step Surgical Management of Eyelid Neurofibromatosis: A Case Report

First Author: Novia **RAHAYU**

Co-Author(s): Rossalyn **ANDRISA**, Hernawita **HERNAWITA**

Purpose: Neurofibromatosis (NF) type 1 (NF-1) is characterized by abnormal growth of neural tissue, causing noncancerous tumors in the skin, nervous system, eye, and others. This report aims to demonstrate satisfactory results of a one-step surgery of large upper eyelid neurofibromatosis.

Methods: A case report. A 23-year-old male patient came with the chief complaint of irregular, indistinct margin, soft on palpation, skin-colored, painless mass on his left upper eyelid since birth. The size of the mass had been progressing substantially, reaching 45 x 30 x 20 mm at initial presentation, and had caused visual axis obscuration for 10 years. Visual acuity of the left eye was counting fingers at 1.5 m. Dermatology examination showed café-au-lait spots and multiple similar masses in smaller size throughout the trunk and extremities. The patient then underwent a combined surgery of wide tumor excision and ptosis correction of frontalis muscle sling using fascia lata graft technique. Postoperatively, the patient was prescribed with lincomycin 3 x 500 mg and potassium diclofenac 2 x 50 mg orally and topical antibiotic ointment.

Results: Biopsy examination confirmed neurofibroma. During follow-up, the patient showed gradual wound healing with remaining palpable mass and mild-moderate ptosis. By the sixth month after surgery, the result was remarkable: no more palpable mass and the patient was content with a 9-mm vertical eyelid fissure and no ptosis.

Conclusions: Surgical management of large eyelid neurofibromatosis with combination of tumor removal and ptosis correction is a favorable therapeutic option with satisfactory outcomes.

Eyebrow Contouring with Filler Injections: 10-Year Experience

First Author: Adit **GUPTA**

Co-Author(s): Danica **FIASCHETTI**, Robert **GOLDBERG**

Purpose: The eyebrow region presents challenges for

filling: the skin is thick, the 3-dimensional (3D) anatomy complex, and there is a predisposition towards fat atrophy and skeletonization with aging. Hyaluronic acid gel (HAG) fillers are well known for the periorbital area. We report our long-term experience with eyebrow filing over 10 years.

Methods: Twenty cases of periorbital eyebrow filling with HAG fillers were followed up over a period of 10 years. The eyebrow filling was customized based on the patient's anatomical features in a 3D plane. Standardized photographs before and after the procedure in standard lighting conditions were evaluated.

Results: HAG fillers were tolerated in the eyebrow region. There were no cases with blue-gray dyschromia or prolonged edema as is the case with lower eyelid injections. The eyebrow gained volume and looked fuller immediately after the injection. There were 3 cases with excessive eyebrow puffiness noted on long term follow-up which may be the accumulated filler weighing the eyebrow. No other adverse events were noted.

Conclusions: The eyebrow anatomy is a complex 3D structure. Deflation in the eyebrow area along with the superior sulcus occurs with aging. Filling the eyebrow with HAG fillers is a safe alternative to surgical rehabilitation. We believe the fillers last longer in the eyebrow region due to the complex anatomy specific to this region.

Eyelid Juvenile Xantogranuloma

First Author: Siti Amirah **HASSAN**

Co-Author(s): Norlaila **T**, Chien Voon **YEW**

Purpose: To report a rare presentation of juvenile xantogranuloma (JXG).

Methods: Case report.

Results: A 3-year-old Malay boy presented to the ophthalmology clinic with left upper eyelid swelling for 6 months which gradually increased in size. He denied any history of trauma, pain, discharge from the swelling, or blurring of vision. On examination, there was left upper lid swelling at lateral 1/3 about 1 x 1 cm in size, firm and non-tender (Figure 1). Other ocular findings including vision and fundus were normal. Initially, he was treated as left upper eyelid chalazion. However, after 1 month he returned with unresolving symptoms. Therefore, excision biopsy of the swelling was done. The histopathology showed a nodular lesion in the subepithelium composed of dense infiltration of lymphocytes, histiocytes, and Touton giant cells with some neutrophils and some fibrous tissue also seen among the inflammatory cells, which was consistent with juvenile xantogranuloma. During subsequent follow-up, the eyelid swelling resolved and systemic examination revealed no lumps on other parts of the body. The child was also referred to the pediatric department for



further assessment.

Conclusions: In the eye, JXG usually affects the uveal tract, and rarely does it affect the eyelid. Although JXG is very rare in the eyelid, we need to have a high suspicion; therefore, full eye examination and systemic examination need to be done to rule out possible latent involvement.

International Multi-Center Review of Orbital Exenteration and Reconstruction Methods and Outcomes

First Author: Alejandra **VALENZUELA**

Co-Author(s): Peter **DOLMAN**, Alan **MCNAB**, Vivian **YIN**, Ze **ZHANG**

Purpose: Orbital exenteration is a disfiguring procedure reserved for life-threatening malignancies or palliation for tumors otherwise unresponsive. This study examines the clinical course and outcomes of a large series of patients who underwent orbital exenteration for malignant periocular neoplasms.

Methods: A retrospective review of patients who underwent orbital exenteration from 7/1/2005 to 6/30/2015 at 4 tertiary referral centers in the USA, Australia, and Canada. Demographics, indication for surgery, pathology, surgical technique, reconstruction type, and outcomes were reviewed.

Results: Orbital exenteration was performed on 102 patients. The mean age was 67.5 years with 55 males and 47 females. Most common malignant tumors encountered were squamous cell carcinoma (SCC), melanoma, and basal cell carcinoma (BCC). Seventy-six patients underwent reconstruction with a localized myocutaneous flap, 12 with partial-thickness skin graft (PTSG), 2 had a free flap, and 1 had a dermis fat graft. Sixteen patients had combined procedures of 2 of the above.

Conclusions: The majority of orbital exenterations performed in this series were secondary to untreated or unsuccessful previous treatments. Regional myocutaneous flaps, PTSG, free flap, and dermis fat grafts are all highly effective and durable reconstructive options for structural, aesthetic, and functional purposes and are able to withstand radiation therapy without complications over time. Our study had a high survival rate for both the SCC and BCC group without disease recurrence up to 72 months of follow-up, and thus provides new insight into the long-lasting efficacy of reconstructive grafts in orbital exenteration patients with and without postoperative radiation therapy.

Intraorbital Wooden Foreign Body with Intracranial Extension: A Case Report

First Author: Amanda **PERTIWI**

Co-Author(s): Agus **SUPARTOTO**, Purjanto **UTOMO**

Purpose: The aim of this study is to report a case of intraorbital wooden foreign body with intracranial extension to the frontal lobe and its management.

Methods: This is a descriptive study of a 53-year-old male referred due to a wooden stick stuck in the orbital cavity causing protruding eyeball and vital sign instability.

Results: Right eye examination revealed light perception visual acuity, with bad light projection and bad color perception, inwardly folded upper palpebra, proptosis, conjunctival chemosis, corneal erosion and edema, dilated pupil with sluggish pupillary light reflex, and limited ocular movement in all directions. Vital signs were unstable with decreasing blood pressure, increasing temperature, and heart rate. CT scan showed complete fracture of the orbital roof due to penetration of the wooden stick, pneumocephalus, cerebral edema, and hematoma. Emergency craniotomy was performed to remove the penetrating wooden stick and bone segment in the frontal lobe and repair the fracture. The ophthalmologist removed the remaining stick, released the superior rectus muscle, and repaired the lacerated eyelid. Visual acuity outcome was no light perception with lagophthalmos and limited ocular motility.

Conclusions: Any case presenting with intraorbital foreign body must undergo immediate neuroimaging to exclude any intracranial extension, especially in patients with worsening general condition.

Invasive Aspergillosis in an Immunocompetent Asian Teenager

First Author: Jose Antonio **PAULINO**

Co-Author(s): Felice Katrina **RANCHE**

Purpose: To report a case of invasive sino-orbital aspergillosis in an immunocompetent Asian teenager.

Methods: Case report.

Results: An immunocompetent Asian teenager with no comorbidities presented with a unilateral orbital proptosis with orbital cellulitis-like symptoms unresponsive to medical therapy. Findings on computed tomography demonstrated a fairly homogenous mass occupying the entire left maxillary sinus, with erosion of the orbital floor and medial wall to invade the ethmoids and the orbit. Excision biopsy of the mass showed fungal elements with tissue invasion and granulomatous reactions. Treatment included excision of the mass and systemic antifungals. During the course of treatment, however, the patient lost vision in the affected eye, which did not improve even after excision

of mass and treatment of the infection.

Conclusions: Clinicians should be aware of the possibility of a fungal infection mimicking other infections and tumors in an immunocompetent host because prompt treatment could possibly save the vision, and, in the long run, the patient's life.

Long-Term Outcomes of a Locally Made Porous Polyethylene Orbital Implant: A Phase II Study

First Author: Sunisa SINTUWONG

Co-Author(s): Kanjana LEELAPATRANURAK, Mingkwan LUMYONGSATIEN, Aree NIMITWONGSAKUL, Jintamai SUWANPRATEEB, Arpha PORNSETH

Purpose: To report long-term outcomes of a locally made porous polyethylene orbital implant in terms of safety and efficacy in anophthalmic socket surgeries.

Methods: Patients who met the inclusion criteria were recruited. The patients were followed up at least 1 week, 1 month, 2 months, 3 months, and 6 months after the operation. Some of them had MRI of the orbit with Gadolinium after the operation. The outcomes were measured in terms of postoperative infection, implant exposure, and implant extrusion. Descriptive statistics was used to analyze the data.

Results: There were 30 patients with the mean age of 41.3 (SD, 17.8) years old. Most of them were males (60%). The right eye was the most common side (63.3%). The main diagnoses were painful blindness (33.3%) and phthisis bulbi (33.3%). The most common surgical procedures were evisceration (50%) and enucleation (40%). The mean follow-up period was 52.9 (SD, 26.4) months. The most common implant size was no. 18 (54.6%). No postoperative infection was found. The most common complications were implant exposure and implant extrusion (20%), respectively. All patients were successfully treated with surgery. Ten patients had MRI of the orbit at the mean time of 9 months after operation. The mean percentage of Gadolinium uptake of an orbital implant from MRI of the orbit was 55 (SD, 11).

Conclusions: A locally made porous polyethylene orbital implant was safe and efficient for evisceration and enucleation at the mean time of 52.9 months after operation. Our phase III (RCT) study has been collecting data at the 2 eye institutes in our country.

Management of Ptosis Surgery-Related Complications in Vietnam

First Author: Nguyen HIEN

Co-Author(s): Pham HONG VAN, Nguyen HUYNH, Ha NGUYEN, Ha THU HA, Pham TRONG VAN

Purpose: To describe ptosis surgery-related complica-

tions and the management outcome.

Methods: A prospective clinical interventional study on 26 patients (28 eyes) attending Vietnam National Institute of Ophthalmology for such complications as recurrent ptosis (16 eyes, 57%), deformed eyelid (9 eyes, 32%), and sling material rejection (3 eyes, 11%). Management included septal adherence release, sling removal, levator recession, or skin and mucosal graft.

Results: Complications were managed with a 90.3% success rate. Undercorrected ptosis was most common and adjusted by applying another procedure, eg levator resection and/or tersectomy or sling operation using fascia lata. Lagophthalmos and ectropion may be related to excessive tissue removal and graft can be applied. We also found that sling operation was wrongly indicated in patients with good levator function leading to lid lag, entropion or lagophthalmos, and deformed eyelid. This should be a good lesson for oculoplastic beginners.

Conclusions: Complications can be significant among patients with ptosis surgery. These can be dealt with successfully when patients are carefully evaluated and even surgically defined. Common causes for undercorrection can be wrong indications in Vietnamese patients.

Modified Quickert Sutures Using Non-Absorbable Suture Materials: Minimally Invasive Surgical Procedure for Lower Eyelid Involitional Entropion

First Author: Min Joung LEE

Purpose: To report the surgical outcomes of Quickert sutures using non-absorbable suture materials for involitional entropion repair in Asians.

Methods: This study included 26 patients (28 eyes) diagnosed with involitional entropion and significant ocular irritation who presented from 2014 to 2016. All patients underwent correction of entropion using 4-point full-thickness mattress sutures with stab incisions. Preoperative clinical characteristics and surgical outcomes including recurrence rate and complications were analyzed. Exclusion criteria included previous lower eyelid surgery and follow-up of less than 6 months.

Results: The average age of the patients was 75.9 ± 7.1 years, and the male to female ratio was 14:12. In this case series, 10 of 26 patients underwent this procedure without discontinuing anticoagulation therapy. Significant lower eyelid laxity over 7 mm was observed in 10 eyes, and 4 eyes underwent simultaneous lateral tarsal strip procedure. With a mean follow-up period of 10.93 ± 4.50 months, 2 eyes (7.1%) experienced a recurrence; 1 eye showed preoperative fat herniation in conjunctival fornix, and the other eye experienced suture abscess with exposure. No other postoperative



complications or dissatisfaction were reported.

Conclusions: Modified Quickert sutures using non-absorbable suture material are a simple and effective surgical procedure for involitional entropion, and this is particularly useful for patients who need maintenance of anticoagulation.

Necrotizing Panophthalmitis with Asymptomatic Liver Abscess in a Filipino Male

First Author: John Philip UY

Co-Author(s): Almira MANZANO, Alex SUA, Roberto UY

Purpose: To report a case of necrotizing panophthalmitis with asymptomatic liver abscess in a Filipino male.

Methods: Descriptive clinical case report.

Results: This is a case of a 59-year-old male with poorly controlled type 2 diabetes mellitus, who presented with rapidly progressive unilateral visual loss, ocular pain, chemosis, external ophthalmoplegia, and proptosis of the left eye. B-scan sonography showed diffuse choroidal thickening, multiple hyperechoic vitreous opacities, and positive T-sign suggestive of panophthalmitis. Orbital CT scan revealed abnormal thickening and enhancement of the globe, orbital cellulitis, and beginning optic neuritis. An impression of possible mucormycosis was entertained. However, initial culture of eye discharge was negative. Systemic work-up showed incidental finding of elevated liver enzymes, leading to abdominal ultrasound that revealed a large liver abscess. Despite intensive antimicrobial therapy, the globe progressively proptosed and corneal melt ensued, with resulting rupture leading to exenteration. Liver abscess drainage culture was positive for *Klebsiella pneumoniae*, similar to culture results of the eye discharge from the ruptured globe.

Conclusions: *K. pneumoniae* is rising as an aggressive causative agent of pyogenic liver abscess-related metastatic endophthalmitis in Southeast Asia. The population at risk are those with uncontrolled diabetes mellitus. An alarming increase of documented cases in this region confers a high index of suspicion by local ophthalmologists for timely diagnosis and management because it creates a tumultuous course that can even progress to debilitating panophthalmitis, which can cause permanent loss of vision or even disfigurement due to exenteration. This case emphasizes the importance of early diagnosis and treatment of metastatic eye infections from *K. pneumoniae*-induced liver abscess.

Operculum Bone Carp (*Cyprinus carpio* Spp.) Scaffold: New Material Xenograft?

First Author: Raden Angga KARTIWA

Purpose: This initial study investigated *Cyprinus carpio*

spp. opercula bone as a potential xenograft.

Methods: EDS chemical analysis using a ZAF standardless method of quantitative analysis (oxide) and SEM examination were conducted in the laboratory of mathematics at the Institute of Technology, Bandung.

Results: Particularly the mass ratio of Ca and P (5.81/3:47), the result is 1.67. This is equivalent to the stoichiometric hydroxyapatite (HA) (Aoki H, 1991, Science and medical applications of hydroxyapatite, Tokyo: Institute for Medical and Engineering, Tokyo Medical and Dental University). C N O showed that there is an element of protein/amino acid collagen builder, which serves as a matrix together with HA. As shown in the SEM analysis, the matrix is a porous sheet-shaped oval that interconnects with each other, which is very good as a scaffold. The pore is composed of large pores > 200 μm and smaller pores between the large pores with a size smaller or equal to 10 μm that can serve for the attachment of osteoblast cells.

Conclusions: Opercula bone carp (*Cyprinus carpio* spp.) scaffold could be a potential new xenograft material.

Orbital Hemangioma in a Preterm Infant: A Change in the Current ISSVA Classification?

First Author: Alejandra VALENZUELA

Co-Author(s): Joshua FORD

Purpose: To describe an unreported classification of an orbital hemangioma with intracranial extension in a preterm infant.

Methods: Case report and literature review.

Results: A 2-week-old corrected age female (born at 35 weeks) presented with a 4-week history of rapidly progressive left eyelid swelling. She had a left RAPD, lagophthalmos, and marked exophthalmos unchanged with Valsalva. The rest of the exam and history were unremarkable. Imaging showed an extensive, ill-defined, left intraconal mass that enhanced with contrast and extended into the left cavernous sinus. Histopathology revealed a capillary hemangioma displaying positivity on CD31, CD34, and vimentin. The lesion continued to grow rapidly, inducing an arreflexic pupil and limitation in abduction of the left eye. After PHACES was ruled out and the child was clear by pediatrics, beta blockers were started with good clinical response.

Conclusions: Infantile hemangiomas are the most common pediatric tumor, affecting females in the cervico-facial area. They usually develop within the first few weeks of life and enlarge over several months, reducing in size during the first decade. They show positivity to Glut-1, Lewis-Y-antigen, Fcg-II-receptor, and merosin with Ki-67 positivity. In contrast, congenital hemangiomas are rare, show no gender predilection, and they are fully developed at birth. They either involute rapidly or remain stable. This case shows a different be-

havior where the tumor became apparent at 38 weeks gestational age, growing dramatically over weeks and inducing a compressive optic neuropathy. The study reviews the literature and offers a reconsideration of the ISSVA classification based on the immunohistochemistry findings.

Outcome of Upper Eyelid Blepharoplasty with Concurrent Mueller Muscle Conjunctival Resection

First Author: *Emmy LI*
Co-Author(s): *Hunter YUEN*

Purpose: To determine the effect of concurrent blepharoplasty and Mueller muscle conjunctival resection (MMCR) surgery on eyelid position.

Methods: This is a retrospective case series. Medical records of 22 patients who received concurrent upper eyelid blepharoplasty and MMCR were reviewed. In this study, blepharoplasty consisted of skin removal and debulking of orbicularis and fat, leaving the tarsus intact. Conjunctivo-mullerectomy was performed after blepharoplasty, and the wound was closed with a single run of prolene suture.

Results: There were 18 cases of bilateral blepharoplasty with bilateral MMCR and 6 cases of bilateral blepharoplasty with unilateral MMCR. The mean preoperative palpebral fissure height (PFH) and margin-reflex distance 1 (MRD-1) were 6.0 ± 0.8 mm and 0.9 ± 0.6 mm, respectively. The mean changes of PFH and MRD-1 were 1.4 ± 0.7 mm and 1.1 ± 0.6 mm, respectively. The mean operating time was 70 ± 9 minutes. Ninety percent of the patients achieved postoperative symmetry. No major complications were observed.

Conclusions: Combining MMCR surgery with upper eyelid blepharoplasty provides a reliable and satisfactory option to correct dermatochalasis and ptosis in the same setting in a relatively short operating time.

Outcomes of Lacrimal Gland Botulinum Toxin Injection for Epiphora and Hyperlacrimation

First Author: *Simranjeet AULAKH*
Co-Author(s): *Nita Amit SHAH, Akshay NAIR, Chhaya Ashok SHINDE*

Purpose: To study the outcomes of botulinum toxin A (BonTA) injection into the lacrimal gland (LG) in cases of epiphora and lacrimation not amenable to lacrimal surgery.

Methods: Retrospective interventional case series of 14 patients with epiphora/hyperlacrimation who were treated with LG BonTA injections.

Results: Fourteen patients (17 eyes; 9 females, 5 males) with a mean age of 61.8 years (range, 29-86) were treated with intra-glandular injections of 2.5

units of BonTA. A mean of 2 injections (range, 1-3) was given per eye. No adverse event was observed during the procedure. All patients received the injections trans-conjunctivally. The most common indication was bicanalicular and common canalicular obstructions (6/14; 43%). Other indications included punctal and canalicular agenesis, post-chemotherapy canalicular stenosis, secondary NLD obstruction (post trauma), and facial palsy. The mean follow-up period was 8.9 months (range, 3-20 months) and the mean interval between injections was 4.06 months. The Munk score was used as an objective measure of the epiphora. The Munk score improved from a mean pretreatment score of 3.92 to a mean posttreatment score of 1.78. This improvement was statistically significant ($P < 0.01$). Transient ptosis was seen in 1 patient.

Conclusions: Our results suggest LG BonTA injection gives acceptable rates of resolution of complaints of epiphora/hyperlacrimation among patients who are not good candidates for surgery or do not want surgery. Further studies are required for standardization of doses and duration in between injections.

Outcomes of Levator Advancement and Muller Muscle-Conjunctiva Resection for the Repair of Upper Eyelid Ptosis

First Author: *George THOMAS*

Purpose: Both the Muller muscle-conjunctiva resection (MMCR) and levator advancement (LA) procedures can be used to manage ptosis in patients with good levator function. The aim of this paper is to evaluate the efficacy and cosmetic outcomes of the 2 procedures.

Methods: The clinical records of 29 consecutive eyelids of 26 patients undergoing MMCR and 30 eyelids of 23 patients undergoing LA were analyzed.

Results: Eleven (42%) in the LA group and 9 (39%) in the MMCR group were male. The preoperative eyelid measurements were significantly different in the LA compared to the MMCR groups, in terms of palpebral aperture (PA) (6.3 vs 7.4, $P = 0.01$), marginal reflex distance 1 (MRD1) (-0.1 vs 1.5, $P < 0.001$), and levator function (LF) (12.1 vs 13.4, $P = 0.03$). The MRD1 1 month post-surgery was slightly less in the LA group compared to the MMCR group (2.6 vs 3.18 mm, $P = 0.047$) but not significantly different at months 3 and 6. The final change in MRD1 was significantly higher in the LA group (2.93 vs 1.76, $P = 0.004$). The MMCR group had a lower incidence of lid contour abnormalities (0% vs 20%, $P = 0.01$) and overcorrection (0% vs 13%, $P = 0.04$). There was no statistically significant difference in the rates of undercorrection in either group.

Conclusions: Both the MMCR as well as LA procedures are effective for mild to moderate ptosis in patients with good levator function. Patients undergoing MMCR



had higher success rates, better preservation of the natural lid contour, and a lower incidence of overcorrection than patients undergoing LA.

Postoperative Closed Suction Drainage in Anterior Orbitotomy

First Author: Pankaj GUPTA

Co-Author(s): Bruttendu MOHARANA, Zoramthara ZADENG

Purpose: The use of postoperative closed suction drainage in orbital surgeries is largely decided by surgeon preference. The present article intends to study the role of postoperative closed suction drainage in anterior orbitotomies.

Methods: The case records of all patients who underwent orbitotomy with mass excision in our department during the past 10 years were reviewed. The patients for whom postoperative closed suction drains were used were grouped into group A and the rest were grouped into group B. The parameters specifically studied included preoperative visual acuity, amount of proptosis or globe deviation, time for subsidence of postoperative edema, and postoperative visual acuity. These parameters were compared between the groups

Results: Group A patients had earlier subsidence of postoperative edema than group B patients ($P = 0.003$). The patients in both groups had similar visual outcomes at 3 months ($P = 0.8$).

Conclusions: The use of postoperative closed suction drainage in orbitotomy is associated with earlier subsidence of postoperative edema and had no impact on final visual outcome.

Proptosis After Blunt Trauma with Posterior Wall Rupture and Intraocular Hemorrhage

First Author: Sekar Ayu SITORESMI

Co-Author(s): Ratna DOEMILAH

Purpose: This case report aims at deciding what intervention should be taken to preserve a good quality of life in a woman of reproductive age with blindness.

Methods: A woman, 24 years old, suffered from pain in her left eye for 6 hours after bumping into a wooden panel, followed by swelling and redness. Visual acuity of both eyes was no light perception since a traffic accident 3 years previously. The left eyelid was edematous. We found chemosis and subconjunctival bleeding in conjunctiva, and the eyeball was protruded. Head CT scan and ultrasonography showed intraocular mass, hemorrhage, posterior wall rupture, and suspicion of craniosynostosis syndrome. Scoliosis and arachnodactyly were also found in this patient. The right eye had shrunk since 1 year prior.

Results: Due to financial and social issues, this patient

refused diagnostic examination for underlying diseases that she may have, as well as surgical treatment. She desired treatment just to relieve her painful blind eye, which was done with intravenous analgesics. When the pain could be controlled with oral analgesics and the inflammation improved, we discharged the patient.

Conclusions: The orbit is a closed space. Any rise in intraorbital contents can cause elevation of intraorbital pressure resulting in orbital compartment syndrome. We suspect a syndrome that may contain some clinical features this patient has (Shprintzen-Goldberg syndrome), but we may have to discuss it in a multidisciplinary manner later. Enucleation with pathology examination and canthotomy-cantholysis-tarsoraphy are the alternatives for this case.

Rare Orbital Tumor, Nodular Fasciitis in an Adult: A Case Report

First Author: Youn-Shen BEE

Purpose: To report a rare case with periorbital nodular fasciitis in an adult.

Methods: Case report.

Results: A 57-year-old female patient presented with a progressively enlarged mass over the left upper medial orbital wall for 2 months. On physical examination, a mass of approximately 1 cm in size with firm and mild-tender nature was noted. There were no other abnormal findings on the general ocular examination. On magnetic resonance imaging, a well-defined 1.0 cm-sized soft tissue mass was noted over the left upper medial periorbital area, with no extension to retrobulbar regions. A complete excision was performed. Macroscopically, the tumor was well circumscribed, non-encapsulated with rubbery to myxoid texture. The histological results showed nodular fasciitis composed of plump but uniform fibroblastic/myofibroblastic cells and typically displaying a loose or tissue culture-like growth pattern. Immunohistochemical study was performed, and the spindle cells were positive for smooth muscle actin, focally positive for CD163, and negative for S100, CD31, and CD34 immunostains. Nodular fasciitis was impressed.

Conclusions: Nodular fasciitis is especially uncommon in the periorbital area, only accounting for less than 1% of all periorbital masses. Only approximately 7% of nodular fasciitis are found on the head and neck areas and such cases generally occur in young children. Nodular fasciitis was rarely reported in the adult periorbital area. We present a case with a rare periorbital nodular fasciitis in an adult with good prognosis.

Releasing Surgery and Amniotic Membrane Transplantation Improve Ankyloblepharon and Symblepharon After Stevens-Johnson Syndrome

First Author: Sylva TAQRYANKA
Co-Author(s): Sutjipto SUTJIPTO

Purpose: To manage ankyloblepharon and symblepharon in children after Stevens-Johnson syndrome.

Methods: A case report. A 6-year-old boy presented with complete adhesion and cicatrizing lesion of the eyelids on both eyes after Stevens-Johnson syndrome. Releasing surgery and amniotic membrane transplantation were performed on the left eye.

Results: Ankyloblepharon and symblepharon releasing surgery was performed on both eyes and amniotic membrane was transplanted in the left eye. A week after surgery, he was able to open both eyes with eyelid fissure measurement of right eye 4 mm and left eye 7 mm. Ocular examination revealed visual acuity of the right eye to be 2/60, left eye 3/60, disturbance of ocular motility in right eye, corneal erosion on both corneas, hyperemia conjunctiva, and symblepharon in both eyes. The left eye showed fewer signs of symblepharon than the right eye.

Conclusions: Releasing surgery and amniotic membrane transplantation improve ankyloblepharon and symblepharon after Stevens-Johnson syndrome. Amniotic membrane has anti-inflammatory and anti-fibroid effects that modulate the healing process. Further evaluation and management was still needed.

Satisfactory Result of Upper and Lower Eyelid Defect Reconstruction in Severe Eyelid Defect Due to Trauma: A Case Report

First Author: Putri IDHAM
Co-Author(s): Hernawita HERNAWITA

Purpose: The aim of this case report is to share the satisfactory result of wide eyelid defect reconstruction with skin flap and oral mucosa graft procedure followed by release of the contracted skin.

Methods: A 21-year-old male presented with the chief complaint of wide right eyelid defect due to trauma 2 months previously. The patient had a history of failed skin graft on the entire right eyelid at a previous hospital. Full thickness defect at the right upper eyelid was 40 x 9 mm with 40 x 4 mm at the lower eyelid. Severe lagophthalmos with exposure of the entire cornea was accompanied by corneal haziness and descemetocele of 3.8 x 5.6 mm. Upper and lower eyelid reconstruction with skin flap rotation to create new eyelid was performed. Oral mucosa graft was harvested as base of lower fornix. Six months after surgery, the wound had improved with mild ectropion cicatrix of the lower eye-

lid. One month later, the next surgery was performed. Simblefaron was released and the contracted skin was disposed. Bare area of the skin was covered by skin graft taken from postauricular.

Results: Two weeks after surgery, the patient could functionally use the entire eyelid to close the eye. There were no sign of graft rejection, ectropion, or corneal exposure.

Conclusions: Eyelid defect reconstruction with skin flap and oral mucosal graft procedure followed by release of contracted skin gave an excellent surgical outcome in a patient with wide eyelid defect. A satisfactory result was achieved after complete surgery. Postoperatively, the patient's subjective appearance improved greatly.

Surgical Correction and Outcome of Cicatricial Ectropion Due to Severe Burn Contracture

First Author: Mukti MITRA
Co-Author(s): Golam HAIDER, Nishat PARVEEN

Purpose: To see the functional and aesthetic results of eyelid reconstruction in patients with severe burn contracture causing cicatricial ectropion of both upper and lower lids and to prevent and treat exposure keratopathy.

Methods: Nine patients with cicatricial ectropion from various causes were treated from January 2010 to May 2016. Among them 2 female patients were known cases of epilepsy, 1 had electric burn, 5 had accidental flame burn due to RTA, and the rest of the patients had homicidal acid burn. Three patients had bilateral involvement and the rest of the patients had unilateral involvement. All the patients presented with moderate to severe lagophthalmos. Age range was 9 to 45 years. Cicatricial ectropion was corrected in all patients with skin graft except 1 in which Z plasty was done. More than 1 donor sites were used to cover large defects.

Results: Successful outcome without lagophthalmos was found in 6 patients (66.6%). Three (33.4%) patients needed revision surgeries with re-graft. Two patients lost 1 eye each preoperatively due to severe exposure keratopathy.

Conclusions: Correction of cicatricial lid deformity is very challenging and the outcome is always unpredictable. Revision surgery is frequently needed due to the presence of extensive scar tissue that is sometimes difficult to excise completely. Acceptable functional and aesthetic outcome is not always possible due to severe tissue loss. Proper technique for successful grafting is essential to save vision.



Surgical Management of Essential Blepharospasm

First Author: Naqaish SADIQ

Co-Author(s): Abdus Salam ARIF

Purpose: To evaluate the efficacy of orbicularis oculi myectomy in essential blepharospasm refractory to botulinum toxin.

Methods: We are presenting a case of a 60-year-old male who presented with severe bilateral blepharospasm. He was treated with botulinum toxin and developed resistance to this and hence needed frequent injections. In a 15-month period he received 14 injections. In the last 3 months he could not experience relief even with 1 injection after 2 weeks and became practically blind. Finally he underwent orbicularis oculi myectomy in both eyes and resumed normal blinking and exposure.

Results: Six months of follow-up have shown that this extremely resistant case had a lot of improvement in his blinking and exposure. He is back to normal life after a period of physical blindness of more than 1 year. He can perform normal day-to-day activities.

Conclusions: Surgery is an excellent option in such resistant cases of blepharospasm. Treating physicians should have a cut-off point while treating this debilitating condition with injections. Although the procedure is not an absolute cure, is time consuming and difficult, it offers very good relief to these patients. Follow-up is needed for the possibility of recurrence of symptoms later on.

Sutureless Repair of Orbital Blowout Fractures

First Author: Surpriya HAWAIBAM

Co-Author(s): Kasturi BHATTACHARJEE, Deepika KA-POOR, Prabhjot Kaur MULTANI, Samir SERASIYA, Richa SHRIVASTAVA

Purpose: To analyze the ease and surgical outcome of using porous polyethylene sheets with fibrin glue in orbital blowout fracture repair via a sutureless transconjunctival approach.

Methods: We retrospectively reviewed 16 cases (11 male, 5 female) of orbital blowout fractures. The duration from time of injury to surgery ranged from 6 weeks to 6 months. Indications for surgery included enophthalmos of 2 mm or more (10 of 16), significant diplopia within 30 degrees of primary gaze (6 of 16), and hypoglobus ranging from 1.5 mm to 6 mm (4 of 16). All patients were assessed through a pre-septal transconjunctival incision. After complete reduction of orbital contents from the fractured site, porous polyethylene implant was placed using fibrin glue; the conjunctiva was just re-approximated and re-draped into position.

Results: Patients were followed after surgery for a period ranging from 4 weeks to 12 months. There was significant reduction in enophthalmos in all the patients. Three of the 4 patients who had hypoglobus showed complete resolution and 1 showed reduced hypoglobus. Of the 6 patients who had diplopia, 2 had complete resolution of diplopia postoperatively, 3 had reduced but residual diplopia in extreme gaze, and 1 patient had diplopia in downgaze. There was no restriction of ocular motility postoperatively. Two patients (12.5%) had lid retraction and 1 patient (6.2%) had early migration of the orbital implant that did not require further intervention.

Conclusions: The technique appears to be a time saving and technically simpler procedure that reduces the likelihood of induced diplopia, avoids suture granuloma formation, and provides excellent functional and cosmetic results.

Pediatric Ophthalmology & Strabismus

A Case Report of Congenital Toxoplasmosis with Severe Neurological and Ocular Manifestations

First Author: Merwyn CHEW

Co-Author(s): Yien LAI, Cheryl NGO

Purpose: To describe a case of congenital toxoplasmosis with severe neurological and ocular manifestations.

Methods: Clinical notes and investigation findings were reviewed.

Results: The mother had antenatal tests that were positive for toxoplasma and fetal scans showed dilated lateral ventricles at 25 weeks of gestation. She reported a febrile illness with lymphadenopathy at 8 weeks of gestation with no history of exposure to cats, farm animals, soil, or consumption of uncooked meat, untreated water, and unpasteurized dairy products. No treatment was given during this time. The baby was born weighing 2715 g at 37 weeks gestation through an elective caesarian section. The fontanelles were widened with a 90th percentile head circumference. He later developed hypertonia with spontaneous clonus. Magnetic resonance imaging (MRI) showed diffusely enlarged lateral ventricles with parenchymal thinning of all cerebral lobes, especially the occipital lobe, and diffuse leptomeningitis and ventriculitis. On ocular examination, there was bilateral microphthalmia and retrolental gliotic mass with some hemorrhage. Normal retinal architecture could not be made out. B-scan ultrasonography and MRI of the orbits showed disorganized retrolental masses bilaterally. Toxoplasma IgM, IgG, and polymerase chain reaction were positive. Systemic anti-toxoplasmosis medications were commenced with oral pyrimethamine, sulfadiazine, and

folinic acid. Given the severity of the ocular infection and poor occipital lobe formation, the likelihood of any vision is very guarded.

