COS 2012 Annual Meeting
Submitted Abstracts

Canadian Ophthalmological Society/ Société canadienne d'ophtalmologie
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PATHOLOGY

TUESDAY 26 JUNE

Paper #1
Neutrophilic dermatosis of the periocular area: case series and literature review

Davin Johnson, Edward B. Moss, Vladimir Kratky

Purpose To report two cases of periocular involvement with neutrophilic dermatoses, a rare non-infectious group of skin conditions characterized by intense neutrophilic infiltrates in the epidermal and dermal layers

Study Design Case series (n=2) and literature review

Methods Two patients with biopsy-confirmed neutrophilic dermatoses, one of which was pyoderma gangrenosum, were referred to the Oculoplastic Service over a 3 month period regarding periocular involvement. The clinical course and management of these patients are reviewed.

Results Both patients were initially diagnosed with skin infections; however, microbial cultures were negative and skin biopsies revealed neutrophilic dermatosis in both patients. In one of the patients biopsy was consistent with pyoderma gangrenosum. Both patients improved on high dose oral prednisone- in the patient with pyoderma gangrenosum, significant cicatricial ectropion and corneal exposure occurred necessitating close follow-up with conservative and later surgical management.

Conclusions Neutrophilic dermatoses, including pyoderma gangrenosum, may rarely affect the periocular area and should be considered in the differential diagnosis of an ulcerative skin lesion. Diagnosis requires tissue biopsy, with treatment involving high dose corticosteroid and/or immunomodulatory therapy. Oculoplastic surgical procedures may be required for resultant deformities. The Ophthalmologist should also be aware of possible underlying autoimmune or hematologic conditions.

CATARACT- POSTERS

WEDNESDAY 27 JUNE

Paper #2
Cost-effectiveness Analysis of Immediately Sequential Bilateral Cataract Surgery

Monali Malvankar, William Hodge

Purpose Cataract is responsible for 48% of world blindness, which represents 18 million people according the World Health Organization. Due to inadequate surgical services in developing countries, cataract remains a leading cause of blindness. Even in developed countries where adequate surgical services are available, cataract may still be prevalent due to long waiting time for operations and associated cost. To enhance cataract surgical productivity and to reduce associated health care cost, immediately sequential bilateral cataract surgery (ISBCS), the cataract surgery that is performed in both eyes simultaneously, can be a plausible solution for patients needing surgery in both the eyes compared to delayed sequential bilateral cataract surgery (DSBCS), the surgery that is performed in each eye on a different day as a completely separate operation. The purpose of our project is to perform a cost-effectiveness analysis of ISBCS to answer the following questions. Is ISBCS, an appropriate cost effective way to rapidly rehabilitate patient's visual impairment? If yes, should ISBCS be offered routinely to patients with bilateral visually significant cataract?

Study Design We performed meta-analysis and cost-effectiveness analysis.

Methods We performed meta-analysis using EPPI Reviewer 4 and STATA. For the economic analysis, we constructed a decision analytic model from the public third-party (Ministry of Health) payer's perspective. The economic analysis consisted of cost-effectiveness analysis in which the cost and the effectiveness of both the surgeries, ISBCS and DSBCS, were compared. A study population consisted of adults with bilateral cataract surgery. Cost data consisted of the cost of the surgery from London Health Science Center-case costing system. The effectiveness was measured by the number of cases of vision of 20/40 or better.

Results The primary outcome measure was quality adjusted life years (QALYs) based on the conducted systematic review. We performed probabilistic sensitivity analysis using Crystal Ball Software to evaluate the robustness of the base-case results.

Conclusions Our research is the first step in performing such health economics assessment of ISBCS and the results of this economic evaluation will be useful for policy makers, clinicians, hospital administrators, and payers in order to put forward a protocol for performing ISBCS.

CATARACT- POSTERS

WEDNESDAY 27 JUNE

Paper #3
Suture fixation of Iris-Claw IOL

Marjorie Carbonneau, Amandeep S. Rai, Devesh Varma, Ike Ahmed

Purpose To report the suturing of a damaged haptic of the iris-claw lens to the iris. An 89 year old female Caucasian patient presented with a subluxed 1-piece acrylic posterior chamber IOL secondary to pseudoexfoliation syndrome in her right eye. She underwent lens exchange with explantation of the PCIOL and implantation of an 18.5D Artisan lens. At postoperative week four, the patient was dilated and shortly thereafter, the nasal haptic of the Artisan lens was found to be de-enclavated. Although the lens remained well enclavated temporally with good clearance from the central cornea, the lens was deemed at risk for subluxation, which could harm the corneal endothelium.

Study Design Case report.

Methods The patient returned to the operating room. The temporal haptic was released allowing the lens to be freely repositioned. It was then noted that the nasal claw was widened with evidence of trauma to the haptic tip from the initial surgery, and it would not be possible to re-enclavate it. One haptic of the nasal claw was sutured to iris using a 10-0 prolene suture on a CIF-4 needle. The needle entered a paracentesis, passed through iris under the haptic and retrieved through a second paracentesis by docking it in a 27 gauge blunt cannula. A knot was then tied using a modified McCannel technique. Once the nasal claw was secured, the IOL was grasped with a micro-tying forcep and aligned over the pupil, and re-enclavated temporally. With two point fixation achieved by one enclavated claw and one 10-0 prolene suture, the lens was felt to be stable.

Results At the one day, one week and one month postoperative visits, the IOL was enclavated temporally, sutured nasally, stable and centered over the pupil. There was improvement in her visual acuity and her vitreous hemorrhage cleared.

Conclusions To our knowledge, this is the first report of an iris-claw lens with haptic failure that was secondarily sutured to iris. The novel technique described provides an option for lens repositioning for ophthalmologists who encounter this situation.

CATARACT- POSTERS

WEDNESDAY 27 JUNE

Paper #4
The effect of patient factors on surgically induced astigmatism (SIA) in cataract surgery

Stephanie Wise, Maurice Agha, Michelle Ceniza, N Kevin Wade

Purpose To investigate the effect pachymetry, pre-operative spherical equivalent, ethnicity, gender and age have on surgically induced astigmatism (SIA).

Study Design A retrospective chart review of patients who underwent cataract surgery was performed. All surgeries used a 2.4mm incision and were completed by the same surgeon. Data on a total of 45 eyes was collected. Eyes with pathology and/or previous surgery were excluded. In assessing ethnicity, data was divided into Caucasian and Asian populations. Keratometry readings were obtained from the Zeiss Atlas 9000. SIA was calculated using the Warren Hill SIA Calculator.

Methods Pachymetry, pre-operative spherical equivalent, ethnicity, gender and age were analyzed by assessing means, standard deviations and one-tailed t-tests.

Results There was no relationship observed between pachymetry and SIA. As well, there was no statistically significant relationship found between age and SIA. However, there was a trend towards increased SIA in older age - in patients less than 75, the average SIA was 0.54 and in patients greater than 75, the average SIA was 0.68 ($p > 0.05$). There was no statistically significant relationship found between pre-operative spherical equivalent and SIA. However, more variability in SIA was seen in highly myopic eyes as compared to hyperopic - the standard deviation in SIA in eyes with a spherical equivalent less than -4 D was 0.48 and the standard deviation in SIA in eyes with a spherical equivalent greater than 2 D was 0.38 ($p > 0.05$).
Females had an average SIA of 0.67 and males had an average SIA of 0.48 ($p > 0.05$).
Caucasians had an average SIA of 0.61 and Asians had an average SIA of 0.56 ($p > 0.05$).

Conclusions This study investigated the impact of patient factors on SIA. This study found no reliable relationship between SIA and the following: pachymetry, gender, ethnicity, age and pre-operative spherical equivalent. However, it was observed that SIA tends to increase in older age and there is increased variability in SIA in highly myopic patients. As well, males have a lower average SIA compared to females. By determining the degree to which different factors contribute to SIA, a reliable calculator could be developed to enable surgeons to predict SIA in each patient. In future studies it may be important to consider axial length and white to white measurements.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #5
Leaks of the Boston Keratoprosthesis Type 1 Device

Kinda Najem, Mikael Sebag, Mona Harissi-Dagher

Purpose The Boston Keratoprosthesis type 1 (KPro) is an increasingly accepted treatment for corneal blindness. However, complications may compromise visual rehabilitation despite successful surgical outcome.
This study aims to report on hypotony after KPro surgery, in particular, a rare complication, a leak at the corneal-anterior front plate interface of the KPro. The impact of hypotony on visual rehabilitation post KPro is evaluated as well.

Study Design Retrospective interventional case series

Methods Medical records of 3 patients who developed hypotony following KPro implantation at our tertiary care centre were reviewed. Pre-operative assessment, operative protocol, and progress notes were reviewed regarding ophthalmic diagnosis, pre- and post-operative visual acuity (VA), digital intraocular pressure, (IOP) and hypotony-related complications. Time to diagnosis of hypotony complication was also noted. The impact of hypotony damage on visual potential, and the need for its medical and surgical treatment were studied.

Results Three patients developed hypotony. Two had a preoperative diagnosis of aniridia and one had a history of failed penetrating keratoplasties for HSV keratitis complications. Pre-KPro best-corrected visual acuity (BCVA) ranged from hand motion (HM) to light perception (LP) and improved to a mean BCVA of 20/100 (range of 20/100 to 20/150) in the operated eyes. Digital measurement of IOP revealed hypotony of approximately ≤ 5 mm Hg. The hypotony was noted at a mean of 13.7 months post-operatively (range of 11-18 months) and choroidal/retinal detachments developed in all patients. All patients had had persistent uveitis and vitritis preceding the posterior pole complications. All patients required pars plana vitrectomy (PPV) with silicone oil injection for repair. In all patients, an objective leak through the cornea-anterior front plate interface of the KPro was seen per-operatively by the vitreoretinal surgeon. One patient required a repeat KPro in the affected eye. In another patient, the leak trans-KPro was repaired with glue. In the third patient, the leak was no longer evident in the post-PPV period and IOP increased. Mean BCVA in these patients stabilized between 20/400 and CF (range of 20/300 to HM) after the complications with a mean IOP of 10 mm Hg (range from 5-15 mm Hg).

Conclusions Hypotony and its associated complications can have devastating visual consequences in patients implanted with KPro. Leak next to the KPro stem, a rare

complication, can occur after a few months in certain patients and can lead to significant visual loss. Prompt recognition of this complication with a team approach management and long-term follow-up are required in these patients.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #6
Prompt amniotic membrane grafting in acute Stevens-Johnson syndrome

Konrad Chmiel, Frozan Qasemi, Vikas Sharma

Purpose To compare the outcomes of amniotic membrane transplant (AMT) in two patients with acute Stevens-Johnson syndrome treated at different time points in their disease.

Study Design Interventional case reports

Methods Bilateral AMTs were applied in three segments to each eye; upper and lower fornix, and cornea. Patient A was treated with bilateral AMTs on day 8 of symptom presentation. Patient A required a total of three AMTs to both upper and lower lids and one AMT to the lower lids. Patient B was treated with AMTs on the third day of symptom onset. Repeated membrane grafting was required to the right inferior eyelid only.

Results Patient A has prominent symblepharon formation in the medial and lateral aspect of the right inferior fornix and the lateral aspect of the left inferior fornix. One month post-operative follow-up in patient B has not revealed any symblepharon formation.

Conclusions It is suggested that early grafting with amniotic membranes reduces the risk of symblepharon formation in acute Stevens-Johnson syndrome.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #7
Success of early amniotic membrane transplantation in preventing irreversible sequelae of ocular graft-versus-host disease (GVHD)

Frozan Qasemi, Konrad Chmiel, Vikas Sharma

Purpose To clarify the usefulness of performing prompt amniotic membrane transplantation in patients with ocular GVHD

Study Design Interventional case report

Methods Two patients with allogeneic hematopoietic stem cell transplantation presented with signs of active ocular inflammation secondary to GVHD. Treatment with topical steroids and antibiotic ointment was initiated in both patients along with prompt amniotic membrane transplantation. In both cases, one layer of amniotic membrane graft was applied to the whole cornea, palpebral and bulbar conjunctiva.

Results During the follow-up, stability of the corneal epithelium and absence of symblepharon was noted in both patients. The amniotic membrane-covered areas showed rapid epithelization, reduced inflammation and absence of fibrosis in both cases.

Conclusions Early amniotic membrane transplantation should be considered as a therapeutic approach in patients with evidence of ocular GVHD in order to prevent any irreversible ocular tissue damage.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #8
Excellent outcome with amniotic membrane transplant following severe ocular chemical injury with extensive limbal ischemia

Gabriela Campos, Matt Regan, Vikas Sharma

Purpose To report a case of successful use of amniotic membrane transplant in a patient with >270 degrees of limbal ischemia following a chemical injury

Study Design Interventional case report

Methods We present a case of a 42-year-old male who sustained a severe chemical injury to his eyes following an explosion of pyrotechnic fireworks in his face at close range. On presentation, his visual acuity was count fingers OD and hand motions OS. In addition, he had >270 degrees of limbal ischemia OD. Approximately 7 hours after his injury, he underwent amniotic membrane transplantation to cover the ocular surface of both eyes

Results 2 months following his initial amniotic membrane transplant, his best-corrected visual acuity was 20/25 OS and 20/20 OD. In addition, he has complete limbal vascularization OU.

Conclusions A high success rate has been shown with use of amniotic membrane transplantation in the acute phase for mild to moderate ocular burns. However, there have been less than ideal results for patients presenting with severe burns, specifically those with extensive limbal ischemia. This report describes a case of chemical injury to the eye, involving significant limbal ischemia, that responded exceptionally well to amniotic membrane transplant in the immediate phase of injury.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #9
3D Corneal Shape Changes with Age and Ametropia

Marina Gilca, Edouard Auvinet, Georges M. Durr, Jeb A. Ong, Marie-Eve Choronzey, Jean Meunier, Isabelle Brunette

Purpose To describe corneal shape as a function of age and ametropia, based on the integrated analysis of Orbscan corneal topography average models (atlases).

Study Design Cross-sectional

Methods A total of 5059 consenting subjects, including 2523 females and 2531 males (5 missing information), with no history of ocular disease, surgery, or recent contact lens wear, were enrolled in this study. The mean (± SEM) age was 40.4 ± 0.2 years (range: 4 to 100 years), with a spherical equivalent of -3.02 ± 0.03 D (range: -14.00 to +14.25 D) and a refractive cylinder of 0.76± 0.01 D (range: 0 to 6.00 D). Subjects were divided in four age groups ([0-25 years[; [25-50[; [50-74[; and [75-100[) and four ametropia groups (spherical equivalent < -4.00 D; [-4.00 to 0[; [0 to +4.00[; and ≥ +4.00 D). Orbscan II corneal topography (Bausch and Lomb, Rochester, NY) was performed on all eyes. An atlas was constructed for each group. Each atlas included a series of anterior surface elevation and curvature maps, posterior surface elevation and curvature maps, and mean pachymetry maps. Difference maps and statistics maps were generated to compare the groups. Several topography parameters were analyzed using a two-way ANOVA model.

Results Preliminary results revealed a significant interaction ($p<0.001$) between the two explanatory variables, age and ametropia, for the thinnest point value, lateral excentricity of the thinnest point with regards to the center of the topograhy, and keratometric astigmatism. No significant interaction was found between age and ametropia, but both explanatory variables, when considered independently, were found to have a significant effect on the following outcome parameters ($p<0.01$): maximum central keratometric value, mean power in the 0 to 3 mm radius central area, and mean power in the 3 to 5 mm annulus area (in these three zones, overall steeper anterior surface in myopic eyes and older subjects), keratometric astigmatism meridian (the steep meridian was closer to vertical in myopic eyes and younger subjects), and vertical location of the thinnest point (lower in hyperopic eyes and younger subjects).

Conclusions Based on Orbscan corneal topography average model analyses, the 3D corneal shape seems to be significantly influenced by age and ametropia.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #10
Outcomes following Boston Keratoprosthesis type I implantation in aniridia patients: the University of Montreal experience

Salima I. Hassanaly, Julia Talajic, Mona Harissi-Dagher

Purpose To describe outcomes after Boston Keratoprosthesis Type 1 (KPro) surgery in aniridic eyes.

Study Design Retrospective, single center, consecutive case series

Methods A chart review of 21 aniridic eyes (15 patients) that underwent KPro implantation by a single surgeon (MHD) between October 2008 and April 2011 in a university center was performed. Preoperative and postoperative best-corrected visual acuity (BCVA), intraoperative and postoperative complications, and keratoprosthesis retention were examined.

Results Mean age was 54.3 years (range, 27-71); 8 patients were male. Six patients had bilateral procedures. No intraoperative complications were encountered. Preoperatively, BCVA was 20/200 or worse in all eyes. After a mean follow-up time of 20.9 months (range, 4.2-36.2), the most recent BCVA ranged from 20/70 to no light perception. Visual potential was limited by pre-existing terminal glaucoma (n=2), phthisis after retinal detachment (n=2), and suprachoroidal hemorrhage (n=2). Other postoperative complications included retroprosthetic membrane formation (n=11), trans-prosthetic leakage (n=2), and extrusion (n=1). Uncomplicated uveitis was reported in 6 eyes. No endophthalmitis or corneal melt occurred in this series. The majority of eyes have glaucoma and are on medical treatment.

Conclusions The prognosis in aniridic patients after KPro is variable, but is favorable overall. Meticulous follow-up and a subspecialty team approach are important.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #11
Tissue engineering of a corneal endothelium using cells from patients with Fuchs endothelial corneal dystrophy

M. Nour Haydari, Benjamin Goyer, Olivier Roy, Simon Laprise, Olivier Rochette Drouin, Isabelle Brunette, Stéphanie Proulx

Purpose To characterize a reconstructed corneal endothelium bioengineered by seeding cultured Fuchs endothelial corneal endothelium (FECD) cells on the denuded Descemet's membrane of a human cornea.

Study Design Experimental laboratory study.

Methods Descemet's membranes from patients undergoing Descemet stripping automated endothelial keratoplasty (n=6) were used to isolate and culture FECD endothelial cells. Second or third-passaged FECD endothelial cells were seeded on top of a previously decellularized human cornea. After 2 weeks in culture, in order to allow for attachment and spreading of seeded cells, the reconstructed corneas were stained with alizarin red and fixed for histology and transmission electron microscopy (TEM). Immunofluorescence labeling of various proteins was also performed.

Results Amplification of the cultured FECD cells generated between 88000 and 1.1 million cells. FECD cell morphology on Descemet's membrane was polygonal. Histology and TEM revealed a monolayer of tightly packed cells well adhered to Descemet's membrane. The reconstructed FECD corneal endothelium expressed K8/18 and did not express a-SMA, confirming the absence of endothelial-mesenchymal transition. Clusterin expression was faint and uniform in all constructs. FECD cells also expressed the function-related proteins Na+-K+/ATPase and Na+/HCO3-. Collagen type IV expression was visible as a thin and uniform line on the endothelial side of Descemet's membrane.

Conclusions This study demonstrates the feasibility of reconstructing a corneal endothelium using cells from patients with FECD. This represents an additional step towards a better understanding of this endothelial dystrophy. Potential applications are numerous, including in vitro pathophysiological and pharmacological studies.
Support: CIHR, FRSQ Research in Vision Network, and Fondation du CHA.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #12
A Delayed Complication of Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK)

Frozan Qasemi, Nishant Sharma, Vikas Sharma

Purpose To report two cases with a unique presentation of DSAEK flap scrolls

Study Design Interventional case report

Methods We report two cases involving a 63 year-old woman and a 68 year-old man with delayed presentation of DSAEK graft detachment. Both patients had undergone uncomplicated DSAEK procedures by two different surgeons in two eye care institutions. The first patient presented after 2 years and the second after 3 years with similar clinical manifestations. In both cases, the DSAEK flap had scrolled towards the anterior chamber and a localized area of corneal edema was noted in association with the graft detachment.

Results Long after an uneventful and presumably successful DSAEK procedure, two patients presented with a slowly progressive graft detachment and scrolling of the edge of the DSAEK flap. Both cases potentially require a re-DSAEK surgery.

Conclusions Even though DSAEK offers an effective and efficient alternative to traditional penetrating keratoplasty for the treatment of endothelial diseases, it is a relatively new procedure and its associated complications are slowly being unraveled. This complication provides a new insight into the survival of DSAEK flaps.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #13
Evolution of Corneal Transplantation in the Province of Quebec from 2000 to 2011

Louis-Pierre Gauvin Meunier, Julie Lapointe, Marie-Eve Choronzey, Sophie Dubuc, Marc Germain, Michèle Mabon, Isabelle Brunette

Purpose To determine the changes in surgical techniques, leading indications and the number of corneal transplantations performed in the cities of Montreal and Sherbrooke (Québec, Canada) from 2000 to 2011.

Study Design Retrospective review of the Quebec Eye Bank and Héma-Québec corneal transplant records.

Methods We reviewed records of all corneal transplants performed between June 2000 and June 2011 in Montreal and Sherbrooke. Tissues were provided by the Quebec Eye Bank and Héma-Québec, the not-for-profit organization responsible for tissues for transplantation in the province of Québec. Transplants were performed by 20 corneal surgeons at 10 university hospitals. Data were collected from the recipient information form completed by the surgeon at the time of surgery, the donor record and, when needed, the patient's clinical chart.

Results Preliminary results on 1865 corneal transplants indicate that in 2010-2011 the main indications for corneal transplantation were: Fuchs endothelial dystrophy (42.3%), pseudophakic corneal edema (25.3%), keratoconus (11.3%), post-infectious keratopathy (5.3%), and trauma (4.6%). This distribution is similar to data from 2007-2008. Available data indicate that in 2010-2011, 29.0% of the transplants were regrafts. Descemet stripping automated endothelial keratoplasty (DSAEK) has become increasingly popular, with 3 such procedures in 2007-2008 (3.2%), compared to 186 (52.7%) in 2010-2011. The ratio DSAEK : penetrating keratoplasty (PK) evolved from 1:12.6 in 2007-2008 to 1:0.2 in 2010-2011 (all grafts considered). The preferred type of graft for endothelial pathologies changed from PK (92.7%) in 2007-2008 to DSAEK (78.0%) in 2010-2011. A significant increase in the total number of grafts performed was observed when Héma-Québec took charge of the procurement and allocation of corneal tissues in 2009, while the Quebec Eye Bank remained responsible for preparing and qualifying the grafts. The mean annual number of transplants performed between 2003 and 2009 (149 ± 38.5; range: 100 to 194) tripled to 466 grafts in 2010-2011.

Conclusions These trends reflect recent reports from the North American literature. Our preliminary results seem to highlight the positive impact of the association between the Quebec Eye Bank and Héma-Québec. Support : CIHR, FRSQ Research in Vision Network.

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #14
Successful culture of human corneal endothelial cells isolated from patients with Fuchs endothelial corneal dystrophy

Isabelle Brunette, Karine Zaniolo, Marie-Claude Perron, Cristina Bostan, Olivier Rochette Drouin, Alexandre Deschambeault, Stéphanie Proulx

Purpose To assess the feasibility of culturing, without viral transduction, human corneal endothelial cells from patients with Fuchs endothelial dystrophy (FECD). We also evaluated which conditions yielded the best results in culture.

Study Design Laboratory Experimental Study

Methods Descemet's membranes (DM) excised from 29 consenting patients undergoing Descemet stripping automated endothelial keratoplasty (DSAEK) were used for this study. Endothelial cells were isolated and cultured. DM of 13 specimens were analyzed by transmission electron microscopy (TEM). Immunofluorescent staining for clusterin was also performed.

Results Of the 29 specimens, 18 successfully initiated a culture. Cell morphology varied from endothelial (rounded, slightly elongated cells, n=12) to fibroblastic-like (thin and very elongated cells, n=6). These differences in cell morphology were also observed with the normal human corneal endothelial cell cultures. Cultures initially presenting with an endothelial morphology maintained their shape in subculture. Similar levels of clusterin expression were observed in FECD and normal endothelial cells. TEM of FECD DM showed abnormalities typical of FECD, including a thickened DM, a posterior banded layer, a fibrillar layer and striated bodies of various sizes and periodicities. Patient's preoperative corneal thickness, specimen size, presence of pigmentation and guttae were not predictive factors of culture success. Patient's age however was correlated with culture success. Endothelial cells from patients younger than 60 years all generated successful cultures of endothelial morphology, while none of those from patients over 80 generated cultures of endothelial morphology. The absence of a fibrillar layer was also associated with greater success in culture.

Conclusions This work shows for the first time that endothelial cells found on the central DM of patients suffering from FECD still retain proliferative capacity and that they can be isolated and cultured without viral transduction. This new in vitro model for FECD opens the way to the development of new treatments for this painful and blinding disease. This work was supported by: Fondation du CHA, CIHR, and FRSQ Research in Vision Network

CORNEA- POSTERS

WEDNESDAY 27 JUNE

Paper #15
Living model for Fuchs endothelial corneal dystrophy

M. Nour Haydari, Marie-Claude Perron, André Deveault, Myriam Bareille, Benjamin Goyer, Olivier Roy, Simon Laprise, J. Douglas Cameron, Stéphanie Proulx, Isabelle Brunette

Purpose To assess the functionality of a tissue-engineered corneal endothelium reconstructed using corneal endothelial cells from human patients with Fuchs endothelial corneal dystrophy (FECD).

Study Design Experimental animal study design.

Methods Sixteen healthy cats underwent penetrating keratoplasty. Eight animals were grafted with a tissue-engineered (TE) corneal endothelium reconstructed using cultured endothelial cells from patients with FECD (TE-FECD). Two control animals were grafted with a TE corneal endothelium reconstructed using cultured endothelial cells from normal eye bank corneas (TE-normal). Two control animals received a native human cornea. Four other controls were grafted with the stromal carrier only (without endothelial cells). Outcome parameters included graft transparency (0 (opaque) to 4 (clear)), central pachymetry, optical coherence tomography, endothelial cell morphometry, transmission electron microscopy (TEM) and immunostainings of function-related proteins.

Results Seven days after transplantation, 6 of 8 TE-FECD grafts, all TE-normal grafts and all native normal control grafts were clear (transparency score greater than 3), while all carrier only control grafts were opaque (transparency score of less than 1). The mean central pachymetry was 755±141 µm for TE-FECD, 524±7 µm for TE-normal, 555±32 for native normal and 1188±245 µm for carrier only. TEM showed subendothelial loose fibrillar material deposition in all TE grafts. Other typical but nonspecific findings included: intracellular filaments, cytoplasmic processes, enlarged rough endoplasmic reticulum and lysosomes. No corneal guttae were observed in this early postoperative period. The TE endothelium expressed Na+-K+/ATPase and Na+/HCO3-. Clusterin immunostaining was faint and similarly expressed in TE-FECD, TE-normal and native grafts.

Conclusions Restoration of corneal thickness and transparency demonstrated that the TE-FECD grafts were functional in vivo. This novel TE approach opens the door to future studies on FECD cell rehabilitation.
Support: CIHR, FRSQ Research in Vision Network, and Fondation du CHA.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #16
Combination therapy as initial treatment in glaucoma and glaucoma suspects.

Frederick Mikelberg, Mahyar Metminan

Purpose We hypothesize that there may be an inappropriate overutilization of initial combination therapy in patients with glaucoma or glaucoma suspects. In order to test this hypothesis, we examined the British Columbia Population Data Base to determine the frequency of combination eye drops prescribed as initial therapy in glaucoma patients or glaucoma suspects.

Study Design The study cohort included all those who visited an ophthalmologist's office from 2004 to 2007. Within the cohort we identified all those who were newly prescribed any ocular hypotensive eye drop. Specifically, we identified those who had been newly prescribed any ocular hypotensive eye drop within 60 days of receiving a diagnosis of glaucoma defined by having received an international classification for disease code (ICD-9) for glaucoma (365).

Methods We used the Population Data British Columbia (POP Data BC) as the main data source for this study. POP Data BC is a provincially linkable database that captures physician visits (including in-patient procedures), hospital admissions, demographics and prescription drug use for 4.5 million residents of British Columbia, Canada.

Results From 2004 to 2007, the frequency of combination therapy as initial ocular hypotensive prescription rose from 12.29% to 18.63%.

Conclusions The high frequency of prescription of combination therapy as initial therapy suggests that ophthalmologists either require additional education in principles of pharmacological therapy or they are unduly influenced by their interaction with the pharmaceutical industry.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #17
Relationship between peripapillary atrophy and lamina cribrosa compliance in open-angle glaucoma and ocular hypertension

Jella A. An, Denise T. Descovich, Ali S. Hafez

Purpose To investigate changes in lamina cribrosa compliance in relation to the presence or absence of peripapillary atrophy (PPA) following therapeutic reduction of intraocular pressure (IOP) in patients with open-angle glaucoma (OAG) and ocular hypertension (OHT). Lamina cribrosa compliance was determined by the tendency of the base of the optic nerve head to move in response to changes in IOP.

Study Design A total of 78 patients with OAG or OHT underwent scanning laser topographic measurements of the optic nerve head using the Heidelberg Retinal Tomograph (HRT) before and after at least 20% therapeutic IOP reduction and a minimum of 4 weeks follow-up.