Conclusions: The management of toxoplasmosis infection during pregnancy remains controversial. However, there can be serious neurological and ocular consequences and more work should be done to establish effective treatment protocols to avoid these devastating sequelae.

A Comparative Study of Occlusion Therapy versus Vision Therapy Software and Home Therapy System in Treatment of Amblyopia

First Author: Rohit **SREENATH**

Co-Author(s): Savitha **A**, Sri **GANESH**, Kritika **C**

Purpose: To compare the efficacy and reliability of Vision Therapy Software 4 (VTS4) and home therapy system (HTS) with conventional occlusion therapy for the management of amblyopia.

Methods: The patients were divided into 2 groups: the first group underwent therapy with VTS4 and HTS and the second only occlusion therapy. Improvement in best corrected visual acuity (BCVA), stereopsis, and contrast sensitivity in the 2 groups was compared. Inclusion criteria were children with anisometropic amblyopia, strabismic amblyopia with eso/exo less than 30 degrees, phorias, and stimulus deprivation amblyopia.

Results: The BCVA in group 1 was 0.429 logMAR before VTS4 + HTS therapy and it improved to 0.3542. The BCVA in group 2 before occlusion therapy was 0.45 logMAR and it improved to 0.312. The BCVA in group 1 patients who received 6 months of therapy was 0.554 logMAR beforehand and it improved to 0.372. The BCVA in group 2 before occlusion therapy was 0.43 logMAR and it improved to 0.231. The BCVA in group 1 patients who received 9 months of therapy was 1.1 logMAR before VTS4 + HTS therapy and it improved to 0.7. The BCVA in group 2 before occlusion therapy was 0.6 logMAR and it improved to 0.328.

Conclusions: Our study concluded that VTS4 and HTS are as effective as conventional occlusion therapy in improving BCVA. However, the compliance and repeatability of the VTS system is much better than conventional occlusion therapy.

Acquired and Progressive Retinal Nerve Fiber Layer Myelination After Fronto-Supraorbital Advancement in Coronal Craniosynostosis

First Author: Kinei **RA**

Purpose: To report the onset and progression of retinal nerve fiber layer myelination in a child after treatment of craniosynostosis with reconstructive surgery.

Methods: Case report. The patient's clinical history, including visual acuity, refractive error, ocular alignment, fundus examination, optic nerve photographs, optical coherence tomography, and electrophysiology, was retrospectively reviewed.

Results: A 3-year-old male was found to have myelination of the retinal nerve fiber layer (MRNFL) in the right eye after reconstructive surgery for craniosynostosis. When he was reexamined at age 4 years, he was found to have new myelination in the left eye and progression of the myelination in the right eye. Cycloplegic refraction was +2.00 sphere in the right eye and +6.00 sphere in the left eye.

Conclusions: Retinal nerve fiber layer myelination can occur spontaneously in childhood, progress in school age, and be associated with craniosynostosis. To our knowledge, this is the first case of fronto-supraorbital advancement leading to bilateral MRNFL reported in the literature.

Barrier Analysis and Outcome of Pediatric Cataract Surgery in Underprivileged Children of Assam, India

First Author: Anshul **SINGH**

Co-Author(s): Kasturi **BHATTACHARJEE**, Jayanta **DAS**

Purpose: The purpose of this study was to identify the barriers to effective treatment of childhood cataract in Assam in the lower socioeconomic group and to determine the outcome of intraocular lens (IOL) surgery in childhood cataract. Pediatric blindness presents problems of human morbidity, economic loss, and social burden of which cataract accounts for 5-20% of cases.

Methods: School screening, home visits, and confirmation of diagnosis at a secondary district eye care center were followed by quantitative and qualitative research methodology, which included questionnaires and analysis of hospital records, respectively.

Results: Of 288 children treated for childhood cataract, percent age distribution showed peak at 9 years of age. On barrier analysis it was found that the majority of the people did not know where to seek treatment and 97% of them had economic difficulties. Timing of surgery and treatment of amblyopia are extremely critical in pediatric cataract surgery for a successful outcome. The intervention could not restore good vision in a majority of the cases because of the lack of detection and mostly due to economic barriers.

Conclusions: Barriers need to be addressed and universal health coverage given so that children get adequate treatment at the right time.



Characteristics and Surgical Time of Congenital Cataracts in Yogyakarta, Indonesia

First Author: Dhimas **SAKTI**

Co-Author(s): Wasisdi **GUNAWAN**, Indra **MAHAYANA**, Krisna **JATI**, Haryo **YUDONO**

Purpose: The aim of this study was to find out the etiology of congenital cataract and the surgical management of the disease.

Methods: Retrospective review of patient medical records with congenital cataract diagnosis at an academic hospital from 2012-2014.

Results: There were 66 patients diagnosed with congenital cataract. Among them 22 patients (33.33%) had clinically confirmed congenital rubella syndrome (CRS); 18 patients (27.27%) had suspected CRS; 1 patient (1.52%) had toxoplasmosis; 1 patient (1.52%) had suspected CRS, active rubella, and cytomegalovirus (CMV) infection all together; 1 patient (1.52%) had cholestasis; and 23 patients (34.85%) did not have systemic conditions/idiopathic. Sixty-one patients (94 eyes) underwent congenital cataract surgery. Average age at time of surgery was 2.59 ± 3.62 years old. The congenital cataract surgeries were ophthalmologist scleral incision surgery without intraocular lens (IOL) (38 eyes, mean duration: 48.02 ± 22.13 mins), ophthalmologist scleral incision surgery with IOL (17 eyes), ophthalmologist corneal incision surgery without IOL (19 eyes, mean duration: 33.94 ± 15.28 mins), ophthalmologist corneal incision surgery with IOL (4 eyes), resident scleral incision surgery without IOL (10 eyes), resident scleral incision surgery with IOL (5 eyes), and resident corneal incision surgery without IOL (1 eye). There was significant difference in ophthalmologist surgical time between scleral and corneal incision surgery, both without IOL implantation ($t = 3.483, P = 0.003$).

Conclusions: Rubella related cataracts (CRS and suspected CRS) were the main etiology of congenital cataract in our academic hospital. Corneal incision surgery provided faster surgical time compared to scleral incision surgery for treating congenital cataract.

Characteristics of Congenital Rubella Syndrome in Central Java: January 2015 to June 2016

First Author: Ivana **TANOKO**

Co-Author(s): Liana **EKOWATI**

Purpose: To describe the congenital rubella syndrome (CRS) cases in Central Java and the manifestations over 1.5 years compared to congenital cataract.

Methods: A review of medical records of CRS and congenital cataract case reports.

Results: During 1.5 years, there were 17 patients reported as CRS, consisting of 10 (58.82%) males and

7 (41.18%) females, which were commonly (52.94%) found in the first 1-6 months of life. Cataract manifested in 12 (70.58%) patients, and most were binocular (83.33%). Congenital heart disease was found in 7 (41.18%) cases and hearing impairment manifested in 11 (64.71%) patients. Congenital cataract, which was diagnosed in 47 patients, had the same characteristics as CRS cases. It was more common in males (29; 61.7%), most cases (89.36%) were detected in the first 6 months of life, and 2/3 of cases were binocular cataract.

Conclusions: A high prevalence of CRS might be useful for consideration in the World Health Organization (WHO) immunization campaign by giving rubella-containing vaccines. As an ophthalmologist, initial screening in patients with congenital cataract is useful to detect CRS cases.

Childhood Esotropia Management Outcome: A Prospective Evaluation

First Author: Mamunur **CHOWDHURY**

Co-Author(s): Mejbah **ALAM**, Enayet **HUSSAIN**, Syeed **KADIR**

Purpose: Esotropia is a common form of strabismus in childhood and more amblyogenic than exotropia. Often it is the presenting symptom of a serious eye disease or systemic conditions. This study was done to assess the common forms of childhood esotropia and their management outcome.

Methods: This prospective, observational study was done in 2015. Main outcome variables were ocular alignment, status of amblyopia, status of BSV, and stereopsis.

Results: Among 100 esotropic children 79% had essential esotropia, 14% had fully accommodative esotropia, and 7% had partial accommodative esotropia. All the eyes were aligned following spectacle use and/or surgery. A total of 80% of children had amblyopia at presentation and among the amblyopic children who received appropriate management, 56.6% had improvement. A total of 86% of children required surgery, 14% required only spectacles, and 7% of children required both spectacles and surgery. A total of 60% of children achieved binocular vision 6 months after surgery or spectacle use or both. Of them, 41.66% achieved stereoacuity < 800 sec of arc.

Conclusions: Although the eyes become aligned following appropriate management, sensory status does not always improve due to late presentation; thus, it demands early diagnosis with appropriate management or referral in daily practicing life.



Clinical Experiences of Orthokeratology with or Without Low Dose Atropine for Myopia Control in Children

First Author: Yun-Wen **CHEN**

Co-Author(s): Po-Chiung **FANG**, Pei-Chang **WU**

Purpose: To evaluate and compare the clinical effect of orthokeratology lenses (OK lens) combined with low concentration (0.01%) atropine or single use of OK lens for myopic control in children.

Methods: This is a retrospective study analyzing the annual axial length elongation between 2 treatment regimens of single use of OK lens and combined use of OK lens and low dose atropine. Baseline criteria including age, sex, spherical equivalent refractive error, and keratometry reading were also analyzed statistically.

Results: Forty-seven eyes from 47 children (9 to 15 years old) with myopia [baseline spherical equivalent (SE), -3.68 ± 1.41 diopters (D)] underwent OK lens or OK lens combined with low concentration atropine treatment from 2009-2013 to 2011-2015. Average follow-up time was 3.93 ± 1.18 years. The mean age of patients was 10.60 ± 1.62 years, including 22 boys and 25 girls. OK lens were prescribed for all children with myopia. Children received OK lens only in 15 cases (31.91%), whereas the other 32 children (68.09%) received OK lens combined with low concentration atropine (0.01%) treatment. Annual axial length elongation did not show significant differences between the 2 groups (single group vs combined group, 0.183 ± 0.109 vs 0.178 ± 0.101 mm, $P = 0.871$ by t test).

Conclusions: Children with myopia receiving treatment with OK lens and low concentration atropine would be expected to have effects as beneficial as with OK lens only. Side effects of the combination with low dose atropine were not common in our study.

Clinical Profile of Restrictive Strabismus and Utility of Magnetic Resonance Imaging in Management

First Author: Rajat Mohan **SRIVASTAVA**

Co-Author(s): Siddharth **AGRAWAL**, Gaurav **KUMAR**, Vinita **SINGH**

Purpose: To study the clinico-radiological profile of restrictive strabismus patients and the usefulness of magnetic resonance imaging (MRI) in management.

Methods: All consecutive patients with restrictive strabismus presenting at our pediatric vision care and strabismus clinic between November 2014 and August 2016 were recruited. Clinical examination was done to reach a probable cause and plan management. MRI of the orbit and brain including fast imaging with steady state acquisition (FIESTA) and fluid attenuation inversion recovery (FLAIR) were done to assess the orbit

contents, cranial nerve nuclei, and nerve. Statistical analysis was done to compare utility of MRI with clinical evaluation in establishing etiological diagnosis and management plan. A P value of 0.05 or less was considered statistically significant.

Results: Out of 23 patients 56% were congenital (11 were Duane retraction syndrome [DRS], 2 were Brown syndrome) and 44% were acquired cases (6 post-traumatic, 3 myocysticercosis, 1 thyroid ophthalmopathy). Seventy percent of congenital cases were females and 90% of acquired cases were males. All DRS patients had normal extraocular muscles and absent abducens nucleus on MRI. Seventy-two percent of post-traumatic patients had inferior wall fracture with inferior rectus entrapment in 83%. MRI plays a statistically significant role in establishing etiological diagnosis ($Z = -4.69$, $P = 0.001$) and guiding precise management ($Z = -3.00$, $P = 0.003$) compared to clinical evaluation alone.

Conclusions: DRS was the commonest diagnosis among restrictive strabismus patients. Besides providing insights into the etiopathogenesis, there is definite utility of MRI in providing proof and establishing evidence-based protocols for managing restrictive strabismus.

Combined Strabismus Surgery with Intraocular Lens Implantation with or Without Cataract Extraction

First Author: Kavitha **KALAIVANI**

Purpose: To analyze our experience with 1-stage strabismus procedures combined with intraocular lens (IOL) implantation with or without cataract extraction.

Methods: We retrospectively analyzed the records of 61 patients ranging from age 10 to 72, in whom strabismus procedures were performed with a cataract surgical procedure during the period between January 2006 and December 2014. We included those patients with a minimum follow-up of 3 months. We included all types of cataract procedures like extracapsular cataract extraction with IOL implantation, phacoemulsification with IOL implantation, and secondary IOL implantation. The types of strabismus entities were sensory, congenital esotropias and exotropias, strabismus fixus, monocular elevation deficits, etc. Indications to combine the procedures were cosmetic reasons, diplopia, or when the strabismus procedure was needed to enable a cataract procedure. We analyzed the effectiveness of achieving motor alignment, relief from diplopia, and the safety of combining the procedures.

Results: There were 61 patients aged between 10 and 72 years. Forty-one patients (67%) had phacoemulsification with lens implantation, 11 (18%) had scleral-fixed IOLs, 4 (6%) had lens aspiration with IOL implantation, 4 (6%) had extracapsular cataract surgery with IOL



implantation, and 1 (1.6%) had small incision cataract surgery with IOL implantation. Except 2 patients (3.2%) all had unioocular squint surgery. Thirteen patients (21%) had surgery under general anesthesia. A majority of patients had improved alignment and vision. Few patients had residual strabismus and diplopia.

Conclusions: Combining these 2 procedures can be a good option if the indications are individualized.

Congenital Cytomegalovirus Retinitis as a Possible Cause of Poor Vision in a Premature Infant: A Case Report

First Author: Amelya SARI

Co-Author(s): Lukman EDWAR, Rita S SITORUS

Purpose: To demonstrate a case of a premature infant with congenital cytomegalovirus (CMV) retinitis.

Methods: A case report. A 3-month-old baby boy was taken by his parents to our pediatric ophthalmology clinic with the complaint of unresponsive eye to a given object. He was born prematurely with gestational age of 30 weeks. There were no apparent systemic disorders except microcephaly. On examination, both eyes were unresponsive to the given light and object. Anterior segment was normal but in funduscopy examination, exudate and frosted angii branch were found on the posterior pole of the retina.

Results: The serology test was performed showing non-reactive anti-HIV, reactive anti-CMV IgG (28.8 U/mL), and reactive anti-CMV IgM (5.8 COI). The serology test was then followed by PCR analysis derived from urine and vitreous, confirming the evidence of CMV infection. For the therapy, intravenous gancyclovir was given 2x20 mg for 7 days continued with oral valgancyclovir 2x60 mg for 4 weeks, resulting in significant resolution of retinitis in 2 months following the treatment.

Conclusions: Developmental delay and retinopathy of prematurity are commonly considered as causes of poor vision in premature infants. This report demonstrates that CMV retinitis may also be another possible cause. Complete examination such as funduscopy and serology test will be useful to confirm the diagnosis.

Difference in Objective Refractive Error Between Preterm and Term Births in Children with Corrected Age from 6 Months to 3 Years

First Author: Gredy ARYANI

Purpose: To analyze the difference in objective refractive error between preterm and term births in children from 6 months to 3 years corrected age.

Methods: This was an observational analytic retrospective cohort study in children with corrected age from 6 months to 3 years. The objective refractive error assessment was done using streak retinoscopy. There

were a total of 82 samples in this study, which were grouped into 2 categories. The first group was preterm birth children, further grouped into 3 subcategories, namely, extremely preterm, very preterm, and moderate to late preterm. The second group was term birth children.

Results: ANACOVA statistical analysis was used. A significant difference in objective refractive error between the preterm birth group and the normal birth group was found, with $P = 0.013$ ($P < 0.05$). A significant difference in objective refractive error between extremely preterm, very preterm, moderate to late preterm, and normal birth groups was found, with $P = 0.034$ ($P < 0.05$).

Conclusions: Gestational age influences objective refractive error, and infants who were preterm tend to be more myopic than those who were term.

Effects of Computer and Mobile Device Usage on Visual Acuity and Tear Film in Children

First Author: Rozalina LOEBIS

Purpose: Children are spending an increasing amount of their time using computers and mobile devices. Eye problems are the most frequent health problems among computer users. The main visual symptoms reported are blurred vision, irritation, eye strain, and double vision, thus termed "computer vision syndrome" (CVS). In the present study we investigated whether there are any effects of computer and other mobile device use in the quality of vision and tear film stability in children.

Methods: Participants were obtained by simple randomization methods. Information about computer and mobile device use and symptoms of CVS was obtained using a structured questionnaire. Visual acuity and tear break-up time were tested. Screen time was categorized as mild, moderate, and severe. Prevalence ratio, 95% confidence intervals, and P values for ocular symptoms were calculated.

Results: Screen time was classified as mild (51%), intermediate (23%), and severe (21%). CVS symptoms were found in 33 children (75%), while 10 children (25%) had no symptoms. The most disturbing symptom was headache (28%), followed by blurred vision (16%). Chi square test was used to measure the effect of screen time on visual acuity and tear film. No relation was found between screen time and visual acuity ($P = 0.966$). A significant relation was found between screen time and tear film ($P = 0.042$).

Conclusions: A higher lifetime exposure to computers and mobile devices was associated with tear film instability that causes computer vision syndrome in children.

Epidemiological Characteristics of Pediatric Ocular Trauma at a Large Tertiary Hospital in Singapore

First Author: Jeremy **HU**

Purpose: To describe the demographics, etiology, and clinical characteristics of ocular trauma in children presenting to the emergency service of a large tertiary hospital.

Methods: This was a retrospective review of data from the injury surveillance database of a large tertiary hospital from February 2012 to April 2016. The authors searched the database and included all patients with periocular and ocular injuries entered in the diagnosis. All children under age 17 were included in this study.

Results: A total of 3733 patients were included in the analysis. The majority of injuries occur in boys (66.6%). The mean age was 6.2 ± 4.1 (range, 0–16.7). The majority of the injuries occur in the less than 6 years old age group (47.0%). The majority of injuries occur at home comprising 51.4% of the injuries, followed by childcare centers comprising 23.5% of the total injuries. The most common causes of ocular injuries are furniture/furnishing (21.2%), animal/plant/persons (18.3%), and no other objects involved (11.9%). The majority of injuries are external injuries comprising 61%. The majority of the patients were discharged, 97.2% ($n = 3627$).

Conclusions: This is the first large epidemiology study of childhood eye injuries in Singapore. Young preschool children are at highest risk and sustain the most injuries in the home. Greater vigilance is necessary to avoid these preventable injuries.

Evaluation of Refractive Errors and Ocular Biometric Outcomes After Individual Treatments of Photocoagulation and Intravitreal Bevacizumab as Monotherapy for Retinopathy of Prematurity at Age 5

First Author: Yoshimi **FUKUSHIMA**

Co-Author(s): Hideki **CHUMAN**

Purpose: To evaluate factors related to refraction in 5-year-old children, who had been treated for retinopathy of prematurity (ROP) in either eye by 1) photocoagulation (PC) and 2) intravitreal bevacizumab (IVB) monotherapy.

Methods: Subjects were 23 patients who received PC in the right eye and IVB in the left eye for ROP treatment between 2008 and 2011. Refractive errors and ocular biometric parameters [corneal curvature (CR), axial length (AL), lens thickness (LT), and anterior chamber depth (ACD)] were measured at 5 years of age in all subjects.

Results: There was a significant difference in the

spherical equivalent (SE) values between PC-treated eyes and IVB-treated eyes ($P < 0.05$). PC-treated eyes had mean SE of $+0.375$ diopters (D) with IVB eyes at -0.375 D, indicating that PC-treated eyes had a greater myopic tendency. In comparison, PC-treated eyes had shorter CR and AL, thicker LT, and shallower ACD than IVB-treated eyes, with P values as follows: $P < 0.05$, $P < 0.001$, $P < 0.001$, $P < 0.001$. PC-treated eyes' SE were correlated to LT, ACD, and PC counts ($r = -0.44$, 0.41 , -0.64) while IVB-treated eyes' SE were significantly correlated to AL ($r = 0.79$).

Conclusions: PC eyes displayed significantly greater myopic tendency when compared with IVB eyes. This suggests that the anterior segment configuration is related to refraction in PC-treated eyes, and AL is related to refraction in IVB-treated eyes.

Evaluation of the Effect of Strabismus Surgery on Higher Order Aberrations in Patients with Intermittent Divergent Squint

First Author: Nripen **GAUR**

Co-Author(s): Anju **BHARI**, Pradeep **SHARMA**, Saurabh **VERMA**

Purpose: To evaluate of the effect of strabismus surgery on higher order aberrations (HOAs) in patients with intermittent divergent squint (IDS).

Methods: Ten patients with IDS planned for horizontal muscle strabismus surgery were included in this study. Preoperative HOAs were evaluated using HOYA iTrace surgical workstation. The measurements were repeated at 1 week and 1 month post surgery. Statistical analysis was done to evaluate the change in the HOAs induced by strabismus surgery.

Results: The mean patient age was 25.3 ± 8.7 years. Of the 10 patients, 8 (80%) patients were male and the left eye was involved in 7 (70%) cases. Seven patients underwent resection and recession surgery, whereas the other 3 patients underwent a single muscle recession. The mean preoperative, 1 week, and 1 month post surgery values of coma in μm were 0.22 ± 0.30 , 0.18 ± 0.29 , and 0.21 ± 0.28 , respectively. The mean preoperative, 1 week, and 1 month post surgery values of trefoil in μm were 0.063 ± 0.074 , 0.205 ± 0.357 , and 0.057 ± 0.030 . The mean preoperative, 1 week, and 1 month post surgery values of spherical aberration in μm were 0.059 ± 0.125 , 0.061 ± 0.214 , and 0.039 ± 0.054 , respectively. The mean preoperative, 1 week, and 1 month post surgery values of total HOAs in μm were 0.214 ± 0.274 , 0.421 ± 0.736 , and 0.226 ± 0.270 , respectively. No significant changes were noted in the magnitude of HOAs post surgery at 1 week and 1 month follow-up ($P > 0.05$).

Conclusions: Horizontal strabismus surgery does not induce any significant higher order aberrations.



Exercise-Induced Esotropia After Strabismus Surgery

First Author: Ajay **KUMAR**

Co-Author(s): Inez **WONG**

Purpose: To report a rare case of exercise-induced esotropia after strabismus surgery with satisfactory postoperative alignment, in which the patient suffered paroxysms of esotropia and diplopia during exercise only.

Methods: A 15-year-old boy presented with large consecutive exotropia. He had a history of non-accommodative esotropia at the age of 2 and underwent a left medial rectus recess and lateral rectus resect procedure at 4 years.

Results: One year postoperatively, he had 2 prism diopters (PD) exophoria for distance and esotropia of 12 PD for near with negative stereoacuity. However, he reported recurrent episodes of diplopia following strenuous exercise in the preceding 6 months. During these episodes, he developed left esotropia of 50 PD for distance and near lasting for 2 hours or so. The visual acuity was normal and extraocular movements full. A workup including magnetic resonance imaging of the brain as well as myasthenia screen were negative. The patient elected to give up strenuous exercise and did not have any further episodes for the next 2 years.

Conclusions: This case of idiopathic exercise-induced esotropia without underlying pathology is 1 of 4 cases reported to date and is the only case that manifested after squint surgery, unlike a previously reported case that actually resolved after surgery. Although it has been postulated that the condition might be due to malfunction of some part of the proprioceptive feedback loop during exercise, the exact mechanism remains elusive and deserves further discussion.

Initial Experience of Pediatric Visual Electrophysiology in a Newly Set Up Electro-Diagnostic Laboratory in a Tertiary Care General Hospital

First Author: Naing **THET**

Co-Author(s): Graham E **HOLDER**, Cheryl **NGO**, Gangadhara **SUNDAR**, Clement **TAN**, Wendy **WONG**

Purpose: To survey the outcome and challenges of pediatric electrophysiological tests.

Methods: Retrospective evaluation of all pediatric (under 16 years) electrophysiological examinations performed from July 2015 to September 2016.

Results: Thirty-seven tests were performed in 28 children. Eleven cases were 1-5 years, 6 were 6-10 years, and 12 were 11-16 years old. Three cases had visual evoked potential, 21 cases had electroretinography (ERG), and 4 cases had combined tests. General anes-

thesia was used in 6 cases to perform ERGs (together with other procedures). Corneal electrodes were used in 19 cases and surface electrodes in 6 cases. Indications included a family history of inherited retinal dystrophy (6 cases), unexplained visual loss (5), retinoblastoma (5), intracranial malignancy (2), choroiditis (2), and 1 case each of amblyopia, cerebral palsy, cortical hypoplasia, cryptophthalmos, hydroxychloroquine, multiple systemic disorder, nystagmus, and optic atrophy. Obtaining satisfactory recordings was often challenging with compliance. Electrophysiological tests were helpful in determining diagnosis and prognosis in 9 cases (severe EORD), diagnosis-making in 8 (nystagmus), of prognostic value in 5 (optic neuropathy in intracranial malignancy), confirmed normal function in 3 (unexplained visual loss), and enabled monitoring of therapy in 3 (retinoblastoma). Skin electrodes were suitable in less cooperative children. Challenges included the need for an additional assistant, frequent cancellation, and a difficult recording environment when tests were performed under general anesthesia.

Conclusions: Electrophysiological tests are useful in the diagnosis, prognosis, and monitoring of neurological, retinal, and neoplastic disorders in children. It is anticipated, with time and experience, that technical challenges can be overcome.

Long-Term Visual Outcomes Following Toric Intraocular Lens Implantation in Pediatric Eyes Undergoing Non-Traumatic Cataract Surgery

First Author: Lajja **SHASTRI**

Co-Author(s): Sajani **SHAH**, Abhay **VASAVADA**, Vaishali **VASAVADA**, Viraj **VASAVADA**

Purpose: To evaluate long-term visual outcomes following toric intraocular lens (IOL) implantation in children with significant pre-existing corneal astigmatism undergoing non-traumatic cataract surgery.

Methods: This ongoing, prospective interventional case series included 51 eyes of 38 pediatric patients undergoing non-traumatic cataract surgery, with pre-existing corneal astigmatism of more than 1.5 diopters (D) which was evaluated by manual keratometry, topography, and IOLMaster. A standardized surgical technique was used with implantation of appropriate toric IOL. The uncorrected distance visual acuity (UDVA), best-corrected visual acuity (BCVA), and residual refractive astigmatism were measured at 1, 6, 12, and 24 months postoperatively. The rotational stability of toric IOL was also evaluated using standardized digital software on day 1 and at 1, 6, and 12 months.

Results: The mean age at surgery was 8.7 (range, 6-12) years. In logMAR, the UDVA improved from 0.99 ± 0.71 preoperatively to 0.38 ± 0.17 , 0.26 ± 0.14 , and 0.30 ± 0.12 at 1, 6, and 24 months, respectively ($P = 0.00$). The

mean astigmatism decreased significantly from 3.24 ± 1.2 D preoperatively to 0.56 ± 0.37 D, 0.41 ± 0.38 D, and 0.61 ± 0.34 D at 1, 6, and 24 months postoperatively ($P < 0.001$). The median rotation of the toric IOL at 6 months postoperatively was 2.3 ± 0.59 degrees (range, 1.3 to 2.7).

Conclusions: Implantation of a toric IOL predictably reduces the impact of significant preoperative corneal astigmatism and results in excellent unaided distance vision even at 24 months of follow-up in pediatric eyes undergoing non-traumatic cataract surgery.

Modified Adjustable Suture Hang-Back Recession: Description of Technique and Comparison with Conventional Adjustable Hang-Back Recession

First Author: Siddharth **AGRAWAL**
Co-Author(s): Vinita **SINGH**

Purpose: To describe and compare modified hang-back recession with conventional hang-back recession in large angle concomitant exotropia.

Methods: It was hypothesized that taking an additional scleral bite while performing adjustable hang-back recession would improve surgical outcomes. This prospective, interventional, double-blind, randomized trial was conducted on adult patients (>18 years) undergoing single eye recession-resection for large angle [>30 prism diopters (PD)] constant concomitant exotropia (XT) between January 2011 and December 2015. Patients in group A underwent modified hang-back lateral rectus recession (LR) with adjustable knot while those in group B underwent conventional hang-back recession with adjustable knot. Outcome parameters studied were readjustment rate, change in deviation at 6 weeks, complications, and need for re-surgery at 6 months.

Results: The groups were comparable in terms of age and preoperative deviation. The patients with the modified suture (group A) fared significantly better ($P < 0.05$) than the conventional group in terms of less need for adjustment, greater correction in deviation at 6 weeks, and less need for re-surgery at 6 months.

Conclusions: It was concluded that this modification offers several advantages, significantly reduces re-surgery requirements, and has no added complications.

Normative Biometric Data in Pediatric Eyes from Birth to 2 Years of Age

First Author: Viraj **VASAVADA**
Co-Author(s): Mamidipudi **PRAVEEN**, Sajani **SHAH**, Abhay **VASAVADA**, Vaishali **VASAVADA**

Purpose: To report and study the progressive change in ocular biometric parameters such as keratometry (K),

axial length (AL), anterior chamber depth (ACD), lens thickness (LT), horizontal corneal diameter (HKD), and intraocular pressure (IOP) at different ages in normal eyes of children from birth up to 2 years of age.

Methods: Cross-sectional study of 408 normal eyes (204 children), both term and preterm, with no ocular disease. Children undergoing surgeries for non-ophthalmic conditions under general anesthesia were examined by an ophthalmologist and optometrist and data recorded. Keratometry was performed using a handheld autokeratometer. AL, ACD, and LT were measured with contact ultrasound A-scan. HKD was measured using calipers. IOP was measured using handheld applanation tonometry. Mean values at each age and change with age up to 2 years were analyzed.

Results: Age was categorized in months as <36 weeks of gestation (premature, $n = 32$), 0.1-3 ($n = 36$), 3.1-6 ($n = 4$), 6.1-9 ($n = 44$), 9.1-12 ($n = 36$), and 12.1-24 ($n = 52$) months. The mean K was 46.58 ± 6.09 (range, 34.81-63.62) diopters, mean IOP was 11.93 ± 2.50 (range, 7.9-22.2) mm Hg, mean AL was 20.49 ± 2.76 (range, 12.54-25.07) mm, mean CCT was 540.76 ± 51.17 (range, 438.0-673.0) μm , mean ACD was 3.31 ± 0.67 (range, 1.34-4.80) mm, mean LT was 3.97 ± 0.60 (range, 2.70-5.50) mm, and mean HKD was 10.62 ± 1.34 (range, 7.3-12.8) mm. Multiple regression analysis found that with increase in age by 1 month, the axial length increased by 0.709 mm ($P < 0.001$), the mean CCT decreased by -0.175 mm ($P < 0.001$), and the average keratometry decreased by -0.294 diopters ($P < 0.001$).

Conclusions: This information provides useful reference values of biometric data in infants, as well as gives expected rates of change in the Indian population.

Optical Coherence Tomography and Refractive Error in Singaporean Children

First Author: Jody **GOH**
Co-Author(s): Yiong Huak **CHAN**, Victor **KOH**, Cheryl **NGO**

Purpose: To study the distribution of macular ganglion cell-inner plexiform layer (GC-IPL) thickness and peripapillary retinal nerve fiber layer (RNFL) thickness in children with spherical refractive errors.

Methods: Two hundred forty-three healthy eyes from 139 children with refractive error ranging from -10.00 diopters (D) to +5.00 D were recruited from the National University Hospital Eye Surgery outpatient clinic. After a comprehensive ocular examination, refraction, and axial length (AL) measurement (IOLMaster, Carl Zeiss Meditec, Inc, Dublin), macular GC-IPL and RNFL thickness values were obtained with a spectral domain Cirrus HD-Optical Coherence Tomography (HD-OCT) system (Carl Zeiss Meditec, Inc, Dublin). Only scans with signal strength of $>6/10$ were included. Correla-



tion between variables was calculated using the Pearson correlation coefficient. A multivariate analysis using mixed models was done to adjust for confounders.

Results: The mean spherical equivalent (SER) was -3.20 ± 3.51 D and mean AL was 24.39 ± 1.72 mm. Average, minimum, superior, and inferior GC-IPL were 82.59 ± 6.29 , 77.17 ± 9.65 , 83.68 ± 6.96 , and 81.64 ± 6.70 μm , respectively. Average, superior, and inferior RNFL were 99.00 ± 11.45 , 123.20 ± 25.81 , and 124.24 ± 22.23 μm , respectively. Average, superior, and inferior GC-IPL were correlated with AL ($\beta = -2.056$, $P = 0.000$; $\beta = -2.383$, $P = 0.000$; $\beta = -1.721$, $P = 0.000$), but minimum GC-IPL was not ($\beta = -1.056$, $P = 0.115$). None of the RNFL parameters were correlated with AL.

Conclusions: This study establishes normative macular GC-IPL and RNFL thickness in children with refractive errors. Among all GC-IPL parameters, minimum GC-IPL thickness remained uninfluenced by AL and myopia, which makes it a robust and consistent predictor of glaucoma in children with spherical refractive error.

Parental Awareness of the Need for Retinopathy of Prematurity Screening in Northern China

First Author: Jing FENG
Co-Author(s): Yi CHEN

Purpose: To analyze the levels of knowledge and awareness about retinopathy of prematurity (ROP) among parents in north China.

Methods: The questionnaire was given to 230 parents known to be involved in the treatment of ROP infants and collected in person between January and April 2013.

Results: In all, 221/230 (96.1%) were returned. Of the 221 completed questionnaires, 128 (57.9%) premature infants received screening during pediatric hospital stays. Two hundred eight (94.1%) parents were informed and received recommendation for screening by pediatricians; 13 (5.9%) did not receive any recommendation for screening. Only 159 (71.9%) parents were aware of ROP, while 62 (28.1%) were not aware of the disease. Since ROP stage 4 and 5 demonstrate poor prognoses, we determined whether parents informed by pediatricians were closely associated with this ($P < 0.001$). However, we found no association between the grade of hospital and whether the parents were informed ($P = 0.625$).

Conclusions: The awareness among parents and pediatricians in north China about ROP still needs to improve. Better communication, education, and promotion from pediatricians and ophthalmologists to inform the parents in a timely manner will help.

Primary Intraocular Lens Implantation in Pediatric Patients Between 7 and 24 Months of Age

First Author: Kimberly YEN
Co-Author(s): Lingkun KONG, Allison YEH

Purpose: To report the long-term outcomes and complications of primary intraocular lens (IOL) implantation in pediatric patients from 7 months to less than 24 months of age.

Methods: This was a retrospective study involving 27 consecutive pediatric patients (28 eyes) between the ages of 7 and 24 months who underwent cataract surgery with primary intraocular lens implantation at a tertiary pediatric hospital. Outcome measures included change in visual acuity, adverse events, strabismus, binocular function, and need for additional surgery.

Results: Average follow-up for the patients was 62.7 months (SD, 41.7; range, 12.2 to 144.4) and mean age at surgery was 14.4 months (SD, 5.6; range, 7.2 to 23.6). The mean final visual acuity was 1.02 logMAR (20/209; median, 0.88; SD, 0.72; range, 0.00 to 2.30). Adverse events occurred in 7 eyes (25%) and included visual axis opacification in 6 eyes and pupillary block glaucoma in 1 eye. Seven patients (25.9%) required additional intraocular surgery. Strabismus was present in 19 patients (70.4%). Better stereopsis was correlated with better final acuity.

Conclusions: Cataract surgery with IOL implantation can be a safe and effective procedure in patients between 7 and 24 months with few complications. Visual axis opacification is the most frequent adverse event after IOL implantation in this age group.

Prospective Comparative Clinical Study of Combined Laser and Intravitreal Bevacizumab Using Two Different Regimens for Management of Aggressive Posterior Retinopathy of Prematurity

First Author: Subhadra JALALI
Co-Author(s): Divya BALAKRISHNAN, Venkateshnaidu LAVETI, Padmaja RANI

Purpose: To assess which combined regimen for aggressive posterior retinopathy of prematurity (ROP) management is better: laser first or intravitreal bevacizumab first.

Methods: The study was conducted on 22 babies (44 eyes) having aggressive posterior ROP in paired eyes. All the right eyes received laser beyond zone 1 on day 1 and left eyes received intravitreal bevacizumab 0.625 mg in 0.025 mL. On day 4, the right eyes received intravitreal bevacizumab and left eyes received laser beyond zone 1. Babies were followed per protocol with Retcam photographs evaluated by 2 masked observ-

ers for 1 year. Additional laser was done in eyes that showed inadequate disease regression or recurrence beyond 2 weeks. Primary outcome measure was the proportion of eyes that had complete ROP regression with no additional treatment within 2 weeks of the onset of therapy.

Results: In the laser first group, 6 out of 22 eyes required additional laser while in the injection first group 1 out of 22 eyes required additional laser beyond 2 weeks of initial treatment for non-regression of ROP. Over 1-year follow-up, all except 2 eyes of 1 baby showed good outcome, complete resolution with no recurrences. In 1 baby both eyes with inadequate peripheral laser had recurrence at 4 months that progressed to stage 5 even after surgery.

Conclusions: In a combined treatment strategy, intravitreal bevacizumab followed after 4-7 days with complete peripheral laser is a better approach than laser first followed by bevacizumab after sparing posterior retina. In eyes with complete peripheral laser, 1-year follow-up showed rare chance of recurrence.

Refractive Errors and Concomitant Strabismus: A Systematic Review and Meta-Analysis

First Author: Jason YAM
Co-Author(s): Shumin TANG

Purpose: To evaluate the risk of developing concomitant strabismus due to refractive errors.

Methods: Eligible studies published from 1946 to April 1, 2016, were identified from MEDLINE and EMBASE that evaluated any kinds of refractive errors (myopia, hyperopia, astigmatism, and anisometropia) as an independent factor for concomitant exotropia and concomitant esotropia.

Results: Totally 5065 published records were retrieved for screening, and 157 of them were eligible for detailed evaluation. Finally 7 population-based studies involving 23,557 study subjects met our criteria for meta-analysis. The combined odds ratio (OR) showed that myopia was a risk factor for exotropia (OR: 5.23, $P = 0.0001$). We found hyperopia had a dose-related effect for esotropia [OR for a spherical equivalent (SE) of 2-3 diopters (D): 10.16, $P = 0.01$; OR for a SE of 3-4 D: 17.83, $P < 0.0001$; OR for a SE of 4-5 D: 41.01, $P < 0.0001$; OR for a SE of ≥ 5 D: 162.68, $P < 0.0001$]. Sensitivity analysis indicated our results were robust.

Conclusions: Results of this study confirmed myopia as a risk factor for concomitant exotropia and identified a dose-related effect for hyperopia as a risk factor of concomitant esotropia. Further prospective epidemiology studies are warranted to confirm the associations.

Retinopathy of Prematurity Screening of Premature Infants in Tertiary Health Care

First Author: Sahilah ERMAWATI

Purpose: To determine the outcomes of retinopathy of prematurity (ROP) screening at a tertiary health care center.

Methods: Medical records of premature infants who underwent ROP screening at a tertiary health care center from May 2012 to June 2016 were obtained. The outcomes of ROP screening were collected and analyzed.

Results: A total of 273 premature infants (546 eyes) were included in the study. There were 86 infants (172 eyes) (31.50%) diagnosed with ROP. There were 8 infants (16 eyes) (2.9%) with ROP classified as stage 1, 6 infants (12 eyes) (2.19%) as stage 2, 28 infants (10.25%) as stage 3, 17 infants (6.22%) as stage 4, and 22 infants (8.05%) as stage 5. There were 31 infants (62 eyes) (36.4%) diagnosed with ROP who received treatment that included laser therapy in 58 eyes (10.62%) and intravitreal bevacizumab injection in 4 eyes (0.07%). Most patients that received treatment regressed, and only 2 patients became stage 4. The patients diagnosed with ROP stage 4 and 5 came to the hospital at mean age (GA) of 62 weeks. One hundred eighty-seven infants (374 eyes) (68.95%) did not have ROP.

Conclusions: Screening examination of premature infants for ROP at a tertiary health care center is important to prevent childhood blindness in premature infants. It could allow for early detection of ROP cases that need early treatment.

Success Rate of External Dacryocystorhinostomy with Irrigation of Nasolacrimal Duct

First Author: Esmat KARBASSI
Co-Author(s): Ehsan ZIASISTANI

Purpose: To evaluate the results of effective washing of the nasolacrimal duct (NLD) with normal saline and dexamethazone as an additional therapy for 2 months after external dacryocystorhinostomy (DCR) in patients with acquired nasolacrimal obstruction (NLDO).

Methods: In this prospective randomized controlled study, a total of 100 patients diagnosed with NLDO were randomly divided into equal groups. For the case group in the follow-up period after surgery, washing of NLD with 500 cc of normal saline and 16 mg dexamethazone were done; the control group was without washing in follow-up.

Results: Effectiveness of external DCR (without epiphora and mucopurulent discharge) in the case group was 94% and in the control group was 80%. A significant efficacy with $P = 0.036$ was reported.



Conclusions: This study suggests that washing of NLD with normal saline after external DCR is effective in increasing the success rate of external DCR surgery.

Surgical Results of Superior Oblique Tendon Tucking for Pediatric Superior Oblique Palsy

First Author: Takashi NEGISHI

Purpose: To investigate the results of superior oblique tucking for pediatric superior oblique palsy.

Methods: Patients under the age of 10 years old who underwent superior oblique tendon tucking in Juntendo University Hospital from January 2013 to December 2014 were surveyed retrospectively.

Results: Seven cases (5 boys and 2 girls) were included in this study. Average age was 3.7 (from 1.5 to 5.5 years old) at surgery. Bilateral tucking was performed in 3 cases. Simultaneous surgery with inferior oblique weakening in the first surgery was performed in 5 cases. The other 2 cases underwent it as an additional surgery after inferior oblique weakening procedure. Quantifications of inferior oblique overaction were +2 or more in 6 cases preoperatively. All the patients showed improvement in the quantification of inferior oblique overaction. Four patients who had difference of inferior oblique overaction between each eye showed head tilt and the difference in traction test of superior oblique tendon preoperatively. Simultaneous surgery with inferior oblique weakening procedure resulted in iatrogenic Brown syndrome in 2 cases that spontaneously disappeared after 1 year.

Conclusions: Bilateral superior oblique palsy with severe inferior oblique overaction or remarkable difference in traction test of superior oblique tendon between each eye showed improvement of head tilt or inferior oblique overaction after superior oblique tendon tucking. Iatrogenic Brown syndrome did not remain permanently even after simultaneous surgery with inferior oblique weakening procedure.

The Difference in Surgical Outcomes Between Manifest Exotropia and Esotropia

First Author: Hsiu-Mei HUANG

Co-Author(s): Yun-Wen CHEN

Purpose: To determine which factors affect ocular alignment and binocular sensory function after strabismus surgery and identify the differences in surgical outcomes between manifest exotropia (XT) and esotropia (ET).

Methods: The medical charts of 41 XT and 17 ET patients without a history of trauma who had undergone strabismus surgery were reviewed retrospectively. After excluding patients with a follow-up duration of less than 6 months, longitudinal information about

duration, age at onset and surgery, refractive errors, pre- and postoperative deviation angles, and binocular sensory functions including macular fusion capacity and stereoacuity was collected.

Results: In both patients with XT and ET, the strabismus deviation angles, stereoacuity, and macular fusion capacity improved with time following surgery. Postoperative 1 month deviation angle determined the final ocular alignment. Patients with final excellent binocular sensory functions restored macular fusion capacity at 1 month after surgery in both groups. Improvement of stereoacuity happened at postoperative 1 and 3 months in the XT and ET groups, separately. The patients with successful ocular alignment had odds of 4.5 in XT and 22.5 in ET to achieve excellent binocular sensory function. XT patients had better pre- and postoperative stereoacuity than ET patients, even though the proportion of stereoacuity and macular fusion capacity improvement did not differ between both groups.

Conclusions: Surgery improves motor and sensory functions in strabismus patients, regardless of onset age, duration, and type. Residue deviation angle (≤ 10 PD) and better stereoacuity with macular fusion capacity at 1 month after surgery were predictors of final successful ocular alignment and excellent binocular sensory functions.

The Effect of Probing Without Irrigation

First Author: Esmat KARBASSI

Co-Author(s): Ehsan ZIASISTANI

Purpose: To evaluate the efficacy of congenital nasolacrimal duct obstruction (CNLDO) by probing without irrigation in children under 3 years old.

Methods: This is a clinical trial interventional study on patients with persistent CNLDO in order to evaluate the results of probing without irrigation. CNLDO is defined by persistent epiphora with or without mucopurulent discharge (MPD) from birth. The inclusion criteria were epiphora, increased tear meniscus, and MPD. In the intervention group probing was performed without irrigation under a short period of general anesthesia without intravenous line. In the control group probing was performed with irrigation under a longer period of general anesthesia with intravenous line. However, probing success was defined as a complete remission of epiphora and MPD at 3 months.

Results: A total of 200 records with CNLDO were reviewed. The rate of improvement was 93.5% in the trial group and 92% in the control group. Intraoperative complications were not recorded for both groups. There was no significant difference between the 2 groups in success rate ($P > 0.05$).

Conclusions: This study suggests that probing without irrigation for patients with congenital NLDO can reduce

the risk of general anesthesia, aspiration, duration of postoperation recovery, and save more time and money.

Unusual Variant of Microcornea, Myopic Chorioretinal Atrophy, and Telecanthus Syndrome Presenting with Bilateral Esotropia: A Case Report

First Author: Simranjeet AULAKH

Co-Author(s): Nayana POTDAR, Chhaya Ashok SHINDE

Purpose: We present an interesting case of a 15-year-old female patient born of consanguineous marriage with the main complaints of diminution of vision and inward deviation of both eyes since birth, along with a constellation of other ophthalmic features.

Methods: On examination the patient had clinical features of telecanthus, bilateral convergent squint, microcornea, iris coloboma, and bilateral total cataract. B-scan and ultrasound biomicroscopy were done for evaluating the posterior segment.

Results: On B-scan, there was posterior staphyloma, and ultrasound biomicroscopy revealed iris coloboma and open anterior chamber angles.

Conclusions: As per a literature search, a case series by Khan et al from Saudi Arabia reported a novel syndrome among 5 unrelated boys who were born of consanguineous marriage with features of microcornea and myopic chorioretinal atrophy with telecanthus (MMCAT). The genetic study of these children led to detecting a mutation in the ADAMTS18 gene on chromosome 16q23, which was responsible for ocular and facial development. No such cases have been reported elsewhere. This case is an interesting and unpublished variant having associated strabismus, coloboma of iris, and cataract in both eyes along with features of MMCAT syndrome.

What Do They Really See After Spontaneous Regression of Retinopathy of Prematurity?

First Author: Subhadra JALALI

Co-Author(s): Divya BALAKRISHNAN, Priyanka KAMMARI, Mahesh KUMAR, Mansoor MOHAMMED, Padmaja RANI

Purpose: To evaluate visual outcomes of babies with spontaneous regression of retinopathy of prematurity (ROP) under close follow-up.

Methods: Our prospectively collected Indian Twin Cities ROP database (2000-2014) was analyzed for visual, refractive, and anatomical outcomes in spontaneously regressed ROP. Of 1474 eyes with ROP, 757 eyes were allowed spontaneous regression. Median follow-up was 11 months. The final visual and retinal outcome was categorized as good, fair, and poor based on visual

acuity and the anatomical status of the retina, respectively. The refractive outcomes were graded as mild, moderate, and severe. Association of birth weight and gestational age with visual and refractive outcomes was assessed.

Results: Good, fair, and poor visual outcomes were seen in 453, 25, and 8 eyes out of 486 eyes, respectively. Refractive error was mild (<3.00 diopters) in 402 eyes, moderate (>3 to <6 diopters) in 60 eyes, and severe (>6.0 diopters) in 26 eyes. Out of 752 eyes in the regressed group, 738 had good, 12 fair, and 2 poor anatomical outcomes. Babies with lower gestational age had significantly higher refractive errors. A follow-up study of 25 fair visual outcome eyes showed that over next 12 months, half the babies improved their visual status to good with or without additional vision exercises and improved compliance with glasses.

Conclusions: Most babies that are screened early, followed closely, and allowed spontaneous regression are able to retain the potentially good vision and ocular and retinal anatomy they are born with. A few babies do need glasses and vision exercises and can have continued visual improvement.

Prevention of Blindness

African Innovation: Improving Ophthalmology Referral Systems with the Vula Mobile App

First Author: William MAPHAM

Co-Author(s): Debre BARRETT, Tiago CLEMENTE

Purpose: To measure the impact of the Vula Mobile App on the ophthalmology referral systems at hospitals in southern Africa.

Methods: All referrals to tertiary ophthalmology services were recorded on the Vula Mobile App. The location of the referring health worker, the speed of response from the specialist, the case details of the referral, and the end result of the referral were all recorded.

Results: Referrals to tertiary services come from health workers up to 6 hours away from the hospital. In 75% of cases the specialists respond to the health workers in less than 15 minutes. In 25% of cases the specialist guides the health worker to manage the patient themselves, saving a referral to the tertiary center.

Conclusions: Vula Mobile shows potential for reducing the financial and time costs to tertiary hospitals, reducing transport costs, and for case-by-case training or peripheral health workers.



Blindness and Visual Impairment Among Glaucoma Patients at a Teaching Hospital in Surabaya

First Author: Yulia **PRIMITASARI**

Co-Author(s): Evelyn **KOMARATIH**, Yuyun **RINDIASTUTI**

Purpose: To assess visual impairment and blindness in glaucoma patients at a tertiary hospital in Surabaya.

Methods: Medical records of first-visit glaucoma patients at the outpatient ophthalmology clinic from January 2014 to April 2016 were reviewed. Classification of visual impairment was based on World Health Organization (WHO) criteria. The demographic and clinical profile of patients were described.

Results: A total of 575 eyes from 363 patients with the mean age of 52.87 ± 15.99 were included. The mean intraocular pressure (IOP) was 23.03 ± 13.09 mm Hg and mean best corrected visual acuity (BCVA) was 0.25 ± 0.05 . There were 159 eyes (27.7%) with no/mild visual impairment, 89 eyes (15.5%) with moderate, and 28 eyes (4.9%) with severe visual impairment. Blindness was found in 319 eyes (52%), of which 133 eyes (19.7%) had total blindness (no light perception). Total blindness was detected as absolute glaucoma at the patient's first visit. Most of the blindness was related to secondary glaucoma in 47 eyes, POAG in 35 eyes, and PACG in 25 eyes.

Conclusions: A large proportion of glaucoma patients suffered from blindness at their first visit to the outpatient clinic.

Evaluating the Effectiveness of Pocket Book Training to Prevent Blindness in Children for Health Cadres in Puskesmas Gunungpati, Semarang

First Author: Sri **MARIATI**

Purpose: To evaluate the effectiveness of pocket book training over a 1-year period to prevent blindness in children in the level of health cadres in Puskesmas Gunungpati, Semarang, Central Java.

Methods: This research was quasiexperimental in 60 health cadres of the population in Puskesmas Gunungpati, Semarang, Central Java. Evaluated information was collected essentially 2 ways: questionnaires and interviews. Knowledge level was measured by questionnaires with confirmed validity and reliability. Interviews were done in a few subjects to get qualitative data.

Results: The Wilcoxon comparison test measuring the effectiveness of training programs between the initial pocket book training and training over a 1-year period showed significant differences ($P < 0.05$). The results of Mann Whitney test showed that the evaluating score

between both groups had a significant difference ($P < 0.05$).

Conclusions: There was a significant difference in training programs between the initial pocket book training and over a 1-year training period.

Evaluation Development Services Center and Community Eye Health Program (P4KMM) at Diponegoro University

First Author: Ika **SETYANINGRUM**

Co-Author(s): Andhika **DHARMA**, Trilaksana **NUGROHO**

Purpose: Closer eye health services in the community.

Methods: The objective of this activity is a group of people with susceptibility to eye health problems. The activities are outpatient eye clinics integrated with Gunungpati Community Health Center services and human resource development. This was a descriptive study.

Results: P4KMM services in Gunungpati Community Health Center are performed once a week. The P4KMM facility has an examination room, slit lamp, Snellen chart, and a room for minor action in the field of the eye. The 6 most common diseases based on patient visits are cataract (28.6%), infection and eye inflammation (48.6%), refraction anomaly (11.4%), glaucoma (5.7%), eye tumors (2.9%), and retinal disease (2.9%). The number of visits has increased from an average of 4-8 patients per week in 2011 to an average of 12-15 patients per week in 2015. Training of cadres, health workers, and teachers is also undertaken.

Conclusions: P4KMM is very important as a primary eye health care service. P4KMM is spearheading the first service to the community and efforts to improve preventive eye health. This has not been accompanied by an increase in the quality of facilities and medicines in the community health center.

One Stop Childhood Refractive Error Services for Marginal Underserved Population of Bangladesh

First Author: Nahid **FERDAUSI**

Purpose: Uncorrected refractive error is one of the leading causes of blindness and visual impairment in children and adolescents that can be easily corrected by eye glasses. Treatment is cost-effective, has significant impact on quality of life, and can prevent advancement to severe impairment or blindness. The purpose of this study was to screen children's vision and to provide one stop services to underserved, marginal children for refractive error.

Methods: This population-based cross-sectional study was conducted during the period of June to August 2016. Vision screening was conducted among 390

children of 6-15 years in selected underserved communities using Snellen chart. Hand-held auto-refractometer was used for detecting refractive errors. Subjective refraction was carried out and spectacles were prescribed by an ophthalmologist. Children were given the opportunity to choose their frames for the spectacles on the spot.

Results: This study was conducted on tribal, slum dwelling, sex workers' children and underprivileged madrasa students. The mean age of the population was 10.95 years. A total of 52% were girls and 48% were boys. Thirty-three children were identified with refractive error. Five children (15%) used proper spectacles (need met) while 28 others (85%) had an unmet need because they either used improper spectacles or did not use them at all.

Conclusions: School-age children represent a vulnerable group among those with uncorrected refractive error. The most acceptable and accessible way to correct these refractive errors is through school vision testing. However, a significant population of children is not school going. This study suggests community vision testing can bridge this gap.

Successful Implementation of VISION 2020 in Nepal

First Author: Shyam POKHREL

Co-Author(s): Rabindra CHAUDHARY, Dron GURAGAIN, Chakor SHAKYA, Hari SHARMA

Purpose: Results of the 1981 Nepal National Blindness Survey showed that 0.84% of the population was blind in both eyes (<3/60). It was estimated that 80% of this blindness was either curable or preventable. The major cause of blindness was cataract: 83% among those >45 years (65.4% among all ages). The magnitude of blindness was considered as a significant public health problem.

Methods: Various international and non-governmental organizations were involved in eye care service delivery in Nepal. Priority eye diseases were identified. Resource allocation in eye care services was increased. After the launch of VISION 2020 in 1999, the program became more focused according to the guideline and target provided by VISION 2020.

Results: The productivity in eye care services was further accelerated. The cataract surgical rate increased to 4500 in 2015. A significant development was also seen in terms of infrastructure development in this period; now almost all districts have either a primary eye care center or eye hospital. In terms of human resource development, the number of ophthalmic personnel has also increased.

Conclusions: Significant progress has been made in Nepal in the field of eye care over the years; as a result,

the eye health status of Nepalese people has improved significantly. Nepal's eye care system has often been cited as a model for this part of the world. In the past 3 decades the prevalence of blindness has declined from 0.84% to 0.35% using the World Health Organization (WHO) definition of blindness.

Tamsoma Jyotirgamaya: Sighting the Causes for Blindness Through Evaluation of Students in a School for the Blind

First Author: Abhishek ONKAR

Co-Author(s): Shipra SINGHI

Purpose: Epidemiological analysis of blindness in 1 of the largest blind schools in Western India.

Methods: Thorough clinical examination of 400 students was done in 1 school for the blind in Western India and data reported using the World Health Organization (WHO)/PBL childhood blindness assessment form. Data analysis was done to find the causes of blindness and localize the anatomical site involved so as to deduce the prevalence of preventable blindness.

Results: A total of 82.5% of the students were blind, with severe visual impairment in 12.5%. Abnormalities pertaining to whole globe accounted for 24.5% of cases, followed by retinal (20.5%), corneal (17%), optic nerve (16%), and lenticular (12.5%), respectively.

Conclusions: Preventable blindness was observed in more than 50% of these children. Accessibility to low vision aids and awareness regarding blindness needs to be improved.

The Development of a Head Mounted Device Application to Improve Reading Ability in Patients with Central Vision Loss: A Pilot Study

First Author: Xian Hui LIM

Co-Author(s): Anna C S TAN, Daniel TING, Arnout Erik WESSELS, Shengdong ZHAO

Purpose: To investigate the usability and acceptance of a newly developed head mounted device (HMD) application to improve reading ability and train eccentric fixation in patients with central scotomas (CS).

Methods: Google Glass is a type of HMD which projects virtual images upon a selected area of the retina and which may aid eccentric fixation. Three patients with macular scars and CS were shown numbers of similar font, size, and contrast on 1) a standardized computer screen and 2) Google Glass. We showed a series of numerals of decreasing size on each medium and recorded the maximum number of numerals that could be read accurately. An application prototype using rapid serial visual presentation (RSVP) was then created and we obtained feedback from 15 additional



patients to optimize the usability of the application.

Results: Two patients with CS were able to read 11 of 14 numerals accurately using the HMD, with less head movements compared with using the computer screen. The other patient was unable to read using the HMD due to a large macular scar. Based on feedback, the application prototype eventually included modifiable font properties, background color, and fixating targets.

Conclusions: A HMD application using RSVP is an alternative reading method in patients with CS despite a few limitations. RSVP, with the addition of various types of fixation targets, may help overcome Troxler fading and improve reading ability. Intensive training over several sessions with adjustments of the settings for each individual patient may be required for optimal results.

WHO Eye Care Service Assessment in Nepal

First Author: Tirtha **MISHRA**

Co-Author(s): Bam Dev **KHANAL**, Chija Kumar **MASKEY**

Purpose: Nepal is signatory to the Global Eye Health Action Plan, which has brought new opportunities to make further progress with additional efforts to prevent visual impairment and strengthen rehabilitation of the blind in communities. Nepal has also instituted the Global Action Plan in Nepal. Further, the “eye care service assessment tool” (ECSAT) of the World Health Organization (WHO) has been used to assess information on the provision of eye care in Nepal to determine whether it meets the objectives of the global eye health action plan.

Methods: Nepal Eye Care Service Assessment was completed in 2015 through discussion between the Ministry of Health and WHO. Data collection was conducted through interviews with relevant eye health service providers, societies, Ministry of Health, INGOs, and document review.

Results: Significant development has been made in eye care in terms of human resources and infrastructure. Nepal is one of the countries where timely scientific and valid blindness surveys are taking place. However, there is no integration of eye care in the government health care system. Almost all eye hospitals, eye departments, and private clinics are located in urban areas and near the Indian border. There is no comprehensive eye care service at the district level. Rehabilitation and cataract surgical services need to be provisioned at the district level.

Conclusions: In view of the need to strengthen effective policies to achieve the global target of reduction of prevalence of avoidable visual impairment by 25% by 2019 from the baseline of 2010, Nepal needs to implement the recommendations of the WHO Eye Care Service Assessment.

Refractive Surgery

Application of Reverse Geometry Contact Lenses for Vision Improvement in Post LASIK Patients

First Author: Lucia **SUTEDJA**

Purpose: To report the improvement in visual acuity (VA) in post LASIK patients wearing reverse geometry (RG) contact lenses (ClS).

Methods: A case report of 2 post LASIK patients wearing RG ClS for overnight orthokeratology of 8 hours minimum. Case 1: A 41-year-old woman visited the clinic in December 2015 with blurred vision. LASIK was done in July 2015. In the right eye (OD) old spectacles were -11.00 diopters (D) and in the left eye (OS) -6.50 D. Autorefractron: OD, -5.00 C-1.00 x 18o; OS, -2.00 C-0.75 x 108o. The OD VA 3/60 corrected to -5.00 C-0.50 x 180o →0.7; Keratometry K = 8.8 mm; k = 8.50 mm. OS VA 4/60 corrected to -2.00 →6/6; K = 8.7 mm, k = 8.6 mm. Case 2: A 43-year-old woman visited the clinic in January 2016 with blurred vision. LASIK was done 10 years previously. Old spectacles OD were -6.50 C-0.50 x 115o and OS -6.50 C-375 x 180o. OD VA was 6/9 corrected to -1.00 C-0.50 x 180o →6/6, K = 8.4 mm, k = 8.2 mm; OS VA was 6/9 corrected to -0.7 -1.00 C-0.75 x 115o →6/6, K = 8.35 mm, k = 8.3 mm.

Results: Case 1 was fitted with the RG ClS: OD RF 5.50, BC 9.38, diameter 10.4 mm; OS RF 3.00, BC 8.65, diameter 10.4 mm. At 1-week follow-up, best unaided VA (BUVA) OD was 0.5 and OS was 0.7. In April 2016 the lenses were changed to OD RF 6.50, BC 9.51, diameter 10.6 mm and OS RF 4.00, BC 8.88, diameter 10.4 mm. At 1-week follow-up BUVA was 6/7.5 and OS was 6/6. Case 2 was fitted with RG ClS: OD RF 2.50, BC 8.88, diameter 10.4 mm; OS RF 2.50, BC 8.76, diameter 10.4 mm. At follow-up BUVA OD was 6/6 and OS was 6/6.

Conclusions: The RG ClS can be used for treatment of post LASIK patients. The best VA that can be achieved ranges from 6/7.5-6/6.

Clinical Outcomes of Scleral Fixated Intraocular Lenses

First Author: Yu Qiang **SOH**

Co-Author(s): Daniel **TING**, Edmund **WONG**

Purpose: Scleral fixation techniques may be employed to secure an intraocular lens in the absence of adequate capsular support. In this study, we evaluated the techniques, outcomes, and complications related to scleral fixated intraocular lenses.

Methods: All patients who underwent scleral fixation of intraocular lenses in our institution from 2006–2016 were included in this retrospective analysis. Eligible

patients were identified based on their surgical and diagnostic codes stored within our institution's electronic medical records database.

Results: A total of 85 scleral fixation procedures were performed from 2006–2016 by a total of 14 different surgeons, out of which 52 (61.2%) were performed by 2 surgeons. Average postoperative follow-up duration was 2.21 years (range, 0.09–6.79). The lens haptic was either externalized with intrascleral fixation ($n = 47$, 55.3%) or secured intraocularly via scleral-anchored haptic sutures ($n = 38$, 44.7%). A majority ($n = 54$, 63.5%) of all scleral fixated lenses remained stable during the follow-up period. There were no significant differences in the occurrence of postoperative lens instability (subluxation or dislocation) when the 2 different surgical techniques were compared (31.6% vs 39.4%, $P = 0.502$). The average duration between surgery and onset of lens instability was 225 days (range, 1–1317 days). Excluding lens instability, the most common early and late postoperative complications were transient ($n = 11$, 12.9%) and persistent ($n = 9$, 10.6%) elevations in intraocular pressure.

Conclusions: Scleral fixation techniques are relatively reliable and effective in securing intraocular lenses in the absence of adequate capsular support.

Comparison of 3-Month Visual Outcomes After Photorefractive Keratectomy and Phakic Intraocular Lens Implantation in Highly Myopic Patients

First Author: Agus **SUPARTOTO**
Co-Author(s): Doni **WIDYANDANA**

Purpose: To compare 3-month visual outcomes between photorefractive keratectomy (PRK) and phakic intraocular lens (IOL) implantation patients.

Methods: All highly myopic patients from 2014 to 2016 who underwent phakic IOL implantation ($n = 23$) were recruited and paired randomly with 23 selected highly myopic patients who underwent PRK in YAP Eye Hospital, Yogyakarta, Indonesia. This study explored the pattern (median) of uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA), then followed up the visual acuity after 1 day, 1 week, 1 month, 2 months, and 3 months (v1-v5). The comparison analysis used Mann-Whitney test.

Results: The median visual acuities before surgery and 3 months after surgery showed that the PRK group had UCVA = 1/60, v1 = 6/30, v2 = 6/40, v3 = 6/20, v4 = 6/30, and v5 = 6/30; the phakic IOL group had UCVA = 1/60, v1 = 6/20, v2 = 6/20, v3 = 6/20, v4 = 6/15, and v5 = 6/12. Both groups had significantly better visual outcome after the third month of follow-up ($P < 0.05$). Visual outcome in the phakic IOL group was significantly better compared to the PRK group starting from v2

to v5 ($P < 0.05$).

Conclusions: In the case of high myopia, phakic IOL implantation may give better visual outcomes compared to PRK. However, PRK still improves visual outcome in highly myopic patients who are contraindicated for phakic IOL implantation.

Correlation Between Distribution of Age and Gender to Central Corneal Thickness of Photorefractive Keratectomy Patients

First Author: Doni **WIDYANDANA**
Co-Author(s): Agus **SUPARTOTO**

Purpose: To correlate the distribution of patient age and gender with central corneal thickness (CCT) before and after photorefractive keratectomy (PRK).

Methods: A retrospective study was conducted to explore characteristics of patients, including age, gender, and CCT before and after PRK during 2015. All PRK patients in a LASIK center in Yogyakarta, Indonesia were included in this study ($n = 488$). Spearman correlation test was used in statistical analyses.

Results: The ages of 488 patients (327 males and 161 females) ranged between 16 and 57 years (mean, 21.69; SD, ± 6.54). There was no correlation between age and gender distribution to patients' CCT before PRK. A significant negative correlation was found between age and CCT reduction after PRK ($P = 0.00$). The correlation between gender and CCT after PRK was also significant, with females having a tendency to need more CCT reduction compared to male patients ($P = 0.000$). Those situations resulted in lower CCT for older and female patients after PRK.

Conclusions: Older patients and female patients have a tendency to require more CCT reduction during PRK intervention.

Impact of Increased PTA Values on Visual Outcomes One Year After Refractive Lenticule Extraction (ReLEx) Smile

First Author: Detlev **BREYER**
Co-Author(s): Gerd **AUFFARTH**, Philipp **HAGEN**, Hakan **KAYMAK**, Karsten **KLABE**, Florian **KRETZ**

Purpose: Former studies showed comparable visual recovery as well as aberrometric results for the refractive lenticule extraction (ReLEx) smile and the femto-LASIK techniques. For the latter treatment, however, there is evidence that a percent tissue altered (PTA) value above 40% can be seen as a contributing factor in the development of keratectasia. This retrospective quality management investigation addresses the question whether this also holds for increased PTA values in case of ReLEx smile.

Methods: We analyzed the impact of high PTA values

by comparing the results of 2 ReLEx smile groups; 350 eyes with PTA < 40% and 350 eyes with PTA > 40%. Follow-up was performed between 1 day and up to 36 month postoperatively. Results were evaluated in terms of visual acuity, manifest refraction, and wavefront analysis (KR-1W, Topcon). Development of ectasia was assessed using difference maps of corneal reference surfaces from Scheimpflug tomography (Belin-Ambrosio Enhanced Ectasia Display, Pentacam, Topcon).

Results: Overall PTA values ranged from 29% to 53%. We could not detect significant differences between the two PTA groups (<40% and >40%) in terms of safety, predictability, and visual recovery. All groups showed a mean monocular UDVA of <0.05 logMAR 1 year after treatment. Furthermore, no significant differences in ectasia difference maps were found between the 2 PTA groups.

Conclusions: For ReLEx smile our results do not provide evidence for keratectasia development for PTA values above 40%.

Long-Term Results of Refractive Lenticule Extraction ReLEx Smile Compared to Femto-LASIK

First Author: Philipp HAGEN

Co-Author(s): Gerd AUFFARTH, Detlev BREYER, Hakan KAYMAK, Karsten KLABE, Florian KRETZ

Purpose: The aim of this retrospective quality management investigation was to answer the question whether 3 years after surgery the visual outcomes for ReLEx smile are as safe, predictable, and efficient as those after femto-LASIK.

Methods: So far the results of 700 eyes in the ReLEx smile group (cap thickness, 120-150 μ m) and 400 eyes operated with femto-LASIK (flap thickness, 100-120 μ m) in the control group have been evaluated. Follow-up was performed between 1 day and 3 years after treatment. For clinical evaluation of visual acuity at far, subjective refraction and wave front analysis (KR-1W, Topcon) were compared. Additionally, patient questionnaires were evaluated for dry eye symptoms, comfort, and recovery time.