Methods Based on the presence of at least 250 microns of temporal PPA (zone beta) measured on HRT images, patients were assigned to either a PPA group (n=39) or a NOR group (n=39). Lamina cribrosa compliance was estimated by the change in mean and maximum cup depth, which indicates displacement of the base of the cup relative to the retinal surface following sustained IOP reduction. Such changes were then assessed in both OAG and OHT subgroups. Statistical analysis was performed on both groups using two-tailed student's t test.

Results Following a similar % of IOP reduction (37% in the PPA group, and 34% in the NOR group, p=0.21), changes in mean and maximum cup depth were not significantly different between both study groups (p=0.098 for mean cup depth and 0.085 for maximum cup depth). Further subgroup analysis revealed a significant change in mean and maximum cup depth within the OAG patients (p=0.007 and 0.025 respectively) but not in OHT patients (p=0.529 and 0.651 respectively).

Conclusions Presence of PPA was associated with greater lamina cribrosa compliance in OAG patients but not in OHT patients. This points to a possible role of lamina cribrosa compliance in the development and progression of glaucomatous optic neuropathy.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #18
Systematic literature review and meta-analysis of IOP elevation post intravitreal steroids

Weerawat Kiddee, Graham Trope, Lisa Sheng, Laura Beltran-Agullo, Michael Smith, M Hermina Strungaru, Jasrajbir Baath, Yvonne Buys

Purpose Currently there is no consensus regarding IOP monitoring post intravitreal (IV) steroids. We conducted a systematic literature review following the PRISMA statement to develop best practice recommendations on IOP monitoring.

Study Design A systematic literature review and meta-analysis

Methods MEDLINE, EMBASE and the Cochrane Registry were searched through August 2011. Inclusion criteria were prospective RCT, cohort or retrospective study,≥15 years of age and English publication. Case reports, review articles, editorials and studies without a definition for ocular hypertension (OHT) were excluded. Meta-analysis or descriptive statistics were performed where appropriate. The main outcome was proportion of subjects with OHT (IOP >21mmHg or >10mmHg rise from baseline). Secondary outcomes included timing of IOP rise, treatment and risk factors.

Results After screening 1338 abstracts 174 full text articles were reviewed resulting in 129 eligible studies. 4 mg triamcinolone acetonide (TA) was the commonest dosage and drug used. The pooled proportion of subjects with OHT was 32.1% (95% CI; 28.2-36.3) of which 50-70% had history of POAG. Medications were used in 40-50% with 2-9% requiring surgery. For fluocinolone acetonide (FA) implant, 55-67% and 79% had a ≥10 mmHg rise after 0.59 or 2.1mg respectively. Medications were used in 20-78% and 40% required surgery. For dexamethasone implant, a ≥10 mmHg rise occurred in 12-15% following 0.35mg and 7-18% following 0.7mg. Antiglaucoma medications were used in 6-16% of subjects and 0.6% required surgery. IOP elevation occurred 1 week after TA and after 2-4 weeks with implants. Mean time to IOPmax was 2-3 months in all groups. Eyes with FA implants took longer to return to baseline IOP compared to the others (9 vs. 6 months). Risk factors for developing secondary OHT included preexisting glaucoma, uveitis, higher baseline IOP, younger age, higher dose of TA and history of OHT with previous steroid injection.

Conclusions IV steroids commonly cause secondary OHT. The majority can be controlled medically however some cases, especially FA implants, require surgery. All patients receiving IV steroid should be warned about this potential side effect. Based on this analysis we recommend checking IOP at 1 week after IV TA injection and 2 weeks after IV implantation. IOP should then be checked 2 weekly for the first month followed

by monthly for 6 months after IV TA injection and dexamethasone implant and for 9 months after FA implant.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #19
Glaucoma tube imaging using anterior segment optical coherence tomography

Weerawat Kiddee, Graham Trope

Purpose Anterior segment optical coherence tomography (AS-OCT) was used to diagnose Ahmed tube tip patency in patients with opaque corneas post corneal transplantation and tube shortening.

Study Design Non comparative observational case series

Methods Three consecutive patients with nonvisualized tubes and uncontrolled intraocular pressure (IOP) post corneal transplantation underwent AS-OCT to determine tube tip patency.

Results In each case AS-OCT allowed for imaging of the tube position (Figure 1-3), wall passage and osteum patency that could not be visualized on gonioscopy. Two of three tubes were found to be non patent (Figure 1, 2A).

Conclusions High-resolution noncontact cross-sectional AS-OCT images provide information on tube position and patency in the presence of opaque media post corneal transplantation, assisting with clinical decision making.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #20
Success rates and risk factors for failure of bleb needling post trabeculectomy.

Andrew Toren, Sadhana Kulkarni, Lesya Shuba, Marcelo Nicolela

Purpose To evaluate the success rate of bleb needling and identify risk factors for failure.

Study Design Retrospective cohort study.

Methods Consecutive patients undergoing their first bleb needling during a period of January 2007- May 2009 were eligible. Patients with less than 1-year follow up were excluded. The primary outcome measure was the absolute and qualified success at the last follow up visit. Absolute success was defined as a reduction of intraocular pressure (IOP) to less than 18mmHg with at least a 20% IOP reduction from pre-needling IOP, with equal or less number of IOP medications compared to before needling, and without further glaucoma surgery or devastating complications. Qualified success allowed for an increased number of IOP medications. The secondary outcome was the time to failure. Statistical analysis included Kaplan-Meier plots and a Cox regression analysis.

Results 96 eyes of 86 patients were enrolled in the study. 9 eyes were excluded due to inadequate follow-up. The mean follow-up for the 87 eyes of 80 patients included was 22.5 ± 9.9 months. Subconjunctival mitomycin C (MMC) (0.02mg) was used in 83 cases (95.4%) and 5-FU (10mg) in 2 cases (2.3%). The mean time between trabeculectomy surgery and the needling procedure was 16.2 ± 34.4 months (range 25 days - 17 years). The mean IOP pre-needling and at the final visit was 21.7±6.7 and 15.2 ± 6.6 mmHg respectively ($p<0.001$). Repeat needling was performed in 23 eyes (26.4%) and additional glaucoma surgery in 15 eyes(17.2%). Absolute and qualified success at the last follow-up visit was 51.7% and 59.8% respectively. The average time to failure was 5.4±8.2 months. Earlier failure was associated with elevated IOP pre-needling as a continuous variable (Hazard Ratio 1.06 95% CI 1.01-1.11). Time interval between surgery and needling, primary diagnosis, previous laser surgery, age, and lens status were not associated with time to failure. Transient hypotony (IOP < 6mmHg) occurred in 14 eyes. Six eyes had choroidals and one had a suprachoroidal hemorrhage.

Conclusions Bleb needling is successful in reducing IOP, has a low rate of complications, and is effective in decreasing the need for further glaucoma surgery. The success is not altered by the length of time since trabeculectomy.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #21
Protective effect of connexin43 in human trabecular meshwork cells exposed to mechanical stretch

Mary M. Feng, Hong Liu, Cindy Hutnik

Purpose The purpose of this study was to determine the effect of mechanical stress on human trabecular meshwork cells (HTMC) and to study the role of connexin43 (Cx43) in HTMC exposed to mechanical strain.

Study Design Basic science.

Methods Primary HTMC were cultured on collagen I coated Flexcell plates for 5 days in 10% FBS and 1%P/S until 90% confluent, and switched to serum free medium immediately prior to mechanical stress. In addition, HTMC were infected with retrovirus encoding empty vector (V) and vectors encoding Cx43 and a disease-linked dominant negative Cx43 mutant (G138R). HTMC were exposed to 15% stretch for 48 hours at 1 Hz using the FX-5000 Tension system. LDH release was measured using the Cytotoxicity Detection Kit and levels of cytosolic DNA fragments were determined to assess apoptosis. Cx43 mRNA and protein levels were measured using real-time PCR and Western Blot respectively.

Results Mechanical stretch increased LDH release from HTMC by 42% ($p<0.05$). In addition, stretching increased HTMC apoptosis by 19% ($p<0.05$). Cx43 mRNA ($p<0.01$) and protein expression ($p<0.01$) decreased significantly after mechanical strain. Cx43 overexpression by retroviral infection reversed the cell injury caused by mechanical stretch, as seen by a significant reduction in LDH release ($p<0.05$).

Conclusions Mechanical stretch induces cell injury and apoptosis, and decreases Cx43 expression in HTMC. Overexpression of Cx43 protects HTMC from mechanical stress.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #22
Risk Factors Affecting Optic Nerve Head Blood Flow after therapeutic IOP Reduction in Patients with Open Angle Glaucoma and Ocular Hypertension

Radwan Ajlan, Denise T. Descovich, Ali S. Hafez

Purpose To detect possible risk factors affecting changes in Optic Disc Rim Blood Flow (ODRmF) following therapeutic IOP reduction in patients with open angle glaucoma (OAG) and ocular hypertension (OHT).

Study Design Retrospective, nonrandomized, self-controlled cohort study.

Methods 40 patients (20 subjects with OAG and 20 subjects with OHT) with clinical indications for therapeutic IOP reduction were included in this study. IOP reduction was achieved by medical, laser, or surgical therapy. All subjects had IOP reductions more than 20% and a minimum of 4 weeks follow-up. Blood flow measurements were originally performed using SLDF analysis of Heidelberg Retina Flowmeter images. Subjects were divided into 2 main groups based on the percentage change of optic disc rim blood flow following therapeutic IOP reduction: Group A with ≥ 20% change in ODRmF (N=20), Group B with < 20% change in ODRmF (N=20). Possible demographic and clinical risk factors that could affect changes in ODRmF were compared in both study groups. These factors include age, sex, co-morbidities, baseline IOP, cup to disc ratio, % IOP reduction and baseline rim blood flow. Statistical evaluations were performed using two tailed paired t-test and analysis of variance.

Results Both groups had similar % IOP reduction (33% in Group A versus 32% in Group B). Group A showed 108% increase in ODRmF (from 122+/-48 to 230+/-69au) whereas Group B showed 3% decrease (from 306+/-95 to 290+/-93au). Mean baseline rim blood flow was significantly lower in Group A patients compared to Group B patients (P=0.000008). Such difference remained significant in both OAG patients (P<0.0001) and OHT patients (P=0.001). ANOVA correlation between the baseline ODRmF and the amount of the change in the flow after IOP reduction was statistically significant in both subgroups (P<0.0001). No difference between the two groups was found in other risk factors studied.

Conclusions Greater improvements in optic disc rim blood flow was associated with lower baseline rim flow values. This finding was apparent in both OAG patients and OHT patients. In addition to indicating a vascular response to therapy, the reported changes suggest that autoregulation of the optic nerve head blood flow may be defective in patients with impaired baseline rim perfusion.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #23
Teleglaucoma: improving access to glaucoma care in underserviced areas

Faazil Kassam, Samreen Amin, Enitan Sogbesan, Marianne C. Edwards, Michael W. Dorey, Ordan Lehmann, Karim F. Damji

Purpose Given the ever increasing burden of glaucoma and human resource capacity constraints, creative solutions are needed for high quality, timely glaucoma assessment and management to prevent visual loss. Teleglaucoma, which adapts telehealth for glaucoma, offers the potential to improve access and efficiency for those in remote communities and underserviced areas. We describe our early experience with such a model.

Study Design Teleglaucoma has been implemented at the University of Alberta as part of a wider patient-centred collaborative care and teleophthalmology approach. The recent development of specialized software permits stereoscopic assessment of digital retinal images in a secure web-based environment (SDI). The program operates on a ‘hub and spoke' construct that remotely transfers structured history, examination (IOP, CCT, slit-lamp) and diagnostic assessment (fundus photographs, visual fields, OCT, and HRT) from capture stations (spokes) to a centre for grading (hub).

Methods A ‘remote' pilot model has been launched in collaboration with 15 community optometrists in Alberta and one comprehensive ophthalmologist in Yellowknife. Key information is uploaded securely, and grading is completed by a glaucoma specialist with a report sent to the referring provider. The goal is to provide earlier access to glaucoma consultation and reduce the need for unnecessary travel cost and time for patients while maintaining the highest quality care. Referral patterns and average reporting turnaround time are monitored for quality control. The model has stringent exclusion criteria that includes advanced glaucoma, significantly elevated IOP, suspicion of angle closure or secondary glaucomas and anxiety/fear among others.

Results Since 2008, 195 consults have been graded through the remote model. 53 of these occurred in 2008-2009, 46 in 2009-2010, and 96 in 2011 January through November. 55% of referrals were received from Red Deer, 22% from St. Albert, 10% from St. Paul, 6% from Morinville, 6% from Edmonton, 5% from Lloydminster, and 6% from other locations. The average reporting time from consultation is 7 days. Participating optometrists have felt that teleconsultation has provided good value, and particularly appreciate the format of the PDF report as well as short turnaround time.

Conclusions Early experience suggests our remote teleglaucoma program is useful to

provide expedited access to glaucoma expertise and participating optometrists are becoming more comfortable in making referrals. However, more data including scientific validation, formal patient/provider satisfaction, cost-effectiveness and comparative effectiveness are needed to ensure teleglaucoma is an effective way to deliver services more commonly in the future.
The authors acknowledge teleophthalmology program coordinator Abshir Moalin for support and Pfizer Inc. Canada for an unrestricted startup grant.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #24
In-house patient-centered teleglaucoma improves access and efficiency for glaucoma suspects and those with early stages of open-angle glaucoma (OAG).

Samreen Amin, Karim F. Damji, Faazil Kassam, Siyi Xu, Marianne C. Edwards, Michael W. Dorey

Purpose There is a need to improve access and efficiency for patients with or at risk for glaucoma. We evaluate early experience with in-house teleglaucoma models which adapt telehealth for glaucoma care.

Study Design Comparison of access and efficiency measures between in-hospital and in-office teleglaucoma and with in-person model of care.

Methods Telegalucoma at the University of Alberta is part of a collaborative care and teleophthalmology approach. Referrals received for glaucoma are triaged. Patients within or outside Edmonton who may be glaucoma suspects or have early stages of OAG, over age 16, with IOP below 30, amongst other criteria are eligible. A teleglaucoma program coordinator (TGPC) books structured visit with ophthalmic technicians: detailed history, slip-lamp exam, IOP, CCT, visual field, anterior and stereo posterior segment photos, and OCT. The hospital model utilizes dilation for fundus photos and LCD shutter glasses for stereo viewing whereas the office uses non-mydriatic camera with stereo viewing using hand held stereoscope. Data is uploaded to Secure Diagnostic Imaging (SDI) and Healthquest EMR software for hospital and office programs, respectively and assigned to a glaucoma specialist (GS). The grading report is sent to the referring provider. The TGPC calls the patients with results and follow up plan including an appointment with GS if needed. Key metrics include access time, program efficiency, visit cycle time, report turnaround time, quality of diagnostic information and patient/provider satisfaction.

Results Since Jun 2011, 72 consults have been completed using the in-house model (25 hospital, 37 office). At present, average access time for in-hospital program is 42

days and in-office 48 days vs. 120-150 days for seeing these types of patients in-person. Average cycle time for the visit is 87 mins in hospital and 90 mins in office vs. 120 mins to see one of the GS in-person. At both locations, quality of diagnostic information including stereo images has been very good, average reporting time is 7 days, and some patients started IOP medication very soon after teleconsult. Patient satisfaction with pilot has been very high. About one-third of all teleglaucoma patients were booked for in-person visit.

Conclusions Our models demonstrate expedited access, with improved cycle time compared to an in person visit. In some cases treatment commenced much more quickly than if patients had been booked for an in person visit. A patient centered approach, standardized assessment, secure software, program admin support and qualified graders are key success factors to date. More data including scientific validation, further analysis of efficiency, cost-effectiveness and comparative effectiveness is needed. The Authors acknowledge the Access Improvement Measures team and Royal Alexandria Hospital Eye Clinic support staff; teleophthalmology program coordinator Abshir Moalin, and Pfizer Canada Inc. for an unrestricted program grant.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #25
Non-psychotropic cannabinoids and cannabimimetic lipids act at a novel non-cannabinoid receptor target to reduce intraocular pressure.

Meggie D. Beazley, Alex Straiker, Melanie Kelly

Purpose To evaluate the ocular pharmacology of cannabinoid-related receptors GPR55 and GPR18 in the regulation of Intraocular pressure (IOP). Non-Psychotropic cannabinoid ligands, abnormal cannabidiol (Abn-CBD) and 0-1602, agonists at GPR18/GPR55 and GPR55 respectively, and the GPR18-selective cannabimimetic lipid N-arachidonoyl glycine (NAGly) were examined as novel ocular hypotensive therapeutics.

Study Design Experimental mixed design

Methods Mice were anesthetized using isoflurane 2-3%. IOP was measured by rebound tonometry in C57BL/6J (C57) and knockout mice for cannabinoid receptor type 1 (CB1-/-), type 2 (CB2-/-), or GPR55 (GPR55-/-) following 5 µl topical application of 2% Abn-CBD, 1% 0-1602, 1% NAGly or vehicle (Tocrisolve®). O-1918, an antagonist at both GPR55 and GPR18, was injected i.p at 2mg/kg. GPR18 protein localization was assessed with immunohistochemistry in frozen sections of mouse eye, and visualized

with an Alexa594 anti-rabbit secondary antibody (1:500 for all antibodies, in PBS).

Results : Abn-CBD (2%) significantly reduced IOP in C57, CB1-/-, CB2-/- and GPR55-/- mice, with decreases of 1.17±0.15, 1.37±0.16, 0.675± 0.08, and 0.85±0.15 mmHg respectively. NAGly (1%) produced similar decreases in IOP of 0.72±0.18, 1.41±0.08, 1.22±0.23 and 0.86±0.18 mmHg respectively. The GPR55 receptor agonist 0-1602 (1%), failed to decrease IOP in C57 mice ($p>0.05$). Abn-CBD and NAGly did not significantly reduce IOP when co-administered with novel Abn-CBD-sensitive receptor antagonist, 0-1918, in C57, CB1-/-, or GPR55-/- mice ($p>0.05$ per respective group). GPR18 protein is expressed strongly in the outer ciliary epithelium and the corneal epithelium though it is also expressed elsewhere at lower levels. Interestingly, GPR18 appears to also be expressed in the trabecular meshwork.

Conclusions GPR18 agonists Abn-CBD and NAGly reduce IOP independently of CB1, CB2, and GPR55. The pharmacology of the Abn-CBD and NAGly drop in IOP, together with evidence of GPR18 expression in tissues involved with aqueous humour secretion and outflow supports a functional role for GPR18 in IOP regulation. These findings suggest that GPR18 could be targeted for the development of novel ocular hypotensive medications used in the treatment of glaucoma.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #26
Mechanisms of benzalkonium chloride toxicity in a human trabecular meshwork cell line.

Angela Qiao Zhang, Hong Liu, Christopher Byrne, Cindy Hutnik

Purpose To evaluate mechanisms of benzalkonium chloride toxicity in a human trabecular meshwork cell line and the possible role of gap junctions.

Study Design To examine the effect benzalkonium chloride has on human trabecular meshwork cell necrosis, apoptosis and gap junction expression using assays like MTT, Cell Death ELISA and Western Blot.

Methods A human trabecular meshwork (HTM) cell line was established in culture. Cells were treated with increasing concentrations of benzalkonium chloride (BAK) ranging from 0.002 to 0.01% for 1, 3, 10 and 30 minutes and cell death was measured using the MTT assay. Cells were treated with BAK ranging from 0.0001 to 0.001% for 24 and 48 hours and cell death was measured using the MTT assay. Cells were treated with 0.0004% and 0.0008% BAK for 24 hours to assess apoptosis by Cell Death ELISA assay. HTM cells were up-regulated by retroviral transfection with Cx43-GFP and down-

regulated with a dominant negative G138R mutant. Endogenous connexin43 expression was measured with Western Blot after 3 minutes BAK treatment and 24 hours incubation.

Results HTM cells exhibited time and dose dependent decrease in cell viability when treated with 0.002 to 0.01% BAK for 1 to 30 minutes (n=3; $p<0.001$). HTM cells exhibited dose dependent decrease in cell viability when treated with 0.0001 to 0.001% BAK for 24 hours and 0.0001 to 0.0004% BAK for 48 hours (n=3; $p<0.001$). HTM cells exhibited dose dependent apoptosis when exposed to 0.0004 and 0.0008% BAK for 24 hours (n=3; $p<0.05$). Furthermore, endogenous connexin43 is upregulated upon BAK exposure.

Conclusions BAK induces time and dose dependent HTM cell cytotoxicity through necrosis and apoptosis. Connexin43 is affected by the cytotoxic effects of BAK in this cell type.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #27
In-house patient-centered teleglaucoma improves access and efficiency for glaucoma suspects and those with early stages of open-angle glaucoma (OAG)

Faazil Kassam, Samreen Amin, Siyi Xu, Marianne C. Edwards, Michael W. Dorey, Karim F. Damji

Purpose There is a need to improve access and efficiency for patients with or at risk for glaucoma. We evaluate early experience with in-house teleglaucoma models which adapt telehealth for glaucoma care.

Study Design Comparison of access and efficiency measures between in-hospital and in-office teleglaucoma and with in-person model of care.

Methods Teleglaucoma at the University of Alberta is part of a wider collaborative care and teleophthalmology approach. Referrals received for glaucoma are triaged. Patients within or outside Edmonton who may be glaucoma suspects or have early stages of OAG, over age 16, with IOP below 30, amongst other criteria are eligible. A teleglaucoma program coordinator (TGPC) books a structured visit with ophthalmic technicians: detailed history, slit-lamp exam, IOP, CCT, visual field, anterior and stereo posterior segment photos, and OCT. The hospital model utilizes dilation for fundus photos and LCD shutter glasses for stereo viewing whereas the office uses a non-mydriatic camera with stereo viewing using a handheld stereoscope. Data is uploaded to Secure Diagnostic Imaging for hospital and Healthquest EMR software for office

programs, and assigned to a glaucoma specialist (GS). The grading report is sent to the referring provider. The TGPC calls the patient with results and follow-up plan, including an appointment with GS if needed. Key metrics include access time, program efficiency, visit cycle time, report turnaround time, quality of diagnostic information, and patient/provider satisfaction.

Results Since June 2011, 72 consults have been completed using the in-house model (25 hospital, 37 office). At present, average access time for in-hospital program is 42 days and in-office 48 days vs. 120-150 days for seeing these types of patients in-person. Average cycle time for the visit is 87 mins in-hospital and 90 mins in-office vs. 120 mins to see one of the GS in-person. At both locations, quality of diagnostic information including stereo images has been very good, average reporting time is 7 days, and some patients started IOP medication very soon after teleconsult. Patient satisfaction with the pilot has been very high. About one-third of all teleglaucoma patients were booked for an in-person visit.

Conclusions Our models demonstrate expedited access, with improved cycle time compared to an in-person visit. In some cases treatment commenced much more quickly than if patients had been booked for an in-person visit. A patient-centered approach, standardized assessment, secure software, program administrative support and qualified graders are key success factors to date. More data including scientific validation, further analysis of efficiency, cost-effectiveness and comparative effectiveness is needed.

The authors acknowledge the Access Improvement Measures team and Royal Alexandra Hospital Eye Clinic support staff; teleophthalmology program coordinator Abshir Moalin, and Pfizer Canada Inc. for an unrestricted grant.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #28
Intermediate term outcome of endoscopic cyclophotocoagulation in glaucoma

Faisal AlMobarak, Sami AlOdhayb, Jose Morales

Purpose To evaluate the intermediate-term outcome & complications of ECP, including cases where it was performed as a primary glaucoma procedure combined with cataract extraction.

Study Design Retrospective chart review

Methods A retrospective chart review included 244 eyes of 205 patients who had undergone ECP with & without cataract surgery at a single tertiary care level institution with a minimal follow-up period of two years.The Main outcome measures were IOP, number of antiglaucoma medications,postoperative complications & need for further glaucoma procedures.

Results 244 eyes of 205 patients were included. 78 eyes (32%) had CACG, 56 (23%) had POAG, 56 (23%) had pseudoexfoliative glaucoma, 14 (5.7%) had NAG, 12 (4.9%) had aphakic glaucoma & the remaining 28 eyes (11.4%) had other types of glaucomas. 190 eyes (77.9%) had no prior intraocular surgery. 222 eyes (90.9%) underwent combined cataract extraction with ECP. The mean follow-up was 29.9 (±10.67SD) months.122 eyes (50%) had advanced glaucomatous optic nerve damage. The mean preoperative IOP was 19.47 mmHg (±8.7 SD) compared with 16.71(±7.6 SD) at the last follow-up (P=0.03) & the number of preoperative antiglaucoma medications was 3.05 (±1.18 SD) compared to 2.1 (±1.47 SD) at last follow-up (P=0.00). Kaplan-Meier survival analysis curve showed a probability of success of 95.5% at one year, 81.8% at two years & 59.1 % at three years. The most frequent postoperative complications were: fibrinous reaction in 28 eyes (11.5%), IOP spike > 30mmhg in 26 eyes (10.7 %), serous choroidal detachment in two eye (0.8%) & suprachoroidal hemorrhage ending in phthisis bulbi in two eye with absolute neovascular glaucoma (0.8%). No further glaucoma surgery was performed
in any eye.

Conclusions ECP seems to offer a good option to decrease IOP & reduce the need for antiglaucoma medications in a variety of glaucomas especially when performed in combination with cataract extraction.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #29
Clinical outcomes for a Schlemm's canal scaffold for IOP reduction after cataract surgery in mild to moderate open angle glaucoma

Hady Saheb, Henry D. Jampel, Ike Ahmed

Purpose To evaluate the 6 month intraocular pressure (IOP) reduction in patients with mild to moderate open angle glaucoma (OAG) following the implantation of an ab interno intracanalicular scaffold (Hydrus™ Aqueous Implant, Irvine, CA).

Study Design Interventional case series

Methods This is a single center pilot study in patients with mild to moderate OAG (based on Hodapp-Anderson-Parrish classification) and concurrent cataract. Study subjects were washed out of all hypotensive medications prior to surgery. The study device was placed into Schlemm's canal via an ab interno approach following phacoemulsification and intraocular lens placement. Follow up was conducted at 1 day, 7 days, and 1, 3 and 6 months postoperatively. Study eyes were evaluated at follow up for IOP, medication use, and changes in visual status.

Results 28 eyes from 26 patients were recruited for the study and the intracanalicular scaffold was successfully implanted in 28/28 attempts. Mean (±s.d.) age was 73.9 ± 9.5; average Humphrey MD was -6.9 ± 4.2 dB. Baseline mean IOP was 17.9 ± 4.1 mmHg on 2.4 ± 1.0 glaucoma medications, and washed-out IOP was 29.9 ± 5.8 mmHg on the day of surgery. Postoperative adverse events included subconjunctival hemorrhage (n=1), hyphema (n=1), and peripheral anterior synechiae (n=2). At 1, 3, and 6 months follow up, IOP was 17.2 ± 3.4, 15.8 ± 2.3, and 15.3 ± 2.3 ($p = 0.04$ compared to baseline, $p < 0.001$ compared to washout) mmHg on a mean of 0.5 ± 1.0, 0.2 ± 0.6, and 0.1 ± 0.4 ($p < 0.001$) glaucoma medications, respectively.

Conclusions An intracanalicular scaffold was safely and successfully implanted after cataract surgery in 28/28 mild to moderate OAG eyes. At 6 months follow up, IOP and number of glaucoma medications were significantly decreased from baseline. The magnitude of reduction of IOP and number of glaucoma medications is unlikely to be due to phacoemulsification alone. Follow-up is ongoing, and definitive proof and quantification of effect will require a randomized controlled trial.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #30
Persistent leak following glaucoma aqueous shunt implantation

Marie-Claude Robert, Patrick Hamel, Pierre Blondeau, Mark Lesk

Purpose We present four cases of persistent leak attributed to subconjunctival fistula formation following glaucoma aqueous shunt implantation. Our preferred method for management is also described.

Study Design Retrospective non comparative case series

Methods Patients with glaucoma aqueous shunts complicated by chronic leaks were identified from tertiary care glaucoma practices at the Université de Montréal and Université de Sherbrooke. We performed a retrospective chart review of these selected patients to identify features of their perioperative courses.

Results Four cases of persistent leak following glaucoma aqueous shunt surgery are described. Three patients had an underlying diagnosis of iridocorneal endothelial (ICE) syndrome and one patient had a diagnosis of chronic panuveitis. Three patients had prior trabeculectomy with adjunctive periocular application of antiproliferative agents (mitomycin C and/or 5-fluorouracil). One patient had aqueous shunt implantation as a primary glaucoma procedure. Implantation of the Molteno (1 patient), Ahmed (2 patients) and Baerveldt (1 patient) aqueous shunts was uneventful in all cases. Early onset of the leak, between postoperative month 1 and 2, was typical. The use of aqueous suppressants, bandage contact lens, conjunctival photocoagulation, sutures, tissue adhesives, conjunctival autografts and scleral patch grafts were unsuccessful in the described cases. Resolution of the leak occurred after removal of the aqueous shunt and elimination of the causative subconjunctival fistula. Methylene blue was used to highlight the course of the fistulous tract and thus, allowed a more complete dissection. Histological support for the formation of a subconjunctival fistula was obtained in 3 cases. Severe complications including endophthalmitis (1 patient), hypotony (4 patients), suprachoroidal hemorrhage (2 patients) and corneal decompensation (3 patients) occurred because of the persistent leaks.