Results: Concerning safety, predictability, and efficiency we could not detect significant differences between both methods. Both groups showed a mean monocular UDVA of <0.05 logMAR 1 year after surgery, which remained stable within the 3 years of follow-up. Visual recovery with the ReLEx smile group was as fast as with the flap-based LASIK. There were significantly lower total higher order aberrations in the ReLEx smile group.

Conclusions: Three years after surgery, ReLEx smile and femto-LASIK show equally good results in terms of safety, predictability, and efficacy. However, no dry eyes were observed in the ReLEx smile group compared to

the femto-LASIK group. Therefore, we clearly favor the ReLEx smile technique in patients who ask for painless refractive correction.

Outcomes of Bi-Optics with Implantable Collamer Lens Followed by ReLEx SMILE for Management of High Myopia

First Author: Sowmya BHAT

Co-Author(s): Sheetal BRAR, Sri GANESH

Purpose: To study the safety, efficacy, and clinical outcomes by combining implantable collamer lens (ICL) and ReLEx SMILE in a 2-stage procedure for the treatment of high myopia.

Methods: Eyes with very high myopia not amenable to correction with either ICL or corneal refractive surgery alone were selected. In the first stage, ICL surgery was performed to debulk the refractive error. After 2 to 3 weeks, the second stage with ReLEx SMILE was performed to correct the residual refractive error.

Results: Eleven eyes from 6 patients with a mean age of 24 years were included. The mean preoperative refractive error was -24.4 diopters (D) (range, -18 to -32 D), which reduced to -3.77 D after ICL surgery and further reduced to -0.25 D after ReLEx SMILE surgery. At 3 months after bi-optics, 82% of eyes were within ± 0.5 D, while 100% of eyes were within ± 1.00 D SE correction. All eyes were 20/40 or better, with 63% of eyes having 20/20 and better uncorrected visual acuity (UCVA) at 3 months. All eyes had a gain in lines of corrected distance visual acuity (CDVA), with 9 eyes gaining 2 or more lines. No eyes lost lines of CDVA. Safety index was 1.87 and efficacy index was 1.84. All patients tolerated the procedures well and the overall satisfaction rate was very high. One patient was prescribed spectacles for fine tuning of vision.

Conclusions: Bi-optics with ICL combined with ReLEx SMILE appears to be a safe and effective approach to the management of extreme myopia. Visual rehabilitation is faster, as the second stage with SMILE can be performed as early as 2-3 weeks from ICL surgery.

Outcomes of Femtosecond Lenticule Extraction and Small-Incision Lenticule Extraction for Correction of Myopia and Myopic Astigmatism

First Author: Astrid CHAIRINI

Purpose: To describe outcomes of femtosecond lenticule extraction (FLEx) and small-incision lenticule extraction (SMILE) in eyes with myopia and myopic astigmatism.

Methods: This was a retrospective observational study. All data were collected from medical records of patients who had undergone FLEx and SMILE from

January 1, 2014, until December 31, 2015. Patient characteristics and visual outcomes at 1 day, 1 week, and 1 month; predictability; efficacy; and complications between the 2 methods were recorded.

Results: This study enrolled 71 patients (139 eyes) including 43 patients (85 eyes) in the FLEx and 28 patients (54 eyes) in the SMILE group. In the FLEx and SMILE groups 1 month postoperatively, as much as 87.06% and 92.59% of eyes, respectively, could achieve a range of Snellen uncorrected visual acuity from 0.80-1.0. Sixty eyes (70.59%) in the FLEx and 40 eyes (74.08%) in the SMILE group were in accordance with the results of best corrected visual acuity preoperatively. No clinically significant complications occurred intraoperatively in both groups. Dry eye was found mostly as a postoperative complication in both groups.

Conclusions: Both FLEx and SMILE are equivalent for correction of myopia and myopic astigmatism refractive errors throughout a 1-month observation period. Postoperative complications are more common in the FLEx group and the incidence of dry eye is higher in this group.

Realignment of ICL Vertically to Reduce the Vault of ICL

First Author: Rashmi KUDARI

Purpose: To redial the horizontally placed implantable collamer lens (ICL) vertically to reduce the vault.

Methods: The ICL manipulator was introduced through the side port and the ICL was redialed to align it in a vertical fashion.

Results: The vault of the ICL when it was in a horizontal position was 1.28 mm and the vault of the ICL when it was redialed in a vertical position was 990 μ m.

Conclusions: As vertical sulcus diameter is greater than horizontal sulcus diameter, alignment of the ICL vertically will reduce the vault.

SMILE Again

First Author: Yuen LEONARD

Purpose: To highlight a unique case of small incision lenticule extraction (SMILE) refractive surgery, where the initial surgery was aborted for safety reasons and was re-commenced 3 months later with a customized parameter, which resulted in successful outcomes.

Methods: A high myope [-9 diopters (D)] underwent SMILE refractive surgery. Her first (right) eye was operated on uneventfully; however, during the femtosecond lenticule creation of the contralateral (left) eye, a drop-let of mucous in the cone-cornea interface was noted intraoperatively which hindered the cut, resulting in an incomplete anterior and posterior lenticule \sim 2 mm

diameter in the 9 o'clock area. The surgery was aborted due to safety reasons and the patient was agreeable for surgery at a future date.

Results: Three months later, SMILE surgery was re-commenced in the left eye with customized settings tailoring a lenticule with a larger diameter and a more anterior and posterior cut, essentially wrapping the previous lenticule. Surgery was uneventful and on days 1, 7, 30, and 60 postoperatively, refractions were exactly on target.

Conclusions: This is the first reported case of SMILE re-performed in a patient using a larger lenticule size for an eye which previously aborted surgery. SMILE cut was performed twice in the same eye, and she smiled again after the second surgery.

Visual Performance After Excimer Laser Photorefractive Keratectomy for High Myopia

First Author: Chien-Chi TSENG

Purpose: To evaluate the efficacy, safety, predictability, and visual performance of excimer laser photorefractive keratectomy (PRK) for myopia greater than -8 diopters (D).

Methods: Fifty-four patients (104 eyes) with myopia from -8 D to -13 D and cylinder up to -4 D received surface ablation technique with the Allegretto Wave version 1009-1 excimer laser to correct their refractive error. The patients were examined on day 1, 3, 7, and 14 and months 1, 3, 6, and 12 postoperatively. Visual acuity, manifest refraction, corneal haze, topography, intraocular pressure, contrast sensitivity, and wavefront aberration were evaluated.

Results: Twelve months postoperatively, 95% of eyes were within 1 D of the intended correction. A total of 94% of eyes attained uncorrected distance visual acuity (UDVA) of 20/25 or better, and 98% of eyes improved or retained their corrected distance visual acuity (CDVA). Barely detectable corneal haze peaked in the first month with gradual reduction in the third month. The mean contrast sensitivity decreased slightly. The spherical and higher order aberrations increased significantly.

Conclusions: Excimer laser PRK is effective and predictable for treatment of high myopia greater than -8 D with or without astigmatism up to -4 D. The incidence of complications was low, but effort should be made to improve reduction of contrast sensitivity and induced spherical and higher order aberrations.



Retina (Medical)

Activation of the Hyaluronan Signaling Pathway in Retinal Pigment Epithelium in a Proliferative Vitreoretinopathy Model

First Author: Ayako **FUKUSHIMA**

Co-Author(s): Eri **TAKAHASHI**, Hidenobu **TANIHARA**

Purpose: Rhegmatogenous retinal detachment triggers proliferative vitreoretinopathy (PVR) and epithelial mesenchymal transition (EMT) is one of the pathogenesis in PVR. We previously reported that the hyaluronan signaling pathway is essential for EMT in retinal pigment epithelium (RPE) cells. This study aimed to investigate the activation of the hyaluronan signaling pathway in a murine PVR model.

Methods: We used an experimental PVR model as previously described by Saika et al. Retinal detachment occurred after undergoing surgical removal of lens through corneal incision. The vitreous cavity was filled with 0.1% hyaluronan, and then the corneal incision was sutured with 10-0 nylon string. Eyes were enucleated, fixed by 4% paraformaldehyde, and embedded in paraffin at 2, 5, 7, 10, and 14 days after operation. Serial sections were subjected to immunofluorescence analysis.

Results: Immunohistochemical analysis showed that RPE formed a multilayer area at day 2 after the operation and collagen and fibronectin increased at the multilayered area. Immunofluorescence analysis revealed that multilayered RPE cells expressed α -smooth muscle actin and linear staining of N-cadherin at cell-cell junctions was dissociated. We found that the expression of hyaluronan receptor CD44 increased and the phosphorylated ezrin/radixin/moesin (ERM) proteins were localized at multilayered RPE cells.

Conclusions: Our findings indicated that the CD44-ERM signaling pathway in EMT-induced RPE cells was associated with PVR.

Analysis of Cardiovascular Disease Biomarkers as Risk Factors for Age-Related Macular Degeneration

First Author: Shweta **WALIA**

Co-Author(s): Vaibhab **SHARMA**

Purpose: The primary purpose of the study was to investigate cardiovascular disease systemic biomarkers [high-sensitivity C-reactive protein (CRP) and homocysteine] as risk factors for age-related macular degeneration (AMD).

Methods: Study participants who attended the eye department of a tertiary hospital, aged 50 to 90 years with AMD, were matched with controls adjusted for

age, environmental factors, etc. Both affected and unaffected individuals underwent testing for CRP and homocysteine.

Results: During the study period, a total of 60 patients were enrolled, 30 cases and 30 controls with equal sex distribution (50% males and 50% females). The mean age of the patients was 66.58 ± 8.7 years. Appropriate test of significance was applied (independent samples, Mann-Whitney *U* test). Homocysteine concentrations in AMD patients were statistically significantly higher than in controls ($U = 85.00$; $Z = -5.396$; $P = 0.00$). CRP concentrations in AMD patients were statistically significantly higher than in controls ($U = 200$; $Z = -3.696$; $P = 0.00$).

Conclusions: Higher levels of C-reactive protein and homocysteine were associated with an increased risk of age-related macular degeneration.

Association Between Dementia, Cognitive Function, and Age-Related Macular Degeneration: A Systematic Review and Meta-Analysis

First Author: Danny **NG**

Co-Author(s): Li Jia **CHEN**, Carol **CHEUNG**, Shisong **RONG**

Purpose: To confirm the association between dementia and age-related macular degeneration (AMD).

Methods: We searched MEDLINE and Embase for studies evaluating the association of AMD with dementia/cognitive impairment, Alzheimer disease (AD), and Parkinson disease (PD). Summary odds ratio (OR), hazard ratio (HR), and mean difference (MD) in cognitive function scores between subjects with and without AMD were estimated using fixed-effect model if there was no interstudy heterogeneity ($I^2 = 0\%$ and P for Q statistics >0.05); otherwise, random-effect model was used. We assessed the quality of each study and performed sensitivity analysis to control potential biases.

Results: Among the 1916 reports that were retrieved, 19 studies encompassing 117,109 subjects were eligible for the meta-analysis. We found dementia and AD to be significantly associated with increased risk of AMD with OR of 1.37 ($P = 7.2 \times 10^{-5}$, $I^2 = 0$) and 2.03 ($P = 2.3 \times 10^{-5}$, $I^2 = 48\%$), respectively. Of note, AMD was also linked to a higher incidence of PD, AD, or senile dementia in cohort studies ($P = 0.038$, $HR = 1.78$, $I^2 = 71\%$). Moreover, cognitive function scores, such as Mini-Mental State Examination ($P = 0.0015$, $MD = -0.98$, $I^2 = 77\%$) and Trail Making Test-A ($P = 5.0 \times 10^{-4}$, $MD = 18.6$, $I^2 = 0$), indicated significant worsening in cases with AMD as compared with non-AMD subjects. Sensitivity analysis and Egger test indicated the robustness of the findings.

Conclusions: Dementia and cognitive impairment were

associated with AMD. Physicians and patients should be aware of the higher chance of their associations. Studies are warranted to uncover the common pathogenic pathways underlying these conditions.

Association of Choroidal Neovascularization and Chronic Central Serous Chorioretinopathy After Photodynamic Therapy with Optical Coherence Tomography Angiography

First Author: Jian-Sheng **WU**

Co-Author(s): San-Ni **CHEN**

Purpose: To evaluate the ability of spectral-domain optical coherence tomography angiography (OCTA) in detecting choroidal neovascularization (CNV) associated with chronic central serous chorioretinopathy (CSCR) after photodynamic therapy (PDT).

Methods: Patients with chronic CSCR (more than 3 months) after PDT were included. Macular angiograms (3 × 3 mm) were obtained using spectral-domain OCT (RTVue XR; Optovue). The angiograms were segmented into 3 vascular slabs: inner retinal, outer retinal, and choriocapillaris. Choroidal neovascularization was defined as flow in the outer retinal slab between the Bruch membrane and outer plexiform layer.

Results: Fifty-nine eyes of 54 patients (47 male and 7 female) were included. The average age was 47 ± 7.5 years old. The average duration of symptoms was 24 ± 33 months. All patients were treated with half-dose PDT initially. Seven patients (11.9%, 7/59) received more than 1 session of PDT. CNV was diagnosed in 24 of 59 eyes (40.7%) based on OCTA. Only 4 patients (16.7%, 4/24) received intravitreal anti-VEGF injection for CNV. Older age, larger maximum spot size of PDT, and longer period of follow-up were noted in the CNV group.

Conclusions: OCTA reveals higher rates of CNV associated with chronic CSCR than previously suspected. Older age and larger spot size of PDT are risk factors. Because OCTA is a completely noninvasive test, it could be considered a first step in identifying CNV in CSCR.

Association of Scleral Irregularity with Severity of Myopic Macular Degeneration

First Author: Wong Chee **WAI**

Co-Author(s): Gemmy **CHEUNG**, Val **PHUA**, Tien **WONG**

Purpose: To examine the relationship between irregularity of the scleral contour and severity of myopic macular degeneration (MMD).

Methods: Prospective study of 63 eyes of 41 patients with high myopia (≤ -6 diopters or axial length ≥ 26.5 mm). Swept source optical coherence tomography (SSOCT) was performed to measure subfoveal scleral

thickness (ST) and to visualize the posterior scleral border. Scleral irregularity was assessed by the number of scleral inflexion (SI) points, defined as the point where the posterior scleral contour changed from concave to convex, in the horizontal and vertical meridians. MMD was graded from fundus photographs according to the META-PM classification. Severe MMD was defined as category 3 or 4 MMD.

Results: The posterior scleral border was significantly more irregular in eyes with severe MMD (1.42 ± 1.64 vs 0.31 ± 0.56 , $P = 0.009$) than in eyes with no or mild MMD. The mean number of SI points were higher in category 4 (2.33 ± 1.80) than in category 1 to 3 (0.07 ± 0.26 , $P < 0.001$; 0.44 ± 0.64 , $P < 0.001$; and 0.60 ± 0.97 , $P = 0.001$, respectively). Multivariable analysis adjusted for age, gender, subfoveal ST, and correlation between left and right eyes of the same patient showed that scleral irregularity was independently associated with severe MMD [odds ratio (OR) per SI point: 2.38, 95% confidence interval 1.32-4.30, $P = 0.004$].

Conclusions: Scleral irregularity was independently associated with severe MMD. Irregularity of the sclera may play a role in the pathogenesis of MMD.

Bimonthly Intravitreal Ranibizumab Injections in Patients with Macular Edema Associated with Branch Retinal Vein Occlusion

First Author: Taku **IMAMURA**

Co-Author(s): Masahito **OHJI**, Yoshitsugu **SAISHIN**, Sachi **TSUKAMOTO**

Purpose: To evaluate the 6-month efficacy of bimonthly intravitreal ranibizumab (IVR) injections in a prospective, consecutive study of patients with macular edema (ME) associated with branch retinal vein occlusion (BRVO).

Methods: Eyes with ME associated with BRVO received bimonthly IVR injections and were followed monthly for 6 months. The best-corrected visual acuity (BCVA) and central foveal thickness (CFT) on optical coherence tomography were evaluated before and after treatment. Patients were eligible to receive an IVR injection as a rescue treatment if prespecified criteria were met.

Results: Twenty-six patients were enrolled in this study. Six patients were lost to follow-up and excluded from the study. Twenty patients (9 male, 11 female) were analyzed in this study. The mean patient age was 66.4 years old and ranged from 43 to 84. The mean logMAR BCVA improved significantly from 0.53 at baseline to 0.28 at month 6 ($P < 0.05$). The mean CFT decreased significantly from 527 μm at baseline to 274 μm at month 6 ($P < 0.05$). Fluctuations in CFT were seen at months 2, 4, and 6. During the study period, no serious complications related to intravitreal injection developed in either eye and no rescue treatment was



required in either eye.

Conclusions: Bimonthly injections of ranibizumab achieved visual improvement during the study period while fluctuations in CFT were seen. Bimonthly injections of ranibizumab could be an effective therapeutic method.

Central Retinal Vein Occlusion Associated with Vemurafenib Use in Metastatic Skin Melanoma

First Author: Shu-Yun YANG

Purpose: We report a case of unilateral central retinal vein occlusion following target therapy of vemurafenib.

Methods: A case report.

Results: A 40-year-old woman with metastatic skin melanoma underwent target therapy with vemurafenib 960 mg twice daily for 10 weeks. However, after withdrawal of vemurafenib for 2 months, she felt left eye floaters and visited our outpatient department. She had best-corrected visual acuity of 20/20 in the left eye. The fundus examination revealed cotton wool spots and tortuous retinal veins in the left eye. Fluorescein angiography and optical coherence tomography confirmed the diagnosis of central retinal vein occlusion.

Conclusions: Vemurafenib is a B-Raf enzyme inhibitor which improved the overall survival rate in patients with BRAF V600E mutation melanoma. Although vemurafenib-induced ocular complications such as central retinal vein occlusion are very rare, careful evaluation of patients on vemurafenib therapy with visual symptoms is required.

Choroidal Mass: An Incidental Finding

First Author: Kathrina TIONGSON-PAEZ

Purpose: To report a case of a choroidal mass and to arrive at the most probable diagnosis.

Methods: The patient was a 32-year-old single female Filipino sales clerk from Makati. 10 years PTC, (+) blurring of vision (BOV) in both eyes (OU) gradual in onset and progressive. 5 years PTC, still with progressive BOV OU. The patient consulted an optometrist and was given prescription glasses: in the right eye (OD), -5.50, and in the left eye (OS), -3.50. 1 year PTC, there was again progressive BOV OU even with her prescription glasses.

Results: Visual acuity OD was 5/200, 20/70, cc: 20/200; OS was 20/200, 20/50, cc: 20/40. Refraction OD was -9.00 = -0.25 x 180 (20/40); OS was -5.75 = -1.00 x 180 (20/40). AT OU was 11 mm Hg. Funduscopy OD showed (+) ROR, (+) CM, (+) DDB, 2:3 AVR, tilted disc, situs inversus, and a yellowish spot present on the inferior of the fovea that may represent an RPE defect, which

was around 2 disc diameters; OS showed (+) ROR, (+) CM, (+) DDB, 2:3 AVR, tilted disc, and (+) pigmented elevated lesion. Fundus photo OS revealed elevated hyperpigmented lesion surrounded by a white halo located on the periphery of the superotemporal area and measuring around 7 x 9 mm. OCT OS showed marked retinal thinning with an intact non-elevated RPE. Nasal edges showed a band of moderate retinal thinning with elevation of an intact RPE. B-scan was normal. Other diagnostic tests were normal.

Conclusions: Choroidal nevus is a benign melanocytic lesion of the posterior uvea and is most commonly mistaken for melanoma. Choroidal melanoma is the most common primary intraocular malignant tumor of the eye and the second most common site of 10 malignant melanoma sites in the body. It can metastasize. Early detection and intervention is important because it may have a critical impact on a patient's visual and life prognosis.

Cisplatin-Related Maculopathy: A Case Report with Spectral Domain Optical Coherence Tomography Findings

First Author: Ming Shan HE

Co-Author(s): Wei-Shan TSAO

Purpose: To report a case of cisplatin-related maculopathy and review the literature.

Methods: Case report.

Results: A 63-year-old male patient visited our clinic with the chief complaint of sudden blurred vision of both eyes for 1 week that had gradually recovered. He had a history of diabetes, hypertension, hepatitis B carrier, and esophageal cancer status post concurrent chemoradiotherapy (CCRT). On examination, best corrected visual acuity was 0.7 and 0.8 in the right and left eyes, respectively. Intraocular pressure was 12 and 10 mm Hg in the right and left eyes, respectively. Fundoscopic examination revealed abnormal macular reflex and depigmentation on the macula in both eyes. Spectral domain optical coherence tomography (SD-OCT) showed hypertrophy of retinal pigment epithelium (RPE) on the fovea with subretinal fluid accumulation. Fluorescent angiography demonstrated RPE window defect around the macula in both eyes. Toxic maculopathy was diagnosed in both eyes. After reviewing his medical history, he had received 3 cycles of CCRT with cisplatin/5-FU for esophageal cancer during the same year. Cisplatin-related maculopathy was highly suspected. The cisplatin-related ophthalmic complications and SD-OCT of cisplatin-related maculopathy are discussed.

Conclusions: Chemotherapy with cisplatin regimen can cause ophthalmic complications. The cisplatin-related maculopathy resulted from RPE disturbance in the macula. All patients receiving cisplatin therapy should



be monitored regarding visual function.

Clinical Course of Recurrent Cases of Myopic Choroidal Neovascularization Treated with Bevacizumab

First Author: Atsushi YAMASAKI

Co-Author(s): Yoshitsugu INOUE, Yukimi KAWAMOTO, Daisuke NAGASE, Fumie OTANI, Shinichi SASAKI

Purpose: To retrospectively investigate the changes of choroidal neovascularization (CNV) in recurrent cases of myopic CNV (mCNV) after intravitreal bevacizumab injection.

Methods: Fifty eyes of 50 patients with mCNV followed up for more than 3 years after initial treatment were enrolled in this study. All eyes initially received intravitreal injection of 1.25 mg bevacizumab followed by pro re nata treatment with bevacizumab or ranibizumab. Changes of best corrected visual acuity (BCVA) and anatomic changes found in optical coherence tomography (OCT) were evaluated.

Results: Twenty eyes (40%) recurred and the mean number of additional intravitreal injections of bevacizumab or ranibizumab was 2.6 in 3 years. Mean BCVA in logMAR improved from 0.74 at baseline to 0.45 in the cases without recurrence but was unchanged from 0.58 at baseline to 0.53 in recurrent cases in 3 years. Fifteen eyes (30%) recurred less than 1 year after initial injection, showing reactivation of the same region of previous CNV. Seven eyes needed additional injection more than 1 year after initial or previous injection and showed new CNV formation from the edge of Fuch spot.

Conclusions: The cases without recurrence had better visual prognosis than recurrent cases. Additionally, mCNV recurrence showed 2 types: reactivation of the same region of CNV and new CNV branching from the edge of previous CNV tissue. The recurrence interval of the same region of initial CNV was short, but new CNV activated from old CNV over 1 year after stabilization. Not only the initial region but also other region(s) near initial CNV need to be scanned by OCT.

Comparability of Ranibizumab Efficacy in nAMD Between the Interventional TREND and Non-Interventional LUMINOUS Studies

First Author: Paul MITCHELL

Co-Author(s): Cornelia DUNGER-BALDAUF, Sue LACEY, Wayne MACFADDEN, Volker MOECKEL, Rufino SILVA

Purpose: Interventional clinical studies are the gold standard for evidence generation; however, stringent inclusion/exclusion criteria mean the results may not reflect “real-world” conditions. This abstract aims to compare data from a clinical study with real-world evidence in neovascular age-related macular degenera-

tion (nAMD) patients treated with ranibizumab.

Methods: One-year results in treatment-naïve nAMD patients (n = 323) from the treat and extend (T&E) arm of the multicenter TREND study were compared with interim data in treatment-naïve nAMD patients from Australia (n = 227) within the LUMINOUS real-world study where use of T&E is predominant.

Results: Patient demographics were generally well balanced, though TREND and LUMINOUS baseline visual acuity (VA) was 59.5 (± 13.2) and 52.9 (± 21.4) ETDRS letters, respectively. Mean VA improvements were 6.6 and 5.3 ETDRS letters, with an average number of ranibizumab injections of 8.7 and 7.9, with 45.0% and 32.3% of patients achieving good vision (≥ 73 letters) in the TREND and LUMINOUS cohorts, respectively. The rate of ocular serious adverse events (SAEs) was 1.2% and 0.44%, while non-ocular SAEs was 11.1% and 4.41% for TREND and LUMINOUS, respectively. No new safety signals were identified.

Conclusions: Treatment-naïve nAMD patients from the Australian cohort of the real-world evidence study LUMINOUS achieved comparable VA improvements after 1 year of ranibizumab treatment to patients in the T&E arm of the controlled clinical study TREND, despite the lack of strict enrollment criteria and stringent oversight. This replication of results from controlled clinical trials in similar real-world populations enhances the validity and generalizability of these “real-world” data.

Cost-Effectiveness of Intravitreal Medication Therapy for Retinal Diseases in a Non-Reimbursed Market

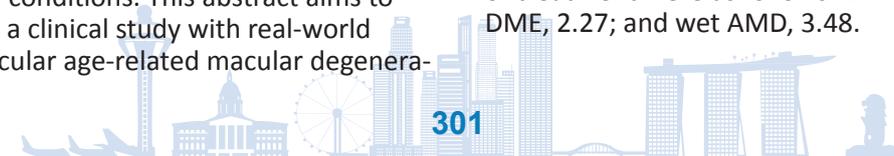
First Author: Pik Sha CHAN-UY

Co-Author(s): Anelisa KOH, Harvey UY

Purpose: To determine the cost-effectiveness of different intravitreal medications for the treatment of common retinal diseases in a non-reimbursed market.

Methods: A meta-analysis of published randomized clinical trials was conducted to determine the visual acuity benefits of aflibercept, bevacizumab, dexamethasone, and ranibizumab for eyes with branch/central retinal vein occlusion (B/CRVO), diabetic macular edema (DME), and wet age-related macular degeneration (AMD). The cost of drugs was determined from the listed price in a published reference book of commercially available drugs. For bevacizumab, the drug cost was based on division of 1 unit into 40 aliquots. Main outcome measures were cost of drug per ETDRS letter gained and the ratio of highest/lowest cost per letter gained per disease category.

Results: The ratio of highest/lowest cost for 1 year of treatment were as follows: BRVO, 4.4; CRVO, 5.86; DME, 2.27; and wet AMD, 3.48.



Conclusions: There is a very wide range of cost for the treatment of each disease category. Besides efficacy, cost-effectiveness and patient socioeconomic status should be considered when recommending treatment options.

Don't Look at the Sun, It's Not Fun: Solar Retinopathy

First Author: Shravan MASURKAR

Co-Author(s): Apoorva AG, Guruprasad AYACHIT, Srinivas JOSHI, Ulka PANKAR

Purpose: Solar retinopathy is a preventable cause of blindness. Prevention through education is paramount.

Methods: A 19-year-old male presented with blurred vision in both eyes (BE) for 1 week. Best corrected visual acuity (BCVA) in the right eye (OD) was 6/18 N6 and in the left eye (OS) was 6/12 N6. There was no history of trauma, night blindness, or drug intake. Interrogation revealed staring at sun for 10 minutes. Fundus of BE showed discrete yellowish lesions in the fovea. Optical coherence tomography (OCT) of BE revealed focal disruption at the level of the subfoveal RPE and outer retinal layers with otherwise normal retinal architecture. FFA and ERG were normal. MFERG showed mildly reduced amplitude at macula. EOG was normal. The patient was observed without any active management.

Results: At 1-month follow-up BCVA OD was 6/6p N6 and OS was 6/6 N6. Fundus of BE showed resolution of yellow lesion. OCT of BE showed changes improved with minimal outer retinal disruption.

Conclusions: The visual prognosis of solar retinopathy is generally favorable and is reversible. Scotomas may persist, reflecting permanent damage to the photoreceptors. The good visual prognosis has been attributed to the resistance of foveal cone. The mainstay of treatment, however, is education and prevention.

Effect of Pretreatment Metabolic Risk Factors on Response of Intravitreal Triamcinolone Acetonide Followed by Macular Laser Treatment in Diabetic Macular Edema

First Author: Prateeksha SHARMA

Co-Author(s): Supriya ARORA, Basudeb GHOSH, Meenakshi THAKAR, Divya YADAV

Purpose: To evaluate the effect of duration of disease, sugar control (HbA1C), blood pressure (BP), lipids (cholesterol, triglycerides, HDL), and kidney function (serum creatinine) on subsequent improvement in best corrected visual acuity (BCVA) and central foveal thickness (CFT) after treatment of diabetic macular edema (DME) with intravitreal triamcinolone acetonide (IVTA) followed by macular grid laser.

Methods: Type 2 diabetes mellitus patients with NPDR

and CSME, who were treatment naive with CFT > 300 μ m and BCVA < 0.3 logMAR, were included. Patients with any media opacity, history of cataract surgery in the past 3 months, ischemic maculopathy, tractional macular edema, and intraocular pressure > 21 mm Hg were excluded. Patients were investigated for HbA1C, BP, lipids, and serum creatinine and treated with IVTA followed by modified macular grid after 3 weeks of IVTA. They were followed up monthly for 3 months. CFT on SD-OCT and BCVA on Snellen chart, logMAR scale were recorded every visit.

Results: Patients with HbA1C = 7 or <7 gm% had significantly higher reduction in CFT > 100 μ m ($P < 0.01$) and significant improvement in BCVA (>0.2 logMAR; $P = 0.015$) compared to patients with HbA1C > 7 gm%. No other metabolic risk factor showed a statistically significant relation for CFT reduction and improvement in BCVA, duration of disease ($P = 0.370$, $P = 0.078$), BP ($P = 0.304$, $P = 0.262$), s. cholesterol ($P = 0.286$, $P = 0.188$), triglycerides ($P = 0.368$, $P = 0.063$), HDL ($P = 0.160$, $P = 0.404$), and s. creatinine ($P = 0.295$, $P = 0.343$). Statistically significant relation was seen between CFT reduction and improvement in BCVA ($P = 0.004$).

Conclusions: Of all the risk factors, glycemic control plays the most important role in affecting the therapeutic efficacy of DME. Reduction in macular edema is related to improvement in BCVA.

Endogenous Bacterial Subretinal Abscess: A Rare Case of Dual Infection

First Author: Ang WEN-JEAT

Co-Author(s): Raja-Norliza RAJA-OMAR, Embong ZU-NAINA

Purpose: To report a rare case of dual retinal infection with meliodosis and *Shewanella algae*.

Methods: Case report.

Results: Clinical data comprising medical history, findings on physical and ocular examination, blood cultures, and an abdominal computed tomographic scan were collected in a 55-year-old Chinese man with underlying myelodysplastic syndrome, *S. algae* sepsis, and a focal subretinal abscess. Ocular data including visual acuity, fundus photographs, optical coherence tomography (OCT), B-scan, and hepatobiliary ultrasound were evaluated, as were results of culture and polymerase chain reaction studies. Despite immediate intervention, including vitreous tap and intravitreal antibiotics, the eye deteriorated, with enlargement of the abscess. A trans pars plana vitrectomy was performed in which the subretinal abscess material was removed. Cultures confirmed *S. algae* and *Burkholderia pseudomallei* subretinal infection. Visual acuity was counting fingers (CF) at 2 feet and has remained stable.

Conclusions: *S. algae* and *B. pseudomallei* endogenous

endophthalmitis with subretinal abscess formation is a rare but devastating ocular condition. In the present case, prompt intervention through systemic and intravitreal antibiotic therapy with subsequent complete abscess drainage resulted in favorable visual recovery.

Evaluation of the Usability and Safety of the InVitria Device for Administering Intravitreal Injections

First Author: Yu Qiang **SOH**

Co-Author(s): Nathalie **CHIAM**, Anna C S **TAN**, Andrew **TSAI**, Edmund **WONG**

Purpose: Intravitreal injections of anti-angiogenic agents are commonly used for the treatment of macular diseases. Some potential advantages conferred by the intravitreal injection assistant device (InVitria) include shorter procedural times and less pain, with comparable safety. In this study, we evaluated the usability and safety of the InVitria when used by individuals with different levels of experience.

Methods: Forty patients were randomized to receive injections by either the conventional method (n = 20) or via the InVitria device (n = 20). The injections were performed by first-year ophthalmology residents (Group 1), senior residents (Group 2), or senior ophthalmologists (Group 3). Procedure duration, post-procedure pain score, and satisfaction of the patient and user were measured.

Results: There were no differences between the conventional and InVitria injection techniques, in terms of time taken for injection, for Groups 1 and 3. However, the InVitria technique was faster than the conventional technique for Group 2 (44.0 ± 25.0 vs 90.0 ± 31.7 seconds, $P = 0.033$). There were no differences in pain scores between the conventional and InVitria techniques for all groups of doctors. Junior residents felt most strongly that the InVitria device was safer than the conventional method, followed by senior residents and senior ophthalmologists. No adverse outcomes were encountered in any patient with both the conventional and InVitria methods.

Conclusions: The InVitria device is a comparable alternative to the conventional method of intravitreal injection delivery. Further testing of the InVitria on larger numbers of patients will provide greater clarity on its usability and safety.

Higher Initial Central Retinal Thickness and Diabetes May Be Significant Risk Factors for the Earlier Need of Repeat Dexamethasone Intravitreal Implant Treatment for Macular Edema due to Retinal Vein Occlusion: A Three-Year Retrospective Case Series

First Author: Chun-Ju **LIN**

Co-Author(s): Wen-Lu **CHEN**, Jane-Ming **LIN**, Cheng **SU**, Peng Tai **TIEN**, Yi-Yu **TSAI**

Purpose: To evaluate the effects of Ozurdex and identify risk factors for repeat treatment in patients with macular edema due to branch or central retinal vein occlusion.

Methods: Patients were retrospectively enrolled from 2013 to 2016. Ozurdex was given as the baseline treatment. The data included demographics, medical history, best-corrected visual acuity (BCVA), intraocular pressure (IOP), central retinal thickness (CRT), and complications. Time to additional Ozurdex was analyzed with Kaplan-Meier analysis and identification of influence factors with Cox proportional hazard model. Multivariate logistic regression was used to identify factors for repeat treatment.

Results: Twenty-four branch retinal vein occlusion and 13 central retinal vein occlusion patients were enrolled. There were 15 males and 22 females. Twenty-two (59.46%) patients needed only 1 Ozurdex. The final CRT and BCVA significantly improved. The risk of receiving the second Ozurdex in the diabetes group was significantly higher when comparing to non-diabetes (the median time to second treatment was 4.12 and 16.7 months, respectively, $P < 0.05$, Kaplan-Meier analysis). By Cox proportional hazard analysis, diabetes and higher CRT were significant risk factors for earlier repeat treatment with hazard ratios of 3.78 and 1.004.

Conclusions: Higher initial CRT and diabetes may be significant risk factors for the earlier need of repeat Ozurdex for macular edema due to retinal vein occlusion. Three-fifths of patients could remain repeat treatment-free. Diabetes, higher CRT, and central retinal vein occlusion associated with poorer outcomes warrant more frequent follow-ups. Further research is required to establish the optimal retreatment schedule for Ozurdex, especially in such patients.

Intravitreal Dexamethasone in Non-Infectious Uveitic Cystoid Macular Edema

First Author: Ronel **SOIBAM**

Co-Author(s): Harsha **BHATTACHARJEE**, Dipankar **DAS**, Surpriya **HAWAIBAM**, Diva **MISRA**, Divya **PANDEY**

Purpose: To assess the role of intravitreal dexamethasone in non-infectious uveitic cystoid macular edema.

Methods: In this interventional case series we present



7 eyes of 5 patients with cystoid macular edema (CME) due to non-infectious uveitis who underwent intravitreal injection of dexamethasone. Out of 5 patients, 3 patients had sarcoid uveitis, 1 presented with pars planitis, and 1 patient had combined diabetic retinopathy and sarcoid uveitis. All patients had a long history of follow-up. All patients had previous treatment in the form of topical as well as systemic steroids and other immunosuppressants.

Results: After injection of intravitreal dexamethasone (Ozurdex) visual acuity improved in all patients by at least 2 lines on Snellen chart. Most of the patients regained visual acuity of 6/9. There was significant reduction in central macular thickness and vitreous haze. Additionally, the need for systemic steroid was avoided, reducing the complications. Recurrence was noted in 1 patient at the end of 1 year after injection. Rise in intraocular pressure was seen in 1 patient that could be managed on topical anti-glaucoma medications. It was also noted that final visual acuity was not dependent on presenting macular thickness and other ultrastructural changes in the macula.

Conclusions: Intravitreal dexamethasone can be effectively and safely used in cases of persistent non-infectious cystoid macular edema.

Long-Term Outcomes of Triamcinolone Acetonide Therapy for Serous Detachment of Retinal Pigment Epithelium Associated with AMD: 36-Month Results

First Author: Taras KUSTRYN

Co-Author(s): Natalia KAPSHUK, Andrii KOROL, Alla NEVSKA, Oleg ZADOROZHNYI

Purpose: To report 36-month outcomes of application of triamcinolone acetonide (TA) in serous pigment epithelial detachment (PED) associated with age-related macular degeneration (AMD).

Methods: Fifty-four eyes (48 patients) with serous PED associated with AMD were observed. Twenty-two eyes of 20 patients were injected with 0.1 mL (4 mg) of intravitreal TA, and 32 eyes of 28 patients received 1.0 mL (40 mg) of TA to the subtenon space. Follow-up examinations were carried out before treatment and 1, 3, 6, 12, 15, 18, 24, 30, and 36 months after treatment.

Results: Mean height of serous PED was 486 (187) μ m, and the length of the serous PED was 1859 (870) μ m. At month 36, mean height of the serous PED decreased to 256 (139) μ m ($P = 0.005$) and the length of serous PED decreased to 1112 (451) μ m ($P = 0.04$). Before subtenon TA mean height of serous PED was 446 (199) μ m, and the length of the serous PED was 2055 (587) μ m. At 36 month, mean height of PED was 232 (117) μ m ($P = 0.001$), and the length was 1423 (465) μ m ($P = 0.002$). Complete reattachment of ret-

inal PED was noted in 8 eyes in the intravitreal group (36.4%) and in 12 eyes in the subtenon group (37.5%). In 13% of cases the development of CNV was noted starting from the 30th month of follow-up. Visual acuity remained stable in all cases.

Conclusions: Application of TA permits a decrease in height and length of serous detachment of the retinal pigment epithelium (RPE) while preserving visual function in most cases. Reattachment of the RPE was observed in 37% of cases.

One-Year Result and Predictive Factors of Visual Outcome in Switching to Intravitreal Aflibercept Injection for Age-Related Macular Degeneration

First Author: Sanae ABE

Co-Author(s): Shungo NISHIYAMA, Masaaki SAITO, Takeshi YOSHITOMI

Purpose: To evaluate baseline predictors of 12-month outcomes in change of best corrected visual acuity (BCVA) after switching to intravitreal aflibercept injection for patients with age-related macular degeneration (AMD).

Methods: We retrospectively reviewed 51 eyes of 50 patients treated with aflibercept after ranibizumab or photodynamic therapy. The BCVA, central retinal thickness (CRT), and subfoveal choroidal thickness (SFCT) measured by optical coherence tomography using an enhanced depth imaging technique were evaluated at baseline, 6 months, and 12 months.

Results: Twenty-five patients with typical AMD and 21 patients with polypoidal choroidal vasculopathy (PCV) were included. The mean logMAR BCVA of typical AMD and PCV improved to 0.45 and 0.29 at month 12 from 0.53 and 0.31 at baseline, respectively, which showed no significant difference in both subtypes ($P = 0.071$, $P = 0.74$). The mean CRT of typical AMD and PCV decreased from 202.8 μ m and 240.6 μ m at baseline to 152.8 μ m and 186.6 μ m at 12 months, respectively, which showed a significant difference ($P < 0.01$, $P = 0.012$). Although the mean SFCT of typical AMD increased from 212.8 μ m at baseline to 220.4 μ m at 12 months, a significant decrease was seen in PCV from 204.2 μ m to 184.5 μ m ($P = 0.23$, $P = 0.049$). Predictive factor of improvement in VA at 12 months with multiple regression model analysis was absence of retinal pigment epithelium (RPE) atrophy at baseline (AMD, $P < 0.01$; PCV, $P = 0.03$).

Conclusions: Switching to aflibercept maintained VA in both typical patients with AMD and PCV over 12 months. The RPE atrophy at baseline was profoundly related to the BCVA changes at 12 months.

Post-Implementation Evaluation of Novel Pilot Intravitreal Injection Order Forms

First Author: Wei Kiong **NGO**

Co-Author(s): Colin **TAN**, Vernon **YONG**

Purpose: Patients require multiple intravitreal injections in individually tailored regimens. We noticed that current electronic medical records (EMR) systems with free text documentation were not tailored to list injections with resultant missing information. Continuity of care is also less efficient as relevant information is not presented in a summarized format. We aimed to create an intravitreal order form and pilot its use.

Methods: In a prospective study, we designed an intravitreal injection order form and piloted its use in patients listed for intravitreal injections. The pre- and post-use of the order forms was evaluated by both quantitative (missing information rates) and qualitative measurements (satisfaction survey scores).

Results: Forty EMR cases and 40 order-form cases were analyzed. Prior to the implementation of order forms, missing critical information was found in the EMR group and was noted to be as high as 20% ($P = 0.005$) in the "Intended TCU" category. The pilot implementation of order forms successfully reduced the rate of missing data to zero. User satisfaction improved from a mean score of 6.13 to 9.25 in the "ease of finding critical information" category ($P < 0.001$) and from a mean score of 6.05 to 9.25 in the "clarity of critical information" category ($P < 0.001$). The time taken to interpret information from the order form shortened to 1.4 minutes from 4.5 minutes using EMR ($P < 0.001$).

Conclusions: The pilot implementation of the order forms reduced the rates of missing critical information, allowed users to extract critical information faster, and improved user satisfaction.

Posterior Segment Manifestation of Ocular Tuberculosis in a Filipino Female

First Author: Almira **MANZANO**

Co-Author(s): Jocelyn **SY**

Purpose: To describe the clinical presentation, diagnosis, and management of ocular tuberculosis in a Filipino female.

Methods: This is a descriptive, retrospective clinical case report of a patient diagnosed with ocular tuberculosis in a tertiary hospital.

Results: A 21-year-old female complained of sudden blurring of vision in the left eye for 2 weeks. There was no associated eye redness, floaters, or photopsia. She had no history of chronic cough, difficulty of breathing, anorexia, or night sweats. On ophthalmic examination, visual acuity was 20/25 in the right eye and 10/200 improving to 20/200 on pinhole of the left eye. Amsler

grid showed central scotoma on the left eye. There was no anterior chamber inflammation or vitritis noted. Dilated fundus examination of the left eye showed clear media and indistinct disc margin with yellowish sub-retinal lesion over the macula. Fluorescein angiogram showed blocked hypofluorescence in the early phase to irregular hyperfluorescences in late phases. Chest x-ray showed fibrotic scarring on both upper lobes, right. PPD revealed +24 mm induration and Quantiferon TB Gold Assay (ELISA) showed a positive result. HRZE treatment was started. While on treatment, there was noted worsening of visual acuity in the left eye. After 1 month of HRZE treatment, prednisone 60 mg/d was started and improvement of visual acuity was noted.

Conclusions: Ocular tuberculosis is diagnosed with a high index of suspicion based on clinical presentation. It is treated with HRZE similar to pulmonary tuberculosis. Systemic corticosteroids are also given with anti-tuberculosis treatment to prevent damage to ocular structures from inflammatory response.

Posterior Segment Ocular Manifestations of Syphilis in Filipino Males

First Author: Almira **MANZANO**

Co-Author(s): Jocelyn **SY**

Purpose: To describe clinical presentation, diagnosis, and management of ocular syphilis in Filipino males.

Methods: This is a descriptive, retrospective clinical case report of 2 patients diagnosed with ocular syphilis in a private tertiary hospital.

Results: Case 1. A 33-year-old male complained of blurring of vision and floaters. Visual acuity (VA) was 20/25 in the right eye and counting fingers at 1 foot in the left eye. Fundus exam showed whitish infiltrates over the optic nerve extending to the temporal arcades in the left eye. Fluorescein angiography showed perivascular staining and focal leakages. Patient noted progressive blurring of vision in the left eye to hand movements. Laboratory results showed (+) FTA-ABS, reactive RPR, positive TP-PA, and positive VDRL. Case 2. A 51-year-old male complained of blurring of vision of the right eye. VA was 20/40 in the right eye and 20/50 in the left eye. Fundus exam showed vitritis and whitish infiltrates inferiorly. Fluorescein angiography showed perivascular staining and diffuse leakage. He was prescribed oral and topical steroids. VDRL and RPR showed positive results. Benzathine penicillin G/IM and methotrexate tablets were given. Several months of treatment showed retinal detachment, and posterior vitrectomy was subsequently done.

Conclusions: Ocular syphilis should be a consideration in patients with significant sexual history where there is retinitis and vasculitis or any uveitis of uncertain origin. Syphilis serology should be done on intractable uveitis



of uncertain origin where there is retinitis or retinal vasculitis. Treatment is similar to neurosyphilis.

Predicting the Risk of Diabetic Retinopathy in Pediatric Populations with Juvenile-Onset Type 1 Diabetes: A Study from Taiwan

First Author: Chun Ting **YEH**

Co-Author(s): Yu-Chuan **KANG**, *Chi-Chun* **LAI**, *Nan-Kai* **WANG**, *An-Lun* **WU**, *Wei-Chi* **WU**

Purpose: The aim of this study was to establish a method to identify patients at higher risk for the development of diabetic retinopathy (DR) in the pediatric populations with juvenile-onset type 1 diabetes.

Methods: This single center, retrospective cohort study of 401 individuals with juvenile-onset type 1 diabetes included participants in the Chang Gung Juvenile Diabetes Eye Study (CGJDES). Risk factors associated with the occurrence of diabetic retinopathy were assessed by the Cox proportional hazard model. Based on the results of the Cox model, the nomogram was accessed for evaluating the risks of diabetic retinopathy in 3 years, 5 years, and 10 years, respectively.

Results: The mean age at the onset of type 1 diabetes was 8.4 ± 4.1 years (mean \pm SD). The mean follow-up was 93.6 ± 30.9 months (mean \pm SD). Cox proportional hazards analysis showed that higher HbA1c, longer duration of diabetes, younger age of onset, and higher concentrations of low-density lipoprotein cholesterol were all significantly associated with the occurrence of diabetic retinopathy.

Conclusions: We demonstrated a nomogram that could be helpful in predicting the risk of developing diabetic retinopathy in patients with juvenile-onset type 1 diabetes, and therefore, identifying those in need for frequent ophthalmic examinations, while reducing the time and cost of the screening process.

Pregnancy: A Poisoned Chalice

First Author: Abirami **SANMUGAM**

Co-Author(s): Mei Fong **CHONG**

Purpose: To report a rare case of bilateral proliferative retinopathy secondary to central retinal vein occlusion in a young, pregnant woman.

Methods: Case report.

Results: A 30-year-old woman presented with bilateral painless blurring of vision for 1 month's duration. She had gestational diabetes mellitus and was in her third pregnancy at 28 weeks with a history of 2 previous miscarriages. On examination, right eye vision was 6/36 and left eye vision was 6/18. She had normal anterior segment findings; however, posterior segment in both eyes showed flame-shaped hemorrhages in 4 quadrants. Right eye had new vessels with preretinal hem-

orrhage. Panretinal photocoagulation was done for her right eye. One week later, the left eye developed new vessels with macular edema and was lasered. Her vision further deteriorated to 6/60 in both eyes. She was screened for antiphospholipid syndrome, connective tissue disease, and blood hyperviscosity, which were negative. Laser therapy was performed in both eyes and vision regained to 6/12 in the right eye and 6/9 in the left eye with resolution of the proliferative state and residual epiretinal membrane in both eyes.

Conclusions: It is rare for a pregnant woman to present with bilateral central retinal vein occlusion. Any such case in a young, pregnant woman should be screened for antiphospholipid syndrome, connective tissue disease, and blood hyperviscosity. Prompt laser therapy is needed to ensure a good visual prognosis.

Prospective Trial of Treat-and-Extend versus Every Two Months Dosing with Aflibercept for Wet Age-Related Macular Degeneration

First Author: Akira **HAGA**

Co-Author(s): Ryuichi **IDETA**, *Yasuya* **INOMTA**, *Takahiro* **KAWAJI**, *Hidenobu* **TANIHARA**

Purpose: To compare 1-year outcomes of treat-and-extend (TAE) regimen and every 2 months (E2M) regimen using intravitreal aflibercept for wet age-related macular degeneration (wet-AMD) patients.

Methods: Prospective, multicenter trial. We randomly assigned patients with wet-AMD to the TAE group or E2M group. The primary outcome measure was the proportion of eyes at week 52 that maintained best-corrected visual acuity (BCVA) within 0.3 logarithm of the minimum angle of resolution (logMAR) units change from baseline. The secondary outcome measures were mean change from baseline in central retinal thickness (CRT) and mean number of injections.

Results: We enrolled 41 patients. At baseline, the mean BCVA was 0.56 and 0.44 logMAR units in the TAE and E2M groups ($P = 0.28$). At week 52, the mean BCVA change from baseline was -0.32 and -0.26 logMAR units in the TAE and E2M groups ($P = 0.46$). All eyes maintained BCVA in both the TAE and E2M groups at week 52. The mean CRT was $374 \mu\text{m}$ and $353 \mu\text{m}$ at baseline in the TAE and E2M groups ($P = 0.93$). At week 52, the mean CRT change from baseline was $-161 \mu\text{m}$ and $-153 \mu\text{m}$ in the TAE and E2M groups ($P = 0.86$). The mean number of injections was 7.5 and 8.0 for the TAE and E2M groups ($P < 0.0001$).

Conclusions: TAE regimen of aflibercept was able to improve both BCVA and CRT as well as the E2M regimen in wet-AMD patients. The number of injections for the TAE regimen was smaller than that for the E2M regimen. TAE regimen offers reduced cost while maintaining similar clinical outcomes.

Psychogenic Stress Induced Cystoid Macular Edema in Patients with Reduced General Health

First Author: Eva-Maria **BORKENSTEIN**

Co-Author(s): Andreas **BORKENSTEIN**

Purpose: To present cases of strongly reduced general health conditions because of mental stress (death in the family) and formation of acute cystoid macular edema with loss of visual acuity without any pre-existing macular disease, systemic risk factors or ocular trauma, and surgery in the previous 6 months.

Methods: Evaluation of exams was done including visual acuity (ETDRS), slit lamp, intraocular pressure, funduscopy, and optical coherence tomography (OCT) and compared with diagnostic findings in acute mental stress situations. In all cases cataract surgery was performed in the past (>6 months previously) without any complications. In the postoperative course BCDVA achieved <0.1 logMAR and BCNVA 0.1-0.0 logMAR. There were no systemic disorders and no ocular inflammations, glaucoma, or postoperative complications were observed.

Results: After severe and painful events occurred (death in the family) patients recognized bad general health conditions and 7-10 days later rapid vision loss for near and far. Acute cystoid edema was diagnosed with OCT and the BCNVA worsened >0.4 logMAR. Local therapy with corticosteroids (periocular injection), carbonic dehydrase inhibitors, and NSAID in systemic (lornoxicam) and topical (bromfenac) forms were prescribed immediately. OCT and visual acuity improved within 5 days and BCNVA again achieved 0.1-0.0 logMAR.

Conclusions: Irvine Gass syndrome is already well known after surgical complications or other systemic risk factors with a peak of incidence 3-6 months post-operatively. We want to present these cases to show that mental, psychogenic stress, and reduced general health conditions can obviously lead to distinct cystoid macular edema even later.

Safety and Efficacy of Razumab (Ranibizumab), the New Biosimilar in India: Our Experience

First Author: Srinivas **JOSHI**

Co-Author(s): Guruprasad **AYACHIT**, Sameera **V V**

Purpose: To evaluate the safety and efficacy of biosimilar intravitreal Razumab for the treatment of diabetic macular edema (DME), neovascular age-related macular degeneration (AMD), and macular edema secondary to retinal vein occlusions (RVO).

Methods: A prospective analysis was performed on consenting patients with DME (group 1), neovascular AMD (group 2), and macular edema secondary to RVO

(group 3) receiving Razumab. All patients received Razumab at baseline. A routine Snellen visual acuity assessment, anterior segment, fundus evaluation with photo, and optical coherence tomography (OCT) imaging was done at days 0, 1, 7, and 30. ERG was performed at baseline and day 30 (23 eyes of patients who could afford it). Primary outcome measured safety parameters that included signs of clinical and ERG toxicity. Secondary outcome measures included changes in BCVA and macular thickness (CMT).

Results: In total, 179 eyes of 165 patients received Razumab injection between November 2015 and July 2016. No serious drug-related ocular adverse events were identified. There were no significant differences in implicit times, "a" and "b" wave amplitudes, or b/a ratios at 1 month when compared with baseline ($P = 0.507$). Mean pretreatment best corrected visual acuity (BCVA) was 0.680 ± 0.40 logMAR with CMT 355.66 ± 128.07 μm , and post injection BCVA at day 30 was 0.581 ± 0.362 logMAR with CMT reducing to 296.87 ± 92.93 μm indicating statistical significance ($P < 0.001$, $P < 0.0001$), respectively, for all groups.

Conclusions: Biosimilar ranibizumab (Razumab) for all 3 groups was tolerated over a month with improvements in BCVA and CMT without detectable ocular or systemic toxicity. While the long-term safety and efficacy remain unknown, these short-term results suggest that this new biosimilar could become a safe, low-cost therapy for macular diseases.

Short-Term Efficacy of Intravitreal Aflibercept Injections for Retinal Angiomatic Proliferation

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Co-Author(s): Lan-Hsin **CHUANG**, Chi-Chun **LAI**, Nan-Kai **WANG**, Wei-Chi **WU**

Purpose: To evaluate the short-term efficacy of intravitreal injections of aflibercept (IVA) to treat retinal angiomatic proliferation (RAP) and identify factors related to functional outcomes.

Methods: This retrospective case series consisted of 19 eyes in 19 patients with RAP. All 19 eyes received 3 monthly consecutive IVA. The primary outcome measures were best-corrected visual acuity (BCVA) and central retinal thickness (CRT) after the last IVA.

Results: Of the 19 treated eyes, 8 (42%) were pre-treated with 1 dose of bevacizumab 1 month prior to the initiation of treatment with aflibercept. BCVA was significantly improved and CRT was significantly reduced after 3 consecutive IVAs ($P = 0.014$ and $P = 0.0002$, respectively). Stabilization or improvement in BCVA was observed in 17 eyes (90%) treated with IVA. Eyes with baseline fibrovascular pigment epithelial detachment (PED) showed no significant gain in BCVA, and fibro-



vascular PED was negatively correlated with final BCVA (Spearman correlation coefficient = -0.481, $P = 0.037$). The mean follow-up was 3.5 ± 0.5 months.

Conclusions: In this short-term study, 3 consecutive IVAs showed efficacy for improving vision and reducing retinal edema in RAP patients. Eyes with fibrovascular PED showed poorer responses, and the presence of fibrovascular PED at baseline was negatively correlated with visual outcomes.

The Effect of Intravitreal Dexamethasone Implant (Ozurdex) for Macular Edema Secondary to Sympathetic Ophthalmia

First Author: Jian-Sheng WU

Co-Author(s): San-Ni CHEN

Purpose: To report the effect of intravitreal dexamethasone implant in a patient with refractory macular edema secondary to sympathetic ophthalmia.

Methods: Case report.

Results: A 63-year-old male patient presented with blurred vision in the right eye (OD). He had a history of closed funnel retinal detachment OD post vitrectomy, encircle buckling, endolaser, and silicone oil infusion 15 months previously. The silicone oil had been withdrawn 1 year prior. Best corrected visual acuity (BCVA) was 20/200 OD. Slit lamp showed corneal KPs with mild reaction in the anterior chamber OD. Fundus examination revealed attached retina and macular edema OD. Optical coherence tomography (OCT) disclosed cystoid macular edema with central retinal thickness of $723 \mu\text{m}$ OD. FAG showed multiple hypofluorescing and hyperfluorescing spots at the RPE level in the early venous phase, which then continued to late leakage and resulted in cystoid macular edema. Cystoid macular edema secondary to sympathetic ophthalmia OD was suspected. After posterior sub-tenon injection of triamcinolone acetonide and oral prednisolone 1 mg/kg were administered, the cystoid macular edema improved. However, recurrence was noted after prednisolone was tapered. Then he was treated with a 0.7 mg intravitreal injection of dexamethasone implant (Ozurdex). BCVA improved to 20/100 OD. The cystoid macular edema decreased and the central retinal thickness was $333 \mu\text{m}$ OD. However, recurrent cystoid macular edema OD developed 3 months later. The intraocular pressure (IOP) was mildly elevated and well controlled with a single anti-glaucoma agent.

Conclusions: Intravitreal dexamethasone implant provides anatomic and functional improvement and may represent a valuable treatment option for patients with refractory macular edema secondary to sympathetic ophthalmia.

The Relation of RPE Atrophy and Long-Term Visual Outcomes in Japanese Patients with RAP

First Author: Masaaki SAITO

Co-Author(s): Sanae ABE, Shungo NISHIYAMA, Takeshi YOSHITOMI

Purpose: To evaluate the relation of retinal pigment epithelium (RPE) atrophy and long-term visual outcomes in Japanese patients with retinal angiomatous proliferation (RAP).

Methods: We retrospectively reviewed 24 eyes of 18 patients (6 men, 12 women; age range, 62-90 years; mean \pm standard deviation, 78.2 ± 7.7 years) with RAP treated with anti-vascular endothelial growth factor (VEGF) therapy from June 2007 to September 2015. All patients completed over 6 months of follow-up.

Results: The initial treatment was performed with combination therapy of intravitreal anti-VEGF injections and photodynamic therapy in 19 eyes and anti-VEGF monotherapy in 5 eyes. The mean logarithm of the minimum angle of resolution best-corrected visual acuity (BCVA) levels declined significantly ($P < 0.001$) from 0.75 at baseline to 1.04 at final visit. The mean follow-up was 29.9 months. New RPE atrophy was seen in 7 (29.2%) eyes. Of the 7 eyes, the mean change in BCVA at final visit was a decline of 6.1 lines, which shows a significant difference compared with that of eyes without RPE atrophy (decline of 1.6 lines) ($P = 0.038$). Predictive factors of incidence of RPE atrophy with multiple regression model analysis were the presence of reticular pseudodrusen ($P = 0.023$), thinner choroid ($P = 0.012$), follow-up periods ($P < 0.01$), and using anti-VEGF monotherapy ($P < 0.01$). No severe adverse events were seen.

Conclusions: RPE atrophy is one of the remarkable risk factors for declining visual acuity in the treatment of patients with RAP. It is important to comprehend predictive factors for incidence of RPE atrophy.

The Role of Optical Coherence Tomography Angiography in the Diagnosis and Monitoring of Paracentral Acute Middle Maculopathy

First Author: Wei Kiong NGO

Co-Author(s): Louis LIM, Tock-Han LIM, Colin TAN

Purpose: Paracentral acute middle maculopathy (PAMM) is characterized by vaso-occlusion resulting in deep retinal capillary ischemia. The use of fluorescein angiography (FA) to delineate the macular lesions in PAMM has met with limited success. We used optical coherence tomography angiography (OCTA) to image the vascular lesions of the superficial and deep retinal plexuses in PAMM.



Methods: Case report of a patient with PAMM followed up over 10 weeks with multimodal imaging.

Results: A 29-year-old female reported bilateral paracentral scotomata with visual acuity of 6/6 (right) and 6/9 (left). Clinical examination revealed a small wedge-shaped discoloration temporal to the fovea in the left eye. Spectral-domain OCT showed a small area of hyper-reflectivity temporal to the fovea at the level of the inner nuclear layer. Fundus autofluorescence and infrared imaging were normal. On FA, an indistinct irregularity of the fovea avascular zone (FAZ) was noted in the left eye, while the right appeared normal. OCTA showed irregular FAZ in both eyes, with areas of capillary dropout in both the superficial and deep plexuses. Retinal vessel densities were reduced in the parafoveal region. Over 10 weeks, symptoms improved subjectively and the region of hyper-reflectivity on OCT resolved. Follow-up OCTA scans, however, still showed regions of FAZ irregularity and capillary dropout in both eyes.

Conclusions: This case illustrates the advantages of OCTA in detecting irregularities of the FAZ and areas of capillary dropout where there were minimal findings using conventional imaging modalities. This helped to confirm the diagnosis and monitor the progression during follow-up.

Unilateral Purtscher Retinopathy: Case Series

First Author: Rajya GURUNG

Purpose: To present a case series of 4 patients with unilateral retinal angiopathy following nonocular trauma.

Methods: Four cases of unilateral retinal angiopathy following nonocular trauma presented in the vitreo-retina department of our hospital. They presented with best corrected visual acuity (BCVA) ranging from hand movements (HM, 2 patients), 6/60, and 6/36. Three patients were male with 1 female. A detailed anterior segment and fundus evaluation was done in all cases. Fluorescein angiography was done according to the availability of the machine. The findings were compatible with Purtscher retinopathy. All 4 patients were managed conservatively with oral steroids for a duration of 1 month.

Results: There was improvement in vision of a minimum of 2 lines in all cases at 1-month follow-up. The retinal findings gradually decreased on subsequent follow-up.

Conclusions: Purtscher retinopathy is a rare but sight-threatening eye condition, most commonly seen in young or middle-aged men and after trauma. Spontaneous visual recovery is seen in most cases.

Vision Preservation in Eyes of Polypoidal Choroidal Vasculopathy with Low-Dose Intravitreal Triamcinolone Acetonide

First Author: I Chia LIANG

Co-Author(s): Hsiang-Wen CHIEN, Yi-Ru LIN, Kwan-Rong LIU

Purpose: To evaluate the efficacy and adverse effects of using low-dose intravitreal triamcinolone acetonide (IVTA) to preserve vision in polypoidal choroidal vasculopathy (PCV) eyes.

Methods: This retrospective chart review examined 8 eyes of 7 PCV patients, for whom verteporfin photodynamic therapy (vPDT) or anti-vascular endothelial growth factor (VEGF) therapy was not affordable/available and also with intolerable risk because of underlying cardiovascular and/or cerebrovascular ischemia. Low-dose IVTA (1 mg/0.025 mL) monotherapy was administered and repeated every 4 weeks if intraretinal edema or subretinal fluid persisted.

Results: The median follow-up time was 26.4 months. Three eyes (3/8) maintained their initial best-corrected visual acuity and 4 eyes (4/8) exhibited improvement, whereas 1 eye (1/8) sustained some loss. The mean injection number per month was 0.7 for the first 6 months, after which it decreased to 0.4. In regard to adverse effects, intraocular pressure (IOP) of more than 21 mm Hg was noted as persisting for a few weeks in 4 eyes, and that of more than 30 mm Hg was noted once in 1 eye. The increased IOP was adequately controlled by using IOP-lowering agents. Two initially phakic eyes each underwent cataract surgery in the 12th and 14th months after treatment.

Conclusions: Low-dose IVTA therapy may be valuable for preserving the vision of PCV patients while vPDT or anti-VEGF is not affordable/available or of those with underlying diseases for whom anti-VEGF therapy is with intolerable risk.

Retina (Surgical)

18-Month Review of the Results of Suprachoroidal Macular Buckling Surgery on Myopic Tractional Maculopathy as Initial Experience in Hong Kong Chinese

First Author: Chi-Wai TSANG

Purpose: To evaluate the 18-month outcome and results of suprachoroidal buckling procedures using a suprachoroidal catheter in treating myopic tractional maculopathy.

Methods: A suprachoroidal catheter was used to deliver stabilized, cross-linked, and long-acting hyaluronic acid (Restylane Perlane) as a filler in the suprachoroidal



space to form a choroidal indent effect in the macula. The results of 3 consecutive cases (1 myopic foveoschisis with foveal detachment, 1 myopic foveoschisis with small macular hole, and 1 myopic macular hole retinal detachment) were reviewed with minimum follow-up of 18 months.

Results: All cases showed anatomical foveal retinal layer restoration. The cases with macular hole were closed on choroidal buckle. The choroidal indent was shown to be adequate over 18 months. The best corrected visual acuity improved from 5/60, finger counting, and 0.4 preoperatively to 0.2, 4/60, and 0.8, respectively, at postoperative 18 months. One case had recurrent myopic choroidal neovascularization requiring intravitreal Lucentis injection. No major intraoperative and postoperative complications were noted.

Conclusions: Suprachoroidal macular buckling surgery is a new technique of treating myopic tractional maculopathy with promising short-term outcomes. Studies on long-term safety and efficacy are warranted.

A Rare Case of Vitrectomy-Induced Sympathetic Ophthalmia in a Young Boy

First Author: Pritam BAWANKAR

Co-Author(s): Manabjyoti BARMAN, Harsha BHAT-TACHARJEE, Dipankar DAS, Satyen DEKA, Hemalata DEKA

Purpose: To describe a case of sympathetic ophthalmia following vitrectomy for retinal detachment due to blunt trauma.

Methods: Retrospective case report.

Results: An 11-year-old male child underwent band buckle surgery with vitrectomy for retinal detachment following blunt trauma in the right eye. On the 26th postoperative day the patient reported diminution of vision in the left eye (OS). Ocular examination revealed flare in the anterior chamber with 2+ vitreous cells, exudative retinal detachment (RD), and disc hyperemia OS. B scan ultrasonography revealed increased retino-choroidal thickness more than 2 mm and shallow RD. The patient was put on intravenous methylprednisolone therapy for 3 days followed by a tapering dose of oral steroids. The patient is maintaining normal vision at present with medication in the sympathizing eye.

Conclusions: Sympathetic ophthalmia can develop following vitrectomy surgery but has a good visual prognosis with appropriate treatment.

Comparison of Surgical Outcomes of Pars Plana Vitrectomy for the Treatment of Highly Myopic Lamellar Macular Hole with and Without the Inverted Lamellar Hole-Associated Epiretinal Proliferation

First Author: Keiko OTSUKA

Co-Author(s): Hisanori IMAI, Makoto NAKAMURA

Purpose: To compare surgical outcomes of pars plana vitrectomy (PPV) for the treatment of highly myopic lamellar macular hole (HM-LMH) with and without the inverted LMH-associated epiretinal proliferation (LHEP).

Methods: A retrospective comparative analysis of 19 consecutive eyes from 19 patients with 6 months of follow-up was performed. Postoperative logMAR best-corrected visual acuity (BCVA), foveal threshold of Humphrey Field Analyzer (HFA), shape of foveal contour, and continuity of ellipsoid zone in optical coherence tomography were evaluated.

Results: Ten patients underwent PPV with the inverted LHEP (group A) and 9 patients without it (group B) for the treatment of HM-LMH. There were no differences in demographic and preoperative ocular characteristics between the 2 groups. Postoperative log MAR BCVA was 0.10 ± 0.16 in group A and 0.07 ± 0.21 in group B ($P = 0.76$), respectively. Postoperative foveal threshold (dB) was 32.3 ± 2.7 in group A and 33.4 ± 3.4 in group B ($P = 0.44$), respectively. The shape of foveal contour was regular in 8 eyes and irregular in 2 eyes in group A, and regular in 7 eyes and irregular in 2 eyes in group B, respectively ($P = 0.97$). Ellipsoid zone was continuous in 8 eyes and disrupted in 2 eyes in group A, and continuous in 7 eyes and disrupted in 2 eyes in group B, respectively ($P = 0.97$).

Conclusions: The surgical results of the 2 methods were comparable. The inverted LHEP may not be needed for the treatment of HM-LMH.

Early Management of Traumatic Extrusion of Posterior Chamber Intraocular Lens Following Trauma to Prevent Severe Visual Loss

First Author: Mominul ISLAM

Co-Author(s): Tanvir AHMED, Quazi IFTEKHAR, Mohammad MALEK, Md Arif PATHAN

Purpose: This article shares an experience of the early management of a case of traumatic extrusion of posterior chamber intraocular lens (IOL) in the subconjunctival space following blunt trauma, in order to preserve good vision.

Methods: A 75-year-old male presented with acute dimness of vision following trauma. On examination, visual acuity was hand movements only. Slit lamp exam revealed a posterior chamber IOL in the subconjunctival space. The patient was, as expected, aphakic, with

cells and vitreous in the anterior chamber and with concomitant vitritis and secondary glaucoma, 7 days following blunt trauma. The patient had undergone cataract surgery with IOL implant 10 years previously. There was no evidence of any other scleral injury, indicating the lens extruded through the scleral tunnel incision.

Results: The patient was managed by topical prednisolone, atropine, anti-glaucoma medication, and oral prednisolone. After controlling inflammation and intraocular pressure, anterior vitrectomy and conjunctival peritomy with removal of posterior chamber IOL from subconjunctival location was performed, followed by prophylactic 360-degree diode barrage laser. After 1 month vision was 6/36 (with +11 diopter lens), and the patient has been planned for a scleral-fixed IOL implantation.