Conclusions Persistent leak is a rare but important complication following glaucoma aqueous shunt implantation. Early consideration for the presence of a subconjunctival fistula, especially in patients with ICE syndrome or chronic uveitis, can spare many ineffective efforts to repair the leak and prevent severe vision threatening complications.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #31
Endocyclophotocoagulation: experience at CHUM

Harmanjit Singh, Katarzyna Biernacki, Sébastien Gagné

Purpose To evaluate the outcome of patients undergoing endocyclophotocoagulation (ECP).

Study Design Non comparative retrospective case series.

Methods We reviewed the charts of 87 patients (113 eyes) who underwent ECP with or without another concomitant procedure (phacoemulsification or goniosynechialysis), from October 2008 to September 2011 at Notre-Dame Hospital, CHUM, Montreal. We only included patients with a follow-up time of at least 1 month. The primary outcome was the mean intraocular pressure (IOP). Secondary outcomes consisted of the change in the medication, in the visual acuity and the postoperative complications. Snellen visual acuities were converted to logMAR values for statistical analysis and data were collected and analysed using t test.

Results The mean follow-up time was 6 months. 81 eyes had an ECP on 270 degrees and 21 eyes around 360 degrees. The most common cases were chronic angle closure glaucoma (CACG, 50%), primary open angle glaucoma (POAG, 10%) and mix etiology of glaucoma (9%). 58% of the eyes underwent the ECP with phacoemulsification/IOL insertion, 29% with phacoemulsification/IOL insertion and goniosynechialysis and 5% with ECP alone. The IOP decreased from 23.79 ± 0.72 preoperatively to 17.53 ± 0.82 ($p < 0.0001$) at 6 months and 16.88 ± 0.49 ($p < 0.0001$) at 12 months. The number of medications decreased from 2.14 ± 0.12 to 1.17 ± 0.18 ($p < 0.0001$) at 6 months postoperatively and to 1.09 ± 0.20 ($p < 0.0001$) at 12 months. The mean best corrected visual acuity (BCVA) preoperatively was 20/45 (logMAR 0.351) and improved to 20/35 (logMAR 0.244) after 12 months ($p < 0.0001$). The complications included 10 cases needing a second surgery (tube or a trabeculectomy) to decrease the IOP, 4 cases had aqueous misdirection, 2 cases had suprachoroidal hemorrhage, 2 cases had vitreous hemorrhage and a single case had cystoid macular edema.

Conclusions Endocyclophotocoagulation is a successful procedure to lower both the IOP and the number of glaucoma medications. At 1 year postoperatively, the mean IOP is reduced by 29% (6.9 mmHg) and the mean number of medications used is reduced by 1.1.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #32
iStent glaucoma device: experience at CHUM

Harmanjit Singh, Sébastien Gagné

Purpose To evaluate the outcome of patients that had an iStent trabecular microbypass.

Study Design Non comparative retrospective case series.

Methods 39 eyes of 33 patients underwent implantation of 2 iStent glaucoma device per eye, from December 2009 to November 2011 at Notre-Dame Hospital, CHUM, Montreal. We only included patients with a follow-up time of at least 1 month. The primary outcome was the mean intraocular pressure (IOP). Secondary outcome consisted of decrease in number of glaucoma medications post-operatively. Data were collected and analysed using t test.

Results The mean follow-up time was 6 months. The mean age of study patients was 73 years. All the patients underwent the implantation of iStent with phacoemulsification/IOL insertion. 6 of the 33 patients had surgery in both eyes. The IOP decreased from 19.1 ± 3.8 preoperatively to 15.1 ± 2.7 ($p < 0.0001$) at 6 months and 15.9 ± 0.9 ($p < 0.01$) at 12 months. The number of medications decreased from 2.5 ± 1.1 to 0.52 ± 0.9 ($p < 0.0001$) at 12 months.

Conclusions iStent implantation is a successful and safe procedure to lower both the IOP and reduce the mean number of glaucoma medications. At 6 months postoperatively, the mean IOP is reduced by 21% and the mean number of medications used is reduced by 1.98.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #33
Post-operative outcome in combined glaucoma surgery and intraocular lens exchange or secondary lens implantation.

Toby Chan, Amandeep Rai, Ike Ahmed

Purpose Elevated intraocular pressure (IOP) and glaucoma can be associated with aphakia or subluxed intraocular lens implants (IOL), such as in cases of aphakic glaucoma, pseudoexfoliation glaucoma (PXG), and uveitis-glaucoma-hyphema syndrome (UGH). Combined glaucoma surgery and intraocular lens exchange or secondary lens implantation is often indicated in these cases. The objective of our study is to evaluate the surgical outcome of patients who underwent combined surgery of both a glaucoma procedure and an IOL exchange/secondary lens implantation (specifically with an iris-claw anterior chamber IOL).

Study Design Retrospective interventional case series

Methods Consecutive patients who underwent combined surgery during the period of February 2007 and June 2011 were reviewed. The main outcome measures were pre- and post-operative IOP, number of glaucoma medications, corneal endothelial cell count with specular microscopy (ECC), best corrected visual acuity (BCVA), and post-operative complications.

Results A total of 24 patients (14 males, 10 females) were included, with mean age 68.2±17.9 years. Mean (±SD) follow-up was 299±271 days. Pre-operative diagnoses include: aphakic glaucoma (n=8), PXG with IOL subluxation (n=11), UGH syndrome with IOL subluxation (n=3), IOP rise with IOL dislocation from iatrogenic zonular dialysis (n=1), and chronic iritis and IOP rise associated with anterior chamber IOL (n=1). Glaucoma procedures performed include: Ahmed glaucoma valve (n=14), trabeculectomy (n=1), Glaukos trabecular iStents (n=7), Ex-PRESS Mini Glaucoma Shunt (n=2). All patients had Artisan iris-claw anterior chamber IOL implantation. Mean IOP was significantly reduced from 25.0±8.0 mmHg prior surgery to 14.2±6.05 mmHg after surgery ($p<0.001$). Mean number of glaucoma medications was also lowered significantly from 3.3±1.4 pre-operatively to 0.9±1.4 post-operatively ($p<0.001$). Pre-operative and post-operative Snellen BCVA were 20/150 (LogMAR 0.87) and 20/50 (LogMAR 0.41), respectively ($p=0.022$). There was no significant drop in ECC with surgery (1683.7±543.1 pre-operatively, versus 1447.3±535.8 post-operatively, $p=0.44$). Post-operative complications were noted in 3 patients (12.5%): choroidal effusion (n=1), synechia to tube with IOL tilt (n=1), retinal detachment (n=1).

Conclusions This is the first report on surgical outcome of combined glaucoma surgery and IOL exchange/secondary IOL (with iris-claw anterior chamber IOL). Our findings suggest that effective improvement in visual acuity and lowering of IOP may be achieved by combined surgery with relatively low complication rate.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #34
In vivo biocompatibility evaluation of a nickel-titanium Schlemm canal scaffold

Hady Saheb, Ian Grierson, Malik Kahook, Murray Johnstone, Carol B. Toris, Ike Ahmed

Purpose A new implant (Hydrus TM Aqueous Implant, Ivantis, Inc.) made of Nitinol (nickel-titanium alloy) that improves aqueous humour flow from the anterior chamber through Schlemm's canal was implanted into rabbits and nonhuman primates (NHPs) to assess the local tissue biocompatibility

Study Design Rabbit and nonhuman primate interventional comparative case series

Methods New Zealand white rabbits were selected to evaluate the ocular biocompatibility of the Hydrus Aqueous Implant. Eight rabbits received implants inserted through the anterior chamber, into the sclera and subconjunctival space. The fellow eye underwent a sham procedure without implant. The rabbits were sacrificed after 6 months, and the eyes were examined by light microscopy. To assess the tissue response to the implant in Schlemm's canal. Hydrus implants were surgically inserted into the canal of NHPs, and the third served as a surgical sham control. After 13 weeks the animals were sacrificed, and the eyes were examined by light and scanning electron microscopy (SEM). The histological slides were evaluated by two independent assessors who were masked as to which eye had received the implant.

Results Minimal mononuclear cell infiltration and minimal fibrotic response at the site of the implants were observed in the rabbit eyes. Histological and SEM analysis of the NHPs demonstrated that the implants were properly located in Schlemm's canal. There was no evidence of an acute or chronic inflammatory response, granulation response or fibrosis in the outflow system or in adjacent tissues. There were minimal differences between study and control eyes. Although rabbits are prone to inflammation, the response was limited and present in both the Hydrus implanted and sham operation eyes. In NHPs, there was only evidence of tissue reaction to mechanical distortion and no persistent inflammatory change or foreign body reaction.

Conclusions The Hydrus Aquous Implant was associated with minimal inflammation in both rabbit and NHP eyes with extended follow-up. In NHP eyes, the implant was placed well within Schlemm's canal with a benign host response. It appears from these preclinical studies that the Hydrus implant is biocompatible.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #35 withdrawn

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GLAUCOMA- POSTERS

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Paper #36
Azarga versus Cosopt in Patients with Open-Angle Glaucoma or Ocular Hypertension: a Canadian Multicenter Study

Baseer Khan, Thomas Klein, Lesya Shuba

Purpose Study design: A prospective, randomized, parallel-group, observer-masked, multicenter 12-week noninferiority study in Canada of Azarga versus Cosopt in patients with open-angle glaucoma or ocular hypertension. The primary effectiveness outcome measure was mean reduction in intraocular pressure (IOP); the secondary outcome was percentage of subjects with IOP ≤18 mm Hg. Adverse events were investigated to assess safety. Eligible subjects were adults with open-angle glaucoma or ocular hypertension receiving an IOP lowering medication other than the study medications.

Study Design Methods: Subjects were randomly assigned to receive 1 drop study medication topically twice daily in the worse evaluable eye (the eye with the higher IOP at baseline) at 9 am and 9 pm for 12 weeks. IOP was measured with Goldmann applanation tonometry. Noninferiority of the 2 fixed combination study medications could be declared based on the difference in mean IOP between treatment groups by ANOVA with a 95% two sided confidence interval at week 12. Visual acuity, slit lamp examination, and adverse events were also assessed.

Methods Methods: Subjects were randomly assigned to receive 1 drop study medication topically twice daily in the worse evaluable eye (the eye with the higher IOP at baseline) at 9 am and 9 pm for 12 weeks. IOP was measured with Goldmann applanation tonometry. Noninferiority of the 2 fixed combination study medications could

be declared based on the difference in mean IOP between treatment groups by ANOVA with a 95% two sided confidence interval at week 12. Visual acuity, slit lamp examination, and adverse events were also assessed.

Results Results: Sixty eligible subjects (n=33, Azarga; n=27, Cosopt) were enrolled at 15 study centers in Canada. At baseline, IOP was 24.6 mm Hg in the Azarga group; 24.1 mm Hg in the Cosopt group. Twelve-week IOP data were available for 23 subjects in each group. IOP reduction was significant in both groups (6.9 mm Hg, Azarga group; 6.5 mm Hg, Cosopt group; p<.001, each); IOP was ≤18 mm Hg for 65% of the Azarga group and 61% of the Cosopt group. One or more adverse events were experienced by 15/33 (45%) in the Azarga group; 9/27 (33%) in the Cosopt group. Adverse events in the study were generally consistent with the currently known safety of both study medications. One serious adverse event of stroke occurred which the investigator assessed as not related to study medication.

Conclusions Conclusions: Azarga was noninferior to Cosopt as demonstrated by primary and secondary IOP outcomes. Both treatments had acceptable safety.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #37
24-hour IOP monitoring with the SENSIMED Triggerfish® contact lens: Effect of body posture during sleep

Laura Beltran-Agullo, Yvonne Buys, Farzana Jahan, Sonja Simon-Zoula, John G. Flanagan, Colin Shapiro, Graham Trope

Purpose To determine the difference in relative IOP measured by the SENSIMED Triggerfish® (TF) in flat compared to 30 degrees head-up sleeping positions in patients with glaucoma. A previous study showed a 20% lower IOP with 30 degrees head-up position in 1/3 of the patients with glaucoma.

Study Design Prospective, randomized, cross-over comparative study.

Methods Patients with progressive POAG or NTG (defined as a new or recurrent optic disc haemorrhage) despite well-controlled IOP were evaluated in this study. IOP was monitored non-invasively for 24hr using the TF contact lenses in 2 separate sessions. Patients were randomly assigned to sleep flat one night and 30 degrees head-up the other. TF IOP-monitoring curves in arbitrary units were obtained. Sleep and wake periods were defined as 22:00-6:00 and 8:00-22:00 respectively. Mean TF values at sleep and wake periods and wake-sleep and sleep-wake slopes were calculated for each session. Comparisons were made between flat and 30 degrees head-up positions.

Wilcoxon Signed-rank test were used to compare mean TF values between positions.

Results To date 6 subjects have completed the study. One subject withdrew consent after the first session and another had an incomplete TF curve which was excluded. 4 of 6 subjects (7 curves) had a significant positive wake-sleep slope which was steeper in 22:00-2:00 interval (Flat, 0.05-1.67; 30 deg., 0.08-0.85). One patient had a negative slope (Flat, -0.05; 30 deg., -0.06) and 1 had a non significant positive slope. The slopes were steeper for flat position compared to 30 degrees head-up although no overall significant mean difference was found. Mean hourly TF values during sleep from 22:00-6:00 were significantly higher in 3 of 4 subjects in the flat position ($p<0.05$ for each of the 3 subjects).

Conclusions In this pilot study, the IOP increased while sleeping in patients with progressive glaucoma, being higher in the flat position compared to 30 degrees head-up in some patients.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #38
Selective laser trabeculoplasty promotes phagocytosis in cultured trabecular meshwork cells.

Grayson A. Roumeliotis, Dov Kagan, Cindy Hutnik

Purpose The mechanism by which selective laser trabeculoplasty (SLT) lowers intraocular pressure is still not known. In contrast to argon laser trabeculoplasty (ALT), there is no morphological change to the trabecular meshwork after SLT. Several authors have suggested that SLTs effect on intraocular pressure relies on an adaptive stress response resulting in a change in meshwork function. Phagocytosis of extracellular debris by trabecular meshwork cells is important for the maintenance of intraocular pressure. We hypothesized that a small amount of stress would promote phagocytosis in cultured human trabecular meshwork cells, and that SLT would have a similar effect.

Study Design Randomized control trials with tissue culture based cell line.

Methods Cultured primary cell cultures of human trabecular meshwork cells were used as a model of the in vivo trabecular meshwork. Cells were treated with tert-butyl hydroperoxide (t-BOOH) at 0.05mM, 0.1mM, 0.25mM, and 0.5mM concentrations for two hours. After treatment, cell viability was assessed using the MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] assay. Phagocytic function was assessed using a novel application of the Vybrant™ phagocytosis assay. To assess the effect of SLT on these variables, cells were exposed to a 532-nm frequency doubled Q-

switched: Nd: Yag laser (3-ns pulse with a 400 μm beam diameter). The proportion of the cell monolayer exposed to the laser was varied from 0-100% (0, 25%, 50%, 75%, 100%). Cell viability and phagocytosis were assessed four hours after laser treatment.

Results : Treatment with 0.05mM, 0.1mM, 0.25mM t-BOOH resulted in 49% (SD= 8%, $p<0.05$, n=2), 37% (SD= 6%, $p<0.05$, n=2), 29% (SD=0.2%, $p<0.05$, n=2) increases in phagocytosis respectively. This response was overwhelmed at 0.5mM, and there was no difference from control ($p>0.05$, n= 2). SLT laser treatment did not affect cell viability (n=4), nor did it cause an observable morphologic change. However, SLT appears to stimulate phagocytosis. SLT laser treatment with 25, 50, 75 and 100% cell coverage resulted in increases of 34% (SD= 27%), 33% (SD= 40%), 15% (SD= 26%) , and 5% (SD= 9%) when compared to untreated control cells in three trials (n=3).

Conclusions These data suggest that the trabecular meshwork exhibits a preconditioning response stress similar to other organ systems, wherein an early stress, here SLT or t-BOOH, elicits a response that protects against later stressors such as a phagocytic challenge. These findings have provided the basis for our ongoing work to elucidate the mechanism of SLTs effect on intraocular pressure.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #39
Correlation between ocular biomechanical factors, vasospasm and open-angle glaucoma

Jing Wang

Purpose Ocular hypoperfusion and IOP-induced mechanical strains likely play a synergistic role in glaucomatous axonal damage. Our objective was to determine if there is a relationship between the biomechanical factors of the eye and the degree of glaucoma damage in vasospastic and non-vasospastic subjects across the spectrum of glaucoma.

Study Design Cross sectional cases-controls study.

Methods Patients with diagnosis of ocular hypertension (OHT), glaucoma suspect (GS) and open angle glaucoma (OAG) were recruited prospectively from a glaucoma clinic. Normal subjects (N) were recruited from a community-based screening program. Intraocular pressure (IOP), axial length (AL), ocular pulse amplitude (OPA), central corneal thickness (CCT), corneal hysteresis (CH), corneal resistance factor (CRF) and pulsatile choroidal blood flow (ChBFp) were measured. Wall stress was calculated according to Laplace's equation and rigidity of the ocular wall (E) was approximated

using OPA and ChBFp according to Freidenwald's relationship. Also recorded were the maximum historic IOP (IOPmax), the most recent visual field mean deviation (MD) and vasospasticity according to a history of cold-hands. Correlation and linear regression analysis were carried out between all biomechanical factors and MD for the entire cohort, and divided into vasospastic and non-vasospastic groups.

Results A total of 260 patients were recruited (N = 57, OAG = 108, GS = 49, OHT = 46). Higher IOPmax, higher wall stress, lower E, lower CH, lower CRF and thinner CCT were correlated with worst MD (P = 0.03 to < 0.001). Wall stress correlated more strongly than IOPmax with MD (R = - 0.404 VS R = - 0. 271). Linear regression analysis for prediction of MD showed higher R2 value in vasospastic group than in non-vasospastic group (R2 = 0.248 to 0.512 VS 0.115 to 0.300).

Conclusions Ocular biometric and biomechanical factors (including factors related to ocular rigidity) correlate with degree of glaucoma damage and this correlation is greater in vasospastic patients.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #40
The Ahmed Versus Baerveldt Study: 3-year results

Panos G. Christakis, James C. Tsai, Jeffrey W. Kalenak, David Zurakowski, Jeffrey A. Kammer, Louis B. Cantor, Paul J. Harasymowycz, Ike Ahmed

Purpose To compare the Ahmed-FP7 valve implant to the Baerveldt-350 implant for treating refractory glaucoma.

Study Design Multicenter randomized clinical trial.

Methods Patients with uncontrolled or high-risk glaucoma refractory to medicinal, laser and surgical therapy were recruited from 7 international centers. Eligible patients were randomized to an Ahmed-FP7 valve implant or a Baerveldt-350 implant, to be followed for 5 years. The primary outcome was failure: intraocular pressure (IOP) out of target range (5-18 mmHg with ≥20% reduction from baseline) for 2 consecutive visits after 3 months, vision threatening complications, additional glaucoma procedures or loss of light perception. Secondary outcomes included IOP, medication use, visual acuity, complications and interventions.

Results A total of 238 patients were enrolled in the study; 124 in the Ahmed group and 114 in the Baerveldt group. There were no significant differences in baseline characteristics between the groups. Preoperatively, the study group had a mean IOP of 31.4±10.8 mmHg on 3.1±1.0 glaucoma medications with a median Snellen acuity of

20/100. The failure rate at 3-years was 48% in the Ahmed group and 33% in the Baerveldt group (p=0.02). Mean IOP was 15.7±4.7 mmHg in the Ahmed group and 14.6±5.2 mmHg in the Baerveldt group (p=0.31). Mean number of glaucoma medications used were 1.7±1.4 in the Ahmed group and 0.9±1.2 in the Baerveldt group (p<0.001). Median visual acuity decreased to 20/200 in both groups, but visual outcomes were similar between groups (p=0.66). High rates of complications (52% Ahmed, 64% Baerveldt, p=0.07) and interventions (34% Ahmed, 50% Baerveldt, p=0.02) were seen in both groups, although most were transient or minor.

Conclusions Both devices were effective in reducing IOP and glaucoma medication use. The Baerveldt group had a higher success rate and used fewer medications than the Ahmed group, but required more interventions. Additional factors to be considered when selecting a device include glaucoma etiology, treatment goals and surgeon experience.

GLAUCOMA- POSTERS

WEDNESDAY 27 JUNE

Paper #41
Human and mouse ODDD retinal disease related to domain-specific Connexin43 mutations share early diagnostic markers and disease mechanisms

Anson K. Li, Justin Mayers, Kathleen A. Hill

Purpose Oculodentodigital dysplasia (ODDD) is characterized by microphthalmia, enophthalmia, iris malformation and microcornea. A recent clinical report (Gabriel et al, 2011. *Arch Ophthalmol 129*: 781) examined two ODDD patients and found optic nerve and retinal aberrations not emphasized previously for humans. Also, ciliary body cysts in one patient had not been associated with human ODDD previously. *Gja1*^{Jrt}/+ mice, a mimic of human ODDD, have ciliary body cysts and retinal abnormalities (Tsui et al. *IOVS 52*:3539). *Gja1*^{Jrt}/+ mice carry a glycine to serine substitution at position 60 (G60S) in connexin43, the product of the gap junction alpha 1 (*Gja1*) gene. Connexins form gap junctions between cells in multiple structures of the eye: ciliary body, lens, iris and retina. The purpose of this project was to show the high prevalence of retinal aberrations in older ODDD mice and the correlation between anterior segment phenotype and the mutant domain of the protein.

Study Design Intraocular pressure of n = 9 wild-type mice was compared to n = 9 *Gja1*^{Jrt}/+ at 31 to 48-weeks of age. *In vivo* imaging of whole eye and retinal structure were performed for the wild type and *Gja1*^{Jrt}/+ mice. Post mortem, C-cut sections (including pupil and optic nerve head) of wild-type and *Gja1*^{Jrt}/+ mice were examined for structural abnormalities and anterior segment features typical of the ODDD phenotype. Retinal layer thicknesses and nuclear counts were compared between *Gja1*^{Jrt}/+ and

wild-type mice.

Methods Intraocular pressure was measured by rebound tonometry. *In vivo* imaging was performed with the Visante™ Ocular Coherence Tomography (OCT). Structural abnormalities, retinal layer thicknesses, and nuclear counts were analyzed by hematoxylin and eosin-stained eye cross sections.

Results *Gja1*^{Jrt}/+ mice showed the typical G60S ODDD anterior segment phenotype with split iris and vesicle-filled ciliary body with normal intraocular pressure. All *Gja1*^{Jrt}/+ mice showed undulations of the outer nuclear layer with cell loss ($p<0.05$) and thinning of the outer plexiform layer ($p<0.05$) of the retina. Two *Gja1*^{Jrt}/+ mice with extreme disease severity also had lens degradation.

Conclusions *Gja1*^{Jrt}/+ mice and a human ODDD patient, both with a mutation in the first extracellular domain, have similar anterior segment phenotypes that progress to retinal degeneration. The mouse ODDD mimic is valuable for *in vivo* tracking of disease onset and progression.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #42
A comparison of research productivity by Canadian and select U.S. Ophthalmology departments in top ten Ophthalmology and vision science journals from 2001-2010

Matthew B. Schlenker, Elbert Manalo, Agnes M. Wong

Purpose To compare Canadian and select U.S. Ophthalmology departments in terms of relative research volume, impact, and funding.

Study Design Systemic Review

Methods Using the Web of Science, the number of peer-reviewed research articles and citations produced by all Canadian Ophthalmology departments from 2001-2010 in the top ten Ophthalmology/vision sciences journals were obtained. The same was obtained for the top six U.S. Ophthalmology departments as rated by the U.S. News & Report and The Ophthalmology Times. The number of faculty, and the amount of funding received by Canadian departments from the Canadian Institutes of Health Research (CIHR) and U.S. departments from the National Eye Institute (NEI) from 2006-2010 were obtained.

Results Johns Hopkins University produced the highest number of articles (1012), which was four times as many as its Canadian counterpart, the University of Toronto (253). Johns Hopkins University (23,621) and University of Toronto (3,608) also had the highest number of citations in their respective countries. The top three departments with the highest number of citations per article were University of Miami (26.2), Johns Hopkins University (23.3), and Harvard University (20.7) in the U.S., and University of Ottawa (20.0), Dalhousie University (19.6), and University of Calgary (16.4) in Canada. From 2006-2010, Johns Hopkins University received the highest funding from the NIH ($66M), which was >2x higher than those received by any other U.S. or Canadian department. The University of Montreal received the highest funding in Canada ($10M). The amount of funding per article was lowest for Harvard University ($60K) in the U.S. and University of Toronto in Canada ($59K). The amount of funding per citation was also lowest for Harvard University ($6K) in the U.S. and University of Toronto in Canada ($8K). The number of articles per faculty was highest for Johns Hopkins University (9.0) in the U.S. and Queen's University (3.9) in Canada.

Conclusions The six U.S. Ophthalmology departments considered the best in research, based on opinion surveys, produced significantly more articles and citations than their Canadian counterparts, although some Canadian departments had higher citations per article. The U.S. departments also received significantly more research

funding (which includes salary support, unlike research funding in Canada), although funding per article and funding per citation were similar among the top schools in both countries.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #43
Lack of government-insured annual eye examinations increases the risk of vision problems amongst low-income elderly

Yaping Jin, Yvonne Buys, Juan Xiong, Graham Trope

Purpose In Canada the costs of annual eye examinations provided to the elderly by optometrists and ophthalmologists are not uniformly covered by government-sponsored health insurance plans. We assessed whether lack of government-funded annual eye examinations resulted in reduced vision health status amongst elderly Canadians.

Study Design Cross-sectional survey.

Methods We compared the prevalence of non refractive vision problems (i.e., unable to see close or distance when wearing glasses or contact lenses) between seniors with and without government-insured annual eye examinations. Data was derived from 24,086 respondents aged 65 years or older participating in the Canadian Community Health Survey 2000/2001.

Results The prevalence of non refractive vision problems was higher in seniors with household incomes under the mid level (7.5%) than in those at mid level or higher (4.3%, $p<0.05$) and in non-Caucasians (7.5%) compared to Caucasians (4.6%). Amongst Caucasians with a household income under mid level, the prevalence of non refractive vision problems was greater (8.5%, 95% CI 6.8-10.2) in those with no insurance compared to those with insurance (6.4%, 95% CI 5.2-7.6). In Caucasians with household incomes at mid level or higher, the prevalence was similar between those with (4.3%) and without (3.6%) government-insured annual eye examinations ($p>0.05$). Compared to elderly Caucasians with mid or high income and living in insured provinces, those residing in provinces with no insurance were associated with 50% higher odds of vision problems (adjusted odds ratio (OR) =1.5, 95% CI 1.1-2.0) if their income was under mid level, but with 30% lower likelihood if their income was at mid level or higher (adjusted OR= 0.7, 95% CI 0.6-1.0). The mean age at diagnosis of glaucoma and cataracts was about 2 years older for people with no insurance versus those with insurance: 68.1 years vs 66.6 years for glaucoma and 72.5 years vs 70.8 years for cataracts.

Conclusions Lack of government funded annual eye examinations is associated with

increased levels of non refractive vision problems amongst the low-income elderly. The negative effect of lack of government-insured annual eye examinations on the risk of vision problems is buffered by high household income.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #44
Visits to Misericordia Urgent Care Related to Ocular Complaints: Establishing Triage Criteria for Direct Consultation with Ophthalmology of Patients Presenting with Specific Symptoms.

Victor Penner, Lrone Bellan

Purpose To identify patients presenting for emergency room assessment with ocular complaints who were routinely referred for ophthalmology assessment. In particular, our hypothesis was that patients presenting with symptoms of "flashes" and/or "floaters" to urgent care were almost always referred for ophthalmological care and therefore a direct triage form could be created to allow for a direct referral.

Study Design A retrospective chart review of patients presenting to Urgent Care at the Misericordia Health Centre in Winnipeg, Manitoba. All charts with ICD codes pertaining to ophthalmology involving visits between January 1 to December 31, 2009 were reviewed.

Methods A total of 3543 charts were reviewed. Cases were categorized by presenting complaint, duration of symptoms, patient demographics and underlying diseases. Other variables recorded included the date, time of day, management by the emergency physician, previous care, the need for referral to an ophthalmologist and their treatment.

Results There were a total of 3543 patients, with some patients presenting more than once for a total of 3673 patient encounters. Of these patient encounters, 1685 were ultimately referred to an ophthalmologist. A total of 608 patients presented with symptoms of "flashes" and/or "floaters" (another 27 patients presented with these symptoms but left without being assessed). Most [564 (93%)] were referred for ophthalmological care and 44 were managed by the emergency room physicians. Those not referred could be distinguished from the rest because they presented with additional symptoms of either ocular surface disease or migraine. The average wait time in the emergency room of the 608 patients was 2 hours 42 minutes (±1:39 hrs).