Conclusions: Traumatic extrusion of posterior chamber IOL in the subconjunctival space has rarely been reported, and here it is seen that the IOL extruded through an apparently healed scleral tunnel. Prompt management helped prevent severe visual loss in the patient.

Early Vitrectomy with Silicone Oil to Cure Severe Ocular Injury

First Author: Phu NGUYEN

Purpose: To evaluate outcomes of vitrectomy within 100 hours for treating severe ocular injury.

Methods: Fifteen patients in the trauma department at Vietnam National Institute of Ophthalmology with Ocular Trauma Score (OTS) < 65 points where vitrectomy was indicated within 100 hours after severe ocular injury were reviewed. The success was the criteria in terms of anatomy, function, and early complications.

Results: Functional outcomes were as follows: 2/15 eyes had visual acuity (VA) of 20/200 to 20/20, 1/15 eyes had VA better than 20/400, 3/15 eyes had VA better than 20/400 and under counting fingers at 1 m, and 9/15 eyes had VA from ST(+) to under counting fingers at 1 m. Anatomical outcomes showed that 100% of cases were able to keep the eye, 13/15 eyes had retina attached, and there was phthisis bulbi in 2/15 eyes. Complications included PVR in 2/15 eyes, glaucoma in eyes 2/15, and cataract in 1/15 eyes.

Conclusions: Early vitrectomy in patients with severe ocular injury can keep the eye and vision was partly preserved. The prognosis depends on damage to the retina (stuck/loss) during injury and damage to the macula.

Efficacy of Subthreshold Micropulse Laser Therapy (577-nm) for the Treatment of Chronic Central Serous Retinopathy: Our Know-How

First Author: Sameera V V

Co-Author(s): Guruprasad AYACHIT, Srinivas JOSHI, Shravan MASURKAR

Purpose: To assess the clinical efficacy of 577-nm micropulse laser therapy (MPLT) for the treatment of chronic central serous retinopathy (CSR).

Methods: Four eyes of 4 patients with chronic CSR (>4 months' duration) were subjected to complete ophthalmic examination, fundus fluorescein angiography (FFA), fundus autofluorescence (FAF), and spectral domain optical coherence tomography (SD-OCT). All eyes were subjected to 577-nm subthreshold MPLT using the IQ 577 laser system and followed up after 4 weeks, 2 months, and 3 months. Treatment was applied as multiple laser spots (grid of 5 × 5) with a duty cycle of 5% over the areas of focal and diffuse leaks with no spot spacing at all. The primary outcome was change in subretinal fluid (SRF) height and central macular thickness (CMT) measured by SD-OCT. The secondary outcome measured change in best-corrected visual acuity (BCVA).

Results: The average age of the patients was 36.4 years and the mean duration of leak was 7 months. All were males and responded to treatment. The mean pretreatment SRF height was 340.25 μm and post treatment showed a mean reduction to 102.75 μm (day 30) and 38.25 μm (3 months), respectively (P = 0.0002). The mean CMT improved from 459.5 μm to 233.5 μm in 3 months (P = 0.006). There was no evidence of retinal or retinal pigment epithelium damage on SD-OCT or FAF. No visible laser marks could be detected by clinical observation, SD-OCT, or FAF. The mean BCVA improved 3 months after laser treatment from 0.71 to 0.27 (P = 0.046).

Conclusions: Subthreshold MPLT is a cost effective and safe treatment option for patients with chronic CSR.

Epiretinal Membrane Surgery: Outcomes with or Without Adjuvant Techniques

First Author: Nishant RADKE

Co-Author(s): Amrita MUKHERJEE, Snehal RADKE, Charudutt KALAMKAR

Purpose: To study the structural and functional outcomes of epiretinal membrane (ERM) peeling with or without adjuvant techniques like additional internal limiting membrane (ILM) peeling and/or intravitreal triamcinolone acetonide (IVTA) injection.

Methods: Twenty pseudophakic eyes with idiopathic ERM with no history of diabetes, retinal vein occlu-



sions, hypertension, trauma, or uveitis were included in the study. Minimum of 1-year follow-up was considered. Duration from first surgery until stabilization of macular anatomy precluding any further invasive treatment like surgery or injections was noted. Stratified randomized prospective, interventional, comparative case series of consecutive patients examined and managed from August 2012 to April 2016. Groups were randomized for ERM removal, ERM removal with IVTA, ERM removal with ILM peeling (double peeling), and ERM with ILM peeling and IVTA. Brilliant Blue green 0.05% (BBG), IVTA 4 mg/0.1 mL, and Trypan Blue 0.15% (TP) were used.

Results: Nine patients were males and 11 were females. P value using *t* test for change in visual acuity was statistically significant for the double peeling as well as double peeling with IVTA groups, whereas it was not significant for the ERM alone and ERM with IVTA groups. P value for one way ANOVA for duration of follow-up until stable macular anatomy was 0.0289 and it was significant.

Conclusions: In our small series, double peeling of ERM and ILM with IVTA seems to be a safe method in minimizing duration of healing and also results in better visual acuity.

Factors Associated with Corneal Epithelial Defect After Pars Plana Vitrectomy

First Author: Wei-Yu **CHIANG**

Co-Author(s): Yun-Wen **CHEN**, Hsi-Kung **KUO**, Jong-Jer **LEE**

Purpose: To investigate the risk factors associated with corneal epithelial defects (CED) and delayed healing (exceeding 1 week) following pars plana vitrectomy (PPV).

Methods: This retrospective study enrolled patients who underwent PPV at a single center in Taiwan between 2011 and 2012. Medical records were reviewed, including demographics, underlying disease, surgical indication, operation parameters, and existence of CED. These data were statistically analyzed. All patients were evaluated during follow-up at day 1 and week 1 after PPV. Patients with persistent CED 1 week after PPV were diagnosed with delayed healing.

Results: A total of 255 patients were included in the study, consisting of 139 men and 116 women, with a mean age of 56.9 years. PPV was performed under the indications of rhegmatogenous retinal detachment (RRD), diabetic retinopathy, or vitreoretinal interface disease. Out of 255 eyes, 59 developed CED 1 day after surgery (23.1%), and CED was associated with younger age, diabetes mellitus (DM), RRD, longer duration of surgery, and silicone oil use during surgery. Among them, 7 patients (11.9%) demonstrated delayed healing, which was associated with a higher rate of DM (P

= 0.085) compared to patients who healed within 1 week.

Conclusions: Patients with RRD, longer duration of surgery, and DM may be at risk of developing CED after PPV. In addition, patients with DM demonstrated a higher incidence of delayed corneal healing.

High-Frequency Electric Welding versus Diode Laser Photocoagulation as Intraoperative Retinopexy in Vitrectomy for Rhegmatogenous Retinal Detachment

First Author: Ning **CHEUNG**

Co-Author(s): Vladimir **NAUMENKO**, Nataliya **PASYECHNIKOVA**, Nicolay **UMANETS**

Purpose: High-frequency electric welding (HFEW) has been developed as a novel retinopexy technique to be used during vitrectomy surgery for rhegmatogenous retinal detachment (RRD). This study aims to compare HFEW technique with diode laser photocoagulation.

Methods: A retrospective interventional cohort study of 112 patients (112 eyes) with primary RRD repaired by vitrectomy surgery. Of these patients, 53 had retinopexy by HFEW method and 59 patients had retinopexy by 810-nm diode laser. Anatomical and functional outcomes were compared between the 2 groups of patients at short- (2 months) and long-term (12 months) follow-up.

Results: Mean visual acuity was significantly better in the HFEW group than in the diode laser group at 2 months of follow-up (0.29 versus 0.21, P = 0.035). This is mostly related to the avoidance of endotamponading agent in 30% of the patients in the HFEW group. There was no significant difference in visual acuity at 12 months. There was also no significant difference in the rate of retinal re-detachment (3.8% in the HFEW group versus 10.2% in the diode laser group; P = 0.18). No adverse outcomes occurred in relation to the use of either retinopexy technique.

Conclusions: HFEW retinopexy was a safe and efficient method to establish chorioretinal adhesion during vitrectomy surgery for RRD. It may allow more instant formation of adequately firm chorioretinal adhesion, obliterating the need for endotamponade for some patients. This may result in faster visual recovery and better visual outcome in the short-term, as well as the convenience of not needing to posture or avoid air travel during the early postoperative period.

Laser Embolotomy for Branch Retinal Artery Occlusion: A Case Report

First Author: Jen-Yu **HUANG**

Co-Author(s): San-Ni **CHEN**

Purpose: To describe a patient with branch retinal ar-



tery occlusion treated with neodymium-doped yttrium aluminium garnet laser arteriotomy and embolectomy.

Methods: Interventional case report.

Results: A 67-year-old man noted sudden loss of vision for 3 days. A lower branch retinal artery occlusion was diagnosed. Arteriotomy and embolectomy with neodymium-doped yttrium aluminium garnet laser was performed. Laser treatment resulted in transient vitreous and subretinal hemorrhages. Displacement of embolus with partial return of retinal perfusion and improvement of vision were noted at 3 months. Subsequent optical coherence tomography showed thinning of the inner retinal layers.

Conclusions: Neodymium-doped yttrium aluminium garnet laser embolectomy in a patient with branch retinal artery occlusion resulted in extrusion of the embolus, reopening of the branch retinal artery, and improvement of vision. Vitreous and subretinal hemorrhages were common complications.

Long-Term Course Following Vitreous Surgery for Epiretinal Membrane

First Author: Takefumi KISHI

Co-Author(s): Kota ARAI, Hiroshi TSUNEOKA, Akira WATANABE, Tomoyuki WATANABE, Shoyo YOSHIMINE

Purpose: The spread of microincision vitreous surgery has recently led to expanded indications for vitreous surgery in patients with vitreoretinal disease. With diagnostic advances using optical coherence tomography, vitreous surgery for epiretinal membrane (ERM) has come to be performed in many patients with good visual acuity. This study investigated patients in whom the long-term course of visual acuity and central retinal thickness (CRT) could be followed for at least 3 years after vitreous surgery for ERM.

Methods: Subjects were 43 patients (43 eyes) who underwent 23- or 25-gauge vitreous surgery for ERM in Jikei University Hospital between July 2010 and June 2013. Mean age was 66.0 ± 9.0 years. Observations continued for a mean duration of 3.91 ± 0.58 years (range, 3-5 years). Preoperative mean logMAR visual acuity was 0.30 ± 0.24 . Mean CRT was 429.0 ± 86.2 μm , and mean axial length was 24.12 ± 1.72 mm. Thirty-seven patients underwent simultaneous cataract surgery.

Results: At 1 week, 1 month, 6 months, 1 year, 1.5 years, 2 years, 2.5 years, 3 years, 3.5 years, 4 years, and 5 years postoperatively, mean logMAR visual acuity was 0.44, 0.21, 0.14, 0.13, 0.11, 0.12, 0.10, 0.14, 0.14, 0.12, 0.16, 0.13, and 0.09, respectively, and CRT (μm) was 417.7, 382.3, 380.3, 359.9, 362.5, 343.1, 349.1, 356.2, 343.1, 345.2, 343.8, 365.5, and 352.0, respectively.

Conclusions: After microincision vitreous surgery for ERM, visual acuity improved for 1 year and CRT for 1.5

years, after which they remained stable.

Modified Chandelier Technique (4-Port Technique) for Bimanual Surgery in 20G Pars Plana Vitrectomy

First Author: Mominul ISLAM

Co-Author(s): Tanvir AHMED, Quazi IFTEKHAR, Mohammad MALEK, Md Arif PATHAN

Purpose: Bimanual vitrectomy in selected cases offers an additional option for bimanual surgery, particularly in procedures where extensive dissection is required. However, in a South Asian setting, 23/25/27 gauge (G) chandeliers are not widely available, in large part due to the costs involved. A cost-effective technique using 4 ports is described in the following report.

Methods: A case of diabetic tractional retinal detachment was treated with the 4-port technique. Conventional 3-port vitrectomy (20G/23G) was initially done. For convenience, the infusion port was done inferonasally (right eye), and an additional port was done inferotemporally. The light probe was held in place by an expert assistant, viewing through the assistant scope. The surgeon then performed bimanual dissection through the primary superior ports. Following completion of dissection of the membranes, the additional port was closed and the surgery completed as a routine case (with endolaser, perfluorocarbon-air exchange, and silicone oil tamponade).

Results: The advantage of this technique is that it is cost-effective, can use traditional 20G ports, and the light can be directed as required by the surgeon, using any of the 3 available ports. Light is much more focused compared to the chandelier technique, which offers diffuse illumination. The con is that an expert hand is required to hold the light in place.

Conclusions: Bimanual dissection improves quality and operating times, and we hope the adoption of the 4-port technique will improve the efficiency of surgery in the long run.

Novel Surgical Technique of Peeled Internal Limiting Membrane Repositioning in Idiopathic Macular Holes

First Author: Peiquan ZHAO

Co-Author(s): Ping FEI, Haiying JIN, Jie PENG, Qi ZHANG

Purpose: To investigate the visual and anatomical outcomes of a novel surgical treatment of peeled internal limiting membrane (ILM) repositioning in eyes with idiopathic macular holes (MH).

Methods: Clinical records of 6 eyes treated for idiopathic MH with at least 1 month of postoperative follow-up were reviewed retrospectively. All patients (5 females and 1 male) were treated with pars plana



vitrectomy, ILM peeling, perfluorocarbon liquid-assisted peeled ILM repositioning, and C3F8 tamponade. All eyes were phakic preoperatively. Six patients also underwent phacoemulsification and intraocular lens implantation at the same time. Pre- and postoperative best-corrected visual acuity (BCVA) and MH diameter along with postoperative adverse events were all recorded.

Results: Mean age of 6 patients was 60.50 ± 12.82 years (range, 44-79 years). The macular hole diameter was $371.67 \pm 97.55 \mu\text{m}$ (range, 289-495 μm). The mean follow-up was 2.08 ± 1.15 months (range, 1.00-4.00 months). At last visit, the MH were closed in all eyes (100.00%) and all eyes showed visual improvement. Mean preoperative BCVA was $\log\text{MAR } 0.93 \pm 0.26$. This had improved to a mean of $\log\text{MAR } 0.64 \pm 0.15$ at the final follow-up with a statistically significant difference ($P = 0.018$, Student test). No postoperative adverse events were noted.

Conclusions: The novel surgical technique of peeled ILM repositioning is safe and efficient in idiopathic MH with a diameter of less than 500 μm . The repositioned ILM may have potential to preserve the inner retinal layers and contour of the macula.

Outcomes of 27-Gauge Microincision Vitrectomy Surgery for Rhegmatogenous Retinal Detachment

First Author: Terumi MAKINO
Co-Author(s): Yasuhiro OHKUMA, Hiroshi TSUNEOKA, Akira WATANABE, Tamaki GEKKA

Purpose: Advancements are being made in the field of microincision vitrectomy surgery, and use of the 27-gauge (27G) system is becoming increasingly common. Herein, we investigate the surgical outcomes of cases that underwent 27G vitrectomy surgery in eyes with rhegmatogenous retinal detachment (RRD).

Methods: This study included 51 patients (51 eyes) who underwent 27G vitrectomy surgery for RRD between July 2014 and May 2016. There were 46 men (46 eyes) and 5 women (5 eyes), and the mean age was 60 years. Of these patients, 32 (32 eyes) simultaneously underwent cataract surgery. A 27G 4-port system was used for the vitrectomy surgery in all patients. A gas tamponade was performed using 20% sulfur hexafluoride gas, and the patients were placed in the prone position after the surgery. We investigated the duration of the surgery, complications during and after surgery, reattachment rate after surgery, and ocular pressure 1 day after day operation.

Results: The mean duration of the surgery was 62 minutes, and the surgery was completed without suture for all patients. The mean ocular pressure on the first postoperative day was 17.2 mm Hg, and there were no

cases with low ocular pressure. Vitreous hemorrhage was seen in 1 eye, which improved during the observation period. There were no cases of re-detachment.

Conclusions: The 27G vitrectomy surgery is a useful and safe procedure for RRD.

Outcomes of Vitreoretinal Surgery for Pediatric Abusive Head Trauma

First Author: An-Lun WU
Co-Author(s): Shao-Hsuan HSIA, Yih-Shiou HWANG, Chi-Chun LAI, Nan-Kai WANG, Wei-Chi WU

Purpose: To describe our experience in surgical management of abusive head trauma (AHT) and assess the structural and visual outcomes.

Methods: Retrospective, interventional case series of pediatric AHT requiring ocular surgical intervention from January 1, 2000, to October 31, 2015. The demographic data, surgical indication, and associated anatomical and visual outcomes were reviewed.

Results: Fifteen eyes of 10 children were included and analyzed. The mean age was 7.31 ± 6.57 months. The mean follow-up was 52.4 months. A total of 7 eyes (46.7%) of 4 children underwent primary vitrectomy for nonclearing vitreous hemorrhage. In 4 eyes of 2 children, internal limiting membrane (ILM) peeling was considered necessary because of sub-ILM hemorrhage. Four eyes (26.7%) of 4 children with macular pucker underwent vitrectomy with epiretinal membrane peeling. Two eyes (13.3%) of 2 children with retinal detachment underwent vitrectomy with scleral buckling in 1 case and with lensectomy in another. These 2 eyes achieved retinal attachment in a single operation. Bilateral eyes (13.3%) in 1 child experienced macular hole and were treated with vitrectomy and ILM peeling, and holes closed successfully after the surgery. Postoperative complications included optic disc atrophy in 7 eyes (46.7%) of 4 children and macular scar in 3 eyes (33.3%) of 3 children. Favorable visual acuity of 20/200 or better was achieved only in 3 (20%) of the 15 eyes.

Conclusions: Despite a substantial proportion of children having anatomical success, visual prognosis may be limited by retinal or brain injury.

Pneumoretinopexy with Sub-Retinal Fluid Drainage in Treatment of Bullous Rhegmatogenous Retinal Detachment

First Author: Ronel SOIBAM
Co-Author(s): Harsha BHATTACHARJEE, Satyen DEKA, Surpriya HAWAIBAM, Diva MISRA, Divya PANDEY

Purpose: To assess the role of pneumoretinopexy with sub-retinal fluid drainage in treatment of bullous rhegmatogenous retinal detachment (RRD).

Methods: In this retrospective, interventional case se-

ries 21 individuals were included. All patients presented with bullous rhegmatogenous retinal detachment. Peritomy of about 3-4 mm was made radial to limbus in the dependent area of detachment, then sub-retinal fluid (SRF) was drained externally and cryo was applied to breaks. Then 0.3 mL of gas was injected in the vitreous cavity and patients were advised to maintain the position depending on position of the break. Patients were evaluated after 1 month.

Results: There were 14 males and 7 females aged between 8 and 65 years. Duration of detachment ranged from 1 week to 3 months. Out of 21 eyes, 10 patients were myopic, 6 hyperopic, and 5 eyes were emmetropic. All patients had superior break between the 10 and 2 o'clock position except 1 patient who had a break at 3 o'clock. Recurrence was noted in 5 eyes by the end of 1 month. In 4 out of these 5 eyes, a new break was noted at a different position from the old break leading to re-detachment of the retina. One of these patients had pre-existing PVR changes. We tried this method of SRF drainage in pneumoretinopexy, due to which even bullous RD could be settled without major surgery.

Conclusions: This novel method can be tried in patients presenting with RRD with superior break. This not only eliminates the need for surgery and reduces the financial burden but also is very safe and effective.

Profile, Outcomes, and Management of Open Globe Posterior Segment Trauma in a Tribal Population of Central India

First Author: Nishant RADKE

Co-Author(s): Amrita MUKHERJEE, Snehal RADKE, Charudutt KALAMKAR

Purpose: To evaluate the profile, outcomes, and management of open globe posterior segment trauma in a tribal population from central India.

Methods: Twelve cases of posterior segment trauma who underwent subsidized treatment under the hospital welfare and government schemes were evaluated for their posterior segment trauma manifestations from April 2013 to August 2015. At least 1 year of follow-up from the last surgery was considered for inclusion. Closed globe injuries were excluded. Correlation co-efficient was calculated for final visual acuity (VA) and VA at presentation, delay in presentation, and ocular trauma score (OTS).

Results: Average age was 36.25 years with a male preponderance of 9:3. Eight patients had intraocular foreign bodies (IOFB). The youngest patient was 11 years old and the oldest was 68 years. Stone foreign body was seen in 1, whereas 7 had metal IOFB. Co-existing retinal detachment was seen in 9 and cataract in 10. Average final visual acuity in logMAR was 0.565. The average OTS score was 28.5. Belt buckle was used

in 6 cases and silicone oil in 9 cases with retinal detachment. Unpaired *t* test was used to calculate the *P* value between VA at presentation and final VA. *P* value was less than 0.0001. Strong negative correlation was noted between final VA and VA at presentation, delay in presentation, and OTS.

Conclusions: Delay in treatment results in poor structural and functional outcomes in posterior segment trauma. A majority of eyes are salvageable with encouraging results.

Recurrent Exudative Retinal Detachment After Trans-Scleral Cyclophotocoagulation in a Postvitrectomized Eye of a Sturge-Weber Syndrome Patient

First Author: Jie Jie LIM

Co-Author(s): Zabri BIN KAMARUDIN, Nor Ismarudi ISMAIL, Noram MAT SAAD

Purpose: To report a case of Sturge-Weber syndrome (SWS) with choroidal hemangioma and secondary glaucoma, which developed recurrent exudative retinal detachment (ERD) after cyclophotocoagulation that was treated with external drainage and transpupillary thermal therapy (TTT).

Methods: Case report.

Results: A 26-year-old Ibanese man, born with port-wine stain over the left side of the face, presented with left eye progressive blurring of vision for 1 month prior to presentation. Before attending our hospital, he had already undergone left eye vitrectomy and gas tamponade for total ERD. A huge choroidal mass found intraoperatively was diagnosed as choroidal hemangioma. After TTT, his vision remained static. Unfortunately, he further developed secondary glaucoma with poorly controlled intraocular pressure. Decision for low power cyclophotocoagulation was made. Two days after cyclophotocoagulation, he had dropped vision and was found to have developed recurrent ERD. He was later referred to our hospital. His left eye visual acuity was perception of light. Fundus showed subtotal ERD with macula involvement. He underwent left eye external drainage and endolaser. Postoperatively, a huge choroidal hemangioma was clearly seen inferotemporally, involving the macula, with residual ERD inferiorly. TTT was successfully performed the next day.

Conclusions: SWS with diffuse choroidal hemangioma can develop into severe ERD spontaneously or after any ocular procedures. During the course of management of glaucoma, our patient developed recurrent ERD after cyclophotocoagulation. This suggests that stimulation to choroidal hemangioma such as manipulation of the eyeball can induce ERD in some cases with SWS and diffuse choroidal hemangioma.



Refractive Error After Surgical Treatment for Macular Disease Measured Using the IOLMaster 700

First Author: Shoyo YOSHIMINE

Co-Author(s): Kota ARAI, Hiroshi TSUNEOKA, Akira WATANABE, Tomoyuki WATANABE, Tamaki GEKKA

Purpose: We used an IOLMaster 700 (Carl Zeiss Meditec AG) fitted for swept-source optical coherence tomography to measure postoperative refractive error after surgical treatment for macular disease performed during simultaneous microincision vitrectomy and cataract surgery.

Methods: Subjects comprised a consecutive series of 21 eyes that underwent preoperative measurement of the epiretinal membrane or macular hole with the IOLMaster 700 prior to 25- or 27-G simultaneous vitrectomy and cataract surgery between April 2015 and April 2016. Refractive error was defined as an absolute difference of >1 diopter (D) between the predicted value of refraction and the postoperative objective spherical equivalent. Eyes for which the fovea was identifiable on swept-source optical coherence tomography were regarded as exhibiting good fixation, and those in which the fovea was unidentifiable or was determined to be extrafoveal were regarded as exhibiting poor fixation.

Results: Mean postoperative refractive error for all cases was -0.32 ± 0.69 D, indicating increased myopia. Refractive error was present in 3 eyes and absent in 18. Of the 3 eyes that developed refractive error, 1 showed long axial length (29.14 mm) and 1 had steep corneal curvature. Poor fixation was evident in all 3.

Conclusions: Refractive error measured by the IOLMaster 700 compared with the predicted value after simultaneous microincision vitrectomy and cataract surgery was comparable with previously reported values. The possibility of postoperative refractive error should be taken into consideration for patients with macular disease who exhibit poor fixation.

Rhegmatogenous Retinal Detachment After Phakic Implantable Collamer Lens Implantation

First Author: Qianyin CHEN

Co-Author(s): Jinglin ZHANG

Purpose: To describe the characteristics and treatment of rhegmatogenous retinal detachment (RRD) in patients after phakic implantable collamer lens (ICL) implantation.

Methods: A review of the characteristics and treatment in 5 cases of RRD in patients after phakic ICL implantation from 2015 to 2016.

Results: Five patients were male, aged 27 ± 8 years old, diagnosed as RRD with a history of ICL implantation.

The interval between surgery and the onset of RRD was 17-45 months. Examinations including uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA), intraocular pressure, slit-lamp, fundus, OCT, and Pentacam were done before the surgery. Fundus examination showed that vitreous opacity and detached areas were more prevalent in the temporal quadrants and inferior quadrants. Four cases of retinal tears were temporal or inferotemporal and 14 cases of retinal tears were inferonasal. There was not lattice retinal degeneration in another eye. Five patients underwent para plana vitrectomy with 2 cases of gas (C3F8) tamponade and 3 cases filled with silicone oil tamponade, respectively. There was retinal reattachment postoperatively.

Conclusions: ICL implantation can correct high myopia effectively. High myopia is a risk factor for RRD, presenting with lattice degeneration and sychysis. Therefore, preoperative and postoperative fundus examinations are very necessary. Photocoagulation intervention is done for lattice degeneration and retinal break. The edge of ICL affect peripheral retina focus during surgery. According to the characteristics of vitreous and retina in these cases, vitrectomy is chosen.

Suprachoroidal Hemorrhage: A Surgical Nightmare. Is It All Doom and Gloom?

First Author: Farah ABU BAKAR

Purpose: To report a case of right eye massive suprachoroidal hemorrhage complicating phacoemulsification, which was treated successfully with drainage sclerotomy and pars plana vitrectomy.

Methods: Case report.

Results: A 79-year-old woman with no medical illness underwent phacoemulsification with intraocular lens implantation for right eye grade 4 cataract. Phacoemulsification of the lens was uneventful until after irrigation and aspiration of cortical matter, when the globe felt tense. Subsequently there was persistent iris prolapse in which a limited pars plana vitrectomy was done to enable the iris to be repositioned. Unfortunately, blood started oozing from the sclerotomy wound and darkening of red reflex was observed. Corneal wound was immediately secured and resultant high intraocular pressure was managed medically. Funduscopy and B scan confirmed massive choroidal hemorrhage involving 3 quadrants with breakthrough vitreous hemorrhage. She was only able to perceive light. Two weeks later, the patient underwent drainage sclerotomy and pars plana vitrectomy with silicone oil as endotamponade. Intraoperative findings were massive suprachoroidal hemorrhage, vitreous hemorrhage, and rhegmatogenous retinal detachment inferonasally. Postoperatively at 1 week, vision improved to counting fingers, 2 feet. The intraocular pressure was normal and the retina was completely flat.

Conclusions: Suprachoroidal hemorrhage is a potentially devastating complication of intraocular surgery. A relatively good visual outcome may be achieved with proper preoperative, intraoperative, and postoperative management. We report this case as an example of successful surgical management of suprachoroidal hemorrhage complicating phacoemulsification.

Sympathetic Ophthalmia: A Survey of Current Practice by UK Vitreoretinal Surgeons

First Author: Jason HO
Co-Author(s): Mahi MUQIT

Purpose: Sympathetic ophthalmia (SO) is an extremely rare but potentially blinding complication of surgery and ocular trauma. We explored contemporary patterns of SO clinical presentation, diagnostic findings, and management encountered by a large cohort of vitreoretinal (VR) specialists across the UK.

Methods: A 10-item confidential questionnaire was distributed online to members of the British and Eire Association of Vitreoretinal Surgeons in August 2016. Descriptive statistics were calculated using GraphPad Prism version 6.0.

Results: Seven of 48 (15%) respondents had encountered a single case of SO in the previous 12 months. Concerning their most recent case of SO, 64% of VR specialists managed these locally; the rest referred to tertiary centers. A total of 82% were trauma-related, 9% occurred post-cataract surgery, and 9% followed buckling surgery with drainage. The most common clinical findings were panuveitis (82%), Dalen-Fuchs nodules (55%), and vitritis (18%). A total of 72% of respondents performed OCT, 55% performed FFA, and 27% performed ICG. Treatment involved systemic steroid administration by 55% of those surveyed, while the remainder commenced patients on various immunomodulators, including mycophenolate (27%), azathioprine (9%), and adalimumab (9%). Nine percent performed enucleation to control inflammation. A total of 72% of cases required long-term immunosuppression, and 18% were treated without requiring ongoing immunomodulatory drugs. A total of 45% of VR surgeons reported a favorable visual outcome.

Conclusions: The survey data reflects the lack of a uniform consensus regarding optimal diagnosis and management of sympathetic ophthalmia. A prospective epidemiological surveillance study would update and inform the ophthalmic community of current trends in diagnosis and treatment.

Visual Outcome of Epiretinal Membrane Peeling in Diabetic Retinopathy

First Author: Wendy CHIN FENG
Co-Author(s): Kiet-Phang LING, Wei Wei LEE, Haslina MOHD ALI, Wan-Hazabbah WAN HITAM

Purpose: To evaluate the visual outcome of patients following vitrectomy and epiretinal membrane (ERM) peeling in diabetic retinopathy.

Methods: Retrospective review. Vitrectomy and membrane peeling were performed on 18 eyes out of 193 patients who underwent diabetic vitrectomy in 2015. Only those eyes with significant ERM without tractional retinal detachment affecting the macula or presence of vitreous hemorrhage were selected. Patients were followed up at 3 and 6 months. Visual outcome was assessed with postoperative logMAR visual acuity (VA). Prognostic factors such as preoperative vision, intraoperative complications, types of intravitreal tamponade used, postoperative lens status, and macula thickness were assessed.

Results: All patients underwent an uneventful operation. A total of 50% showed visual improvement in logMAR VA of more than 0.2, one sixth stabilized, and in one sixth vision deteriorated. A total of 16.7% defaulted during 6 months of follow-up. However, all the defaulters did show 2-3 lines improvement in the third month postoperatively. Patients with poor preoperative vision (4/60 or poorer) were those who retained worse postoperative vision, as they presented at more advanced stages which required oil/gas tamponade intraoperatively. Half of them had cataractous lens after operation. Combined cataract operations were performed in 5 patients (27.8%). Postoperatively, 55.56% were pseudophakic, 38.89% had immature cataract, and 5.56% had clear lens. As measured by optical coherence tomography, generally the mean central foveal thickness decreased from 332.75 to 266.31 μm .

Conclusions: ERM peeling improves vision in a majority of patients. However, guarded prognosis needs to be explained to patients who present with advanced stages of disease, as restoration of vision is rarely achieved.

Vitrectomy with Hemi-Inverted Internal Limiting Membrane Flap Technique for Macular Hole Retinal Detachment

First Author: Toshiya SAKURAI

Purpose: Hypermyopia may cause macular hole retinal detachment (MHRD). Vitrectomy with hemi-inverted internal limiting membrane (ILM) flap technique has been successfully performed for refractory MH. We report 2 cases using this technique for MHRD.

Methods: Case 1: A 76-year-old female. Her decimal best corrected visual acuity (BCVA) of the right eye was



0.04, and axial length was 27.46 mm. Vitrectomy with hemi-inverted ILM flap technique was performed for MHRD with posterior staphyloma. At 6 months postoperatively, decimal BCVA of the right eye was 0.03 with closure of macular hole and retinal reattachment.

Results: Case 2: A 67-year-old female. Her decimal BCVA of the right eye was 0.04, and axial length was 29.2 mm. Vitrectomy with ILM flap technique was performed for MHRD involving 2 quadrants. At 6 months postoperatively, decimal BCVA of the right eye improved to 0.6 with closure of macular hole and retinal reattachment.

Conclusions: Although long-term follow-up with a large number of patients is required, vitrectomy with hemi-inverted ILM flap technique for MHRD may be useful for macular hole closure and retinal reattachment.

Vitreous Proteomic Profile in Diabetic Retinopathy

First Author: Lei ZHOU

Co-Author(s): Ning (Danny) CHEUNG, Choi Mun CHAN, Gavin TAN, Xiaomeng WANG, Tien WONG

Purpose: Diabetic retinopathy (DR) is an ocular pathology that is caused by both type 1 and type 2 diabetes. This study aims to compare the proteomic profile of the vitreous in patients with diabetic retinopathy against patients without diabetic retinopathy.

Methods: Vitreous from 8 patients with proliferative diabetic retinopathy (DR group) and 8 patients with retinal detachment (non-DR group) were collected during surgery. Vitreous proteins were tryptically digested and analyzed using a 2-hour nanoLC-MS/MS and MS data was acquired using MS/MSALL with SWATH acquisition on a TripleTOF 5600 system. Data from 3 information dependent acquisition (IDA) experiments were combined and used as ion library for subsequent SWATH data processing. Several protein candidates were verified using high-resolution MRM (HR-MRM).

Results: In total, 343 vitreous proteins were identified and quantified using SWATH. Of these 343 vitreous proteins, 51 proteins were up-regulated and 75 proteins were down-regulated (ratio of DR vs non-DR > 1.5 or < 0.67). Some differentially expressed proteins (for example, SIPRAD targets 31, 32, and 33) were found to be associated with angiogenesis. Several interested protein targets were also verified by HR-MRM and Western blot.

Conclusions: The differential expression of several vitreous proteins between DR and non-DR may provide us with valuable information regarding the pathogenesis and possible new treatment of DR.

Celastrol Inhibits Transforming Growth Factor β 2-Induced Epithelial-Mesenchymal Transition of Lens Epithelial Cells

First Author: Liping WANG

Co-Author(s): Baoxin CHEN, Jieping CHEN, Shan HUANG, Yizhi LIU, Xiaoxian LU

Purpose: Celastrol is extracted from the traditional Chinese medicinal plant *Triperygium wilfordii* Hook F. It has been shown that celastrol exhibits significant activity in the treatment of inflammatory, tumor, hypertensive, and diabetic activity. Cataract is the leading cause of vision loss in the world. Posterior capsule opacification (PCO) is the most common complication of cataract surgery. It has a relationship with the pathologic progression of postoperative residual lens epithelial cells (LECs), such as epithelia-to-mesenchymal transition (EMT). The purpose of this study was to investigate the effect of celastrol on EMT of LECs.