Conclusions Patients' presenting with symptoms of "flashes" and/or "floaters" without symptoms of migraine or ocular surface disease can be directly referred. This is based on the fact this cohort of patients received no care by the Urgent Care physician and was always referred to the ophthalmologist on call. By directly referring patients with

"flashes" and/or "floaters", these patients will ultimately get the proper care sooner as they will not have to wait 2:42 hours in Urgent Care. Also, these patients will no longer have to be assessed in Urgent Care which can help to reduce the wait times for all other patients.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #45
Prescheduled appointments as a strategy for improving follow-up rate among at-risk subjects identified in a glaucoma screening setting

Tave A. van Zyl, Elaine Zhou, Zhuo Su, Rohit Thummalapalli, Elizabeth K. Marvin, Susan H. Forster

Purpose To investigate whether provision of pre-scheduled follow-up appointments at time of screening increases follow-up rates among participants identified as glaucoma suspects.

Study Design Randomized Control Trial

Methods Between June 2010 and October 2011 Yale Sight Savers Program screened 302 underserved individuals ages ≥40 in a local primary care or community health fair setting within the Greater New Haven Area. Screening modalities included visual acuity, automated perimetry, portable tonometry and ophthalmoscopy performed by an ophthalmology resident. Participants with abnormal screening results were randomized to receive either a pre-scheduled appointment for a low-cost complete eye exam within 7-10 days of the date of screening (intervention), or counseling on their results and the importance of timely follow-up (control). Follow-up rates were determined via clinical records and phone surveys and analyzed using Fisher's exact test with significance set at $p<0.05$.

Results Among 302 screened participants, 60 (20%) were identified as "glaucoma likely", and 18 received pre-scheduled appointments. Of the 60 subjects identified as "glaucoma likely", 37 were available for post-hoc phone surveys and were included in the analysis. Thirteen subjects (35%) completed follow-up eye care, including 5 (26%) in the control and 8 (44%) in the intervention group. Overall, intervention resulted in no statistically significant impact on follow-up rates compared to controls ($p=0.31$). Among those lacking health insurance, however, intervention led to a statistically significant increase in follow-up rates (71% vs. 0%, $p=0.02$). Similarly, among those lacking car access intervention was associated with a statistically significant increase in follow-up rates (71% vs. 20%, $p=0.04$). Ethnicity ($p=0.26$), living alone ($p=0.17$), and not having an eye doctor ($p=1.0$) led to no statistically significant difference in follow-up rates within either group.

Conclusions Provision of pre-scheduled follow-up appointments to glaucoma suspects at the time of screening does not lead to a significant increase in overall follow-up rates. This intervention may, however, prove both clinically valuable and cost-effective when offered specifically to individuals lacking access to a car and/or health insurance.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #46
Outcomes of a low-tech pediatric vision screening program targeting high-risk kindergarten children.

Adil Bhatti, Andre Ali-Ridha, Darrell Lewis, Michael D. O'Connor

Purpose To describe the outcomes of a new kindergarten vision screening program Ottawa, Ontario.

Study Design Retrospective review of data collected from the first year of a new pediatric vision screening program run by University of Ottawa medical student volunteers.

Methods Vision screening was performed on 138 kindergarten children in high-risk Ottawa public schools (mean age 4.9, range 3 - 6 years). Distance monocular visual acuity was tested with the Lea symbol flip chart at 3 m with matching card. Stereoacuity was tested using the Stereo-fly with Lea symbol at 40 cm. Children with visual acuity was <20/30 in either eye, or stereoacuity <100 seconds of arc were referred for optometric assessment.

Results Mean visual acuity was 0.1 LogMAR bilaterally (range -0.2 - 0.9 LogMAR) . A total of 37 children (26.8% of those screened) were offered optometric referral. The most common reason for referral was failed stereoacuity testing (36 children). Of these children, 25% (n = 9) also failed visual acuity testing. Only one child failed visual acuity testing despite normal stereoacuity. 15.2% (n = 21) of children had a stereoacuity <400 seconds of arc, 9.4% (n=13) <200 seconds of arc, 5.1% (n=2) <100 seconds of arc, and 70.3% (n=97) had >100 seconds of arc.
Complete follow-up data was obtainable for 24% (9 of 37) of the children who failed vision screening. 56% of these children (5 of 9) were diagnosed with a vision disorder. Refractive errors were the most common diagnosis, with myopia in 2 cases, and one case each of astigmatism and anisometropic hyperopia. Two of the children with refractive errors had amblyopia. One case of strabismus was identified.

Conclusions In this first year of a new vision screening program, a significant minority

of kindergarten children met the criteria for referral, primarily due to failed stereoacuity testing. Although practical obstacles limited data collection from subsequent optometric examinations, the available data suggest a significant burden of vision disorders, particularly uncorrected amblyogenic refractive errors, in this population. Our data suggest that it may be in the public interest to support some form of pediatric vision screening program in this population.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #47
The Canadian Eye Injury Registry.

David V. Dudok, Philip Hooper

Purpose To establish a recording mechanism for serious eye injuries at Canadian eye centres which can be used to create targeted preventative health programs.

Study Design An ongoing prospective database of all serious eye injuries presenting to Canadian eye centres was designed. The pilot centre was the Ivey Eye Institute in London, Ontario. Inclusion criteria included all injuries with the potential to significantly affect the structure or function of the eye in the long-term. Thus less significant injuries such as corneal abrasions were excluded. All reporting physicians were staff or resident ophthalmologists.

Methods Reporting forms were designed similar to United States Eye Injury Registry (USEIR) forms. Data was recorded on a standardized form for each injury and then backed up on a secure server database. Six-month follow up forms were created to assess injury outcomes after the initial trauma.
The information recorded included patient demographics, place of injury, source of injury, associated factors, ocular tissues involved, presenting visual acuities, and initial diagnoses and operative interventions.

Results Recording of serious eye injuries has been ongoing since March 2011. A total of 54 injuries matching the inclusion criteria have been recorded. The majority occurred in males (81.5 %) and were not work-related (87.0%).
The most common places of injury were home (35.2%), recreational facility or sports field (25.9%), and street or highway (14.8%). Only two injuries (3.7%) occurred on an industrial site. The common sources of injury were blunt objects (44.4%), sharp objects (33.3%), and BB or pellet gun (9.3%).
The most common initial diagnoses were hyphema (51.9%), commotio retinae (42.6%), and uveitis (25.9%). Seven eyes (13.0%) sustained an open globe injury. Most of the injuries (75.9%) did not require surgical intervention.

Conclusions Previous Canadian registries such as the Sports Eye Injury registry have resulted in significant improvement in injury prevention in sport. By obtaining data on all types of eye injuries in a format which is directly comparable to the format used in the US and other countries will allow Canada to compare our statistics to other industrialized nations and better develop and implement prevention programs. Working with organizations such as the Canadian National Institute for the Blind, ongoing data collection and analysis may be used to develop targeted public health interventions to prevent future eye injuries. Expansion beyond the pilot site is planned in the near future.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #48
Comparison of Emergency Physician Ophthalmic Examination Findings to Ophthalmologists - Addressing Needs in Teaching.

Steven Schendel, Steve D. Levasseur, Ari Giligson

Purpose To compare the clinical examination findings of emergency physicians (EPs) to that of resident and attending ophthalmologists in a tertiary care setting. This will allow better definition of deficiencies in ophthalmic teaching.

Study Design Cohort Study

Methods Two ophthalmology residents prospectively entered ophthalmic physical examination findings as reported by EPs at the time of referral to a tertiary ophthalmology service. Data were collected on a standardized form for a cohort of 100 patients (200 eyes) during referral from 6 emergency departments. Physical examination findings included visual acuity, pupillary responses, ocular movements, confrontational visual field testing, intra-ocular pressure (IOP), anterior segment slit lamp examination findings, and fundus findings. EPs were also asked the most likely diagnosis for each referral. Exam findings were then anonymously compared to that of ophthalmology residents and attending physicians. EPs were masked to their participation in the study.

Results 200 eyes of 100 patients were compared and analyzed using a T-test and chi-squared testing. No differences in logMAR visual acuity were noted between the groups. Pupillary abnormalities were noted in 17 eyes by ophthalmologists and in 7 eyes by EPs (P=0.035). One ocular movement abnormality was noted by an ophthalmologist; none were noted by EPs. Visual field defects were found by ophthalmologists in 12 cases, and by EPs in 4 cases (P=0.041). One case of elevated IOP was detected both by ophthalmologist and EP. Anterior segment slit lamp findings by EPs agreed with ophthalmologist findings in 24/52 cases (P=0.00036), and fundus

findings were in agreement in 3/33 cases. (P<0.0001). EP final diagnosis concurred with the ophthalmologists in 55/100 patients.

Conclusions Emergency physicians did not appreciably differ from ophthalmologists in examining vision, ocular movements, or noting elevated IOP. However, significant differences were noted between the groups in assessment of pupillary responses, visual fields, anterior segment by slit lamp, and fundus examination. These differences provide direction for improving the teaching of the ophthalmic examination.

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #49 withdrawn

INTERNATIONAL & PUBLIC HEALTH OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #50
Access to government-insured vision care versus privatized dental care amongst Canadian adolescents: Is cost the sole barrier?

Kunyong Xu, Graham Trope, Kednapa Thavorn, Yaping Jin

Purpose To assess cost barriers to vision care, we compared utilization of government-insured eye care providers versus privatized dental care providers by Canadian adolescents.

Study Design Cross-sectional survey.

Methods Data on annual utilization of eye care providers (ophthalmologists and optometrists) and dental care providers (dentists, dental hygienists, or orthodontists) was collected from the Canadian Community Health Survey 2007/2008. Respondents aged 12-14 were included (n=5,457). Government insurance coverage was obtained from official reports.

Results Amongst adolescents living in provinces where government provides insurance for routine eye examinations once per year but no coverage for dental checkups (Alberta, British Columbia, Ontario, Quebec and Saskatchewan), utilization of dental care providers (82.8%) was 1.8 times more frequent than eye care providers (45.8%, p<0.05). Utilization was increased significantly to 93.9% (p<0.05) for dental care providers but was remained at 48.2% (p>0.05) for eye care providers amongst

adolescents from families with the highest household income. Amongst families with the lowest household income, utilization was 70.5% for dental care providers and 45.5% for eye care providers ($p<0.05$).
In Prince Edward Island where government provides 0% coverage for routine eye examinations but 100% coverage for preventive dental services, utilization was 2.6 times greater for dental care providers (86.2%) than for eye care providers (32.9%, $p<0.05$). When neither routine eye examinations nor dental care services are sponsored by government (Newfoundland and Labrador, New Brunswick, Nova Scotia), utilization was 2.3 times higher for dental care providers (78.5%) than for eye care providers (34.6%, $p<0.05$).

Conclusions Adolescents utilize dental care providers twice as often as eye care providers. When cost barriers for annual routine eye examinations are removed by government health insurance, over half Canadian adolescents do not take advantage of this opportunity to have their eyes examined. Barriers to vision care services other than cost need to be identified and addressed.

NEURO-OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #51
Central and Peripheral Visual Fields in Patients with Migraine.

Hadil Eshtayah, Paul Artes, Lesya Shuba, Allan Purdy, Charles Maxner

Purpose 1) To determine if patients with migraine show clinically apparent visual field losses in the central and peripheral visual field, 2) to investigate how these losses, if present, are related to the frequency, duration, and severity of migraines, and 3) to determine if any visual field losses are related to the type of migraine (with or without aura).

Study Design Using different perimetric techniques to assess the central visual field, previous studies have not found differences between patients with and without migraine aura. However, automated kinetic perimetry of the peripheral visual field may provide a more powerful approach for uncovering subtle cortical visual field losses associated with migraine. To carryout this experiment, single centre prospective study was conducted.

Methods Controls (n=25) as well as migraine patients with (n=25) and without aura (n=25) will be selected from a neuro-ophthalmology clinic. Inclusion criteria are a visual acuity better than +0.3 logMAR (6/12), age between 21 - 65 years, refractive error within ± 6D sphere and ± 3D astigmatism, and a normal eye examination. Diagnosis of migraine will be based on criteria established by the International Headache Society, and the three groups will be matched for age and gender. A single examiner, masked to the diagnosis, will examine central and peripheral visual fields with the Octopus 900 perimeter, at least 14 days after the last migraine.

Results We will determine if there is a difference in the visual field between controls and migraine patients. Regression analyses will then be carried out to determine the relationship between frequency, duration, severity, and type, of migraine and the visual field.

Conclusions There was no significant difference found between the visual fields of patients with migraine and controls. The severity of migraine was not related to the type, duration, or frequency of migraines.

NEURO-OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #52
Walfram Syndrome case report

Mohammad Naqeeb, Dina Abdulmannan, Hatim I. Batawi

Purpose To report and review a case of Walfram Syndrome and compare it to other Walfram Syndrome cases have been reported in the literature worldwide.

Study Design Case Report.

Methods Case Report.

Results Late diagnosed Walfram Syndrome presented with a rare ophthalmological findings which include proliferative diabetic retinopathy and powder like cataract.

Conclusions Walfram Syndrome is a rare autosomal recessive disorder characterized by diabetes insipidus, juvenile onset diabetes mellitus, optic atrophy and deafness. Also known as (DIDMOAD). Sometime associated with renal tract abnormality and psychiatric problem. About 300 cases have been reported in the literature worldwide and less than 8 percent had diabetic retinopathy. Here we report the first case of Walfram Syndrome in a Saudi family in Saudi Arabia that presented with a rare ophthalmological findings. In our case, the patient is late diagnosed at the age of 27. diabetes mellitus appeared at the age of 8. Bilateral optic atrophy appeared at the age of 18. Diabetes insipidus and sensory neural deafness are confirmed late at the age of 27. A summary of ocular and systemic clinical features will be reviewed and presented.

NEURO-OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #53
Congenital Horner syndrome caused by hypoplasia of the internal carotid artery: two cases

Stephanie West, Arun Reginald, Helen Branson, J. Raymond Buncic, Asim Ali

Purpose Hypoplasia of the internal carotid artery is a rare cause of congenital Horner syndrome. We describe the clinical findings and investigations of two cases; a thirteen year old boy with Horner syndrome secondary to ipsilateral internal carotid hypoplasia and a 15 year old girl (previously published) presenting with intermittent mydriasis associated with congenital Horner syndrome and hypoplasia of the internal carotid artery.

Study Design Descriptive case report and review of the literature

Methods Description of presentation, clinical findings and investigations

Results A thirteen year old boy was referred to the Ophthalmology Clinic for anisocoria noted following a motor vehicle accident the previous day. Clinically, he was noticed to have left miosis and 2 mm ptosis consistent with Horner syndrome. There was also subtle iris hypochromia but as neither himself nor his mother had noticed any findings previously, and in view of the recent trauma, a MRA/MRI scan was promptly organized. This clearly demonstrated ipsilateral hypoplasia of the common carotid and internal carotid artery, in particular narrowing of the carotid canal in the petrous bone confirming this as a congenital abnormality. Testing with topical 4% Cocaine confirmed the diagnosis of Horner's syndrome.
A fifteen year old girl presented for assessment of her right iris heterochromia and miosis with recent onset intermittent episodes of asymmetric dilatation of the right pupil. MRA demonstrated the absence of a right internal carotid, but high resolution CT through the skull base demonstrated an atretic bony carotid canal confirming the presence of a hypoplastic artery prior to skull development. It was postulated that the underlying cause of mydriasis in this patient is related to hypertrophied posterior communicating artery (visible on MRA secondary to the development of transcranial collaterals from the external carotid circulation) intermittently compressing the cisternal segment of the third cranial nerve and causing transient dysfunction of the sphincter muscle.

Conclusions Hypoplasia of the internal carotid artery is a rare congenital anomaly and its association with Horner syndrome is even more infrequent with only 3 previous case reports reported in the literature, including one presented here. Both cases demonstrated narrowing of the carotid canal through the skull base confirming these

anomalies as congenital in origin. Hypoplasia of the internal carotid artery should be included in the differential diagnosis of congenital Horner syndrome.

NEURO-OPHTHALMOLOGY- POSTERS

WEDNESDAY 27 JUNE

Paper #54
Polyangiitis overlap syndrome with granulomatosis with polyangiitis (Wegener's) and giant cell arteritis

Stephan Ong Tone, Anita Godra, Edsel Ing

Purpose Systemic vasculitides are characterized by inflammation of blood vessels that are classified by the size of the affected vessels. While distinct categories exist based on clinical and pathological features, rarely some patients present with converging features of these vasculitic syndromes, an entity known as polyangiitis overlap syndrome. Here, we describe a rare case of polyangiitis overlap syndrome consisting of granulomatosis with polyangiitis (formerly known as Wegener's) (GPA) and giant cell arteritis (GCA) in a 61-year-old woman.

Study Design Case report

Methods Case report of these two overlapping vasculitides including their clinical presentation, investigations, treatment and clinical outcome.

Results Laboratory and pathological investigations confirmed the diagnosis of GPA through the presence of c-ANCA antibodies and a kidney biopsy showing pauci-immune crescentic glomerulonephritis. The concurrent diagnosis of GCA was made with an elevated ESR (65 mm/hour) and a temporal artery biopsy showing transmural vasculitis. The patient was treated with prednisone and cyclophosphamide with resolution of her symptoms.

Conclusions This is a rare case of polyangiitis overlap syndrome where two different vasculitides are diagnosed in a patient. To the best of our knowledge, GPA associated with vasculitis of the temporal artery has been previously reported in only eight patients, of which only two had biopsy-proven GCA. Our case provides further evidence that distinct systemic vasculitides can occur in a single patient as a polyangiitis overlap syndrome. It is important to identify patients with polyangiitis overlap syndrome as systemic steroids are usually sufficient to treat GCA but GPA usually requires cyclophosphamide therapy.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #55
Radiotherapy for management of medial canthal basal cell carcinoma

Hatem Krema, Evelyn Hermann, Alisha Albert-Green, David Payne, Normand Laperriere

Purpose To report efficacy and complication rates of radiotherapy in the management of medial canthal basal cell carcinoma (BCC)

Study Design Retrospective case series analysis

Methods Consecutive patients with medial canthal BCC treated with fractionated Orthovoltage Radiotherapy between 1998- 2010. The cohort was subdivided according to the treatment intent (primary, adjuvant, recurrence), and Voltage power of treatment (75, 100, 225 KV). Actuarial rates of tumour control for the entire cohort and its subdivisions, and the complications at 10 years were calculated using Kaplan -Meier estimates. Logrank test was used to compare these estimates.

Results : 90 patients were included, of which 50 patients (56%) were managed with radiotherapy as a primary treatment. 57 patients (63%) were treated with medium power of 100 KV. The total dose was 35-45 Gray in 5-10 fractions. The overall tumour control rate at 10 years was 94% (95% Confidence Interval (CI): 84-98). Tumour control rates according to treatment intent were: primary treatment 95%, adjuvant 100%, and recurrence 91 %. Actuarial rates of radiotherapy complications were lash loss 59%, Epiphora 51%, Telangiectasia 33%, Dry Eye 14%, and conjunctival scarring 11%.

Conclusions : Fractionated Orthovoltage radiotherapy provides a non- invasive alternative to surgery for treatement of medial canthal BCC with a tumor control rate of 94% at 10 years. The radiotherapy complication rates are acceptable and manageable in most cases.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #56
Dacryops: A series of six cases and a review of the literature

Kay Lam, Seymour Brownstein, Andre Jastrzebski, David R. Jordan, Joseph de Nanassy

Purpose To present a series of 6 cases of lacrimal ductal cysts, also known as dacryops, which is an uncommon condition. The clinical descriptions, histopathological findings, and immunohistochemical stains were analyzed.

Study Design Retrospective case series of 6 cases including 4 from the palpebral lobe, 1 from the orbital lobe of the main lacrimal gland and 1 from a gland of Krause in the inferior fornix.

Methods We reviewed the clinical patient information and confirmed histologically that all the cases arose from ductal epithelium. Histopathological and immunohistochemical studies including sections stained with hematoxylin-eosin, periodic acid-Schiff, glycosaminoglycan stains, and monoclonal antibodies against immunoglobulins were performed. We also assessed the nature of the cyst epithelium, the presence of mucus-secreting goblet cells, and the associated inflammatory infiltrate.

Results The 6 cases displayed similar histopathologic features compatible with dacryops including a cyst lined by a double layer of non-ciliated epithelium; the inner layer was columnar with apical changes of apocrine secretion and the outer cellular layer was slightly flattened with variable number of goblet cells in 4 cases, more flattened in both layers in 1 case, and 1 case showed stratified squamous epithelium blending with a double columnar layer. Subepithelially, inflammatory cells were frequently identified in areas surrounding the cyst, especially in the lacrimal gland tissue. IgA staining was positive in the apices of the luminal cells, while IgM and IgG staining were negative in the same areas. We propose that the histopathological and immunohistochemical findings may play a pathogenetic role for the evolution of this condition.

Conclusions We present one of the largest recent reviews of dacryops with current immunohistochemical stains. Only 9 cases have been reported in the reviewed English literature in the last decade of this well-recognized, but poorly understood condition. Our series reviews the distinguishing histopathological features and immunoreactivity of dacryops, which can be differentiated from other more commonly occurring cystic lesions in the orbit and ocular adnexa.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #57
Oculovagal reflex associated with a chronic/occult medial wall fracture

Daniel Warder, Vladimir Kratky

Purpose To describe the presenting signs, symptoms and imaging of a 35-year-old female with a chronic, undiagnosed medial wall fracture that presented with debilitating symptoms of the oculovagal reflex.

Study Design Retrospective, observational case report.

Methods Descriptive case report of a patient with an oculovagal reflex associated with a chronic medial wall fracture referred to a tertiary care oculoplastics service. The clinical course, imaging and management was reviewed.

Results A 35-year-old female was referred by another service for evaluation of a medial wall blowout fracture secondary to trauma, which occurred 1.5 months earlier. Her presenting symptoms were severe, debilitating nausea and vertigo triggered upon left gaze. This had been present since her initial injury and was initially diagnosed as post-concussion syndrome. Exam demonstrated reproduction of her vagal symptoms with forced abduction of the left globe. CT and MRI demonstrated a displaced medial wall fracture with orbital soft tissue prolapse. "Oculovagal reflex" with entrapment of orbital soft tissue was diagnosed and the patient ultimately underwent surgical exploration and repair of the medial wall with complete resolution of her symptoms.

Conclusions The oculovagal or oculocardiac reflex is a well described, however rare phenomenon resulting from orbital floor fractures with orbital soft tissue entrapment. It is more commonly encountered in children and younger adults with the so-called "white-eye" or "trap-door" blowout fracture and may present with nausea, vertigo or significant bradycardia and cardiovascular instability and serve as an indication for immediate surgical repair. Our case represents a chronic orbital fracture whereby the mechanism of the oculovagal reflex was likely secondary to prolapse and tethering of soft tissue into the medial wall defect, and ultimately restriction due to scarring because of delayed diagnosis and repair. This case highlights the importance of recognition of the oculovagal reflex in orbital trauma which can help identify occult fractures and soft tissue entrapment despite inconclusive imaging or an unremarkable exam. Additionally, while our patient had no cardiovascular instability, her incapacitating nausea and vertigo with lateral gaze should be considered a functional deficit and serve as an indication for surgical repair.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #58

Herpes zoster ophthalmicus complicated by ipsilateral isolated Bell's palsy: a case report and review of the literature

Susan M. Wakil, Radwan Ajlan, Bryan Arthurs

Purpose To present a unique case of unilateral facial nerve palsy as an isolated complication of herpes zoster ophthalmicus.

Study Design Case report and review of the literature.

Methods Case report involved a chart review of the patient's file.

Results An 81-year-old immunocompetant male presented with a one-week history of painful left scalp lesions. The diagnosis of left herpes zoster ophthalmicus with associated keratoconjunctivitis was established. A 7-day course of oral acyclovir 800 mg per day along with topical prednisolone acetate 1% and moxifloxacin were started. Three weeks later, the ocular zoster involvement resolved and the vesicular lesions of the skin had regressed. However, the patient developed an isolated left Bell's palsy that gradually improved with conservative therapy.

Conclusions To the best of our knowledge, this is the first report in the literature describing a case of herpes zoster ophthalmicus complicated by an isolated ipsilateral Bell's palsy. The patient has had a near complete resolution of all symptoms following antiviral therapy for the zoster ophthalmicus component along with conservative management for the Bell's palsy.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #59
Complete visual recovery and improved extraocular movements after attempted auto-enucleation.

Sonul Mehta, Andrea K. Leung, Dan DeAngelis

Purpose To describe the immediate evaluation, management, and surgical technique in a patient with traumatic injury to the optic nerve and transected extraocular muscles.

Study Design Case Report

Methods A review of a 16-year-old male presented to the ER following a psychotic episode. He attempted to auto-enucleate his right eye. There was a 1-hour period where his right eye was located on his right malar area before he self-reposited the globe. Pre-operative examination revealed NLP vision in the traumatized eye, a large afferent pupillary defect, and significant damage to the extraocular muscle tissue. An emergent examination under anesthesia was performed which revealed a complete right ptosis, an avulsed superior oblique muscle with a tendon that measured more than 20mm and transected medial rectus muscle stump of 9mm. The globe and other extraocular muscles were otherwise intact. The optic nerve appeared stretched but was otherwise intact and attached. Surgical repair involved bolstering the right medial rectus insertion to the right medial canthus.

Results Post-operatively at 2 months, the patient complained of binocular diplopia in left gaze. On examination, vision was 20/20 in each eye, trace right afferent pupillary defect, and orthophoric in primary gaze. Extraocular movements were found to be full in abduction and partially limited in adduction in the affected eye.

Conclusions Evaluation and timely management of a patient who presented with attempted auto-enucleation resulted in complete visual recovery and improvement in extraocular movements.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #60
Bilateral orbital hemorrhage in a 7-day old newborn.

Sonul Mehta, Arun Reginald, Dan DeAngelis

Purpose To report a case of non-axial proptosis in a newborn resulting from biopsy-proven orbital hemorrhages and to discuss the diagnostic and therapeutic management of this condition.

Study Design Case Report

Methods Case report of an infant who following normal uncomplicated vaginal delivery presented to our institution 7 days post partum with significant non-axial asymmetric proptosis, more marked in the left than the right eye. The proptosis was reported to be present since birth and not resolving. Ocular examination at the bedside revealed inferolateral displacement of the left globe, good vision, normal anterior segment examination, preservation of Bell's phenomenon and unremarkable dilated fundal examination with no choroidal folds, retinal detachment or hemmoraghe. There was no history of pre or post natal trauma. Computed tomography revealed bilateral supraperiosteal orbital masses in the superior aspect of each orbit. The masses appeared hyperdense with radiological evidence of molding of the frontal bone superiorly. Examination under anesthesia and orbital biopsy were undertaken. Serum for coagulation and hematological investigation were taken.

Results Explorative biopsy of the left orbit revealed the presence of dark-chronic appearing blood in the supra-periosteal space. The blood was evacuated with immediate resolution of the proptosis. There was successful, complete recovery after surgery. Parental interview, pediatric assessment and skeletal survey revealed no evidence of intentional injury.

Conclusions Bilateral spontaneous orbital hemorrhage in a newborn without history of birth trauma is uncommon. Surgical exploration can result in definitive exclusion of other more malignant causes of bilateral orbital masses in a neonate. Surgical evacuation of the blood proved to be a successful treatment of this condition, reducing the risk of other mass-related sequelae in an infant. Infants should also be screened for risk of non-accidental injury and hematologic disorders.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #61
Ultrasound Biomicroscopy of the Ciliary Body in Ocular/Oculodermal Melanocytosis

Juan P. Velazquez-Martin, Hatem Krema, Emiliano Fulda, Ronaldo Santiago, E. Rand Simpson, Charles J. Pavlin

Purpose To describe the ultrasound biomicroscopy (UBM) findings of the ciliary body in patients with ocular and oculodermal melanocytosis (O(D)M).

Study Design Retrospective electronic chart and imaging database review.

Methods A retrospective electronic chart and imaging database review was conducted for all patients with O(D)M, who underwent UBM examination at the Ocular Oncology Clinic of Princess Margaret Hospital. Demographic and clinical data were included. High-resolution ultrasonographic imaging of the ciliary body was performed using the UBM with a 50 MHz transducer at a standard gain of 80 dB for all scans. Radial (longitudinal) images of the ciliary body at the 3-, 6-, 9- and 12-o clock positions were obtained in both eyes (affected and unaffected). UBM characteristics included measurements of the ciliary body thickness and internal reflectivity. Internal reflectivity was graded as: low, medium/low, medium, medium/high and high. UBM characteristics in the eye with O(D)M were compared to the contralateral unaffected eye as a control in all cases. Statistical significance of the mean differences in thickness of the ciliary body between both eyes was analyzed by using Student t-test.

Results Twelve patients were included. Seven patients (58.3%) presented ocular melanocytosis and 5 (41.7%) were oculodermal melanocytosis. Median age was 45.5 years. All patients showed unilateral diffuse pigmentation involving episclera, anterior chamber angle, and fundus. Monocular iris heterochromia presented in 2 patients. Mean thickness of the ciliary body of the affected eyes was 0.566 ±0.022 mm (range 0.535 - 0.583) compared to 0.472 ±0.014 (range 0.457 - 0.491) of the contralateral eye. The difference in the mean thickness between the hyperpigmented and the contralateral eye was found to be statistically significant (p= 0.001). The ciliary body of eyes with O(D)M showed intense hyperreflectivity on UBM imaging when compared with the contralateral unaffected eye. All affected eyes were graded as medium to high reflectivity compared to the unaffected eyes that showed a medium to medium/low reflectivity.