Methods: Human lens epithelium cells (SRA01/04) were treated with celastrol (1 μ M). Expressions of EMT markers (fibronectin and α -SMA) were detected by Western blot, PCR, and immunofluorescence.

Results: We observed that celastrol inhibited TGF- β 2-induced EMT. TGF β 2 significantly increased the expression of fibronectin and α -SMA at protein levels in SRA01/04. Meanwhile, mRNA levels and immunofluorescence staining of fibronectin were also enhanced obviously. On the contrary, celastrol completely abrogated the upregulation of fibronectin and α -SMA in SRA01/04. TGF β 2 alone activated Smad2 via the stimulated phosphorylation, whereas co-treatment with celastrol inhibited phosphorylation of Smad2 in SRA01/04 cell lines.

Conclusions: This study demonstrates that celastrol influences the response of LECs to TGF- β 2. Our studies raise the possibility that celastrol might be a potential novel drug in the prevention and treatment of PCO.

Complex Crosstalk Between Ocular Tissues and Adnexa Identified by a Genetically Engineered Mouse Model

First Author: Chunqiao LIU

Purpose: Accessory ocular tissues including the lacrimal apparatus, extraocular muscles, eyelids, eyelashes, and conjunctiva are collectively called ocular adnexa. Malformation of such structures would lead to congenital vision dysfunction or loss. The purpose of this study is to characterize the crosstalk points between ocular adnexa and adjacent tissues, cornea, and lens.

Methods: Genetically engineered knockout mice lack-

ing a Wnt signaling component were used for histology examination. The development of the eyelid, cornea, conjunctiva, and lens was studied at different ages from the embryo to adulthood. Immunohistochemistry was performed using cell type/tissue specific markers to monitor the molecular changes of each tissue.

Results: We found that eyelid development underwent severe disruption in the mutant mice in that the closure process was much later compared to normal, whereas the opening was present earlier. Massive cell proliferation was detected in tarsal and bulbar conjunctiva and atop the cornea. Accordingly, differentiation of several cell types was hampered in the mutant adnexa tissues. In some cases, we also found significantly increased infiltration of inflammatory cells in between the cornea and conjunctiva.

Conclusions: We found that Wnt signaling is a major platform by which ocular tissues and adnexa communicate and interact with one another. The current study details the molecular mechanisms which could be involved in such interactions and crosstalk.

Effect of ROCK Inhibitor K-115 (Ripasudil) on Murine Corneal Transplantation

First Author: Takenori **INOMATA**

Co-Author(s): Tohinari **FUNAKI**, Akira **MURAKAMI**, Tina **SHIANG**

Purpose: To evaluate the effect of K-115 (ripasudil) on murine corneal transplantation.

Methods: Allogeneic donor corneas were transplanted onto quiescent graft beds. Topical administration of K-115 3 times or twice daily, PBS control twice daily, and brimonidine twice daily were performed post-transplantation (n = 5 mice/group). Graft survival and opacity and neovascularization scores were evaluated using slit lamp biomicroscopy. Draining lymph nodes (dLNs) were harvested at day 14 post-transplantation. We analyzed the frequencies of CD4 + CD25 + Foxp3 + Tregs, IFN- γ - and IL-17-producing CD4 T cells in the host dLNs using flow cytometry. The mean fluorescence intensity (MFI) of Foxp3 in Tregs was analyzed by flow cytometry.

Results: Transplant recipients with topical administration of K-115 3 times daily showed significantly increased graft survival and reduced graft opacity scores compared to PBS controls. Recipients with topical administration of brimonidine twice daily showed significantly decreased graft survival and increased graft opacity scores compared to PBS controls. Frequencies of Tregs and MFI expression of Foxp3 in Tregs were significantly increased in the dLNs of recipients with topical administration of K-115 3 times daily compared to PBS controls, but significantly decreased in recipients with topical administration of brimonidine twice

daily. IFN- γ -producing T cells were decreased in the dLNs of recipients with topical administration of K-115 3 times daily compared to PBS controls, but significantly increased in recipients with topical administration of brimonidine twice daily. Frequencies of IL-17-producing T cells were not significantly different between groups.

Conclusions: Our results suggest that topical K-115 prolongs graft survival by downregulating IFN- γ and Treg induction.

Identification of ANGPT2 as a New Gene for Neovascular Age-Related Macular Degeneration and Polypoidal Choroidal Vasculopathy

First Author: Li Jia **CHEN**

Co-Author(s): Haoyu **CHEN**, Li **MA**, Calvin **PANG**, Moto-kazu **TSUJIKAWA**, Alvin **YOUNG**

Purpose: To determine the angiopoietin 2 (ANGPT2) gene as a new susceptibility gene for neovascular age-related macular degeneration (nAMD) and polypoidal choroidal vasculopathy (PCV).

Methods: Thirty-four haplotype-tagging single-nucleotide polymorphisms (SNPs) were first genotyped in an exploratory Hong Kong Chinese cohort. Significant SNPs were replicated in a Shantou Chinese cohort and an Osaka Japanese cohort, with a total of 2343 subjects. Genetic association was analyzed.

Results: In the Hong Kong cohort, 4 SNPs in ANGPT2 were significantly associated with both nAMD and PCV. The 4 ANGPT2 SNPs showed the same trends of association in both the Shantou and Osaka cohorts. Pooling the data from the 3 study cohorts revealed that 2 SNPs achieved study-wide significance (P < 0.0016), conferring a ~1.3-fold increased risk for nAMD and PCV.

Conclusions: This study reveals ANGPT2 as a new susceptibility gene for nAMD and PCV.

Intravital Cellular Dynamics of Inflammatory Cells in Mouse Subconjunctival Tissue After Filtering Surgery

First Author: Sachi **KOJIMA**

Co-Author(s): Tomokazu **FUJIMOTO**, Toshihiro **INOUE**, Kazuyuki **KAWABATA**, Hidenobu **TANIHARA**

Purpose: To evaluate behaviors of inflammatory cells in mouse subconjunctival tissue after filtering surgery using multiphoton microscope.

Methods: LysM-eGFP knockin mice (gene-targeted mice expressing enhanced green fluorescent protein under the control of the endogenous lysozyme M promoter) underwent filtering surgery. Vessels were visualized by intravenously injecting Texas Red-conjugated 70 kDa dextran immediately before imaging.



Using multiphoton microscope (FV1000MPE Olympus, Tokyo, Japan), 3-dimensional images of mouse subconjunctival tissue were acquired every 1 minute for 30 minutes and reconstructed to 4-dimensional images. Raw imaging data were processed and analyzed with Imaris software. The character of LysM-eGFP-positive cells isolated from subconjunctival tissue after surgery were analyzed by immunocytochemistry.

Results: Intravital green-labeled LysM-eGFP-positive cells and red-labeled vessels were successfully visualized using multiphoton microscope. LysM-eGFP-positive cells in the subconjunctival tissue mainly consisted of F4/80-positive macrophages, and 4-dimensional intravital imaging revealed behaviors of the cells. LysM-eGFP-positive macrophages accumulated to the wound site. Moreover, the activity of the cells increased after filtering surgery compared with the intact status.

Conclusions: Four-dimensional intravital imaging first identified the behavior of LysM-eGFP-positive macrophages after filtering surgery. The observation of the intravital dynamics of the inflammatory cells in the subconjunctival tissue contribute to analysis for the wound healing after filtering surgery.

The Influence of Alpha Lipoic Acid (Reixoft) on Color Vision of Patients with Diabetes

First Author: Wiktor STOPYRA

Purpose: Comparison of color vision of patients with diabetes who take alpha lipoic acid (Reixoft) and those who do not.

Methods: Forty-two patients with diabetes (21 men and 21 women) with correct visual acuity were divided into 2 groups. The first group consisted of 21 patients who had been taking alpha lipoic acid (Reixoft) for 90 days, whereas the second one consisted of 21 patients who had not been taking it. Farnsworth-Munsell 100 hue test was used in this research. Each patient was tested twice: on the first day and on the 90th day of research.

Results: The following average total error score (TES) values were observed: 68 on the first day of research and 54 on the 90th day among patients who had been

taking alpha lipoic acid (Reixoft; $P = 0.083$); 56 on the first day of research and 85 on the 90th day among patients who had not been taking alpha lipoic acid (Reixoft; $P = 0.001$).

Conclusions: Alpha lipoic acid has a positive impact on the color vision of patients with diabetes.

The Structural Protection of TREK-TRAAK Two Pore Potassium Channel in Human Retinal Pigment Epithelium Cells Against Oxidative Stress

First Author: Xiaobo ZHU

Co-Author(s): Hao HUANG, Han LI, Kangpei SHI, Lei WANG, Xiaotong ZHANG

Purpose: To observe the protective effect on a structure level mediated by TREK-TRAAK K2P channels in human retinal pigment epithelium cells (hRPE) under oxidative stress.

Methods: The P4 hRPE cells were divided into 7 groups: control group, (3h) t-BH group, (3h) t-BH + DHA group, (3h) t-BH + DHA + fluoxetine group, (6h) t-BH group, (6h) t-BH + DHA group, and (6h) t-BH + DHA + fluoxetine group. Each group was treated with 300 $\mu\text{mol/L}$ t-BH for 3 or 6 hours relatively. All groups were proceeded to immunofluorescence to observe the structural changes. Scanning electron microscopy (sem) and transmission electron microscopy (tem) were carried out to observe the subcellular structural changes in 3h groups.

Results: Oxidative stress can damage the cytoskeleton structure, subcellular structures, and aggravate cyto-pyknosis of hRPE cells. The degree of damage to the cell structures was positively associated with treatment time of t-BH. Activating the TREK-TRAAK K2P channels can reduce cytoskeleton damage of hRPE cells under oxidative stress. On the contrary, inhibiting the TREK-TRAAK K2P channels promotes cytoskeleton damage.

Conclusions: The TREK-TRAAK K2P channels function as a protector toward hRPE cells under t-BH-induced oxidative stress. The channels are capable of stabilizing the cellular structure and maintaining cellular homeostasis of hRPE cells against oxidative stress.



Cataract

Battle-Axe Fold: Surgical Technique for In-the-Bag Implantation of an Artificial Iris Implant

First Author: Mohammed ZIAEI

Co-Author(s): Peter HADDEN, Bia KIM, Charles MCGHEE

Purpose: Loss of the iris diaphragm integrity often results in significant ocular morbidity. We describe a technique for in-the-bag implantation of a custom-made, 10-mm diameter, silicone iris prosthesis in partial aniridia to restore function and cosmesis.

Methods: Two 3-mm diameter hemi-circles are trephined from the periphery of the silicone iris prosthesis to create a trailing section that can be folded over and inserted into the capsular bag through a 5.0- to 6.0-mm capsulorhexis using forceps.

Results: This “battle-axe” configuration allows for a predictable and atraumatic in-the-bag implantation of the iris prosthesis in eyes that may have compromised zonules subsequent to prior trauma or surgery.

Conclusions: Intraocular control is crucial while performing surgery in patients with aniridia as they often have a compromised zonular apparatus as a result of prior surgery or trauma. We believe that the presented technique provides excellent surgical control for in-the-bag implantation of a custom-made iris prosthesis.

CSI Heidelberg: Unfolding the Characteristics of Preloaded IOL Systems

First Author: Gerd AUFFARTH

Co-Author(s): Chul Young CHOI, Bert GIERS, Patrick MERZ

Purpose: To evaluate unfolding characteristics of hydrophobic intraocular lenses (IOLs) implanted via preloaded delivery systems that require manual loading of the IOL.

Methods: In this prospective interventional case study 88 implantations of different preloaded hydrophobic lenses (Alcon: SN60WF/CWS, AcrySert system; AMO: PCB00/Tecnis, i-Tec system; Hoya: Vivinex P261, iSert system; and Zeiss: CT Lucia 601P, Accuject system) were recorded and implantation behavior was evaluated statistically in terms of smooth unfolding and implantation duration.

Results: All intraocular lenses could be implanted without complications. Unfolding time ranged from 30 to 120 sec. Several hydrophobic lenses presented with adhesions of the haptics to the anterior or in some cases even the posterior surface of the optic. Stickiness was different between the different types of hydrophobic

materials. No damage to optics or haptics due to the implantation process occurred. All cartridges were analyzed using light microscopy and, in some cases during IOL delivery, damage of the nozzle of the cartridge occurred.

Conclusions: Implantation and unfolding behavior among hydrophobic intraocular lenses revealed large variability. Haptic adhesions to the optic can be of clinical significance, especially in complicated cases.

Conquering a Tiger in Sheep's Skin

First Author: Rashmi KUDARI

Purpose: To manage hypermature cataract with powdery cortex covering the brown nucleus.

Methods: Demonstrates and displays the systematic phacoemulsification of hard cataract.

Results: Phacoemulsification was performed successfully, with cornea being clear postoperatively.

Conclusions: Problems of and tips for safe phacoemulsification of hypermature hard cataract are discussed.

Cruising with Capsule Damage

First Author: Amash AQIL

Co-Author(s): Muhammad MOIN

Purpose: To demonstrate the technique of vitreous management and intraocular lens (IOL) placement in patients with posterior capsule rupture.

Methods: Two videos with posterior capsule rent during routine phacoemulsification will be demonstrated. Successful intraocular lens placement with good centration will be shown in these videos.

Results: The first case will show how a single piece acrylic foldable IOL, which was about to fall back in the vitreous cavity during implantation, was retrieved and positioned in front of the anterior capsule with optic fixation in the bag. The second case will show cortical cleanup with dry aspiration in a case with posterior capsule rent at the end of phacoemulsification. Foldable single piece acrylic IOL placement in the sulcus will be shown with optic capture in the bag for good centration.

Conclusions: Early identification of a posterior capsule rent with careful management is essential for good visual outcome with a well-centered intraocular lens.



Individualized Patient Care with Different Variants of Blended Vision: The Duesseldorf Formula

First Author: Detlev BREYER

Co-Author(s): Gerd AUFFARTH, Philipp HAGEN, Hakan KAYMAK, Karsten KLABE, Florian KRETZ

Purpose: New bilateral implantation variants of segmental MIOLs (Oculentis) have the ability to meet highest needs of patients individually. The aim of this video is to demonstrate the process of consultation, medical examination, and implantation with the femtosecond laser in our eye surgery. Furthermore, within a retrospective quality management investigation we compared binocular visual outcomes between emmetropic vision with blended vision variants.

Methods: The Comfort [1.5 diopters (D) addition] was implanted in the dominant eye and in the non-dominant eye we implanted one of 3 MIOL variants: a) Comfort (200 patients); b) Comfort with -1.5 D target refraction (75 patients); c) MplusX with 3.0 D addition (25 patients). We analyzed binocular defocus curves and compared the area under these curves (MIOL-capacity) to those of phakic patients. Furthermore, size and intensity of halo and glare were assessed with a computer-based system and categorized according to "none," "mild," "moderate," and "severe."

Results: Compared to phakic juvenile eyes, all 4 MIOL variants showed binocular defocus capacities above 85% with variant b achieving the highest value: 104%. Mean binocular uncorrected distance visual acuity (UDVA) was <0.05 logMAR in all groups. After 3 months, photopsia were either absent or described as undisturbing. The distributions of halo and glare were only slightly shifted towards higher values and comparable to those of phakic eyes.

Conclusions: MIOL-capacity showed results competitive to trifocal IOLs. The mixed implantation of 2 different refractive MIOLs creates blended vision and seems to provide a new alternative to a diffractive trifocal IOL with only minor halo and glare.

Initial Experience with the Verus Caliper for Capsulorrhexis

First Author: Mun Wai LEE

Purpose: To share our initial experience with the Verus caliper, which is a micropatterned silicone ring used as a physical guide during capsulorrhexis.

Methods: A well-centered, appropriately sized, and round continuous curvilinear capsulorrhexis (CCC) provides consistent capsule overlap and good intraocular lens (IOL) centration, which are important for optimum refractive outcomes in cataract surgery. With femtosecond laser assisted cataract surgery (FLACS), this is

consistently achievable. Unfortunately, the high costs associated with FLACS, as well as recent studies showing that the femto CCC is potentially less resilient to tearing forces compared to manual CCC, mean that the search for alternative methods continues.

Results: This video illustrates the effective use of the Verus caliper together with the Verion Image Guided System to consistently achieve a well-centered and round CCC.

Conclusions: Compared to FLACS, this is a significantly more cost-effective and feasible solution. The use of this ring in more complicated cases such as white, intumescent cataract and small pupil are illustrated as well.

Innovative Needle-Assisted Haptic Externalization and Fixation of Alcon AcrySof Multipiece Foldable IOL

First Author: Zia MAZHRY

Purpose: To present innovative needle-assisted haptic externalization and fixation of Alcon AcrySof Multipiece (MP) Foldable intraocular lens (IOL).

Methods: This video demonstrates innovative haptic externalization and fixation of AcrySof MP IOL. A 67-year-old female presented with aphakia, absent capsule, and best corrected visual acuity (BCVA) of 6/18. The surgery was performed on July 15, 2014. Two 3.2-mm incisions were fashioned. The IOL was placed in AC and haptics externalized through corneal incisions using 2 Sinsky hooks. A 25G needle was passed 1.00 mm behind the limbus through fixation sites. Both the needles were brought out through the opposite corneal incisions using a visco cannula as a guide. The IOL haptics were threaded into 25G needles and retrieved back gently through fixation sites. Haptics were tucked and secured beneath scleral tunnels by 10/0 nylon cross sutures.

Results: The IOL was well centered and remained so to date (2 years postoperatively). The BCVA was 6/18 with a quiet eye.

Conclusions: Haptic externalization and fixation of Alcon AcrySof Multipiece Foldable IOL is a viable and effective option for such cases. One does not need to use specialized larger-gauge forceps to retrieve the IOL haptics outside of the eye.

Issues Related to Argentinian Flag Sign

First Author: Amit PORWAL

Purpose: Phacoemulsification in mature intumescent cataracts is always a challenge. In this video illustrative presentation tips will be shown regarding to how to handle and overcome this sign while doing capsulorrhexis. Tips and tricks of avoiding the occurrence of Argentinian flag sign will also be demonstrated.

Methods: A video-based education program on handling Argentinian flag sign. Doing a CCC in intumescent cataracts is always a nightmare, even to an experienced surgeon. The video will be divided into 3 parts: first, what it is; second, how to manage this sign when it occurs and what precautions to take while proceeding with phacoemulsification; and third, how to avoid the occurrence of this sign.

Results: Excellent results in overcoming this sign.

Conclusions: At the end of the video the viewer will be able to detect, manage, and avoid the Argentinian flag sign.

Overcoming Small Pupils with a New Polyurethane, Hinged Pupil Expansion Device Among Eyes Undergoing Anterior and Posterior Segment Surgery

First Author: Harvey UY

Co-Author(s): Kenneth KENYON

Purpose: To demonstrate the indications for and technique of using a new polyurethane, hinged pupil expansion device for improving surgical visualization of eyes undergoing cataract surgery, intraocular lens (IOL) implantation, or pars plana vitrectomy.

Methods: The video will demonstrate the technique of using a pupil expansion device (I-Ring) in several cases of complex small pupil surgeries including uveitic cataract, secondary IOL, dislocated IOL, and pars plana vitrectomy. Surgical tips and tricks will also be demonstrated.

Results: The I-ring was successfully deployed in all eyes. Cataract surgery was successfully performed in all eyes. There were no cases of iris sphincter rupture, bleeding, or postoperative iris atrophy. Protection of the pupil borders from surgical instrument trauma was observed. Postoperative iris appearance will be demonstrated.

Conclusions: This new pupil expansion device is a versatile addition to the toolkit of anterior and posterior segment surgeons encountering limited visualization from small pupils. The learning curve is short and the device has the advantages of easy removal and protection of the pupil and iris structure.

PC Rupture! No Problem

First Author: Sudhank BHARTI

Purpose: To demonstrate methods for successful management of intraoperative posterior capsule rupture of various grades, thereby improving the visual outcomes and reducing the chances of immediate and long-term complications.

Methods: Posterior capsule rupture during cataract

surgery can occur in the best of hands and with all techniques be it phacoemulsification or femtosecond laser assisted cataract surgery (FLACS). A planned approach of management includes converting a small tear into posterior capsulorrhexis, using dispersive viscoelastic wherever required, avoiding vitrectomy when vitreous is not disturbed, and performing good anterior vitrectomy by staining with triamcinolone and removing it completely from the anterior chamber and corneal sections.

Results: Posterior capsule defects occurring during cataract surgery via phacoemulsification or FLACS were managed successfully by planned approach for each type and size, thereby providing excellent visual outcomes.

Conclusions: Posterior capsule rupture can happen in the best of hands. A planned approach is required to manage this complication successfully. Anterior vitrectomy is not required in all cases of posterior capsule rupture. Vitreous incarcerated in the section leads to retinal tears, retinal detachment, and endophthalmitis. Using dispersive viscoelastic reduces the chances of increased intraocular pressure postoperatively. Anterior vitrectomy by anterior segment surgeon can be done successfully and vitreous staining by triamcinolone helps to remove vitreous completely from the anterior chamber and sections.

Phacoemulsification in Posterior Ruptured Lenticonus

First Author: Praveen SUBUDHI

Purpose: To show a method to manage a case of posterior ruptured lenticonus.

Methods: A 14-year-old male presented with defective vision in the right eye (RE) for 10 days. On examination white mature cataract was seen in undilated pupil examination, but on dilation of pupil there was a slit shaped posterior capsular tear. With a diagnosis of posterior ruptured lenticonus, the patient was scheduled for phacoemulsification with anterior vitrectomy with intraocular lens (IOL) implantation. Superior triplanar tunnel was constructed with the help of 2.8-mm keratome. After making a side port, capsular staining with trypan blue was done and capsulorrhexis was attempted with 26 g cystitome. Unfortunately capsular extension happened; however, capsulotomy was completed with forceps. No hydrodissection was done to avoid dislocation of contents into vitreous. As the nucleus was soft, irrigation aspiration probe was used for aspiration of nucleus and peripheral cortex. After partial removal of nucleus, a part of it was dislocated to vitreous; anterior vitrectomy was done initially with 23G vitrectomy later on manually by vannas scissors. Dislocated nucleus material was retrieved back to the anterior chamber, which was removed subsequently with simcoe cannu-



la. Residual cortex was removed with simcoe cannula instead of I/A probe. Foldable IOL was implanted in sulcus. Intracameral pilocarpine 1% was used to notice any vitreous strands extending to the incision. Single suture was placed at the main incision port.

Results: Patient had good postoperative recovery with best corrected visual acuity (BCVA) of 6/6.

Conclusions: Posterior ruptured lenticonus is a rare phenomenon and this is the first case from this region.

Ray Tracing Aberrometry for Cataract Surgeons

First Author: Ashwattha **SHETTY**

Co-Author(s): Luci **KAWERI**, Mathew **KURIAN**, Rohit **SHETTY**

Purpose: To demonstrate the use of ray tracing aberrometry for cataract surgeons.

Methods: Ray tracing aberrometry (iTrace; Tracey Technologies USA, Houston, Texas) was done for different lenticular conditions like pseudomyopia, dysfunctional lens syndrome, congenital cataract, microspherophakia, lens coloboma, and lenticonus. Change in higher order aberrations and vision quality as well as quantity was noted after treatment.

Results: Ray tracing aberrometry can be used for diagnosis, preoperative planning, and postoperative assessment. Its objective evaluation of quality of vision helps in educating and counseling the patients.

Conclusions: This video shows that ray tracing aberrometry is an important tool in the cataract surgeon's armamentarium.

Single Haptic Fixation of Intraocular Lens

First Author: Sinumol **THULASEEDHARAN**

Purpose: Single haptic fixation of intraocular lens (IOL) is a faster and easier technique of scleral fixation of the IOL when there is some capsular remnant. Indications include 1) as a secondary procedure of IOL implantation in aphakia following extracapsular cataract extraction (ECCE) with peripheral capsular remnants; 2) as a primary procedure of IOL implantation in cases of intraoperative large posterior capsular (PC) rent, zonular dialysis, and bag subluxation or in the management of subluxated cataracts; 3) to reposition and fix a previously implanted subluxated IOL.

Methods: Materials needed include 1) PC IOL such as rigid/foldable, open loop/closed loop, single piece/3 piece IOLs; 2) double armed 9-0 prolene. We utilize the available capsular remnant to support the leading haptic and an easy single scleral fixation suture in the tunnel bed to support the trailing haptic.

Results: The procedure has minimal operation time,

minimal manipulations, and minimal complications (vs conventional SFIOL and glued IOLs). It is possible even in aniridia and distorted pupil (vs iris claw and AC IOLs). There is good IOL stability.

Conclusions: Single haptic fixation of IOL is a faster, easier, and low-cost technique of scleral fixation of the IOL when there is some capsular remnant. The available capsular remnant supports the leading haptic and an easy single scleral fixation suture in the tunnel bed supports the trailing haptic. It can be done as primary and secondary IOL implantation in aphakia, subluxated cataract, and subluxated IOL. It is possible even in aniridia and distorted pupil. There are excellent postoperative results. This video demonstrates step-by-step procedures in different situations.

Surgical Management of Traumatic Iris Cyst with Traumatic Cataract

First Author: Mano **DAS**

Co-Author(s): Naveen **RADHAKRISHNAN**

Purpose: To demonstrate the surgical pearls during the excision of post-traumatic iris cyst with traumatic cataract extraction.

Methods: Case report.

Results: A 35-year-old female presented to us with right eye (RE) defective vision with a history of surgery for penetrating injury 5 years prior. Best corrected visual acuity in RE was 6/36 by Snellen chart. Anterior chamber examination showed an old limbal scar with traumatic iris cyst and cataract. Left eye was normal. The patient underwent excision of iris cyst with small incision cataract extraction and intraocular lens (IOL) implantation. Intraoperative and postoperative period was uneventful. Best corrected visual acuity postoperatively was 6/9 with a clear cornea, quiet anterior chamber, and absence of secondary cyst.

Conclusions: We report a case of excision of traumatic iris cyst with traumatic cataract extraction with good visual outcome.

Surgical Technique for Optimal Management of Late Postoperative Capsular Block Syndrome with Flocculent After Cataract

First Author: Jeewan **TITIYAL**

Purpose: To describe a novel technique to manage late postoperative capsular block syndrome with flocculent after cataract.

Methods: Seven eyes of 7 patients with late postoperative capsular block syndrome, characterized by in-the-bag intraocular lens (IOL), well-centered rhexis-IOL complex, proliferation of flocculent cortical matter behind the IOL, and bag distension, were managed with a novel technique of in-the-bag aspiration of flocculent

after cataract with posterior continuous curvilinear capsulorhexis (PCCC). A sharp MVR blade was used to separate the fibrosed anterior capsular rim densely adhered to the IOL optic and circumferential radial nicks were made in the capsular rim extending beyond the IOL optic to separate it from the optic, which provided easy access to the bag without stress on the capsular zonular complex. The flocculent matter was aspirated with bimanual IA. In-the-bag aspiration prevented flocculent lens matter from dropping behind in the vitreous cavity. Subsequently PCCC was performed to prevent further VAO.

Results: All 7 eyes had clear visual axis with stable IOL. No recurrence or postoperative complications were noted.

Conclusions: Flocculent after cataract is the most common late postoperative complication of cataract surgery. Flocculent after cataract is unique for perfectly placed in-the-bag square-edge IOLs. Our technique of in-the-bag aspiration of flocculent after cataract with PCCC provides optimal results with long-term clear visual axis. Laser capsulotomy should be avoided as posterior dislodgement of flocculent matter may incite posterior segment inflammation.

Symmetric Scaffold, Stable IOL

First Author: Viraj VASAVADA

Co-Author(s): Vandana C NATH, Samaresh SRIVASTAVA, Abhay VASAVADA, Shail VASAVADA, Vaishali VASAVADA

Purpose: Managing vitreous disturbance can be a challenge to the cataract surgeon. Despite a seemingly adequate vitreous management, often intraocular lens (IOL) stability is an issue in these cases. This film highlights the value of performing a symmetric anterior vitreous removal and thus creating a symmetric scaffold for stable IOL fixation.

Methods: As surgeons, we always consider achieving stable posterior capsule support in case of a posterior capsule rupture and removing the prolapsed anterior vitreous from the anterior chamber. We used clinical case scenarios, animations, and cadaver eye experiments to demonstrate the importance of removing the prolapsed anterior vitreous symmetrically behind the IOL optic to achieve better IOL stability. We also compared the limbal versus pars plana approach to achieve this aim.

Results: We introduce the concept, supported by clinical and experimental evidence that emphasizes how important it is to symmetrically remove anterior vitreous from behind the posterior capsule rupture as well as behind the IOL optic. The pars plana approach helped us to achieve this better.

Conclusions: Clearing the prolapsed anterior vitreous

symmetrically behind the posterior capsule can help achieve more symmetric IOL placement.

Terminal Chop: New Technique for Full Thickness Nuclear Segmentation in Mature Hard Cataract

First Author: Rajendra PRASAD

Purpose: To describe a new efficient, simple, swift, and safe chopping technique in hard mature cataract enabling a full thickness nuclear segmentation with minimal manipulation or risk of complications.

Methods: A 1-year, non-randomized prospective series of 108 eyes of 79 subjects who underwent elective phacoemulsification for cataract of nuclear opalescence of grade IV or more (LOCS III). A short central shallow trench was created. The phaco tip was engaged at the distal end of the trench impaled towards equator within the superficial plane of the nucleus parallel to the pupillary plane to achieve a firm grip at the periphery within the equator of the nucleus. An olive tipped chopper was then hooked around the equator and drawn just 1 mm into the terminal edge of equator, then laterally separated creating a lateral vector force splitting the whole nucleus into 2 halves.

Results: The terminal chop technique of nuclear segmentation of hard, large, mature cataracts was successfully performed in all 108 eyes of 79 patients. Following complete segmentation of the nucleus, further steps of phacoemulsification were performed with minimal manipulation and use of phaco power.

Conclusions: Terminal chop involves utilization of unique mechanical forces to pull apart and split the hard nucleus along the natural cleavage plane from its weakest soft and thin equator along anatomical arrangement of lens fibers. Terminal chop allows complete full thickness equator to equator nuclear segmentation including the posterior plane, with safe and consistent results.

Comprehensive Ophthalmology

Seven Habits for Effective Ophthalmic Investigations

First Author: Abdelsattar FARRAG

Purpose: The goal of this video is to provide the audience with the essential tools and resources which can improve effective interpretation of ophthalmic investigations and avoidance of technology fallacies.

Methods: Review of ophthalmic investigation interpretation manuals and publications that reviewed interpretation fallacies.

Results: "One out of every 3 OCT scans has some form



of an artifact or anomaly, which shows up red on the OCT scanner." This not only occurs with optical coherence tomography (OCT) but also in different ophthalmic investigations. The need for awareness of young ophthalmologists about effectively dealing with these investigations and avoidance of the fallacies become equally important as basic clinical skills. In this video are illustrations of the 7 habits essential for effective ophthalmic investigation. Developing these 7 habits will help young ophthalmologists to improve their clinical skills and also will reflect on everyday case management.

Conclusions: After watching this 7-minute video, I hope that ophthalmology residents can practice the 7 habits for effectively dealing with ophthalmic investigations.

Cornea, External Eye Diseases & Eye Bank

Anterior Segment Revision for Severe Scleral Wound Burn Following Failed Fragmatome Lensectomy

First Author: Mohammed ZIAEI
Co-Author(s): Charles MCGHEE

Purpose: Wound burns are a rare but serious complication of intraocular surgery. We present a challenging case of a severe scleral wound burn that occurred at the time of fragmatome lensectomy in a patient with a longstanding dislocated crystalline lens. This was managed with the application of cyanoacrylate glue intraoperatively and the surgeon elected to remove the crystalline lens through a 10-mm corneal incision. The cyanoacrylate glue failed to achieve a watertight closer of the scleral wound resulting in a hypotonous eye and the patient was referred to us for further management.

Methods: The patient underwent wound revision with removal of excess cyanoacrylate glue and suturing of a scleral patch graft to allow for a watertight wound closure.

Results: The suturing of a scleral patch resulted in optimal wound closure with resolution of hypotony and a significant improvement in patient comfort levels. The patient underwent secondary implantation of an iris fixated intraocular lens at a later date.

Conclusions: Thermal wound damage has become a relatively rare complication, owing to improved fluidics, power modulations, and refined surgical techniques. Nonetheless, it is still important for surgeons to fully comprehend the fluidics of modern phacoemulsification machines and the physics behind wound burns to avoid their occurrence and be equipped with a variety of surgical techniques to manage such thermal wound burns.

Corneal Transplant with Anterior Segment Reconstruction in a Large, Totally Keratinized Corneal Staphyloma

First Author: Khalid MAHMOOD

Purpose: The purpose of the surgery was to avoid enucleation in a 17-year-old male having a huge corneal staphyloma with total keratinized surface after a healed corneal abscess. Amniotic membrane transplant was done twice. The main goal was to preserve cosmesis of the eyeball and secondarily achieve any useful vision.

Methods: Counseling was mainly for avoidance of enucleation of the eyeball, which was advised previously by a few ophthalmologists. Two full depth trephinations of 8.5 mm failed and the third time AC entry was successful. Fibrosed cataract was removed and anterior vitrectomy performed. The fully keratinized cornea was excised wide to wide limbus. As the punch was not available to cut a very large diameter donor tissue, it was managed manually with sharp scissors. Additional procedures included iridoplasty and fine cautery to bleeder vessels. The patient was kept on systemic steroids for a longer period of time along with topical cyclosporine.

Results: The results were remarkable. The eyeball showed excellent cosmetic look even 1 year after surgery with a visual acuity of 6/36 with aphakic contact lens. The satisfaction level of the patient and his family was at the highest.

Conclusions: Wide to wide full thickness corneal transplant with anterior segment reconstruction is very useful to preserve eyeball cosmesis and to gain some useful vision. Enucleation should be kept as a very last option. Extended counseling in such cases is of paramount importance.

Educational Video to Improve the Diagnostic Yield from Corneal Scrapes for Microbial Keratitis

First Author: Pauline KHOO
Co-Author(s): Maria CABRERA-AGUAS, Roland HOLLHUMER, Stephanie WATSON

Purpose: To demonstrate the best practice for obtaining a diagnostic sample from corneal scraping in microbial keratitis in order to increase the diagnostic yield from the procedures. Current positivity rates from corneal scraping range from 20% to 60%.

Methods: A systematic review was undertaken and consultation with corneal specialists at a tertiary hospital and microbiologists in Sydney, Australia was conducted to determine current best practices for the corneal scraping procedure when performed for the diagnosis of microbial keratitis. An educational video was then produced, with animation, to demonstrate

key steps able to increase diagnostic yield from corneal scraping.