Conclusions Ciliary body involvement in O(D)M presents as increased thickness and higher ultrasound reflectivity on UBM compared to the contralateral eye. UBM is helpful in imaging clinically undetectable areas of melanocytosis involving the ciliary body. The

ciliary body should be periodically screened with UBM to detect early development of uveal melanomas.

OCULOPLASTICS- POSTERS

WEDNESDAY 27 JUNE

Paper #62
The Medial Tarsectomy - a quick, efficient and small-incision office based approach to repair of the medial ectropion.

Vasudha Gupta, Robert Adam, Yasser Khan

Purpose Lower eyelid ectropion is a common age related eyelid malposition. Anatomic changes that lead to this problem can be difficult to correct surgically, as successful corrective surgical techniques must re-establish normal anatomical relationships between the horizontal and vertical forces acting on the medial eyelid. The purpose of this paper is to describe a small-incision based technique for repair of medial ectropion.

Study Design Description of surgical technique.

Methods The basic concept is a retro-punctal excision of a tarsoconjunctival diamond of tissue followed by reinsertion of the lower lid retractors onto the lower tarsal border. By resecting both conjunctiva and a small piece of tarsus the posterior lamella is shortened. In conjunction with meticulous reinsertion of the lower lid retractors, this provides the inward force needed to correct the ectropion, allowing the anterior lamella to role superiorly thereby placing the punctum back in the tear lake.

Results Our preferred technique is a variation on the transconjunctival approach to retractor plication. This is a quick office based procedure that is effective and efficient.

Conclusions Medial ectropion can be a difficult clinical problem to correct surgically. Functional correction of the punctal eversion is crucial to re-establish normal corneal wetting physiology as well as tear-lake drainage. The medial tarsectomy is described as a small-incision based efficient procedure for the correction of medial ectropion. The minimal equipment and speed of this procedure makes it ideal to be used in an office or procedure room setting.

PEDIATRICS- POSTERS

WEDNESDAY 27 JUNE

Paper #63
Investigate barriers to follow-up eye care after vision screening in a pediatric primary care setting

Zhuo Su, Bing Q. Wang, Elizabeth K. Marvin, Tavé A. van Zyl, Esteban N. Garza, Susan H. Forster

Purpose To assess barriers for children who fail vision screenings by pediatricians and family physicians to obtain follow-up care with an ophthalmology specialist.

Study Design Records were accessed retrospectively of children ages 3 to 14 who failed a vision screening between January 2009 and October 2010 at a private university health center, two community health centers, and a private pediatric primary care practice in New Haven County, CT. A phone survey, approved by Yale University Human Investigation Committee, was conducted in English or Spanish with parents of a simple random sample of 146 children 4 months after the screening to allow follow-up to be completed.

Methods Each survey took 20 minutes to complete and consisted of 37 questions with prompts of possible answers regarding family demographics, parent knowledge of child eye care, and barriers to follow-up. Data analysis was performed via Minitab 16 with $p<0.05$ as significant for Fisher's exact test.

Results 53 families completed the survey, 17 refused, 47 moved or disconnected their phones, 28 never answered calls, and one could not speak English or Spanish. The response rate was 75.7% (53 of 70 eligible). 37 families (69.8%) were aware of the screening failure; of these 23 (62.2%) followed up. Of the 14 informed families that did not follow up, one had scheduled but was still waiting for an eye appointment, one missed an appointment due to child sickness but had not rescheduled, three had difficulty scheduling an appointment, three forgot to schedule, three considered follow-up unnecessary, two had to miss work for an appointment, and one cited a lack of insurance. 70% of families with access to eye care knowledge followed up while 28.6% of those without did ($p=0.08$). Follow-up rate was 87.5% if the pediatric office scheduled eye appointments but 52% if the office left parents to schedule ($p=0.11$). Statistically significant difference in follow-up rates was found between children who had eye appointments (71%) and who had not (20%) before the screening ($p=0.047$) and between children who had to wait less than 2 months (100%) and who had to wait longer (50%) for an eye appointment ($p=0.013$). Ethnicity ($p=0.26$), child health insurance ($p=0.71$), family income ($p=0.67$), parent marital status ($p=0.71$), car access ($p=1$), and private or public primary care setting ($p=0.48$) led to no statistically significant difference in follow-up rates.

Conclusions To improve follow-up eye care access in children who fail vision screenings, pediatric primary care providers should clearly communicate screening failures, immediately schedule follow-up appointments with eye specialists, educate parents on the benefits of timely intervention, and issue appointment reminders, especially targeting children without previous eye care access.

PEDIATRICS- POSTERS

WEDNESDAY 27 JUNE

Paper #64 - withdrawn

PEDIATRICS- POSTERS

WEDNESDAY 27 JUNE

Paper #65
New ophthalmic phenotypic associations in a case of monosomy 1p36

Stephanie West, J. Raymond Buncic, Asim Ali

Purpose Monosomy 1p36 is the most common terminal deletion syndrome in humans, occurring in 1 in 5,000 births. Previously described ophthalmic features include visual inattentiveness, refractive error, strabismus, sixth nerve palsy and anomalous optic discs. We describe a case additionally found to have marked aqueous tear deficiency and an acquired vertical nystagmus.

Study Design Descriptive case report of clinical findings, investigations and management of a patient with 1p36 monosomy.

Methods Description of clinical findings, investigations and management of a case of monosomy 1p36.

Results A 3 year old girl presented in infancy with dysmorphic features, seizure disorder, visual inattention, marked hyperopia, normal fundal examination and marked aqueous tear deficiency. Visual evoked potentials were normal. Magnetic resonance imaging demonstrated multiple malformations characterized by corpus callosum shortening, septum pellucidum thickening and upper spinal cord syrinx without Chiari malformation. Genomic microarray analysis identified a terminal 10.93 Mb deletion from chromosome region 1p36.33 to 1p36.22 confirming 1p36 micro-deletion syndrome. Dry eye symptoms required management with punctal plugs and tear replacement. At the age of 2 she developed sudden onset vertical jerk nystagmus, coinciding with an

increase in seizure activity, with complete resolution within 12 months. Repeat MRI and ophthalmic examination revealed no causal changes.
The deleted region includes the GABRD and SKI genes have been associated with seizures but not with nystagmus or aqueous tear deficiency.

Conclusions 1p36 deletion syndrome is a rare condition; our case had the additional features of aqueous tear deficiency and acquired transient vertical nystagmus of unknown etiology.

PEDIATRICS- POSTERS

WEDNESDAY 27 JUNE

Paper #66
Adjustable versus non-adjustable sutures in thyroid strabismus surgery: which is the better technique?

Adil Bhatti, Simran Takhar, Vivek Patel

Purpose To compare the surgical outcomes of adjustable and non-adjustable suture techniques in vertical thyroid strabismus surgery.

Study Design This retrospective, case series, single surgeon study of 15 patients compared outcomes of adjustable (N=7) and non-adjustable suture (N=8) techniques in vertical thyroid strabismus surgery.

Methods Pre-operative data including age and gender as well as surgical data such as number of muscles, amplitude of intended surgical correction and post-operative outcomes were compared. Primary surgical outcomes included post-operative angle deviation in primary gaze, diplopia in primary gaze and incidence of post-operative overcorrection. Data was included for the 1 week, 6 week and 6 month visits.

Results There was no difference in the baseline demographics including age ($p=0.41$) or gender ($p=0.12$) between the two study groups. There was no difference between the two groups in the mean number of muscles operated on ($p=0.90$) or the mean inferior rectus recession ($p=0.72$). There was a significant difference in the pre-operative mean angle deviation measurements between the two groups (adjustable 32.42 prism diopters, non-adjustable 15.25 prism diopters, $p=0.011$). Post-operative mean angle deviation measurements in primary gaze were significantly reduced at 1 week, 6 week and the 6 month visits ($p<0.001$) from preoperative measurements in both the adjustable and non-adjustable groups. There was no significant difference in post-operative deviation at 6 months between the two groups ($p=1.00$). There was no difference between the two groups in the number of patients with post-operative overcorrection at the 6 month visit ($p=0.53$).

Conclusions In our study, we found that adjustable and nonadjustable techniques showed similar post-operative effectiveness at 6 months in adult patients with vertical strabismus secondary to thyroid ophthalmopathy.

RETINA- POSTERS

WEDNESDAY 27 JUNE

Paper #67
Digital Reader vs. Print Media: the role of digital technology in reading accuracy in Age-Related Macular Degeneration

Kulbir S. Gill, Alexander Mao, AnneMarie Powell, Thomas Sheidow

Purpose The purpose of this study is to compare patient satisfaction, reading accuracy and speed between digital electronic readers and standard paper/print media in patients with ARMD.

Study Design This study is a prospective study that enrolled low vision patients who were being evaluated in the retina clinics for follow up post-treatment for wet AMD.

Methods Patients recruited for the study are ARMD patients who require low vision aids. Each patient recruited for the study will be asked to read standardized text developed through the Hahn study that have been validated for reading speeds. Patients recruited for the study will be assessed for reading speeds on both digital readers (Apple Ipad and Sony eReader) and standard paper text. Each patient will be presented with standardized and randomized texts on either a digital reader or paper text and will be asked to read it aloud. Patients will start with the smallest print size they can read on the standardized paper text. They will then use digital readers to read the same sized standardized text on the digital readers. Oral reading times will be measured. Reading speeds will be calculated based on a formula incorporating speed and accuracy in a "words per minute" formula.
The patients will complete a Visual Analog Scale after they have completed the study. It will focus on the ease of use and reading clarity of both digital devices and standard print media.

Results Number of patients in study: 26
Average Age: 75.69 yrs ± 8.79
Average WPM: 156.26 ± 14.01
Range of VA: 20/25 to CF
The average WPM on all three modalities was as follows: Paper (123.75 WPM), Ipad (126.53 WPM), Sony eReader (120.23 WPM).
We then subdivided the patients into 3 subgroups based on what text size they chose to read from (Group 1: size 16, Group 2: size 24, Group 3: size ≥ 32). Based on the subgroup analysis, we compared reading speeds on the 2 digital readers to that of paper. We found that for groups 2 and 3, patients read faster on the Ipad compared to Paper (5.52 WPM faster (p value: 0.0189) and (3.54 WPM faster (p value: 0.0057)) respectively.
When comparing the Sony eReader to the paper text, patients consistently read slower

in all three subgroups with the Sony eReader.
With our visual analog survey score, Patients gave the Ipad the highest score for clarity (9.3) and the Paper text the highest score for ease of use (8.9)

Conclusions 1) For Larger text sizes, (size 24 or greater) patients read faster on the IPAD compared to the standard Paper.
2) Patients consistently read faster in all text sizes with standard paper than the eReader
3) Patients found the clarity of text to be superior on the IPAD. (IPAD>Paper>eReader)
4) Patients found Paper to be superior in "ease of use" (Paper>IPAD>eReader)

RETINA- POSTERS

WEDNESDAY 27 JUNE

Paper #68
Risk factors associated with post-vitrectomy nonarteritic anterior ischemic optic neuropathy

Micah Luong, Micheline Deschenes, Nidhi Lodha, Fiona Costello, Geoff WIlliams, Amin Kherani

Purpose With the advent of pars plana vitrectomy, the landscape of retinal surgical therapy has drastically changed. However, vitrectomy is not without consequences. Three cases of post-vitrectomy nonarteritic anterior ischemic optic neuropathy (NAION) have been previously reported. The purpose of this case series is to report five cases of NAION post-vitrectomy and any potential modifiable risk factors.

Study Design Retrospective chart review

Methods : A retrospective chart review of 2035 patients who underwent vitrectomy surgery from November 2007 to March 2010 at the Rockyview General Hospital and Calgary Retina Consultant (Calgary, Alberta) was performed. Of the 2035 vitrectomy surgeries, 1205 surgeries were performed without epinephrine, and 830 surgeries were performed with the use of 2.5 or 3cc of 1:10000 epinephrine in the infusion line. The diagnosis of NAION was made based on the following: acute decrease in vision, associated relative afferent pupillary defect, colour vision loss, optic nerve pallor, associated nerve fiber layer defect on visual field and optical coherence tomography, and an evaluation for reasonable alternate etiologies. Patients who developed NAION were identified and included in our case series for comparison purposes.

Results Of the 2035 vitrectomy surgeries, five patients developed NAION post-vitrectomy. All of the affected patients received epinephrine infusion and had small physiological cupping, suggesting an ‘optic disc at-risk' for NAION. Four of the five

patients had increased intraocular pressure post-operatively, and all five patients had risk factors for NAION such as a history of hypertension, cardiac failure or smoking. Other systemic, ocular and peri-operative risk factors were also shown to be significant.

Conclusions This retrospective chart review revealed that NAION may occur post-vitrectomy surgery. Patients with an established vascular disease and a ‘physiological disc at-risk' along with the use of epinephrine should all be reviewed as risks for NAION and should be addressed in the consent process. Since there is no effective treatment for NAION, it might be prudent to discuss NAION as a possible consequence in patients with known systemic, ocular and peri-operative risk factors, especially those who are undergoing elective treatments that involve vitrectomy.

RETINA- POSTERS

WEDNESDAY 27 JUNE

Paper #69
Advance glycation end product and its role in age-related degenerative diseases of the eye

Tony Lin, Jing Cui, Joanne Matsubara

Purpose Advanced glycation endproducts (AGE), a result of covalent modifications of proteins by glycosylation, accumulate with aging and are linked to several age-related retinal disorders. AGE deposits are found in drusen and in Bruch's membrane of aged and diseased eyes, but what cellular pathways are activated by their presence in outer retina is not fully known. This study investigates the effects of AGE stimulation on global gene transcription, cellular pathways and protein secretion in primary culture of human retinal pigment epithelial cells (RPE).

Study Design Basic science cell culture

Methods Primary cultures of human RPE cells were stimulated with 10µg/ml AGE for 4h, and genome-wide changes in gene expression were studied with Agilent Oligo microarrays. Primary genes of interest were detected in RNA samples using qRT-PCR with primers designed from Primer Express 2.0 software. Western blot analysis of protein extract was performed with select primary autoantibodies. RPE gene differential expression was analyzed using gene set enrichment analysis (GSEA). Protein levels of secreted cytokines and growth factors were studied using Bio-Plex Luminex arrays.

Results A total of 41 up- and 18 down-regulated RPE genes were differentially expressed. These genes fell into three main categories as assessed by GSEA: inflammation, proteasome degradation and caspase pathways. The highest upregulated gene was CXCL11, a chemokine. Its production in AGE stimulated RPE cells was

confirmed using western blot analysis. Cytokine assay of supernatant using Bio-Plex Luminex assay showed the highest increase in pro-inflammatory cytokine GM-CSF secretion along with several anti-inflammatory cytokines including IL-10, IL-1ra and IL-9, while many pro-inflammatory cytokines remained unchanged or underexpressed after AGE stimulation.

Conclusions Our studies provide new insights into the cellular pathways triggered by the accumulation of AGE in the outer retina. RPE cells respond to AGE stimulation by activation of two major cell signaling pathways: the NF-kB pathway and the JAK-STAT signaling pathway. Our results suggest novel mechanisms for AGE modulation of RPE cellular pathways and identify novel targets for drug development that can minimize the progression of age-related retinal diseases.

RETINA- POSTERS

WEDNESDAY 27 JUNE

Paper #70
Prognostic factors of final visual outcome after open globe injury

Gareth Lema, Khawla Abu Samra, Pradeepa Yoganathan

Purpose To determine visual outcomes and prognostic factors of open globe injuries and to assess the prognostic power of the Ocular Trauma Score (OTS).

Study Design Retrospective review of the medical records of all consecutive patients with open globe injury between September 2009 to November 2011.

Methods Mechanism of injury, initial visual acuity, presence of afferent pupillary defect, globe rupture, zone of injury, presence or absence of retinal detachment, and final visual acuity were analyzed as prognostic indicators of final visual acuity. Open globe injuries were classified into zone 1, 2 and 3 as defined by the Ocular Trauma Classification Group and were designated an OTS category. The final visual acuities were compared to those predicted by the OTS.

Results The study group consisted of 32 consecutive patients. Average age was 50 (range 10-90). Initial visual acuity ranged from NLP to 20/25. In multivariate analysis, zone 3 injuries (> 5mm posterior to the limbus), the presence of retinal detachment, afferent pupillary defect, and globe rupture were related to visual acuity of 20/100 less. For patients in OTS category 1 (worst prognosis), 57% had final visual acuity of NLP, versus 74% predicted by the OTS. Of our patients in category 2, none resulted in NLP vision (27% predicted).

Conclusions We have identified prognostic factors for open globe injury, including the zone of injury, presence of retinal detachment, afferent pupillary defect and globe

rupture. Final visual acuity was better than predicted by the ocular trauma score in all categories, which we hypothesize is due to improvements in intraocular surgery.

UVEITIS- POSTER

WEDNESDAY 27 JUNE

Paper #71
A rare ocular manifestation of Crohn's disease.

Nishant Sharma, Frozan Qasemi, Vikas Sharma

Purpose To present a case of severe acute bilateral panuveitis and optic neuritis secondary to Crohn's disease.

Study Design Interventional case report.

Methods This case report describes a 17-year old male with no pre-existing history of IBD who presented with severe visual loss secondary to acute bilateral panuveitis and optic neuritis. Later in the course of his disease he developed multiple white-centered retinal hemorrhages. Histopathologic findings confirmed the diagnosis of Crohn's disease.

Results Despite the aggressive presentation in this case, the patient was successfully treated with high dose oral steroids leading to complete resolution of his inflammatory symptoms and full recovery of his vision.

Conclusions Even though the association of ocular disorders with IBD has been well documented in the literature, the variable spectrum of ocular manifestations make the diagnosis challenging. Our patient had diffuse inflammatory disease in the setting of hyperacute, severe bilateral panuveitis and optic neuritis. Our experience, supported by a review of the literature, suggests that our patient's presentation was atypical.

UVEITIS- POSTER

WEDNESDAY 27 JUNE

Paper #72
A novel case (category) of posterior uveitis

Shawkat S. Michel, Monica S. Michel

Purpose To show the clinical features, investigation and results of follow up/ treatment of a case of posterior uveitis that presents with many new features.

Study Design This is a case study of a patient presenting with the complaint of a floater in his left eye for two months.

Methods 29 year old male, of Indian origin, presents with the complaint of a floater in his left eye for two months duration. Examination showed that he had 20/20 unaided visual acuity in each eye. The anterior segment and intra-ocular pressure were normal bilaterally. He had no vitreous cells in either eye. A single, rounded, slightly bulging above surface, white lesion with a pigmented border, 3-4 disc diameters above and slightly nasal to the left optic disc (Figure 1).

Results This is a left fundus lesion that looked like a granuloma, tuberculoma or a non-melanotic melanoma. Review of systems and investigations were all un-revealing. Six weeks later there was dramatic spontaneous resolution of this fundus lesion (figure 2).

Conclusions This is probably a case (category) of posterior uveitis that has not been described before.

UVEITIS- POSTER

WEDNESDAY 27 JUNE

Paper #73
CHARACTERIZATION OF PATIENTS UNDERGOING TUBE SHUNT OR TRABECULECTOMY SURGERY FOR UVEITIS-RELATED INTRAOCULAR PRESSURE ELEVATION.

Umair Iqbal, Jonathan Tsang, Ralf Buhrmann, Chloe C. Gottlieb

Purpose To compare demographic data, including uveitis and glaucoma diagnosis, of patients with uveitis-related intraocular pressure elevation undergoing tube shunt or trabeculectomy surgery.

Study Design This was a single center, observational, and restrospective chart review study.

Methods Patients were identified by an electronic search of one surgeon's billing records for glaucoma filtering procedure codes. Inclusion criteria were diagnosis of uveitic glaucoma or elevated intraocular pressure associated with uveitis and either tube shunt or trabeculectomy surgery. A chart review was conducted and information tabulated for: age, gender, uveitis diagnosis, angle status.

Results Of 37 patients diagnosed with uveitis, 23 (62%) were male and 14 (38%) were female. The mean age was 60 years (range: 18 to 95 years). Open angle glaucoma (OAG) was present in 25 cases (67.6%). There were 17 males with OAG (68%), while only 8 females (32%) had OAG. Six patients had angle closure glaucoma (ACG) (16.2%). The number of males with ACG was 5 (83.3%) and that of females with ACG was 1 (16.6%). One patient had mixed mechanism glaucoma (2%). The angle status of 2 uveitic glaucoma cases (5.4%) was unknown. Three patients had ocular hypertension (OHT, 8.1%), of which 1 had angle closure and 2 had an unknown angle status. The number of females with OHT was 2 (66.6%) and that of males was 1 (33.3%).

Conclusions In the patients studied, the age range was broad and the majority of patients were male. OAG diagnosis was more frequent than ACG diagnosis. Both OAG and ACG were more prevalent in males while uveitis related OHT with no glaucoma was diagnosed in more females than males. Only a minority of patients developed OHT without glaucoma. One patient with OHT had angle closure and the status of angle in other 2 patients was unknown.

VISION REHABILITATION- POSTERS

WEDNESDAY 27 JUNE

Paper #74
Burden and Depression in the Caregivers of Blind Patients in the Upstate New York

Puneet S. Braich, Sai Gandham, Paul Beer, Devang Bhoiwala, Stephen Knohl, Sri Narsipur, David Almeida

Purpose To describe the degree of burden and the prevalence of depression among those caring for legally blind patients.

Study Design Clinic-based cross-sectional study.

Methods Self-rated questionnaires were completed by 207 family members who were the primary caregivers of legally blind patients in the central and capital New York regions. The patients were stratified into three categories by severity of blindness: (1) 20/200 to 10/200, (2) 10/200 to light perception (LP), and (3) no light perception (NLP). Patients with additional medical conditions requiring regular assistance from a caregiver (e.g., neurological deficit) were excluded from the study. This criterion was implemented to isolate those caregivers that needed to provide care solely due to a patient's visual impairment. The validated Burden Index of Caregivers (BIC) was used to measure care burden and the Center for Epidemiologic Studies Depression (CES-D) scale was applied to determine depression.

Results Severity of vision loss in patients directly correlated with rates of depression in caregivers. The prevalence of caregiver depression increased with degree of visual impairment from 9% in the 20/200 group to 27% in the NLP cohort ($P<0.01$). In assessing burden, hours spent providing care, the intensity of care-giving, and the presence of multiple chronic illnesses in the caregiver were the definitive factors linked to high Burden Index of Caregivers (BIC) scores ($P<0.01$). Unlike a similar study in an Indian population, the relationship of the caregiver to the blind patient played no significant role in depression or perception of burden.

Conclusions The intensity of care-giving, hours spent providing care, and presence of chronic illness in caregivers were the main variables significantly related to burden. Caregivers of patients with NLP experience greater burden and depression than caregivers of patients with lesser degrees of blindness. Depression in American caregivers was less prevalent than depression in Indian caregivers from our earlier study. The differences between both populations are likely due to disparities in socioeconomic status, cultural attitudes about autonomy in visually impaired patients, and the availability of vision rehabilitation services. We are currently examining this relationship in a Canadian population (Kingston, Ontario).

CATARACT SURGERY

WEDNESDAY 27 JUNE

Paper #75
Comparison of the most popular prophylactic intracameral antibiotics used with cataract surgery

Stephan Ong Tone, Syed Y. Habeeb, Steve A. Arshinoff

Purpose Postoperative endophthalmitis is a rare but devastating complication of cataract surgery. While numerous studies have been conducted to evaluate the safety and efficacy of various intracameral antibiotics, there is no consensus as to which antibiotic, if any, to use as prophylaxis for cataract surgery. We wanted to determine, based on current best available evidence, the optimal prophylactic intracameral antibiotic.

Study Design Literature-review and review of our experience from 1996-2011.

Methods We reviewed our own and world-wide experience and publications with the 3 most commonly used prophylactic intracameral antibiotics used for cataract surgery: cefuroxime, vancomycin and moxifloxacin.

Results We have used prophylactic moxifloxacin and vancomycin each in about 5,000 intraocular surgical procedures. Cefuroxime, used mostly in Europe is safe and effective at reducing the rate of endophthalmitis, but has important gaps in its antimicrobial coverage that include Gram-negative organisms, methicillin-resistant Staphylococcus aureus and Enterococci. Cefuroxime inhibits the final stages of peptidoglycan synthesis in bacterial cell walls by binding to specific penicillin-binding proteins. While clinically useful doses are safe, inadvertent high doses, due to dilution complexity, of intracameral cefuroxime have led to ocular toxicity. Vancomycin is safe and effective at reducing the rate of endophthalmitis, especially against multi-resistant Gram-positive bacteria, but is not effective against Gram-negative organisms and Enterococci. Vancomycin binds with high affinity to the D-alanine-D-alanine C-terminus of the peptidoglycan chain precursor and inhibits its incorporation into the bacterial cell wall. Moxifloxacin demonstrates excellent ocular penetration and broad spectrum activity against Gram-positive, Gram-negative, atypical and anaerobic organisms. Moxifloxacin interferes with bacterial cell replication, transcription, and DNA repair by inhibiting two bacterial enzymes, DNA gyrase and topoisomerase IV. Unlike cefuroxime and vancomycin, moxifloxacin shows dose-dependent rather than time-dependent kinetics for bacterial killing. The more recent appearance of dose-dependent resistance has led to an increase in the recommended prophylactic dose. Unlike vancomycin and cefuroxime, moxifloxacin is unrelated in antibiotic class, or by mechanism of action, to

current preferred therapeutic agents for the treatment of endophthalmitis, and therefore poses less risk of selection of an infection resistant to those agents.

Conclusions Intracameral moxifloxacin appears to be the most desirable agent for cataract surgical prophylaxis.

CATARACT SURGERY

WEDNESDAY 27 JUNE

Paper #76
The Effects of pictograms in educating low-literacy populations on the use of postoperative cataract medication

Puneet S. Braich, Mary T. Coleman, Simon Hollands, David Almeida

Purpose To examine the effectiveness of pictograms in educating low-literacy patients in order to improve adherence to postoperative cataract regimens.

Study Design Multicenter, single-blinded, randomized controlled trial.

Methods A group of 225 patients from across India, all below a 10th-grade education level, were divided into 3 groups of 75 patients. Each group was educated differently regarding medication use and frequency of dose. The control group was given verbal instruction only. Experimental group 1 (EG1) was taught using the pictograms in the clinic. Experimental group 2 (EG2) was taught in the same way as EG1 but was given the pictograms to take home. Each group was given three 10-point oral exams: on the operative day (Test 1); on postoperative day 7 (Test 2); and on day 28 (Test 3). During the patients' final visit, medication bottles were measured to ascertain use.

Results Test 1 showed no significant difference in mean scores among groups. For Test 2, EG1 and EG2 scored similarly but significantly better than Control (control group, 5.77; EG1, 7.33; EG2, 7.62 ; $p < 0.001$). For Test 3, EG2 scored significantly better than Control and EG1 (control group, 4.37; EG1, 5.44; EG2, 7.17; $p < 0.001$). The only parameter significant for a higher test score was the participants' educational level. Higher test scores were significantly associated ($p < 0.001$) with greater medication consumption.

Conclusions Taking the pictograms home proved to be the most effective way to educate patients who had low literacy levels, and it increased adherence to regimens by 28 days or more. Education through pictograms strictly in the clinic was sufficient for short regimens (≤ 7 days).

CATARACT SURGERY

WEDNESDAY 27 JUNE

Paper #77
Randomized controlled trial comparing nepafenac, ketorolac and placebo in preventing macular edema after uncomplicated cataract extraction

David Almeida, Zainab Khan, Lin Xing, Shahrukh N. Bakar, Karim Rahim, Todd E. Urton, Sherif El-Defrawy

Purpose To evaluate the efficacy of prophylactic ketorolac 0.5% versus nepafenac 0.1% versus placebo on macular volume after uncomplicated phacoemulsification cataract extraction. To ascertain the health-related quality-of-life (HRQOL) and tolerability of prophylactic topical non-steroidal anti-inflammatory drugs (NSAIDs) in uncomplicated cataract surgery.

Study Design Prospective placebo-controlled parallel assignment double-blind randomized clinical trial.

Methods Patients were randomized for one month to placebo (n=54), ketorolac 0.5% (n=54), or nepafenac 0.1% (n=54) dosed QID starting one day before surgery. Spectral-domain ocular coherence tomography (OCT) scans were performed at baseline and one month after surgery. The Comparison of Ophthalmic Medications for Tolerability (COMTOL) questionnaire was completed by 97 patients (60.0% response rate) after surgery. Main outcome measures include change in OCT central subfield thickness (CST), macular cube volume (VOL), and average macular cube thickness (AVG) as well as the COMTOL HRQOL analysis and safety.

Results In all 3 groups, OCT VOL and AVG increased significantly at one month, but in the placebo group, CST was also significantly increased (17.1 μm, $p<0.0001$). There was a significant difference in cube volume between ketorolac (9.86mm3) and nepafenac (10.16mm3) ($p=0.0491$) but no difference between either medication and placebo (10.07mm3). Analysis of means of differences reveals no statistically significant difference for the OCT macular cube values of CST, AVG, and VOL among the three study groups ($p=0.2901$). COMTOL analysis found no difference between ketorolac and nepafenac when compared to placebo in terms of tolerability, compliance, side effect frequency and bother, and effects on HRQOL.