Results: The systematic review identified 5 comparative case series, which enrolled a total of 3514 eyes with suspected microbial keratitis. A total of 2510 (71.4%) reported a positive diagnostic result with the use of slides for gram stains and solid (conventional) media. Two of the 5 studies compared use of indirect transport (liquid media) to conventional method with a positivity rate of 46.9% to 70.3%, respectively. Two studies compared the use of swabs and blades for sample collection; 88% and 81% positivity, respectively. Seventeen key messages were identified and communicated in the 2:35 minute video, including the use of “traditional” slides and solid media.

Conclusions: Available evidence for the corneal scraping procedure can be used to develop best practice guidelines. A short animated video illustrating the key steps able to increase the diagnostic yield of the procedure was developed.

Intracameral Descemetopexy in Fibrin Glue-Assisted Deep Anterior Lamellar Keratoplasty in Healed Viral Keratitis with Descemetocele

First Author: Shikha YADAV

Co-Author(s): Radhika TANDON, Murugesan VANATHI

Purpose: Deep anterior lamellar keratoplasty (DALK) is an option for the management of epithelized descemetocele which may be complicated by Descemet membrane (DM) perforation. We describe the use of tissue adhesive for sealing of DM perforation and successful completion of DALK.

Methods: A young man presented with healed necrotizing viral keratitis with a paracentral descemetocele. Lamellar dissection was performed from the edge of the descemetocele proceeding to the corneal periphery using a blunt dissector up to the trephine mark. During the surgical procedure, DM perforation was noted which was sealed using fibrin glue and the procedure was completed successfully. On postoperative day 1, DM detachment was noted and intracameral 14% C3F8 gas was injected. One day after descemetopexy, the graft was clear with DM attached. Corneal thickness decreased from 830 μm to 680 μm on postoperative day 3. The clarity and state of corneal graft and postoperative visual acuity were noted on subsequent follow-ups.

Results: At 1-year follow-up, the graft was clear with a best corrected visual acuity of 20/40.

Conclusions: DALK may be complicated by DM perforation which can be managed intraoperatively by a tissue sealant and maintaining low intraocular pressure to prevent further extension of perforation. The graft can be saved by an intracameral descemetopexy in the

immediate postoperative period for DM detachment for better tectonic and visual outcome.

Iris Claw Lens: A Breather for an Eye with Sandwiched EK Graft

First Author: Vikas MITTAL

Purpose: To report challenges in intraocular exchange during endothelial keratoplasty.

Methods: A 65-year-old female patient was referred for the management of failed Descemet stripping endothelial keratoplasty (DSEK). This hyperopic patient with Fuchs dystrophy and cataract was planned for DSEK and cataract surgery but during surgery, the primary surgeon noticed posterior capsule rupture and placed an anterior chamber intraocular lens (ACIOL) and performed DSEK few weeks later. The patient developed total angle closure and DSEK graft was sandwiched between IOL and host cornea and was referred for further management. After controlling IOP, the patient underwent surgical intervention. The steps of the second surgery were as follows: removal of DSEK graft, removal of ACIOL, anterior vitrectomy, implantation of iris claw lens was (retrofixation), and implantation of new DSEK graft in that order.

Results: While explanting ACIOL, it was noticed that the haptics of the IOL were fibrosed in the angles and had to be cut with scissors. A smaller sized iris claw lens was used. Another challenge posed during the surgery was movement of air into the vitreous cavity that was managed by a cohesive viscoelastic plug. The graft and cornea were cleared within 1 month; IOP was controlled with topical medications.

Conclusions: This video demonstrates that iris claw lens can be helpful in IOL exchange during endothelial keratoplasty.

Simple Limbal Epithelial Transplantation: A Transforming Approach to Unilateral Limbal Stem Cell Deficiency

First Author: Anand PASARI

Co-Author(s): Virender SANGWAN

Purpose: This video illustrates an approach to management of unilateral limbal stem cell deficiency with simple limbal epithelial transplant and elaborates on the surgical technique and improved outcomes.

Methods: This video briefly discusses the architecture of limbal stem niche and development of limbal stem cell deficiency following chemical injury. The video illustrates the surgical technique of simple limbal epithelial transplant with emphasis on pannus dissection with different techniques.

Results: Meticulous pannus dissection is a crucial step and requires knowledge of different techniques. This



is followed by transplantation of limbal explants harvested from a limbal biopsy from healthy donor eye on an amniotic membrane. The technique stabilizes the ocular surface with rapid epithelization and leads to gratifying visual and anatomical outcomes which are maintained over subsequent long follow-ups. This novel technique is cost effective and can be performed as a single-stage procedure at any ophthalmic institution without sophisticated laboratory setup.

Conclusions: Simple limbal epithelial transplant is a novel single-stage technique in the management of unilateral limbal stem cell deficiency with gratifying surgical outcomes.

Glaucoma

Managing Traumatic Retinal Detachment and Angle Recession Glaucoma in the Same Sitting: A Novel Approach

First Author: Ankur **SINHA**
Co-Author(s): Ajay **JHINJA**

Purpose: Traumatic retinal detachment and angle recession glaucoma are a few of most disastrous consequences of blunt trauma. The problem arises when they coexist. The options available to manage dialysis include explants or vitreoretinal surgery. Explant is favored in young adults as it causes minimum disturbance to physiology and the need for oil removal is avoided. However, in the presence of explant, intractable angle recession glaucoma is difficult to control and filtration surgery is expected to fail, hence shunt surgery is a viable option. Even if one chooses a vitreoretinal surgery with oil injection, filter is at risk with further mandatory vitreoretinal interventions.

Methods: A case report of a young boy, who sustained tennis ball injury 6 months previously leading to poor vision. He experienced sudden precipitous fall of vision for the past 2 months. Old records mention uncontrolled glaucoma on maximal glaucoma therapy. On examination, he had best corrected vision (BCVA) of 1/60, resolved Berlin edema, supero-nasal dialysis with retinal detachment (RD), choroidal rupture, and 360-degree angle recession.

Results: After informed consent and explained risks/benefits to patient, a successful coalition of vitreoretinal and glaucoma surgeons performed sectoral buckling for RD, valved shunt for glaucoma, and limited 23G vitrectomy to reduce intraocular pressure (IOP) to facilitate shunt surgery in a child and avoid multiple general anesthesia. At 6 months of follow-up the BCVA was 6/36 (preoperatively 1/60) and IOP was 12-14 mm Hg with a flat retina.

Conclusions: Judicious use of tubes with explants and limited vitrectomy is a viable option in cases with coex-

isting glaucoma and retinal detachments.

New Surgical Technique of Intrasceral Tube Fixation in Ahmed Glaucoma Valve Implantation to Prevent Postoperative Tube-Related Complications: "Scleral Sleeve Method"

First Author: Charudutt **KALAMKAR**
Co-Author(s): Amrita **MUKHERJEE**, Nishant **RADKE**, Snehal **RADKE**

Purpose: To present a new surgical technique, "scleral sleeve method," which reduces the risk of Ahmed glaucoma valve (AGV) tube exposure, extrusion, and retraction in patients with refractory glaucoma.

Methods: Sixteen eyes of adult patients with refractory glaucoma underwent AGV implantation with intrasceral tube fixation by "scleral sleeve method." Instead of using sutures to fix the AGV tube to sclera, which carries risks of breakage or getting loose, we devised a novel method of intrasceral tube fixation by creating a scleral tunnel.

Results: There was no case of tube exposure or extrusion in our series. Scleral tunnel fashioned in the form of a sleeve allows proper tube fixation within the sclera.

Conclusions: Use of the scleral sleeve method reduced the risk of tube-related complications like exposure, extrusion, and endophthalmitis. It also reduced suture-related complications. Larger studies and longer follow-up periods are required to confirm our findings regarding this new technique.

Trabeculotomy and Trabeculectomy in Congenital Glaucoma

First Author: Rakshya **PANTA SITOULA**

Purpose: To study the efficacy of trabeculotomy and trabeculectomy in children with congenital glaucoma and to measure the corneal diameter, intraocular pressure (IOP), and cup-disc ratio (CDR) preoperatively and postoperatively.

Methods: Retrospective analysis of prospectively collected data of 11 children with primary congenital glaucoma from November 2014 to December 2015 was done. All patients underwent examination under anesthesia. On the basis of corneal diameter, IOP, and CDR children who met the criteria were subjected to combined trabeculotomy with trabeculectomy (16 eyes of 11 patients).

Results: There were 11 patients (6 males and 5 females); mean age of first consultation was 10.7 (SD ± 3.8) months. Eight patients had bilateral involvement and 3 had unilateral involvement. Mean vertical corne-

al diameter was 12.8 (SD ± 1) mm and horizontal corneal diameter was 13.5 (SD ± 1) mm. The mean IOP was 45 (SD ± 8) mm Hg. The mean IOP decreased to 25 (SD ± 8) mm Hg.

Conclusions: Trabeculotomy and trabeculectomy is an effective surgical procedure for children with congenital glaucoma. Success depends on timely intervention and regular follow-up.

Intraocular Inflammation, Uveitis & Scleritis

Tackling Chronic Hypotony Due to Uveitis by Its Roots: Cyclitic Membrane Removal

First Author: Mohit **DOGRA**

Purpose: Management of hypotony in a uveitic eye is a challenge given the extensive damage by inflammation and its sequelae. We demonstrate a simple technique for the successful management of such cases, with good postoperative results.

Methods: We demonstrate a surgical technique to adequately manage such cases from their root cause: the cyclitic membrane. Once other causes of hypotony like acute inflammation have been managed, the presence of a membrane is documented by ultrasound biomicroscopy. The patient is then taken up for surgery, which includes a complete vitrectomy and lensectomy. This is followed by dissection of the epicyliary membrane using the principles of segmentation and delamination.

Results: Intraocular pressure (IOP) and visual acuity improvement is seen in uveitic eyes post lensectomy, vitrectomy, and ciliary membrane dissection (with or without silicone oil).

Conclusions: Hypotonous uveitic eyes with cyclitic membranes and ciliary body atrophy can be salvaged with gratifying functional outcomes with meticulous surgery and planning.

Neuro-Ophthalmology

Four-Muscle Tenotomy in Infantile Nystagmus Syndrome

First Author: Ungsoo **KIM**

Co-Author(s): Ye Jee **KIM**

Purpose: To present the surgical procedure of 4-muscle tenotomy in infantile nystagmus syndrome.

Methods: Two patients (a 24-year-old woman and a 42-year-old man) presented with infantile nystagmus syndrome. We performed full ophthalmologic examinations and video nystagmography (VNG).

Results: Both of them showed a conjugate left beating jerky nystagmus (increasing velocity in the slow phase)

without null point. We performed 4-muscle tenotomy using fornix-based incision. After that, the waveform of nystagmus changed. Although they had no visual improvement, decrease in frequency was found in both.

Conclusions: The surgical technique of 4-muscle tenotomy is not quite different from conventional strabismus surgery. Four-muscle tenotomy is a surgical option for infantile nystagmus syndrome without null point.

Transconjunctival Medial Rectus Sparing Optic Nerve Sheath Fenestration: A Modified Technique

First Author: Samir **SERASIYA**

Co-Author(s): Kasturi **BHATTACHARJEE**, Surpriya **HA-WAIBAM**, Deepika **KAPOOR**, Prabhjot Kaur **MULTANI**, Richa **SHRIVASTAVA**

Purpose: To demonstrate a modified technique of optic nerve sheath fenestration (ONSF) via transconjunctival medial rectus sparing approach for idiopathic intracranial hypertension (IIH).

Methods: A 52-year-old obese female diagnosed as IIH was referred to us by the neurologist for ONSF. She complained of gradual diminution of vision in both eyes, double vision on right gaze, and intermittent headache for 18 months. On examination, vision was 20/80 and 20/60 in the right eye (OD) and left eye (OS), respectively. She had right sixth cranial nerve palsy with bilateral papilledema. Her CT scan of the brain was normal and lumbar puncture showed high cerebrospinal fluid (CSF) pressure. Patient underwent surgery via transconjunctival approach under general anesthesia. After performing 180-degree peritomy, medial rectus muscle was tagged with 3-0 silk suture. In contrast to conventional method, medial rectus muscle was spared. After blunt dissection in supero-medial quadrant, optic nerve was identified and fenestration was done by cutting the dura resulting in gush of CSF, thus achieving the objective of surgery. Conjunctiva was sutured with 8-0 polyglactin. No intraoperative complication occurred.

Results: On postoperative day 1, papilledema had reduced in both eyes. Gradual improvement of vision was noted on subsequent visits on the first, third, and 14th day up to 20/30 in both eyes. Fundus photographs and fundus examination by 90 diopter (D) lens showed drastic reduction in papilledema. Patient reported symptomatic improvement and reduction in the intensity of headache.

Conclusions: Optic nerve sheath fenestration via transconjunctival approach without cutting medial rectus provides adequate exposure to perform the procedure with excellent outcomes and minimal complications.



Orbital and Oculoplastic Surgery

Endonasal Endoscopic Dacryocystorhinostomy from a Trainee's Perspective

First Author: Adit GUPTA

Co-Author(s): Mohammad ALI, Prerana TAHILIANI

Purpose: To elucidate a step-by-step approach to endonasal dacryocystorhinostomy (DCR) surgery.

Methods: Recorded video clip of endonasal DCR surgery performed by the author with animations and elaborate surgical diagrams.

Results: The video very clearly demonstrates the surgical steps with anatomical models for this procedure.

Conclusions: Endonasal DCR surgery is one of the commonest performed surgeries by an oculoplastic surgeon in training. Understanding the surgical anatomy is very important for the oculoplastic surgeon as this is a new territory anatomically for us. This video will help novice surgeons to understand a step-by-step approach to the surgical procedure.

Endoscopic Lacrimal Duct Recanalization

First Author: Stephanie YOUNG

Co-Author(s): Gangadhara SUNDAR

Purpose: The current gold standard treatment for nasolacrimal duct obstruction (NLDO) is external or endoscopic dacryocystorhinostomy (DCR). With a continued search for minimally invasive surgery, an even newer and more physiological approach to treating NLDO is endoscopic lacrimal duct recanalization (ELDR). It restores the integrity of the natural lacrimal drainage system and avoids the necessity of osteotomy and making new openings. We created a video to provide a background and detailed explanation of ELDR and conducted a retrospective cohort review to determine the safety and efficacy of ELDR in treating acquired NLDO.

Methods: Patients with complete and partial primary acquired nasolacrimal duct obstruction (PANDO) who underwent ELDR from 2010-2016 were recruited. Follow-up was conducted for at least 6 months and patients were evaluated for anatomical and functional patency. Complications, if any, were also noted for both groups.

Results: A total of 25 ELDR procedures were performed, 17 of which were for complete PANDO and 8 for partial NLDO. Eight patients underwent bilateral ELDR. At 6 months' follow-up, anatomical success was obtained in 92.0% (n = 23) of cases, while functional success was obtained in 88.0% (n = 22) of cases. No significant complications were seen.

Conclusions: Endoscopic lacrimal duct recanalization

has a comparable success rate to DCR. It has the advantage of being more physiological without any need for osteotomy, hence allowing a faster rehabilitation. Potential disadvantages include its shorter history, lack of long-term evidence, and requirement for instrumentation. While relatively new, ELDR may become the future of lacrimal drainage surgery.

Eyelid-Sparing Orbital Exenteration

First Author: Raksha RAO

Co-Author(s): Santosh HONAVAR, Gangadhar JALLI, Chalamala JANGAIAH

Purpose: To demonstrate the simplified version of lid-sparing orbital exenteration.

Methods: This video demonstrates the eyelid-sparing technique in a patient with orbital extension of conjunctival squamous cell carcinoma.

Results: Orbital exenteration is often performed as a life-saving measure for eyelid, ocular surface, and intra-ocular tumors with orbital extension, and for primary orbital tumors or infections such as mucormycosis where conservative treatment is not feasible. Following orbital exenteration, the challenge lies in providing a customized orbital prosthesis. A good surgical technique is essential to provide a concave, smooth, stable skin cover, over which an orbital prosthesis can be glued. This method, described by Coston and Small, is a modification of the total exenteration technique that spares parts of both the eyelids, with transverse blepharorrhaphy to cover the orbit, and ensures better cosmesis and early rehabilitation. In addition, sparing of the orbicularis muscle provides an excellent vascular supply to the skin flap.

Conclusions: Eyelid-sparing orbital exenteration enables early wound healing and cosmetic rehabilitation, thus minimizing patient morbidity.

Fishing Out the Hook: A Modified Approach

First Author: Nilutparna DEORI

Co-Author(s): Manabjyoti BARMAN, Harsha BHATTACHARJEE, Kasturi BHATTACHARJEE, Ganesh KURI, Diva MISRA

Purpose: This video demonstrates a modified approach for fish hook removal from the oculo-orbital area with minimal tissue damage.

Methods: A 59-year-old man presented with an accidental fish hook injury to the left eye. On examination, the hook was embedded in the cornea and lens. Visual acuity was HMCF at presentation. Corneal edema and hyphema obscured the posterior segment view. X-ray revealed the barbed end impaled at the inferior orbital rim. B-scan USG localized the exit point at the pars plana region inferiorly. Double perforation of the

globe with vitreous tract at the exit wound was noted. Surgery was performed under general anesthesia and a transconjunctival approach was planned to clear the hook from the inferior orbital rim, following a lateral canthotomy. A modified approach was thus adopted instead of the conventional cut-advance method because of the large eyelet and thick metal. Herein the cornea was cut up to the limbus inferiorly and the fish hook removed in toto. Damaged iris was abscised and ECCE was done.

Results: Postoperatively at the end of 4 weeks, the eye appeared quiet with minimum anterior chamber reaction and intact corneal sutures. Vision was maintained at HMCF and intraocular pressure (IOP) was normal.

Conclusions: Fish hook removal from ocular coats appears to be very exigent. The above technique could be used as a novel and modified technique of salvaging the globe in difficult situations of fish hook injuries having extensive oculo-orbital involvement.

Myofibro Dermis Fat Graft Technique with Amniotic Membrane Overlay for Severely Contracted Socket

First Author: Deepika **KAPOOR**
Co-Author(s): Kasturi **BHATTACHARJEE**, Surpriya **HA-WAIBAM**, Prabhjot Kaur **MULTANI**, Samir **SERASIYA**, Richa **SHRIVASTAVA**

Purpose: To demonstrate a novel technique of myofibro dermis fat graft (DFG) with amniotic membrane (AM) overlay in a severely contracted socket.

Methods: This video takes viewers through the steps of the challenging surgical correction of a severely contracted socket (grade 3 Gopal Krishna classification). It highlights the harvesting of DFG and the novel technique of fashioning myofibro socket flaps, which are sutured to the corresponding quadrants of the DFG. All of the patients were then given AM overlay, fornix forming sutures, and placement of conformer.

Results: The author has performed this technique in 22 patients so far and has provided them with good socket reconstruction and enhanced prosthesis motility that have surpassed those with routine techniques.

Conclusions: Dermis fat graft with amniotic membrane overlay provides excellent outcomes in terms of cosmesis and motility. The use of amniotic membrane provides a smoother surface and offers a reduced healing time, which gives us the advantage of fitting a prosthesis as early as 3 weeks after surgery.

Orbital Floor Fracture Repair Simplified

First Author: Santosh **HONAVAR**
Co-Author(s): Chalamala **JANGAIAH**, Gangadhar **JALLI**, Raksha **RAO**

Purpose: To demonstrate the minimally invasive simplified technique of orbital floor fracture repair by the transconjunctival approach.

Methods: The use of porous polyethylene implant and cyanoacrylate tissue adhesive for fracture repair in a 10-year-old girl with orbital floor fracture is shown.

Results: Orbital floor fractures can result in severe aesthetic and functional complications if inappropriately managed. Floor is the most common site of fracture in the orbit, and successful repair is essential for anatomical continuity and functional recovery. Various materials used in orbital fracture repair include titanium mesh, silicone, autologous bone, etc. This video illustrates the use of porous polyethylene implant stabilized with cyanoacrylate glue to repair an orbital floor fracture by the transconjunctival technique.

Conclusions: Orbital floor fracture with porous polyethylene stabilized by cyanoacrylate glue is a simple procedure, which offers excellent structural support, shorter operative time, and cost-effectiveness.

Transnasal Wiring for Telecanthus

First Author: Sunil **MOREKER**
Co-Author(s): Harshvard **GHORPADE**

Purpose: To report the results of a novel prolene transnasal wiring for congenital telecanthus and for traumatic lacrimal sac recession with dacryocystitis secondary to traumatic telecanthus.

Methods: Transnasal wiring followed by prolene suturing of the medial canthi with double Z plasty was done for correction of telecanthus in 1 patient and for correcting lacrimal sac recession and secondary dacryocystitis in the other. They were evaluated at 3 months and a patient satisfaction score form was completed.

Results: Both patients had complete correction of telecanthus and high patient satisfaction scores.

Conclusions: Transnasal wiring with prolene suture is a novel option for telecanthus correction.

Pediatric Ophthalmology & Strabismus

Iris Claw Lenses for Correction of Aphakia in Children

First Author: Mohammad **MOSTAFA HOSSAIN**
Co-Author(s): Quazi **IFTEKHAR**, Mastura **KHATUN**, Milind **KILLEDAR**

Purpose: Surgical treatment of aphakia without capsu-



lar support in children is a great challenge, particularly in unioocular aphakia and noncompliant patients.

Methods: A prospective interventional case series was undertaken on 12 eyes of 8 children with aphakia without capsular support who underwent iris claw lens implantation through superior limbal incision by lens forcep and then positioned retropupillary by traditional enclavation of both haptics one by one into iris mid-periphery posteriorly through paracentesis near 3 o'clock and 9 o'clock position by dialer or Sinsky hook from October 2014 to April 2015. A detailed record of visual acuity, slit-lamp examination, and fundus evaluation was carried out. Patients were followed up for about 1.5 years.

Results: The study enrolled 12 eyes of 8 children. The age of patients ranged from 5 to 10 years. Among them, 5 were male and 3 were female. Patients who underwent posterior iris claw lens implantation showed improvement in visual acuity from at least 1/60 pre-operatively to 6/12 postoperatively. We encountered no postoperative complication. Amblyopia was a vision limiting factor.

Conclusions: The study revealed that retropupillary iris claw lens implant (posteriorly) is simple, safe, and effective in aphakia with no capsular support in children when noncompliance with spectacles and amblyopia are great concerns. However, further study with larger sample size and longer follow-up is warranted.

Medial Transposition of Split Lateral Rectus Augmented with Fixation Sutures in Cases of Complete Third Nerve Palsy

First Author: Digvijay SINGH
Co-Author(s): Medha SHARMA, Rohit SAXENA, Pradeep SHARMA

Purpose: To describe a modified technique of medial transposition of split lateral rectus muscle in cases of complete third nerve palsy.

Methods: The video shows the modified technique which involves splitting the lateral rectus into 2 halves followed by transposing the superior half from below the superior oblique and superior rectus and inferior half from below the inferior oblique and inferior rectus and attaching them at the superior and inferior edge of the medial rectus insertion, respectively. This is followed by placing non-absorbable posterior fixation sutures to fix each split belly of the transposed muscle to the sclera at the equator adjacent to the medial rectus.

Results: The split muscles lie nearly parallel to the medial rectus until the equator before reflecting away. Therefore, the posterior fixation sutures augment the force of the transposed muscles by redirecting the force vectors in the direction of action of the medial

rectus. There is satisfactory alignment even after 1 year of follow-up. Since only 1 muscle is disinserted, other muscles can be operated upon if required. With careful attention one can avoid the need for resurgery and achieve more predictable results.

Conclusions: This surgery provided satisfactory outcomes in cases treated with this technique.

Refractive Surgery

A to Z of Diagnosing and Managing Post-LASIK Ectasia

First Author: Bhupesh SINGH
Co-Author(s): Sudhank BHARTI

Purpose: Iatrogenic keratectasia is one of the most feared and dreaded complications of laser in situ keratomileusis (LASIK) for patients as well as surgeons. LASIK ectasia risk is underestimated due to lack of diagnosis and underreporting by surgeons. This video demonstrates the basic concepts in identifying cases of post-LASIK ectasia. The video will demonstrate various treatment modalities of managing post-LASIK ectasia.

Methods: Various management options of post-LASIK ectasia include hard contact lenses; intraocular pressure-lowering drugs; and intracorneal ring segments (ICRS), or INTACS. A corneal transplant may be required in advanced cases. A step-by-step approach to diagnose and manage such cases is shown in the video.

Results: Understanding corneal topography and signs of post-LASIK ectasia is very important in managing these cases.

Conclusions: Proper investigation and management modalities are useful in managing post-LASIK ectasia.

Flap Striae Management

First Author: Sujatha MOHAN
Co-Author(s): Mohan RAJAN

Purpose: To highlight the causes and management of flap striae in patients undergoing laser in situ keratomileusis (LASIK).

Methods: Flap striae can be divided into micro and macro striae. Any visually disturbing striae needs to be dealt with immediately. This video highlights the management of striae in patients with misalignment of the corneal flap and displaced flap.

Results: Early intervention in flap striae management gives excellent results and reduces the complications of epithelial ingrowth.

Conclusions: In our series of patients we had excellent recovery of vision after managing flap striae.

Negotiating the Learning Curve in Refractive Lenticule Extraction: A Beginner's Perspective

First Author: Sheetal **BRAR**
Co-Author(s): Sri **GANESH**

Purpose: To provide tips and tricks for refinement of clinical results in refractive lenticule extraction (ReLEx) small incision lenticule extraction (SMILE) surgery for a beginner.

Methods: A video-based step-by-step approach to SMILE surgery for a beginner.

Results: Various aspects of SMILE surgery such as patient preparation, energy optimization, cyclotorsion compensation, surgical techniques of lenticule management, and tips to avoid and manage complications are discussed.

Conclusions: This video is intended to guide beginners in SMILE surgery about the various dos and don'ts in the learning phase in order to improve their confidence in this surgical technique.

Retrieving Dropped IOL

First Author: Farukh **JAMEEL**
Co-Author(s): Hussain **KHAQAN**

Purpose: To retrieve dropped intraocular lens (IOL) and perform scleral fixation of the same IOL.

Methods: Pars plana vitrectomy was done, and IOL was retrieved lying on the retina. IOL was held with end grasping forceps and brought to the anterior chamber in front of the iris. Scleral fixation of the same IOL was done at 6 o'clock and 12 o'clock positions and IOL was placed behind the iris.

Results: IOL was well centered on the first postoperative day. Best corrected visual acuity (BCVA) was 6/12. No intraoperative or postoperative complication was observed.

Conclusions: Good anatomical and visual outcome can be achieved by retrieval and scleral fixation of the same IOL.

Tips and Tricks of Implantable Collamer Lens Implantation

First Author: Ganesan **VAITHEESWARAN**
Co-Author(s): Hema Malini **M S**, Luci **KAWERI**, Rohit **SHETTY**

Purpose: To elucidate the tips and tricks in implantable collamer lens (ICL; Staar Surgicals) loading, implantation, and sizing; the complications that can occur in a subset of patients during and after implantation; and the management of such complications.

Methods: ICL is considered as a preferred method of correcting ametropia in higher refractive errors. The

preoperative workup includes meticulous refraction, biometry, topography, and UBM, which are done for WTW estimation, sizing, and calculation of ICL power. Anterior segment optical coherence tomography (ASOCT) is used to determine the postoperative vault obtained. In spite of the careful preoperative workup and extensive ICL planning, it is unlikely to predict the accurate vault value resulting in various postoperative complications. Poor vault < 250 μm leads to cataract formation and capsular opacities, whereas excessive vault > 750 μm causes angle closure, pupillary block glaucoma, pigment dispersion glaucoma, or endothelial loss. An intraoperative OCT can also be used to guide the vaulting during implantation.

Results: Meticulous preoperative workup and a precise selection of ICL size along with a systematic and step-wise surgical approach can help minimize the rare complications associated with ICL implantation.

Conclusions: This video aims to portray various complications associated with ICL sizing, loading, and implantation in a case-based manner and provide a management algorithm to tackle these complications skilfully.

Retina (Surgical)

Application of the Viscoelastic Substance—An Innovative Technique in the Surgical Management of Proliferative Diabetic Retinopathy

First Author: Wang **SHUYA**
Co-Author(s): Yu **WANG**

Purpose: Diabetes is the the most common cause of legal blindness among individuals 20 to 74 years old. Due to short follow-up and lack of prevention consciousness, proliferative diabetic retinopathy (PDR) is quite common in China and often needs surgical intervention. In surgery for proliferative diabetic retinopathy, peeling of the proliferative membrane can be very tricky, especially in the macula. Iatrogenic hole and angiorrhesis in this kind of surgical management can bring unfavorable prognosis. How to optimize the surgical technique and tricks has always been our paramount consideration.

Methods: Viscoelastic substance has been recognized for its excellent malleability and histocompatibility and has been widely used in cataract surgery. In this video we provide a novel use of viscoelastic substance in PDR surgery. First, the operator isolated the proliferative membrane, then made a little tunnel from one edge of the membrane with the 23G vitrectomy probe, and injected viscoelastic substance into the tunnel to separate the membrane from retina as blunt dissection.

Results: This efficiently reduced the risk of retina tears, iatrogenic hole, and angiorrhesis while peeling the



proliferative membrane and improved the prognosis of PDR.

Conclusions: The application of viscoelastic substance in the surgical management of proliferative diabetic retinopathy is innovative and proved to be safe and effective.

Jet Stream Retinal Damage

First Author: Shaheeda MOHAMED

Co-Author(s): Chi-Wai TSANG

Purpose: To demonstrate retinal damage which occurred secondary to jet stream from the infusion cannula during air-fluid exchange.

Methods: Video showing a surgical case.

Results: This video will make use of an illustrative surgical case to demonstrate retinal break occurring secondary to jet stream from the infusion cannula during air-fluid exchange. Possible mechanisms will be discussed, as well as other infusion cannula-related retinal injuries.

Conclusions: Surgeons should be aware of the potential for retinal damage secondary to jet stream from the infusion cannula during air-fluid exchange.

Managing PVR

First Author: Kashif IQBAL

Purpose: To describe the steps involved in managing a case of retinal detachment with very advanced proliferative vitreoretinopathy (PVR) and funnel.

Methods: A video presentation of managing a case of retinal detachment with advanced PVR and funnel. The important steps are highlighted. The use of endoforceps is shown to assist the surgeon in opening up PVR membranes. The author has shown his method of dealing with this situation. The surgery was done using Biom viewing system and Constellation vitrectomy machine.

Results: In the end, complete retinal attachment was achieved and silicone oil endotamponade is preferred.

Conclusions: The author has shown his way of managing advanced PVR cases. Different steps are highlighted to explain to other surgeons the ways to deal with this situation.

Rescue Vitrectomy with Blocked Artery Massage and Bloodletting for Branch Retinal Artery Occlusion: Case Report

First Author: Chun-Ju LIN

Co-Author(s): Wen-Lu CHEN, Chung-Yuan KUO, Jane-Ming LIN, Cheng SU, Yi-Yu TSAI

Purpose: To report the effects of the rescue vitrectomy

with blocked artery massage and bloodletting in a case of branch retinal artery occlusion.

Methods: Interventional case report.

Results: A 61-year-old male with hypertension suffered from sudden blurred vision and superior visual field defect in the right eye. His vision was counting fingers at 20 cm in the right eye (OD) and 20/20 in the left eye (OS). Fundoscopy demonstrated inferior pale retina and a large embolus located at the proximal inferior retinal artery. Hence branch retinal artery occlusion was diagnosed. Initial paracentesis, topical alphagan, oral pentoxifylline, and hyperbaric oxygen therapy were performed but showed no improvement. Thus, he received 25-gauge vitrectomy, artificial posterior vitreous detachment, blocked artery massage, and bloodletting 5 days after onset. After the surgery, his vision improved to 20/25. Fundoscopy showed reperfused retina and optical coherence tomography revealed no residual retinal edema.

Conclusions: Retinal artery occlusion is an ophthalmological emergency; however, no standard guideline is available. Vitrectomy with blocked artery massage and bloodletting was performed uneventfully in a case of branch retinal artery occlusion with a large embolus. More prospective clinical trials are needed to establish the standard treatment of branch retinal artery occlusion.

Use of Temporary Keratoprosthesis in a Case of IOFB Complicated by Opaque Cornea

First Author: Ronel SOIBAM

Co-Author(s): Manabjyoti BARMAN, Harsha BHAT-TACHARJEE, Satyen DEKA, Jnanankar MEDHI, Diva MISRA

Purpose: To show the use of temporary intraoperative keratoprosthesis in severe traumatic endophthalmitis vitrectomy.

Methods: This video demonstrates the use of temporary intraoperative keratoprosthesis in severe endophthalmitis cases with opaque cornea that underwent hybrid vitrectomy combined with penetrating keratoplasty.

Results: Using the temporary keratoprosthesis, vitrectomy was possible in an almost unsalvageable eye with endophthalmitis where the cornea had become opaque and melting. This combined technique could save eyes with satisfactory postoperative outcomes with improvement of vision from perception of light to finger counting close to face.

Conclusions: Temporary intraoperative keratoprosthesis is useful to facilitate pars plana vitrectomy in severe endophthalmitis cases with grossly opaque cornea and can salvage the eye.

“Extreme Inversion”—Inverted Internal Limiting Membrane Peel in Detached Retina with Macular Holes

First Author: Vishal **AGRAWAL**

Purpose: To demonstrate the technique of inverting the internal limiting membrane (ILM) in detached retina with macular holes and its role in better closure rates.

Methods: Nine eyes with retinal detachment associated with macular holes were treated between July 2014 and September 2015. The etiology primarily included high myopia and trauma. After completion of vitrectomy, the area around macular hole was stained with BBG dye. Perflouorocarbon liquid (PFCL) was then injected to flatten the posterior pole. Under high magnification, the ILM was inverted over the hole either using a few broad flaps or multiple radial flaps. Fluid-air ex-

change was then performed slowly aspirating the PFCL, taking care not to disturb the flap.

Results: All 9 eyes achieved type 1 closure which was sustained at final follow-up.

Conclusions: ILM peeling for macular holes associated with retinal detachment is still subject to debate. Moreover the indications where it is performed, like myopic detachments with macular holes and detachments with large macular holes, often result in suboptimal outcomes and non-closure. Inverted ILM peel was introduced in 2010 for large macular holes. This video showcases different techniques in inverting the ILM in detached retina. In our experience inverted ILM peel for macular holes in detached retina offers excellent closure in all cases performed and is a reproducible manoeuvre, thus offering increased anatomical closure rates and probably improved functional outcomes also.



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