Conclusions At one month, after uncomplicated phacoemulsification cataract extraction, we found no difference in macular volume between placebo, ketorolac, and nepafenac. Both ketorolac and nepafenac are well-tolerated medications with minimal side effect profiles. For patients without risk factors, prophylactic use of topical NSAIDs is not recommended.

CATARACT SURGERY

WEDNESDAY 27 JUNE

Paper #78
Practice Patterns of Canadian Ophthalmological Society members in Cataract Surgery - Survey 2012

Lindsay Ong-Tone

Purpose This is the fourth annual survey on the practice patterns of the members of the Canadian Ophthalmological Society on cataract surgery.

Study Design A web based study

Methods The current survey will be done in January 2012 when an e-mail with a link to Fluid Surveys will be sent to all the COS members who have indicated that their Practice Focus is on Cataract and IOL. A reminder e-mail will be sent about 3 weeks later.

Results The previous surveys have shown some definite trends. NSAID drops were being used for longer periods preoperatively. More of the participants were using the NSAID drops postoperatively. There was a moderate increase in the use of multifocal and toric intraocular lenses. There was a significant drop in the use of microincisional cataract surgery (MICS)

Conclusions Continuing advances and developments affect the practice patterns of the COS members in cataract surgery

CATARACT SURGERY

WEDNESDAY 27 JUNE

Paper #79
Does the use of a Surgical Safety Checklist Have Impact on Reducing Medical Errors and Near-Misses?

Hamza Khan, Malcolm Orr, Michael Quinlan, Donna Gramigna, Carla Service, Courtney Addis

Purpose To assess the impact of a safety checklist tool on safety in cataract surgery. Checklists are used in many applications to help improve team communications, task completion and error reduction. The World Health Organizations Surgical Safety Checklist is mandated as part of hospital accreditation across Canada. Limited evidence exists of its impact in ophthalmology, despite cataract surgery being the most common surgical procedure in North America.

Study Design Prospective cohort study

Methods We evaluated the effectiveness of a newly developed Safety Checklist for cataract surgery. The WHO instrument was specifically tailored for use in ambulatory cataract surgery. Over a period of 1 year, 3900 surgical procedures with the use of the new Cataract Checklist were reported. Quality Improvement reviews included rates of preventable errors, near misses and survey of staff. A survey of staff and surgeons provided user-input into the perceived impact on team communication and ease of use.

Results Significant education was needed to implement the newly developed tool. One case of wrong IOL implantation was reported in periods 1 and 2 (pre and post implementation). However, near misses, recorded as identification and prevention of wrong surgical site, procedure or implant errors that were identified through the checklist reduction in wrong IOL implants was seen. Staff and surgeons reported better communication, including several near-misses which were corrected during the safety checklist.

Conclusions A low rate of preventable errors was reported in both measurement periods, thus no statistical error reduction was observed. This is despite a large sample of all cases in a 12 month period (3900 eyes). However, significantly improved team communication was noted based on survey results. This can allow errors to be caught prior to harm and allow improved team function. Wider study of ophthalmology checklists is recommended to determine effectiveness in error prevention.

CORNEA- CONTROVERSIES IN CORNEA

WEDNESDAY 27 JUNE

Paper #80
Single or paired intrastromal corneal ring segments combined with cross-linking in keratoconus

Judy Y. Ku, Sonia N. Yeung, Stephanie A. Low, Alejandro Lichtinger, David S. Rootman

Purpose To report the efficacy of single or paired intrastromal corneal ring segments (ICRS) combined with cross-linking in keratoconus

Study Design Retrospective nonrandomized study

Methods A retrospective nonrandomized study comprised of keratoconus (KC) patients with implantation of single (35 eyes of 32 patients) or paired (30 eyes of 27 patients) ICRS using femtosecond laser with axis of incision in the steep axis. Both groups had corneal collagen cross-linking with riboflavin (C3-R), which was performed following insertion of ICRS. Preoperative demographics, visual acuities (uncorrected, UCVA; st corrected, CVA), refractive and keratometric (K-) values were matched. Outcome measures included improvement in VA, refractive error, keratometry and wavefront high order aberrations (HOA). Preoperative data was compared to measurements at the last postoperative visit.

Results Both groups showed improvement in UCVA, but this was only significant in the single ICRS group (2.80 lines, p=0.003; paired 2.37 lines, p=0.074). The reduction in cylinder was also significant in both (respectively 1.83±1.48D, p=0.013; 1.5±1.11D, p=0.025). The single group showed significant reduction in the steep K (3.53±4.24D, p=0.01), while the paired group approached significance (2.19±3.22D; p=0.052). The reduction in total HOA was significant in both (single 4.19±7.59um, p=0.032; paired 2.40±2.36um, p=0.008). There was more improvement in the single group mean K than in the paired group (p=0.05). Other outcome measures were not statistically significant.

Conclusions Implantation of single or double ICRS combined with cross-linking leads to improvement in UCVA, steep keratometry, cylindrical error and total HOA in KC patients. The single ICRS segment showed greater improvement in UCVA, and reduction in steep K and mean K when compared to paired segments.

CORNEA- CONTROVERSIES IN CORNEA

WEDNESDAY 27 JUNE

Paper #81

Comparison of intrastromal corneal ring segment implantation with same day corneal UV-A/riboflavin collagen cross-linking (ICRS-CXL) versus ICRS implantation alone in patients with progressive corneal ectasia.

Marie Eve Légaré, Alfonso Iovieno, Sonia N. Yeung, Peter Kim, Alejandro Lichtinger, Simon Hollands, Allan R. Slomovic, David S. Rootman

Purpose To compare combined intrastromal corneal ring segment (ICRS) implantation with same day corneal UV-A/riboflavin collagen cross-linking (CXL) versus ICRS implantation alone in patients with progressive corneal ectasia.

Study Design Retrospective cohort study

Methods Clinical charts for patients that had undergone ICRS-CXL and ICRS alone from November 2008 to February 2011 were reviewed for preoperative and postoperative uncorrected and best-corrected distance visual acuity (UDVA and BDVA), sphere, cylinder, manifest refractive spherical equivalent (MRSE) and topographical imaging were recorded from the charts. Mean and steepest keratometry (K) as well as root-mean-square (RMS) from corneal aberrations were extracted from the topography.

Results Sixty-eight eyes with progressive ectasia were included in the study. The ICRS-CXL group was composed of 32 eyes from 27 patients and ICRS alone group was composed of 36 eyes from 27 patients. A significant improvement in UDVA was seen at 12 months in both groups with a change in logMAR of 0.22 (p=0.0004) in the ICRS-CXL group and a greater improvement of 0.645 (p=0.038) in the ICRS alone group. The change in BCVA and MRSE were insignificant in both groups. There was a significant decrease of 1.29 diopters (D) (p=0.0023) of astigmatism in the ICRS-CXL group at 12 months while the improvement was insignificant in the ICRS alone group with 0.47 D (p=0.29). There was a significant and similar flattening of the mean and steepest K in both the ICRS-CXL and ICRS alone groups with 1.176 D (p=0.016) and 1.145 D (p=0.011) for mean K and 1.43 D (p=0.016) and 1.74 D (p=0.007) for steepest K respectively. RMS of total higher order aberrations significantly decreased by 2.06 µm (p=0.0002) in the ICRS-CXL group and by 6.12 µm in the ICRS alone group. No complications were observed during the entire follow-up period.

Conclusions Both ICRS-CXL and ICRS alone are effective in patients with progressive ectasia. The ICRS alone group demonstrated a threefold improvement of UDVA and Total RMS-HOA in comparison to ICRS-CXL at 12 months.

CORNEA- CONTROVERSIES IN CORNEA

WEDNESDAY 27 JUNE

Paper #82

Single inferior intrastromal corneal ring segment combined with phototherapeutic keratectomy and cross-linking in the management of keratoconus

Stephanie A. Low, Sonia N. Yeung, Judy Y. Ku, Alejandro Lichtinger, Alfonso Iovieno, David S. Rootman

Purpose To evaluate the efficacy of a single inferior intrastromal corneal ring segment (ICRS) combined with phototherapeutic keratectomy (PTK) and corneal collagen cross-linking performed sequentially in the same day in the management of keratoconus.

Study Design Retrospective case series.

Methods This study is a case series of keratoconus patients treated with a single inferior 0.45mm (Intac, SK version, Addition Technology Inc, Sunnyvale, CA) ICRS implantation combined with 50 micron PTK and corneal collagen cross-linking with riboflavin. Subjects had no previous ocular intervention and no post-intervention treatment. Outcome variables included uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), mean spherical refractive equivalent, and keratometry. Analyses were completed at 1 and 3 months postoperatively.

Results Eighteen eyes from 13 subjects were analyzed. Seven of the 13 subjects were female. Mean age was 24.4 ± 9.4 years (range 13-45) at the time of the procedure. At 3 months, UCVA significantly improved from 20/224 (1.05 ± 0.42 LogMAR) preoperatively to 20/84 (0.62 ± 0.44 logMAR) (p=0.03). There was a significant reduction in steep K (54.03 ± 5.2 D preoperatively vs. 47.51 ± 2.96 D, p=0.004). Mean K also showed significant improvement (50.44 ± 4.65 D preoperatively vs 45.35 ± 2.88 D, p=0.01). No other outcome measures were statistically significant at this follow-up point.

Conclusions A single inferior ICRS combined with PTK and cross-linking performed sequentially in the same day demonstrated a significant improvement in UCVA, steep K, and mean K three months postoperatively. Short-term results suggest that this novel approach may be effective in the management of keratoconus.

OCULOPLASTICS-2

WEDNESDAY 27 JUNE

Paper #83
Clinical imaging of peribulbar and retrobulbar injections with high-resolution surface coil magnetic resonance imaging

David Almeida, Michel J. Belliveau, Thomas Enright, Omar Islam, Sherif El-Defrawy, Jeffrey Gale

Purpose Retrobulbar and peribulbar blocks are commonly used forms of anesthesia for ophthalmic surgical procedures; however, the precise anatomic localization of injected solution is unknown for each technique. We set out to examine the anatomic distribution of gadolinium contrast by high-resolution surface coil magnetic resonance imaging (MRI) after peribulbar and retrobulbar injection.

Study Design Comparative case series.

Methods Four eyes were randomized to either peribulbar (n=2) or retrobulbar (n=2) injection of gadolinium and lidocaine 2% without epinephrine. Serial MRI imaging with surface coil was performed to determine anatomic distribution.

Results Retrobulbar injection technique localizes to the intraconal space with central nervous system (CNS) access via the optic canal, superior orbital fissure, and cavernous sinus. Contrastingly, peribulbar administration produces a mostly extraconal distribution; however, a small amount of intraconal solution may communicate with the CNS via the inferior orbital fissure and pterygopalatine fossa.

Conclusions We show the full extent of spread of anesthetic blocks and demonstrate the novel finding of pterygopalatine fossa extension, which provides a readily accessible route for CNS toxicity after peribulbar injection. Additionally, we highlight cavernous sinus involvement with the retrobulbar technique. MRI with gadolinium contrast administration provides an important methodological advantage over previous reports and is a safe, reproducible, and superior method of orbital imaging.

OCULOPLASTICS-2

WEDNESDAY 27 JUNE

Paper #84
Cadaveric anatomical comparison of the lateral nasal wall after external and endonasal dacryocystorhinostomy

Dan Rootman, Dan DeAngelis, Nancy Tucker, Albert Wu, Jeffrey Hurwitz

Purpose Much literature has accumulated espousing the relative merits of endonasal and external dacryocystorhinostomy (DCR). However there is comparatively little information on the relative anatomic differences between these two approaches. The purpose of this study is to investigate the anatomic relationships of the lateral nasal wall for endonasal and external DCR.

Study Design Prospective cadaveric anatomical study.

Methods Ten cadaver half heads were utilized in this study. Half were subject to endonasal and half to external DCR procedures. The lateral nasal wall was then dissected and measurements were taken of ostium and anastomosis size and position relative to other landmarks on the lateral nasal wall. Relationships were compared between the two procedures.

Results The dimensions and area of the ostium and the anastomosis were similar between the two procedures. The lower portion of the ostium was located more inferiorly in endonasal DCR. Additionally, the ostium was more likely to be found lateral to the axilla of the middle turbinate in endonasal DCR, as compared to anterior for external. External DCR was also more likely to involve opening anterior ethmoid air cells than by endonasal approach.

Conclusions Endonasal and external DCR osteomies appear to be of similar size, with the endonasal opening being located slightly lower and more posterior on the lateral nasal wall.

OCULOPLASTICS-2

WEDNESDAY 27 JUNE

Paper #85
External dacryocystorhinostomy without intubation: results of a single-center cohort study

Harmeet S. Gill, Stuart R. Seiff

Purpose The purpose of this study is to determine the success rate of external dacryocystorhinostomy (Ex-DCR) without intubation for the management of primary acquired nasolacrimal duct obstruction (PANDO) in patients without evidence of canalicular disease.

Study Design Retrospective consecutive cohort study.

Methods A review of medical records for all consecutive patients undergoing Ex-DCR without intubation from June 2001 to June 2011 that were followed for a minimum of 6 months post-operatively was conducted. Surgical failure was defined as symptomatic epiphora post-operatively with evidence of nasolacrimal duct obstruction (NLDO) to irrigation at any of the follow-up visits.

Results 33 procedures were performed for 31 patients. The mean patient age was 65.6 years (range 22-89) and all demonstrated NLDO to irrigation pre-operatively. Primary Ex-DCR was performed for 31 cases (94%) while the other 2 cases (6%) were referred for revision surgery. A limited anterior ethmoidectomy was performed in 23 cases (70%) and partial or complete middle turbinectomy in 17 cases (52%). The mean duration of follow-up was 3.4 years (range 0.5-8.3). At last follow-up, a complete resolution of symptoms was reported for 30 cases (91%) and partial resolution for three cases (9%). Of these three symptomatic patients, one demonstrated partial obstruction four weeks post-operatively, which ultimately resolved after Kenalog-40 irrigation. These three patients continued to experience "some tearing" despite anatomic patency.

Conclusions Patients with PANDO without canalicular disease can be managed effectively by Ex-DCR without intubation. No surgical failures were detected in our series.

OCULOPLASTICS-2

WEDNESDAY 27 JUNE

Paper #86
Clinical, Histopathological and Microbiological Characteristics of Dacryoliths

Suryasnata Rath, Valerie A. White, Frank V. Buffam, Diane Roscoe

Purpose To describe the clinical, histopathological and microbiological profile of lacrimal sac dacryoliths.

Study Design This was a non-comparative observational retrospective chart review.

Methods All consecutive patients found to have dacryoliths during dacryocystorhinostomy (DCR) surgery between January1983 and December 2010 were included. Demographics, relevant details from history and systemic and ocular examination were collected after review of medical records. Histopathology and culture results were retrieved from the Ophthalmic Pathology Laboratory and Medical Microbiology and Infection Control databases.

Results Sixty nine patients were found to have dacryoliths with a median age of 58 (range 22-93) years. There were 46 males. While 66 patients had dacryoliths in one eye, three patients had bilateral involvement. All had epiphora with a median duration of 16 (range 1.5-360) months. Blood-tinged tears and passing stones to the throat were recorded in 2 patients each and epistaxis in one. While most were healthy there was history of smoking in 13, oculo-facial trauma in 4, renal calculi in 3 and hypothyroidism in 1. Ocular co-morbidities included glaucoma in 5 and thyroid associated orbitopathy in 1. Syringing showed complete obstruction in 38, partial obstruction in 26, free patency in 3 and was not performed in 2 patients. Out of 24 patients who developed acute dacryocystitis, 8 patients experienced 3 or more such attacks and one developed an ipsilateral orbital cellulitis. Lacrimal sac distension was noted in 10 patients. DCR was performed through an external approach in 55 and endonasally in 14 patients. Histopathological examination of the dacryolith with routine and special stains showed no organisms in 32, fungi in 23, bacteria in 10, polymicrobial infection in 3, and actinomycetes in one patient. Candida sp. was most common and seen in 16 patients, followed by Aspergillus sp., Exophiala sp.in one patient each and unidentified fungal filaments in the remaining. Fungal culture showed confluent growth of Candida sp. in 10, yeast other than Candida in 3, and Exophiala sp. in one patient. Concordance between histopathology and microbiology was found in 10 patients. At a median follow-up 5.3 + 3.11 months, all patients were found to be asymptomatic with patent nasolacrimal passages on syringing.

Conclusions Patients with dacryoliths present with epiphora and may have partial obstruction and frequent attacks of acute dacryocystitis. Microorganisms such as fungi,

bacteria or actinomycetes may have a role in etiopathogenesis of dacryoliths. DCR, either through an external or endonasal approach, has excellent results in these patients.

OCULOPLASTICS-2

WEDNESDAY 27 JUNE

Paper #87
Epiphora as an indicator of ocular surface disease in an oculoplastics practice

Liat Attas-Fox, Bryan Arthurs

Purpose To assess the prevalence of ocular surface disease in tearing patients referred to the oculoplastic outpatient clinic in our center, using tear osmolarity as a guide. Hyperosmolarity of the tear film is recognized as an important pathognomonic factor in dry eye syndrome (DES).

Study Design Prospective observational non-interventional case series.

Methods The study was performed with ethics committe approval with consecutive prospective recruitment. All patients referred to our clinic with tearing underwent a standardized assessment including structured clinical history (Canadian dry eye assessment CDEA) in the following order: Best corrected visual acuity (BCVA), Tear Osmolarity measurement (TearLab system, San Diego CA), slit lamp examination, tear film break up time (TBUT), Schirmer test with anesthetic and irrigation of tear ducts. Exclusion criteria were use of eye drops within 2 hours of examination, use of contact lenses within 2 hours of assessment and a history of corneal refractive surgery.

Results We examined 100 eyes in 50 patients (16M, 34F, median age 68years) complaining of tearing in one or both eyes. Sixty seven eyes were symptomatic. We classified eyes according to the results of the clinical examination without reference to tear osmolarity. The most common cause of epiphora was dry eye (n=32) followed by lid malposition (24) and NLDO (11). In patients with dry eye diagnosis, tear osmolarity was significantly higher than in the other groups (dry eye median 308mOsm/l; Others 294mOsm/l $p<0.0001$).
Using the accepted cutoff of tear osmolarity (>305mOsm/l) to detect dry eye had sensitivity of 63% and specificity of 85%. When analyzed with a ROC technique, maximum AUC was reached with a cutoff osmolarity of 301mOsm/l - sensitivity 72%, specificity 79%.

Conclusions A small proportion of the tearing patients described above that were referred to our oculoplastic clinic had a diagnosis of NLDO. Dry eye was the most common diagnosis.

Tear Lab osmolarity readings were highest in patients with dry eye. Nonetheless, In our series, TearLab measurements lacked sufficient sensitivity and specificity to be used alone to diagnose or rule out dry eye.

RETINA 1-SURGICAL RETINA

WEDNESDAY 27 JUNE

Paper #88
Visual fixation stability and location in patients with mcular idiopathic epiretinal membrane

Mark Mandelcorn, Luminita Tarita-Nistor, Martin J. Steinbach, Efrem Mandelcorn, Esther G. Gonzalez

Purpose Patients with severe retinal damage to the macula from macular hole or age-related macular degeneration use eccentric areas of the macula, termed preferred retinal locus (PRL), to fixate. These areas of eccentric fixation are unstable and are located outside the fovea. Surgical or pharmacologic treatment of these two severe macular diseases improves fixation stability and visual performance. The aim of the current study was to explore the fixation stability of patients with clinically significant idiopathic macular epiretinal membrane (ERM) in which the degree of macular damage is less than in macular hole and in age-related macular degeneration.

Study Design Fixation stability was studied pre-operatively in patients referred with ERM for possible vitrectomy so that changes in ocular motor fixation after surgery could be evaluated.

Methods Fourteen consecutive patients with unilateral ERM participated. Visual acuity was measured with ETDRS and fixation stability was recorded with the Nidek MP-1 microperimeter for both eyes.

Results Acuity of the affected eye (mean = 0.45±0.23 logMAR) was significantly worse than that of the good eye (mean = 0.11±0.16 logMAR), $p < 0.001$. Acuity of the affected eye did not correlate with that of the good eye $r(12) = 0.33$, $p = 0.25$. Yet fixation stability of the affected eye was not significantly different from that of the good eye $p = 0.3$. There was a high correlation between fixation stability of the affected and good eyes, $r(12) = 0.67$, $p < 0.01$. Moreover, fixation was central for half of the patients and within 3 degrees from the fovea for the other half.

Conclusions Eyes with untreated ERM have normal central fixation despite poor visual acuity. Improvements in visual acuity following surgical treatment cannot, therefore, be due to improvements in fixation stability or location.

RETINA 1-SURGICAL RETINA

WEDNESDAY 27 JUNE

Paper #89
Comparison of corneal endothelial cell loss among vitrectomy, phacoemulsification, and combined phacoemulsification-vitrectomy patients

Keyvan Koushan, Mikel Mikhail, Allan Liszauer, Nina Ahuja, Anne Beattie, Lawrence Kobetz, Forough Farrokhyar, James A. Martin

Purpose There is a wide range of endothelial cell loss previously reported in the literature for cataract surgery (anywhere from 4% to 25%). There has been no modern study, however,to investigate endothelial cell loss in vitrectomy or phacoemulsification-vitrectomy surgeries. That knowledge can help the surgeons in their decision-making paradigm regarding combining pars plana vitrectomy and phacoemulsificaiton surgeries.

Study Design Prospective cohort study

Methods 174 eyes of 159 patients undergoing pars plana vitrectomy and/or phacoemulsification-IOL implantation between June 2009 to November 2011 were enrolled. Patients were divided into 3 groups: 1) Patients undergoing combined phacoemulsification-IOL implantation and pars plana vitrectomy by one surgeon (60 eyes of 58 patients), 2) Patients undergoing pars plana vitrectomy alone by the same surgeon (44 eyes of 44 patients), and 3) Patients undergoing phacoemulsification-IOL implantation alone by 4 different cataract surgeons (73 eyes of 59 patients). All patients had one pre-operative visit to measure their baseline Best Corrected Visual Acuity (BCVA) and corneal endothelial cell count by spectral microscopy. The same measurements were taken 3 months post-operatively. The primary outcome was the percentage of endothelial cell loss in each group. Sample size calculation was based on independet t-test with unequal variances. This study was approved by St. Joseph's Healthcare Research Ethics Board.

Results Our preliminary data analysis shows that the mean endothelial cell loss was 16.13% +/- 12.93 in group 1 (42 eyes), 13.65% +/- 11.09 in group 2 (37 eyes), and 23.92% +/- 16.22 in group 3 (29 eyes). Complete data will be available in February 2012. Both groups 1 and 2 showed significantly less endothelial cell loss compared to group 3 (P value of 0.018 when comparing groups 1 and 3, and P value of 0.003 when comparing groups 2 and 3). The endothelial cell loss was not statistically different between groups 1 and 2 (P value 0.18).

Conclusions Our preliminary analysis shows that patients undergoing either vitrectomy or phacoemulsification-vitrectomy surgeries have less endothelial cell loss compared to patients undergoing cataract surgery (control group). This can be expected based on different fluid circulations in vitrectomy compared to cataract surgery, which explains

why groups 2 and 3 show different endothelial cell losses. Using low-flow anterior chamber circulation (low bottle height) and use of scleral tunnel approach that was used in group 1 are possible reasons why our groups 1 and 2 have similar endothelial cell loss and why group 1 actually shows less endothelial cell loss compared to group 3. Our results suggest that performing combined phacoemulsification-vitrectomy is a reasonable option over vitrectomy when the patient has at least a moderate degree of cataract which is anticipated to worsen following the vitrectomy and require a separate operation.

RETINA 1-SURGICAL RETINA

WEDNESDAY 27 JUNE

Paper #90
Anterior segment complications of combined phaco-vitrectomy

Roxane J. Hillier, John Doris, Rita McLauchlan, Niall Patton

Purpose To determine the incidence of anterior segment complications associated with combined phaco-vitrectomy, and to identify factors which influence the frequency of these

Study Design Prospective observational study

Methods Setting: Manchester Royal Eye Hospital, England, United Kingdom. Study population: adult patients undergoing combined phaco-vitrectomy surgery, between July 2009 and November 2010. Data collection: baseline demographics, surgical data and anterior segment complications were documented prospectively using a standardised data collection proforma. Data was captured at the following time points: intra-operatively, day one post-operatively, 2-3 weeks post-operatively, and 6-12 weeks post-operatively.

Results n = 102. Indications for vitrectomy were full thickness macular hole (46%), rhegmatogenous retinal detachment (16%), epiretinal membrane (12%), vitreous haemorrhage (11%), vitreomacular traction (8%) and tractional retinal detachment (7%). Intraocular lenses in use were Alcon AcrySof® MA60 (52%), Alcon AcrySof® SA/SN 60 (20%), Bausch + Lomb Akreos® Adapt (17%), Rayner Superflex® (8%) and Rayner C-flex® (3%). Tamponade agents in use were gas (67%), aqueous (24%), silicone oil (6%), air (2%) and heavy silicone oil (1%). The most common anterior segment complication (all time points combined) was intraocular lens displacement/iris capture in 8.8% (9/102). Other relevant complications were posterior synechiae in 5.9% (6/102), posterior capsular rupture in 3.9% (4/102) and iris prolapse in 2.9% (3/102). Use of the Alcon AcrySof®MA60 intra-ocular lens (Fisher's exact p = 0.0027) and large capsulorrhexis size (Fisher's exact p = 0.0117) were associated with an increased

incidence of intraocular lens displacement/iris capture. The following factors did not appear to influence the rate of intraocular lens displacement/iris capture: corneal suture placement, topical atropine at end of case, presence or absence of intra-ocular tamponade, post-operative topical steroid frequency, post-operative face down posturing and grade of surgeon.

Conclusions Intraocular lens displacement/capture is a common problem following combined phaco-vitrectomy. Intraocular lens choice and large capsulorrhexis size were positively correlated with this complication. We propose that haptic design and capsulorrhexis size play an important role in the positional stability of the intra-ocular lens following combined phaco-vitrectomy surgery.

RETINA 1-SURGICAL RETINA

WEDNESDAY 27 JUNE

Paper #91
Macular hole development following vitrectomy for retinal detachment

Lisa Lagrou, Micheline Deschenes, Geoff WIlliams, Amin Kherani

Purpose To determine the incidence, risk factors and assess visual outcomes of secondary macular holes.

Study Design Restrospective, interventional case series

Methods A retrospective chart review was performed on 3807 retinal surgical procedures performed by two retinal surgeons in Calgary, (A.K. and R.G.W.) between January 2002 and October 2010. Patients were excluded if they did not complete a 4-month follow-up post-surgical repair, if the macular hole (MH) was discovered during primary vitrectomy, or iatrogenic MH during surgical repair. Patients were categorized as post-retinal detachment (RD) MHs or idiopathic MHs. Two-tailed t-test was performed to compare risk factors and visual outcomes of post-RD MHs. Data will be presented as average±S.E.M.

Results Thirteen post-RD MHs and 108 idiopathic MHs were included. MH surgical repairs contributed 8% of the surgical procedures, whereas post-RD MHs contributed 0.5%. Best corrected visual acuity (BCVA) in the idiopathic MH group improved following surgical repair ($p<0.01$). However, there was no statistically significant BCVA improvement post-MH repair. Post-RD MHs occured at an earlier age (62±1.2years) from idiopathic MHs (68±1.4 years), $p<0.01$. Following RD repair (83% macula-off detachments), MH development occurred after 92±19.7 days. Compared to idiopathic MHs, post-RD MHs have decreased visual acuity pre- and post-repair, have had more surgeries pre-MH development, but less likely to have ARMD or systemic hypertension ($p<0.05$).

Conclusions Secondary macular holes occur in a small percentage of the population, and had poor visual outcomes, despite earlier age occurrence. Negative risk factors included ARMD, and HTN, while positive risk factors included more surgeries pre-MH development and younger age.

RETINA 1-SURGICAL RETINA

WEDNESDAY 27 JUNE

Paper #92
Imaging analysis of foveal microstructure in rhegmatogenous retinal detachments using spectral domain optical coherence tomography

Chryssa McAlister, Rajeev H. Muni, Wai-Ching Lam

Purpose To evaluate the correlation between microstructural abnormalities in the outer retina on spectral domain optical coherence tomography (SD OCT) and visual recovery after successful repair of rhegmatogenous retinal detachments (RRD) involving the macula.

Study Design Prospective consecutive case series.

Methods 43 patients (43 eyes) with macula-off RRDs recruited preoperatively and followed for 6 months postoperatively. SD OCT imaging was completed at each visit.

Results Patients with photoreceptor inner segment/outer segment disruption (IS/OS) seen on SD OCT have worse visual outcomes at 6 months (0.58logMAR; 20/76) than those with a normal IS/OS junction (0.33logMAR; 20/42). This difference is significant when adjusted for other OCT abnormalities, including external limiting membrane (ELM) disruption, subretinal fluid, macular edema, and epiretinal membrane (P=0.02). IS/OS disruption was seen on SD OCT imaging in 84.4%, (27 eyes) at 1 month, but resolved in 44.4% (12 eyes) by 6 months. ELM disruption occurred infrequently, in only 3% (1 eye) of patients at 6 months, and was not found at a frequent enough rate to analyze its correlation with visual recovery.

Conclusions Patients with persistent poor visual acuity after successful retinal reattachment surgery can be followed with SD OCT to assess for the presence of microstructural abnormalities in the outer retina. SD OCT may become an important tool in predicting visual outcomes of patients with repaired macula-off RRD.

RETINA 1-SURGICAL RETINA

WEDNESDAY 27 JUNE

Paper #93
Travel to high mountain elevations following vitrectomy with intraocular gas

Steve D. Levasseur, Firas M. Rahhal

Purpose Several experimental models and anecdotal reports provide valid evidence against postoperative air travel in patients with intraocular gas. Contrarily, the literature is limited to support the current practice of discouraging such patients to travel by land through mountainous areas. The purpose of this study was to evaluate the effects and safety of travel by land through relatively high mountain elevations following surgery in a cohort of patients who have undergone pars plana vitrectomy (PPV) with intraocular gas.

Study Design Retrospective consecutive case series

Methods A cohort of 75 consecutive patients who underwent PPV with gas tamponade between 2005 and 2011 were included in the study. Within one day of surgery, all patients returned to their homes by land, travelling through mountain elevations of up to 4259 feet. Eyes were treated with 25 or 23 gauge vitrectomy, with either 20% sulfur hexafluoride (SF6) or 16% perfluoropropane (C3F8) gas. They were also instructed to stop at a designated rest area, altitude of approximately 3100 feet above sea level, for a minimum of 90 minutes, prior to completing their ascent. Patients had routine postoperative care and positioning.

Results The average rate of ascent was 134 ft/min with a peak of 293 ft/min lasting 2 minutes. Using Boyle's law, the maximum theoretical ocular compensation in order to maintain a stable IOP for these patients was 0.57 cubic centimetres (cc) which occurred 70 miles from the point of departure at 4259 feet above sea level. The gas expansion at the rest point at 3159 feet above sea level was 0.41cc and the final gas expansion at the common final destination was 0.36cc at 2902 feet above sea level. The mean change in preoperative and postoperative intraocular pressure (IOP) was a decrease of 0.2 mmHg (P=0.67) on postoperative day 1 and an increase of 2.8 mmHg (P=0.06) on postoperative day 10. No reported incidents of retinal vascular occlusion, acute elevations in IOP requiring surgical intervention or symptomatic visual field loss attributable to elevated IOP were observed.

Conclusions It appears that patients with a complete fill of their vitreous cavity following PPV with intraocular gas can travel safely by land through mountainous areas to an elevation of at least 4250 feet above sea level. These findings can significantly impact patient costs and convenience. More investigations are required to further characterize the globe's compensatory limits for expanding gas secondary to atmospheric pressure changes from mountainous travel by land.

RETINA 1-SURGICAL RETINA

WEDNESDAY 27 JUNE

Paper #94
Comparison of 1-session pneumatic retinopexy with cryopexy to 2-session pneumatic retinopexy with laser retinopexy.

David Ehmann, Raúl García

Purpose To compare the functional and anatomical outcomes of basic technique pneumatic retinopexy (PR) performed with cryopexy or laser retinopexy.

Study Design Retrospective chart review.

Methods 149 patients who underwent PR for repair of a superior rhegmatogenous retinal detachment between 1998 and 2009 were included. Group 1 (n=51) patients underwent a 1-session PR with cryopexy. Group 2 (n=96) patients underwent a 2-session PR with laser retinopexy within 24 hours. The primary outcome measures were visual acuity, rates of retinal detachment recurrence, and rates of new tear development. Additional data included: age, sex, eye involved, macula status (on or off) at time of initial detachment, lens status (phakic or pseudophakic), time from initial procedure to re-detachment or new tear, total follow up, visual acuity at presentation and final follow up, procedure(s) for recurrent detachment repair, number of patients developing more than 1 re-detachment, and rates of PVR between groups.

Results For all patients, single operation success rate was 64%. For group 1 patients the mean preoperative and postoperative visual acuities were 0.58±0.74 logMAR and 0.34±0.45 logMAR respectively. For group 2 patients the mean preoperative and postoperative visual acuities were 0.68±0.80 logMAR and 0.27±0.42 logMAR respectively. There was no difference in preoperative visual acuity between groups (Z=-0.16, P=0.88) nor did the improvement in visual acuity differ significantly between groups (Z=-0.66, P=0.51). Recurrent retinal detachments were found in 47.1% of group 1 patients and 30.2% of group 2 patients ($p<0.05$). New tears were found in 7.8% of group 1 patients and 21.9% of group 2 patients ($p<0.03$). The majority of recurrent detachments (53%) and new tears (48%) occurred within 1 month and 2 weeks respectively with no significant difference in time to development between groups (RD p=0.36; NT p=0.26). Retinal detachment recurred more than once in 12% of group 1 patients and 5% of group 2 patients (P = 0.15). PVR developed in 2% of group 1 patients and 5% of group 2 patients (P = 0.34). Mean follow up was 801 days for group 1 and 1168 days for group 2 (p=0.5).

Conclusions Although both procedures were equally effective at improving visual acuity, patients who underwent 1-session PR with cryopexy were found to have a higher rate of re-detachment and lower rate of new tear development compared to 2-session

patients with laser retinopexy. Further large prospective studies are required to confirm or refute these findings.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #95

Presence of HPV and immunohistochemical staining patterns for p16, p53 and Ki-67 in ocular surface squamous neoplasia.

Gregory Moloney, Adnan Pirbhai, Richard Moore, Susan Lewallen, Valerie A. White

Purpose To examine the prevalence of HPV infection in samples of ocular surface squamous neoplasia (OSSN) submitted to the University of British Columbia (UBC) Division of Anatomical Pathology. To correlate immunostaining patterns with the presence of HPV infection and examine for patterns suggestive of an oncogenic pathway.

Study Design Retrospective analysis of consecutive OSSN specimens submitted to our tertiary referral centre over a 5 year period.

Methods All formalin-fixed, paraffin embedded (FFPE) specimens of conjunctival squamous cell proliferative lesions that were submitted to the Anatomic Pathology laboratory of the Vancouver General Hospital over the past 5-year period were re-examined for diagnosis. Cases were stained by routine immunohistochemical methods for the presence of p16, p53 and Ki-67. Where sufficient tissue remained, specimens were submitted for molecular testing by PCR for the presence of the L1 gene of HPV. When this was found, the DNA was sequenced to identify the HPV type present. The presence of HPV DNA was correlated with p16 staining to determine if the latter was a reliable marker for the presence of high risk HPV DNA (Fisher's exact test). The pattern of staining of p16 and p53 was evaluated to determine if these were mutually exclusive, suggesting two different oncogenic pathways.

Results A total of 70 specimens were evaluated: 52 neoplastic lesions (5 CIN2, 34 cases of CIN3, 13 invasive SCC), 18 benign lesions (4 non-dysplastic squamous metaplasia, 6 pterygia, 8 squamous papilloma). 6/33 neoplastic lesions tested were positive for HPV16. None of 12 benign lesions with adequate DNA were positive for HPV16. Six neoplastic lesions (15.4%) and one benign lesion (5.6%) were positive for diffuse, strong p16 staining. 44.2% of neoplastic lesions were diffusely and strongly positive for nuclear p53 staining, compared to 16.7% of benign lesions ($p<0.05$). Only 3 neoplastic cases were positive for both p16 and p53 with the remaining cases showing staining for only one antigen. P16 identified 4/6 cases that were positive for HPV16 (sensitivity 67%, specificity 92.6%, positive predictive value 67% and negative predictive value 92.6%).

Conclusions A minority of OSSN lesions are positive for HPV16 in a North American setting. Sensitivity and positive predictive value of immunohistochemical staining of p16 for identifying HPV is only moderate. Approximately 50% of OSSN lesions are positive for p53. Correlation of p53 and p16 staining patterns may imply two separate pathways of carcinogenesis in OSSN, similar to that in the vulva and oral cavity.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #96
Loss of integrin beta 1 in corneal keratocytes results in keratoconus-like phenotype

Sunil K. Parapuram, Kun Huh, Shangxi Liu, Andrew Leask

Purpose The precise role of a normal keratocyte (fibroblast) in maintaining corneal structural integrity is unclear; it is generally considered to remain quiescent at the end of cell division. Since cornea is a structure under constant stress due to intraocular pressure, we hypothesized that keratocytes are essential to maintain corneal structural integrity through their interaction with extracellular matrix. Given that cells interact with their extracellular matrix mainly through integrin receptors we conditionally deleted integrin beta 1 (Itgb1) gene in keratocytes to test our hypothesis.

Study Design We conditionally deleted the Itgb1 gene in corneal keratocytes of mice during postnatal extracellular matrix maturation phase of corneal development (21 days) as well as after complete corneal maturation (40 days). After the deletion of Itgb1 gene in keratocytes, corneas were studied at 21, 42, 56 and 75 days. At least six mice were studied at each time point.

Methods Mice with exon 3 of integrin beta 1 (Itgb1)gene flanked by loxP sites were mated with mice expressing tamoxifen-dependent cre recombinase under the control of fibroblast-specific regulatory sequence from the pro alpha 2 (I) collagen gene. Mice homozygous for loxP Itgb1 and hemizygous for cre were administered tamoxifen (1mg/mouse for 5 days) at 21 and 40 days of age to delete Itgb1 gene specifically in keratocytes. Control mice administered with corn oil (vehicle) were maintained. The effects of deletion of Itgb1 gene were monitored histologically and by macroscopic observation of the cornea.

Results The corneas in which Itgb1 gene was deleted at 21 days showed an initial thinning of the stroma, reduced space between collagen fibrils, loss of epithelial layers and subsequent edema, thickening of Descemet's membrane, and degenerative changes in the endothelial cell layer, with eventual scarring. These pathologic changes have similarities to human corneal disease keratoconus. The phenotype did not develop when Itgb1 was deleted after complete corneal maturation.

Conclusions Loss of integrin beta 1 expression in keratocytes during the phase of stromal maturation results in corneal thinning and edema. Keratocyte-ECM interaction is essential for matrix maturation and thus in the maintenance of corneal structural integrity. This model has relevance in understanding corneal diseases such as keratoconus.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #97
Early Clinical Results of LipiFlow Thermal Pulsation System for meibomian gland dysfunction

John F. Blaylock, Zhaomin Si, Sandi Aitchison

Purpose To report the early results on secretions of meibomian glands (MG), lipid layer of tear film and patients' self-reported symptoms after the LipiFlow treatment, a thermal pulsation system to unblock MG, caused by MG dysfunction (MGD), by applying a combination of precise localized heat and programmed pressure to the eyelid.

Study Design Retrospective case series

Methods Twenty-one eyes in 13 patients with MGD had LipiFlow treatment performed from May 2011 to Oct 2011. The secretions of MG, lipid layer thickness in tear film measured by LipiView interferometer and the scores of a questionnaire before and 1 - 6 months after the LipiFlow treatment were assessed and retrospectively analyzed. The patient questionnaire on symptoms of ocular surface disease was answered by patients before and after the treatment. The higher scores, on the questionnaire, indicate more symptoms.

Results The average (±SD) number of functional MG increased from 1.8 ± 1.5 before the treatment to 3.8 ± 1.6 (P=0.0003) 1-4 months after the treatment, the average (±SD) ICU from LipiView (lipid layer thickness in tears) changed from 60.0 ± 19.6 nm before the treatment to 63.9 ± 17.8 nm (P=0.56) at 1- 4 months after the treatment. The average (±SD) questionnaire score decreased from 12.5 ± 5.3 before the treatment to 6.8 ± 3.6 after the treatment (P=0.0008). No complications or serious adverse events were found after the treatment.

Conclusions The LipiFlow treatment significantly improved the secretions of MG and reduced patients' symptoms of ocular surface disease although the LipiView showed an insignificant increase in the lipid layer thickness of the tear film. It is an easily tolerated and safe procedure.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #98
ENZYME ASSISTED DEEP ANTERIOR LAMELLAR KERATOPLASTY - A NEW METHOD OF LAMELLAR DISSECTION - A WETLAB BASED PILOT STUDY

Gregory Moloney, Alex Lange, Mayte Arino, Valerie A. White, Martin McCarthy, Simon Holland

Purpose To explore the safety of a new technique of lamellar dissection, using enzymatic digestion of the corneal stroma and extracellular matrix.

Study Design Wetlab based pilot study

Methods This was a wetlab based pilot study of hyaluronidase, trypsin and collagenase assisted deep anterior lamellar keratoplasty (DALK) in cadaveric human corneal tissue. Enzyme assisted DALK was performed on 25 tissues. These underwent histologic and electron microscopic analysis using a pneumatic dissection specimen as control. Rates of perforation and DM exposure were recorded by clinical observation and by Optical Coherence Tomography in selected cases. Where possible, pre and post surgical endothelial cell counts were obtained via specular microscopy. Two tissues from the same donor were halved, with each half soaked in a different solution (Optisol, balanced salt solution, hyaluronidase and trypsin) for 13.5 hours to observe maximal effect.

Results Successful exposure of DM was achieved in 16 specimens. In the remaining nine, manual dissection was possible to a residual depth of 25-90 micrometers where measured with OCT. Three tissues had perforation of DM, all via manual manoeuvres. No deleterious effects on residual host tissue were observed by light microscopy with no significant rates of endothelial cell loss in 8 tissues in which a pre dissection cell count was obtainable. The enzymes had differing effects on soaked specimens that were reflected intraoperatively

Conclusions Preliminary results of this ex vivo study are encouraging that enzymolysis may represent an effective innovation in DALK surgery with an acceptable safety profile. Further studies are required to refine the technique and application of the enzymes in vivo.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #99
Tissue engineering of a corneal endothelium

Isabelle Brunette, Stéphanie Proulx

Purpose To describe the research progress made during the past few years in the area of corneal endothelium tissue engineering.

Study Design Experimental animal and pre-clinical studies.

Methods The collaborative work of the BioFemtoVision team (Maisonneuve-Rosemont Hospital, Montréal, QC and LOEX, Québec, QC), with the support of the Province of Québec cornea specialists and the help of local Eye Banks, will be described.

Results The series of experiments developed during the last few years and up to now will be summarized: Development of the animal models; Optimization of the conditions for corneal endothelial cell culture; Optimization of the conditions for the in vitro reconstruction of a corneal endothelium; Optimization of the conditions for the in vivo transplantation of this tissue-engineered corneal endothelium in the animal experimental model; Postoperative assessment of this tissue-engineered transplant; Characterization of normal and diseased corneal endothelial cells in culture; Reconstruction and transplantation of an endothelium using endothelial cells from patients with Fuchs dystrophy; Development of in vitro and in vivo models for the study of the Fuchs endothelium; Creation of the Quebec corneal cell bank (Banque québécoise de cellules cornéennes (BQCC)).

Conclusions This work as well as that of others in the field may open the door to innovative and improved therapeutic alternatives for patients with corneal endothelial diseases.
This work was supported by CIHR, The FRSQ Research in Vision Network, and Fondation du CHA.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #100
Topographic analysis of the first biomimetic corneal substitutes implanted in vivo

Jeb A. Ong, Edouard Auvinet, Marie-Eve Choronzey, Neil Lagali, Per Fagerholm, May Griffith, Jean Meunier, Isabelle Brunette

Purpose To define the 3-D shape of the first biomimetic corneal substitutes (BCS) post-implantation and to compare this shape to that of normal corneas, based on the integrated analysis of Orbscan corneal topography average models (atlases).

Study Design Retrospective cohort study

Methods This study was conducted on 10 eyes of the first 10 subjects implanted with biomimetic corneal substitutes. All surgeries were performed by Dr. Per Fagerholm at the Linköping University Hospital, Sweden, between October and November 2007. Serial Orbscan II (Bausch and Lomb, Rochester, New York, USA) corneal topographies were performed on all eyes and several topography parameters were analyzed. Four-year follow-up was available for most subjects. Ten normal controls (spherical equivalent within ± 2.00 D and cylinder within ± 1.00 D from emmetropia) were matched for age and gender to each tested subject. 3-D atlases were constructed for the 10 BCS corneas and all 100 controls. Each atlas illustrated mean anterior elevation, mean posterior elevation and mean pachymetry. Difference maps and statistics maps were generated to compare the "BCS corneas" and "All controls" atlases.

Results Preliminary results show a smooth integration of the BCS surgical wound within the anterior surface profile, without significant steps or gaps. The Thinnest point was thinner (mean ± SEM: BCS: 266.22±29.88 µm; Controls: 570.86±4.03 µm; $p < 0.001$) and more inferiorly located (BCS: -1.04±0.24 mm from the center of the topography; Controls: -0.13±0.05 mm; $p < 0.001$) in BCS corneas, but did not seem to be displaced laterally (BCS: -0.21±0.29 mm, Controls: -0.42±0.04 mm; $p = 0.1900$). In the central 3.0 mm radius area, Surface irregularity (BCS: 8.81±1.15 D, Controls: 1.26±0.04 D; $p < 0.001$), Mean power (BCS: 49.23±1.92 D; Controls: 43.60±0.16 D; $p <0.001$) and Astigmatic power (BCS: 5.46±1.83 D; Controls: 0.74±0.05 D; $p < 0.001$) were increased in BCS corneas. Similar findings were observed in the annular 3.0-5.0 mm zone ($p < 0.001$).

Conclusions By highlighting the differences in shape between BCS corneas and corneas of normal emmetropic subjects matched for age and gender, this comparative study will help optimize the shape of future BCS corneas. Supported by the CIHR and the FRSQ Research in Vision Network.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #101
Prospective comparison between superior and inferior conjunctival autograft for primary pterygia

Uri Elbaz, Sonia N. Yeung, Judy Y. Ku, Alejandro Lichtinger, Peter Kim, Maoz D. Amiran, Allan R. Slomovic

Purpose To prospectively compare the success and complication rates between superior and inferior conjunctival autograft in primary pterygia.

Study Design Prospective controlled randomized clinical trial

Methods A prospective, randomised study involving primary pterygia and conjunctival autograft harvested from either the superior (25 eyes of 22 patients) or inferior (20 eyes of 18 patients) bulbar conjunctiva. Surgeries were performed by trained corneal fellows, using local anaesthetic and tissue fibrin glue. Surgical times were recorded and patients were given a pain questionnaire to complete on days 1, 3, 7 after surgery. Postoperative regimen included a tapering course of topical steroids and oral analgesia to use as required. Postoperative visits were at 1, 7, 30 days and 3 and 6 months. Outcome measures were complication and recurrence rates.

Results All pterygia in the inferior group were nasal compared to 89% in the superior group. The mean size of the pterygia (p=0.110 - 0.233) and the graft sizes (p=0.630 - 0.958) were similar between the two groups. The mean surgical time was not significantly longer in the inferior group (16:58mins vs superior 14:40mins, p=0.557). Pain experienced at days 1, 3 and 7 was similar (p=0.666 - 0.910). At 6 months, there was only one recurrence in the superior group. There were no significant visual changes, symblepharons or significant conjunctival scarring. Each group had one patient with a persistent epithelial defect.

Conclusions Inferior conjunctival autograft in pterygium surgery is an effective technique with results comparable to superior autografts. It has a low complication and recurrence rate. This is a useful technique when the superior donor site is less desirable.

CORNEA- THE LATEST IN CORNEAL, EXTERNAL DISEASE AND REFRACTIVE SURGERY RESEARCH

WEDNESDAY 27 JUNE

Paper #102
Comparison of pain between patients assigned to bandage contact lens vs. patching following Pterygium surgery

Uri Elbaz, Sonia N. Yeung, Alejandro Lichtinger, Peter Kim, Maoz D. Amiran, Judy Y. Ku, Rachel Wolff, Allan R. Slomovic

Purpose To compare pain severity following pterygium surgery between patients assigned to one day patching vs. one week bandage contact lens (BCL) at the end of the surgery.

Study Design Prospective randomized controlled clinical trial

Methods Sixty eyes of sixty patients that were scheduled for pterygium excision with conjunctival autograft were recruited prospectively to the study. They were randomly assigned to either patching for one day or bandage contact lens for one week. The surgery was fashioned identically in both groups. All patients were prescribed analgesics (300 mg acetaminophen, 30 mg codeine, 15 mg caffeine, Tylenol 3, J&J, NJ, USA) and were instructed to use it as needed. All patients filled a questionnaire evaluating the severity of their pain on a scale from 0 to 10 (the worst pain) on the day of the surgery (day 0) and on postoperative days 1, 2, 3 and 7. In addition, they were asked to report the numbers of Tylenol 3 they used and any symptoms of photophobia, epiphora or foreign body sensation.

Results Mean patient age was 49.2 (range 22-84) years. Thirty three men and 27 women completed the study. The average pterygium size was 16.1mm2 in the BCL group vs.11.9 mm2 in the patch group (p=0.99). In the BCL group, average analog pain score was 5.3, 3.3, 2.2, 1.2, and 0.4 (mean 2.5) as compared to 5.8, 3.4, 2.3, 1.5, 0.7 (mean 2.7) in the patch group for days 0, 1, 2, 3, 7 respectively. The average number of Tylenol 3 used in the BCL group was 2.25, 1.5, 1.2, 0.7, and 0.25 for days 0, 1, 2, 3, 7 respectively, with a mean of 1.2 for the whole week. The average number of Tylenol 3 used in the Patch group was 2.7, 1.5, 1.0, 0.6, and 0.1 for days 0, 1, 2, 3, 7 respectively, with a mean 1.2 for the whole week. There was no statistically significant difference in either pain severity or analgesics use between the BCL and the patch group in any of the assessed days. Similarly, there was no statistically significant difference in any of the symptoms evaluated e.g; photophobia, epiphora or foreign body sensation.

Conclusions Despite the common believe that the use of BCL may reduce pain severity in the first postoperative week, this intervention is equivalent to one day patching in the management of postoperative pain following pterygium surgery.

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Paper #103
Canadian ophthalmologists' opinions concerning complementary and alternative medicine use in glaucoma

Tenley N. Bower, Sana Muhsen, Olga Overbury, Catherine Birt, Oscar Kasner

Purpose Our goal was to investigate the opinion and practice pattern of Canadian ophthalmologists regarding the use of and recommendations for Complementary and Alternative Medicine (CAM) for their glaucoma patients.

Study Design The study was a prospective, cross-sectional survey of practicing ophthalmologists in Canada.

Methods Institutional review board approval was obtained from the Research Ethics Board of Sunnybrook Health Sciences Centre. The survey was sent to all ophthalmologists in Canada available electronically through the email lists of four ophthalmology associations.

Results A total of 241 ophthalmologists representing all provinces in Canada responded to the questionnaire. Twenty two percent felt that CAM does have a role in glaucoma therapy with specialists being more likely believe there is a role ($p < 0.05$). Of the total respondents, 26% ask their patients if they use CAM with those in practice less than 20 years more likely to encourage use ($p < 0.05$). Of the respondents, 9% recommend CAM and if an ophthalmologist was in practice less than 20 years he/she was significantly more likely to recommend CAM ($p < 0.01$). Respondents (62%) in general do not discourage CAM with younger ophthalmologists (< 50 years old, $p < 0.02$) and ophthalmologists in practice less than 20 years ($p < 0.05$) being less likely to discourage CAM use. Respondents (41%) believe that CAM rarely ever affects compliance with ophthalmologists from an urban practice ($p < 0.01$) and academic practice ($p < 0.05$) more likely to deny effect on compliance. Respondents believe that CAM sometimes (46%) results in patient morbidity with ophthalmologists being in practice less than 20 years believing that morbidity is less likely ($p < 0.05$).

Conclusions Ophthalmologists treating glaucoma need to make themselves aware of the use of CAM by their patients. A substantial minority of respondents believe that CAM has a role in glaucoma therapy, recommend its use and ask their patients if they use CAM. Younger doctors are more likely to encourage alternatives; those in practice less than 20 years are more likely to ask about alternative medicine use, recommend its use, and believe that morbidity usually doesn't result from the use of alternative treatments.

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WEDNESDAY 27 JUNE

Paper #104
Refractive status in patients with narrow angles

Sarah M. Simpson, Daniel Warder, Angela Moore, Isabella Irrcher, Delan Jinapriya

Purpose To evaluate the prevalence of myopia in patients with narrow angles, to compare ocular biometric parameters, and to determine the effect of laser peripheral iridotomy (PI) on myopic and hyperopic patients with narrow angles or primary angle closure glaucoma (PAC).

Study Design This study is a retrospective comparative study with prospective data collection of biometric parameters.

Methods We reviewed the charts of 272 consecutive patients who received a PI in the Department of Ophthalmology at Queen's University, Kingston, Ontario by reviewing provincial billing data between August 2006 to March 2011. After excluding for non-narrow angle related PIs (n=26) and those without refractive data at the time of PI (n=22), 224 patients were identified. These patients were classified as myopic (spherical equivalent (SE) < 0 D) or hyperopic (spherical equivalent > 0 D). Immersion A-scan to determine ocular biometry was performed prospectively on available myopic (n = 36) and hyperopic (n = 45) narrow angle patients having had a PI within the last 24 months.

Results Of the 224 narrow angle patients 28% (n=62) were myopic and 72% were hyperopic (n=161). Ninety-eight patients (44%) had a refractive status between 0 D and +2 D. Four patients (2%) were highly myopic with a SE greater than 5 D of myopia. A-scans revealed longer axial lengths in myopic patients ($p < 0.001$) but no difference in lenticular thickness or anterior chamber depth between the 2 groups. A PI was effective in deepening anterior chamber angles in both groups, with no significant difference in the amount of opening post-PI between groups.

Conclusions More than 25% of a consecutive series of 224 patients with narrow angles were myopic in our study population. Furthermore, almost half were only mildly hyperopic. Our data points to a high prevalence of narrow angle patients traditionally not thought to be at risk for narrow angle glaucoma. This stresses the importance of evaluating all glaucoma patients for narrow angles regardless of refractive status.

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WEDNESDAY 27 JUNE

Paper #105
Latanoprost stimulates lymphatic drainage from the mouse eye.

Alex L. Tam, Neeru Gupta, Zhexue Zhang, Yeni H. Yucel

Purpose We recently reported a lymphatic outflow pathway from the mouse eye using in vivo imaging of quantum dots (1). Here we determine whether latanoprost stimulates lymphatic drainage from the normal mouse eye.

Study Design Experimental study comparing treated and control groups.

Methods All procedures adhered to the ARVO Statement for the Use of Animals in Ophthalmic and Vision Research. Under general anaesthesia, 3 µL of quantum dots nanocrystals (QD655) were injected into the left anterior chamber of 11 latanoprost-treated mice and 11 artificial tear-treated control mice. Latanoprost (0.005%) was applied to both eyes 17 hours and 1 hour before in vivo imaging performed with a hyperspectral fluorescence imaging system (Maestro, CRi). Images were captured prior to injection, and at later time points: 5, 20, 40, 70, 120, and 360 min. Following sacrifice at 360 min, imaging was performed to locate QD signals. Neck tissue with signals was removed, and sectioned. QD signal intensity on serial sections was measured using hyperspectral imaging and ImageJ. Immunostains for basement membrane (collagen IV antibody), and Sytox Green were examined by confocal microscopy. Two-sample t-tests were used to compare means of QD signal detection rate (60/time to detection) (hours^-1) and means of total QD intensity (log scale) between the two groups.

Results 10 of 11 control mice showed QD signals in the left neck region as early as 120 min (n=3), and 360 min (n=7). In contrast, all latanoprost-treated mice showed left neck signal ranging from 20 min (n=2), 40 min (n=4), 70 min (n=1), to 360 min (n=4) after injection. An increased QD signal detection rate was noted in the latanoprost-treated group compared to controls (1.23±1.06 hours^-1 vs. 0.30±0.17 hours^-1, mean±SD, $P<0.02$). Immunofluorescence studies showed QDs confined to the subcapsular region of the left submandibular node in all mice. QD signal intensity was increased in latanoprost-treated mice compared to controls (10.55±1.12 vs. 9.48±1.24, mean±SD, $P<0.05$).

Conclusions Latanoprost, a drug commonly used to treat glaucoma, enhances lymphatic drainage from the normal eye. Additional studies in glaucomatous mice are needed to determine whether the action of latanoprost on the lymphatic system contributes to its pressure lowering effects.

1. Tam AL, Gupta N, Zhang Z, Yücel YH. Quantum dots trace lymphatic drainage from the mouse eye. Nanotechnology. Oct 21; 22(42):425101, 2011

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WEDNESDAY 27 JUNE

Paper #106
A Randomized Clinical Trial of Selective Laser Trabeculoplasty versus Argon Laser Trabeculoplasty in Open Angle Glaucoma and Ocular Hypertension Secondary to Pseudoexfoliation

Francie Si, Shefalee S. Kent, Cindy Hutnik, Catherine Birt, Karim F. Damji, Paul J. Harasymowycz, William Hodge, Irene Y. Pan, Andrew Crichton

Purpose To evaluate the efficacy of selective laser trabeculoplasty (SLT) versus argon laser trabeculoplasty (ALT) in lowering intraocular pressure (IOP) in patients with open angle glaucoma or ocular hypertension secondary to pseudoexfoliation (PXF).

Study Design Prospective randomized clinical trial

Methods A prospective randomized clinical trial was conducted in eyes with PXF and uncontrolled IOP treated with SLT or ALT. The primary outcome was the change in IOP at 6 and 12 months vs baseline and a secondary outcome included change in number of glaucoma medications post-laser. Baseline variables included age, gender, angle grade, angle pigmentation and number of glaucoma medications. Patients with prior laser trabeculoplasty, ocular surgery within 6 months, previous glaucoma surgery, an advanced visual field defect, current steroid use, and monocular patients were excluded.

Results Seventy-six eyes of 60 patients with PXF underwent either 180-degree SLT or 180 degree ALT. The baseline IOPs in the SLT and ALT groups were 23.1mmHg and 25.2 mmHg respectively (p= 0.03). The IOP reductions 6 and 12 months post SLT were -6.8 mmHg and -6.2 mmHg, respectively. The IOP reductions post ALT were -7.7 mmHg and - 8.6 mmHg at 6 and 12 months. Neither the 6 nor the 12 month pressure reduction difference was statistically significant between groups. The SLT group had reduced medications by an average of 0.30 drop at 1 year and the ALT group had decreased use of glaucoma drops by an average of 0.13 drop over the same time period (p=0.65). There were no post laser IOP spikes in either group.

Conclusions ALT and SLT are equivalent in lowering IOP at 6 and 12 months post treatment in patients with PXF.

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WEDNESDAY 27 JUNE

Paper #107
Faster visual recovery following Ex-PRESS than trabeculectomy: results of a prospective randomised controlled trial

Laura Beltran-Agullo, Delan Jinapriya, Yaping Jin, Lilach D. Wagschal, Graham Trope, Yvonne Buys

Purpose To compare the rate of visual recovery after Ex-PRESS vs trabeculectomy.

Study Design Randomized controlled trial (NIH, #NCT01263561).

Methods Patients with uncontrolled OAG were randomized to Ex-PRESS or trabeculectomy. Best-corrected VA was recorded at baseline, day 1, weeks 1 and 2 and, 1, 3, 6 and 12 months post-op. Snellen acuities were converted to logMAR. Profile analysis was used to compare VA at each follow-up visit to baseline for each group and between groups. The change in number of Snellen lines at 6 months and one year post-op from baseline was compared between groups.

Results 64 subjects were enrolled (33 Ex-PRESS, 31 trabeculectomy). All subjects completed 3 months follow-up, 58 completed 6 months and 43 completed 1 year. There was no significant difference in VA between groups at baseline or any study visit. Mean logMAR VA was 0.39±0.56 for Ex-PRESS versus 0.49±0.55 for trabeculectomy at baseline ($p=0.47$) and 0.48±0.64 for Ex-PRESS versus 0.87±0.83 for trabeculectomy at one year ($p=0.11$). Comparing within each group VA was significantly reduced following surgery. In the Ex-PRESS group VA was significantly decreased compared to baseline at day 1 ($p<0.001$) and weeks 1 ($p=0.002$) and 2 ($p=0.02$). By month 1 VA in the Ex-PRESS group was no longer significantly different from baseline ($p=0.42$) and remained non significant at subsequent visits. In the trabeculectomy group VA remained significantly lower than baseline at each study visit from day 1 ($p<0.001$) to 1 year ($p<0.001$). A median loss of 0 and 1 Snellen lines at 6 months ($p=0.05$), 1 and 1.5 lines at 1 year ($p=0.07$) was observed for Ex-PRESS and trabeculectomy, respectively. At last follow-up, 7 subjects in the trabeculectomy compared to 2 in the Ex-PRESS group had lost more than 2 Snellen lines. Reasons for VA loss in the trabeculectomy group included central retinal vein occlusion (1), vitreomacular traction (1), cataract (1) and hypotony (3) and in the Ex-PRESS group included hypotony (1). No cause for reduced VA could be determined for 1 subject in each group.

Conclusions Although no significant differences in final visual outcomes were found between the two surgical groups, VA recovered faster in patients following Ex-PRESS than trabeculectomy. At 1 month the VA in Ex-PRESS group was no longer significantly decreased from baseline while in the trabeculectomy VA remained statistically significantly worse than baseline up to 1 year.

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WEDNESDAY 27 JUNE

Paper #108
Does Macular RNFL Thickness Measurement Correlate To Changes In Visual Field Progression In Advanced Glaucoma?

Sadhana V. Kulkarni, John Hamilton, Stuart Coupland

Purpose In advanced glaucoma, visual field defects are often dense and involve the central 10°. Assessment of retinal sensitivity by various visual field techniques e.g. Humphrey 10-2 Full Threshold (H10) and SLO-Microperimetry (SLO-MP) within areas of RNFL defects by SLO-Optical Coherence Tomography (SLO-OCT) permits correlation of functional damage to anatomical loss, thus facilitating early detection of progression in advanced glaucoma. The purpose of this investigation was to correlate changes in visual fields (H10, SLO-MP) to changes in macular RNFL thickness (SLO-OCT) in advanced glaucoma at 3-years follow-up.

Study Design Prospective, observational, cohort study.

Methods 18 eyes of 12 patients with advanced glaucoma enrolled in a pilot study in 2008 were re-recruited for this study. At 3-year follow-up, a modified 10-2 SLO-MP (OPKO/OTI Instrumentation Inc.) was performed within 3-months of the last reliable H10 (Zeiss Medetec) using a Goldman size III 200 msec stimulus presented at 1-second interval with real time monitoring of fixation. A standard CSME grid (diameter=3.5 mm) was used to divide the baseline macular RNFL (SLO-OCT, 2008) into 3 ring segments. Primary outcome was correlation of retinal sensitivity measured as the mean dB attenuation level (H10 and SLO-MP) at 3-years to mean baseline macular RNFL thickness (SLO-OCT) within the corresponding ring section of the CSME grid. Secondary outcome was decline in mean retinal sensitivities (dB) of SLO-MP and H10 at 3-years. Linear regression and ANOVA was used for analysis.

Results At 3-years, mean macular RNFL thickness (SLO-OCT) recorded at baseline did not correlate significantly with the H10 or SLO-MP thresholds in ring 1. However, in ring 2, the 2008 RNFL thickness significantly correlated with both H10 ($p=0.0477$) and SLO-MP ($p= 0.0452$). In Ring 3 the 2008 RNFL thickness was significantly correlated with both H10 ($p=0.0255$) and SLO-MP ($p=0.0320$). There was a comparable reduction in retinal sensitivity in both SLO-MP (Rings 1, 2 and 3 = $p < 0.0001$) and H10 (Ring 1: $p=0.0116$, ring 2: $p=0.0027$ and ring 3: $p=0.0064$) at 3-years.

Conclusions Macular RNFL thickness measured by SLO-OCT is a good predictor of 3-year reduction of retinal sensitivity by H10 and SLO-MP with a trend towards better correlation with SLO-MP.

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WEDNESDAY 27 JUNE

Paper #109
Patient appropriate health literacy materials in ophthalmology

David Mikhail, Kari Visscher, Joy Wang, Barry Emara, Cindy Hutnik

Purpose "Health literacy" is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions". Studies show health materials are written at literacy levels that exceed patient's literacy skills contributing to lower functional health literacy, compliance and autonomy. We expect to see a difference in health literacy between a glaucoma tertiary care centre and a community clinic. We expect that health literacy materials written at a lower literacy level will allow for better functional health literacy.

Study Design This randomized study involved approaching glaucoma patients in the waiting room of both a tertiary care glaucoma centre and a community ophthalmology clinic. We assessed the functional health literacy of both glaucoma patient populations and compared effectiveness of a grade 5 level educational pamphlet with a current (grade 10 level) pamphlet. This was done through administering standardized health literacy tests and comparing a newly developed information pamphlet to an older one.

Methods Patients aged 19-90 completed an S-TOFHLA (Short Test of Functional Health Literacy for Adults) and then given one of two educational pamphlets, a Cloze procedure and a Likert survey to gauge comprehension and satisfaction.

Results 200 patients participated (124 London, 76 Windsor; 61% female; average age = 66); 52% had a previous diagnosis of glaucoma. About 45% of London patients had a high school education or less; 50% in Windsor. Twenty (10%) were born in a non-English country. 179 patients (90%) completed the study. London showed 23% marginal or inadequate functional health literacy with 8% barely adequate; Windsor showed 26% and 9% respectively. In London, both the higher literacy pamphlet group (n=52) and lower literacy pamphlet group (n=58) were essentially the same - no significant difference in age (65 vs. 63), sex (69% vs. 71% female), marginal or inadequate health literacy (25% vs. 24%), overall satisfaction with pamphlets, or time spent on Cloze procedure. Time spent with pamphlet (4:58 vs. 3:07; $p<0.05$) and overall comprehension as gauged by accuracy on Cloze procedure (48% vs. 61%; $p<0.05$) were significantly different.

Conclusions Based on our results, we established baseline functional health literacy among patient populations in London and Windsor as 69-77% and 65-74% respectively. We have also shown that information presented at a lower literacy level will be better understood by all patients and in less exposure time. Some data still to be analyzed.

GLAUCOMA: FREE PAPERS

WEDNESDAY 27 JUNE

Paper #110
Prospective, Randomized MIGS Study of One, Two or Three Trabecular Micro-Bypass Stents and Travoprost in Open-Angle Glaucoma

Ike Ahmed, Hady Saheb, Lilit Voskanyan

Purpose IOP and medication reduction following micro-invasive glaucoma surgery (MIGS) of single or multiple trabecular bypass stents during cataract surgery has been reported. , This study examined the effect of 1, 2 or 3 stents on IOP and medication reduction in OAG subjects previously not controlled on two medications.

Study Design Prospective randomized trial

Methods Prospective, randomized study by MIGS Study Group enrolled phakic or pseudophakic subjects with OAG and IOP 18-30 mmHg on two ocular hypotensive medications. After medication washout, 120 subjects with unmedicated IOP 22-38 mmHg were randomized (1:1:1 ratio) to implantation of 1, 2 or 3 stents (Glaukos) and postoperative Travoprost.

Results To date 30 subjects have presented at 6 months. IOP after medication washout was 23.3 mmHg ±1.3, 23.2 mmHg ±0.9 and 23.2 mmHg ±2.4 in 1-, 2- and 3-stent groups, respectively. Month 6 IOP was significantly lower in the 1-stent (16.1 mmHg ±4.4; p=0.004), 2-stent (13.7 mmHg ±2.5; p=0.002) and 3-stent groups (13.6 mmHg ±2.1; p=0.002). Medications reduced from two preoperatively to one postoperatively. Transient hypotony and small hyphema were reported in 1 eye each and resolved by 1 week; no other complications were reported.

Conclusions One or multiple stents in phakic/pseudophakic eyes can provide IOP control and reduce drug burden in OAG not previously controlled on two medications. Data shows further IOP reduction with 2 or 3 Stents vs 1 Stent.

INTERNATIONAL OPHTHALMOLOGY
WEDNESDAY 27 JUNE

Paper #111
Eye cancer pathology in Kenya: The Retinoblastoma Collaborative Laboratory Service

Helen Dimaras, Elizabeth Dimba, Wairimu Waweru, Brenda L. Gallie

Purpose Accurate and timely pathology reporting is necessary for physicians to effectively manage and treat retinoblastoma patients, yet this relatively simple but key part of care is absent or delayed in many parts of the world. We aim to improve the availability, speed and accuracy of pathology reporting for retinoblastoma, and facilitate growth of retinoblastoma research capacity, in Kenya.

Study Design Prospective.

Methods The Kenyan Retinoblastoma Strategy (KNRbS) was launched in response to the urgent need for the development of an evidence-based, comprehensive treatment system for retinoblastoma in Kenya. A Retinoblastoma Pathology working group was created within the KNRbS to perform a needs assessment and develop an implement a workable plan to avail retinoblastoma pathology.

Results The Retinoblastoma Pathology working group developed a plan to implement the Retinoblastoma Collaborative Laboratory (RbCoLab): a centralized, digital retinoblastoma pathology service in Nairobi, which receives specimens from around the country. A signed MoU with the University of Nairobi (UoN) availed 15 years of cost-free pathology by UoN Maxillofacial Department, reducing financial burden on families. Training in Ocular & Retinoblastoma Pathology in Canada for a lead KNRbS pathologist faciliated knowledge dissemination and exchange within Kenya. A standard proforma for pathology analysis was developed with KNRbS group consensus support. Donation of: a functioning microtome, assisted RbCoLab pathology technicians to prepare eye specimens according to standard laboratory practices; a digital slide scanner, allowed documentation of specimen images; pathology educational software, facilitated image sharing, real-time pathology training, reporting and consultation throughout Kenya; start-up funding supplied the laboratory with equipment and consumables required for initial service delivery, including a server which houses pathology images for sharing, training and consultation. Retinoblastoma specimens are received from around the country and analyzed within two weeks, according to standard of practice, and detailed results shared online between pathologists and physicians in real-time, with parallel training and consultation, facilitating knowledge dissemination and exchange throughout Kenya.

Conclusions The digitization of pathology is quickly becoming standard of care worldwide, and surpasses the barrier of distance between clinics and specialized centers. We report the first evidence of this technology in a low-income country to deliver comprehensive retinoblastoma pathology services and improve quality of care.

INTERNATIONAL OPHTHALMOLOGY

WEDNESDAY 27 JUNE

Paper #112
Corneal Transplantation and Eye Bankingin Canada Where are we? Where could we go?

Paul Dubord

Purpose To compare the current status of Corneal Transplantation and Eye Banking in Canada on the world stage, with a focus on potential future opportunities.

Study Design To use the best available performance metrics regards, Corneal Transplantation and Eye Banking available to assess the key metrics that may apply to the Canadian model.

Methods Models of Eye Banking from local, national and international organizations including the WHO will be assessed.(Both from the developed and developing world)

Results The key metrics of potential models of a world class comprehensive,local,self-sustaining Eye Banking System for Canada will be presented.

Conclusions A real potential opportunity exists to improve the quality and accessibility of Corneal Transplantation for patients in need in Canada.

INTERNATIONAL OPHTHALMOLOGY

WEDNESDAY 27 JUNE

Paper #113
What are the present international electives offered by Canadian Ophthalmology Residency programs?

Sylvia H. Chen, Andrew Toren, Ginette Snook, Ralf Buhrmann

Purpose To identify the international electives offered by each Ophthalmology training program in Canada, the support provided, and the current program directors' views on their role and importance.

Study Design A cross-sectional survey of all Ophthalmology residency program directors across Canada.

Methods A survey was emailed to all program directors and their administrative assistants in November 2010. In the following months, further telephone contact was made to aid in the completion of these surveys.

Results Six out of fourteen Canadian Ophthalmology Residency programs have residents who have participated in international electives. Half (3/6) of these training programs offer formal electives through established educational linkages with centres in the developing world. They provide varying levels of financial support ranging from 0 to $8000 (inclusive of other conferences and elective support) throughout residency. Some programs offer no elective time for international electives while others have as much as 6 months over 5 years available, though 2-8 weeks is recommended by program directors.

Conclusions Responses from Ophthalmology program directors across Canada are quite polarized. Some programs do not encourage residents to seek international electives, while others have established partnerships with financial support and protected time for residents.

OCULOPLASTICS-3

WEDNESDAY 27 JUNE

Paper #114
Serum cholesterol levels and Chalazion

Galina Sholohov, Edsel Ing

Purpose Chalazia are lipogranulomas. We will determine if patients with chalazion have elevated serum lipids.

Study Design Prospective

Methods Fasting serum choleseterol and triglyceride levels were collected in patients with and without chalazion.

Results Pending.

Conclusions Pending.
If patients with chalazion have elevated serum cholesterol levels, it is possible that dietary therapy or anticholesterolemic medications may be useful in the prevention of chalazion.

OCULOPLASTICS-3

WEDNESDAY 27 JUNE

Paper #115
Does frozen or permanent section control in surgical management of periocular nodular BCCs result in better histological and clinical outcomes ?

Vladimir Kratky, Davin Johnson, Hussein Hollands, James Farmer

Purpose To compare the histological and clinical clearance rates for periocular basal cell carcinomas (BCCs) of the nodular type.

Study Design A prospective randomized clinical trial.

Methods Consecutive patients were randomized to surgical excision with permanent sections alone (group I) or surgical excision with intraoperative frozen sections (group II).

Results Our sample consisted of 62 patients in group I and 42 patients in group II.

There was no statistically significant difference between the two groups with respect to histological clearance rates (59/62 (95.2%) in group I and 40/42 (95.2%) in group II). At a mean follow up of 18 months, there were no clinical recurrences in either group.

Conclusions In the management of nodular BCCs, surgical resection with permanent pathology appears to have equivalent histological clearance rates as surgery with the use of frozen sections. This will likely translate into significant time and cost saving to the health care system.

PEDIATRICS-1

THURSDAY 28 JUNE

Paper #116
Cyanoacrylate tissue adhesive on a Vicryl (TM) scaffold in strabismus surgery: a laboratory study

Mark Bona, Brian Arthur

Purpose The use of a cyanoacrylate tissue adhesives (CTAs) has been investigated in strabismus surgery with varying success. We investigate a novel approach, involving CTA on a Vicryl (TM) scaffold, as a potential alternative in strabismus surgery.

Study Design Experimental Laboratory Study

Methods Butyl-cyanoacrylate was used to glue a polyglactin mesh to the sclera of cadaver eyes. After time was given for polymerization of the CTA, a force was applied to the mesh until the sclera-Polyglactin bond failed. The maximum load (gm) required for bond failure was recorded. The effects on bond strength of two variables, surface area of the polyglactin mesh and time for CTA polymerization, were investigated.

Results All experiments involving a polyglactin mesh of surface area 40mm2 or greater, regardless of time, as well as those with a surface area of 30mm2 and a polymerization time of 45 seconds, achieved a bond strength that was significantly greater than those forces seen in a physiologic setting ($p<0.05$). Increasing area or time resulted in increasing bond strength. Area and time were found to be independent variables.

Conclusions The CTA-polyglactin-sclera bond achieved a maximum load resistance greater than that seen in a physiologic setting. Our novel approach demonstrates a clinically feasible alternative to traditional strabismus surgery.

PEDIATRICS-1

THURSDAY 28 JUNE

Paper #117
Congenital Fibrosis of the Extraocular Muscles in Pakistani Families (Classification, Inheritance Pattern, and Genetic Testing)

Radwan Ajlan, Wai-Man Chan, Caroline Andrews, Elizabeth Engle, Ayesha Khan

Purpose To outline the clinical features of Pakistani patients with familial form of congenital fibrosis of extraocular muscles (CFEOM), their inheritance pattern, and correlation with genetic testing.

Study Design Cross sectional study.

Methods Fifteen patients from 4 families with CFEOM received a clinical ophthalmological exam. DNA from an affected proband from each family was sequenced for mutations in the coding exons and intron-exon boundaries of the KIF21A, PHOX2A, TUBB3, and CHN1 genes. For each putative mutation, family members were sequenced to confirm co-segregation.

Results Phenotypic analysis showed that, families 1, 3, & 4 met criteria for CFEOM type 3, while family 2 met criteria for CFEOM type 1. Inheritance pattern analysis revealed that families 1, 2, & 3 segregated CFEOM with an autosomal dominant (AD) mode of inheritance, while family 4 segregated CFEOM as an autosomal recessive (AR) trait. Affected members of family 2 harbor a heterozygous missense mutation in KIF21A resulting in the R954Q amino acid substitution. Affected members of family 3 harbor a heterozygous missense mutation in TUBB3 resulting in the R262C amino acid substitution. No KIF21A, PHOX2A, TUBB3, or CHN1 mutations were identified in the probands of families 1 and 4.

Conclusions In Pakistan, there are patients with CFEOM1 and CFEOM3 caused from common mutations, however evidence of new CFEOM genes exists as well.

PEDIATRICS-1

THURSDAY 28 JUNE

Paper #118
Visuo-motor control following surgical correction of strabismus in adults

Gavin Buckingham, Sapna Sharan, Melvyn A. Goodale

Purpose This study was aimed at determining whether surgery to correct strabismus in adulthood had any impact upon common visually-guided manual tasks, such as reaching and grasping.

Study Design The study was a continuous assessment design.

Methods Three adult patients took part in a series of binocular and monocular reaching and grasping tasks before and after undergoing surgical correction of their strabismus. Some of these tasks were designed to examine different facets of normal goal-directed actions (e.g., reaching to visual targets with and without vision, grasping blocks of different sizes), while others were designed to highlight the differences between binocular and monocular control of action (e.g., grasping a visible object in an otherwise dark environment). Two testing sessions were completed prior to surgery and two sessions were completed post-surgery to gauge pre-surgery performance and long term outcomes.

Results Patients did not exhibit a consistent pattern of improvement or deterioration following their surgery in any of the tasks. Any improvements in kinematic performance appeared to stem from pre-surgical repetitions of the various tasks, rather than the corrective surgery. Performance decrements which occurred shortly after surgery returned to pre-surgery levels in a longer term follow up session.

Conclusions Surgery in adulthood to correct strabismus does not have a significant impact upon the control of visually-guided actions, at least in the first 6-12 months post-operative period. These preliminary findings suggest that the compensatory strategies employed by these individuals throughout their development (e.g., enhanced reliance on monocular cues) continue to be used for controlling behaviour long after the strabismus has been surgically corrected.

PEDIATRICS-1

THURSDAY 28 JUNE

Paper #119
Surgical Management of Bilateral Superior Oblique Palsy

Qianqian Wang, Claire Blais, Michael Flanders

Purpose To present the unique, clinical characteristics of 15 cases with bilateral superior oblique muscle palsy (BSOP) and to report the results of strabismus surgery on these patients.

Study Design Retrospective, observational study

Methods Fifteen cases of surgically treated BSOP were taken from a personal, computerized database (Dr MF). Pre and postoperative data was extracted from the recorded ophthalmological and orthoptic examinations. Based on primary position alignment and measurements of excyclotorsion and esotropia in downgaze, surgery was performed, consisting of combinations of superior oblique tuck, Harado-Ito procedure, bimedial recession with infraplacement, and occasional inferior rectus or inferior oblique weakening. Surgical success was defined as good postoperative alignment (vertical, horizontal and torsional), with elimination of diplopia in functional positions of gaze and improvement of abnormal head posture.

Results The majority of patients had post-traumatic BSOP with primarily torsional and vertical diplopia in primary position and torsional and horizontal diplopia in downgaze. The mean preop, primary position hypertropia (HT) was small (4.6 prism diopters (PD)). The mean preoperative, downgaze esotropia (14.2 PD), and the mean, preoperative, downgaze excyclotorsion (18.4°) were large.
The mean preop primary position HT of 4.6 PD (range 0-15) improved to 2.6 PD (range 0-10 PD) postoperatively. The mean preop esotropia in downgaze improved from 14.2 PD (range -15 to 38 PD) to 2.4 PD (range -2 to 10 PD). The mean excyclotorsion in primary position improved from 10° (range 0 - 25°) to 2° (range -5 to 11°), and in downgaze from 18.4° (range 10 - 30°) to 7.3° (range 0-20°).
Eleven of the 15 patients achieved surgical success.

Conclusions Application of appropriate surgical strategies for this cohort of patients with acquired bilateral superior oblique palsy produced satisfactory functional improvement in the majority of these patients.

UVEITIS- MYSTERY OF UVEITIS: HOW TO MAKE A DIGANOSIS

THURSDAY 28 JUNE

Paper #120
Prevalence of inflammatory back pain in a cohort of patients with anterior uveitis

Clara C. Chan, Taucha Inrig, Catherine Molloy, Millicent A. Stone, Larissa Derzko-Dzulynsky

Purpose To determine the prevalence of inflammatory back pain in an anterior uveitis cohort.

Study Design Retrospective cohort study.

Methods Patients with anterior uveitis were recruited from the clinic of an ophthalmologist to complete a survey between March and December 2008. Patients were classified with inflammatory back pain if they had ≥ 2 positive responses to 4 validated inflammatory back pain questions: Presence of morning stiffness >30 minutes in duration; improvement in back pain with exercise but not with rest; awakening from back pain during the second half of the night only; and presence of alternating buttock pain. Disease activity was assessed using the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI). The impact of disease on quality of life was measured using the EuroQOL (EQ-5D) questionnaire. Twenty-five patients underwent further rheumatologic examination.

Results 141 of 167 patients (84.4%) completed the survey. 66 of 141 patients (46.8%) were classified to have inflammatory back pain. Mean BASDAI (4.2, SD 2.41) and EQ-5D scores (0.73, SD 0.21) were lower than patients with no inflammatory back pain (0.82, SD 0.16, $p = 0.0048$). In the subgroup that underwent rheumatologic assessment, a classification of inflammatory back pain was 92% sensitive and 67% specific for a diagnosis of inflammatory back pain.

Conclusions The prevalence of inflammatory back pain in a cohort of anterior uveitis patients was found to be 46.8%. Patients with inflammatory back pain had worse quality of life than those without. Ophthalmologists may use these questions on back pain to select patients classified to have inflammatory back pain to refer for early rheumatologic assessment.

PEDIATRICS 2

THURSDAY 28 JUNE

Paper #121
Orthoptists screening in Pediatric Ophthalmology practice

Inas Makar, Kathy Smith

Purpose Objective: The purpose of the study is to determine whether screening by Orthoptist aid in prioritizing access to Pediatric ophthalmology clinics and improve patient care accordingly.

Study Design Retrospective chart review of 202 children seen in pediatric ophthalmology practise after being screened and examined by orthoptists.

Methods A computer search of the patient database of one pediatric ophthalmologist was performed to identify children referred over a period of 2 years. All children included were initially screened by orthoptists. Data collected included: diagnosis and management provide by the Orthoptist and Pediatric ophthalmologist as well as waiting time to see pediatric ophthalmologist.

Results Results: Diagnosis made by pediatric ophthalmologist was identical to orthoptist in 98.5% of all children. Mean wait time to see pediatric ophthalmologist after being screened by orthoptists was 2.15 Ms for children with esotropia, 4.98 Ms for children with no abnormality detected and 4.02 Ms for children with intermittent exotropia.4 patients out of 202 did not show up for the ophthalmologist appointment 2 of which had no abnormality detected and 2 had partially accommodative esotropia as diagnosed by orthoptist screening. Mean age at examination for all patients was 39.5 Ms. Mean waiting time to see orthoptist was 1.5Ms and mean total wait time to see pediatric ophthalmologist was 4.85M. 34.7% of all patients needed treatment for amblyopia, 52% of those were started on treatment prior to seeing ophthalmologist.15.34% of all patients needed surgery.

Conclusions Screening all referrals to pediatric ophthalmology clinics by orthoptists (for children under age 4 year) allows us to prioritize access to our clinics according to diagnosis detected. For example children with infantile esotropia were seen within 1 month from being screened by orthoptist and were offered soon surgical intervention. Screening by orthoptist allows better allocation of clinic time and can improve patient outcomes in a subgroup of patients.

PEDIATRICS 2

THURSDAY 28 JUNE

Paper #122
Have the PEDIG studies changed amblyopia patching regimens?

Amy Chow, Yaping Jin, Linda Colpa, Agnes M. Wong

Purpose In 2003, daily patching of 2 hours for moderate amblyopia and 6 hours for severe amblyopia were recommended by the Pediatric Eye Disease Investigator Group (PEDIG) based on results from randomized clinical trials. The purposes of this study were to examine whether this evidence-based recommendation has been translated into clinical practice in Toronto, and to compare responses to the patching regimen in Toronto with those reported in PEDIG studies.

Study Design Structured, retrospectively chart review.

Methods The medical records of 361 patients referred to the orthoptic service at The Hospital for Sick Children (SickKids) in Toronto for amblyopia check in 2007-2009 were reviewed. Of these patients, 162 were referred by 6 SickKids staff and 199 by 32 community ophthalmologists. Using the same inclusion and exclusion criteria as PEDIG, 71 children with moderate amblyopia and 53 with severe amblyopia were included in the analysis. The prescribed patching hours and the visual acuity of both eyes in patients in Toronto were compared with those in PEDIG studies.

Results Compared to PEDIG recommendations, patients in Toronto were prescribed 1 hour more for moderate amblyopia (mean=3 hours; range=0.5-10 hours; $p<0.01$) and 2 hours less for severe amblyopia daily (mean=4 hours; range=0.5-7 hours; $p<0.01$). Compared to the initial visit, the prescribed patching hours in Toronto were reduced by 1 hour ($p<0.05$) at the 13-18 month visit for moderate amblyopia, but was virtually unchanged for severe amblyopia (3.9 hours at the first visit and 3.2 hours at the 13-18 month visit; $p=0.12$).
For moderate amblyopia, the amblyopic eye visual acuity at the 3-6 month visit in Toronto (0.23 logMAR) was similar to that of 4-month visit in PEDIG studies (0.24 logMAR; $p=0.74$). For severe amblyopia, the amblyopic eye visual acuity at the 3-6 month visit in Toronto (0.51 logMAR) was worse than that of 4-month visit in PEDIG studies (0.40 logMAR; $p=0.02$). However, at the 7-12 month visit, the amblyopic eye visual acuity in patients with severe amblyopia in Toronto (0.45 logMAR) reached a similar level as that of 4-month visit in PEDIG studies (0.40 logMAR; $p=0.35$).

Conclusions Although the number of hours of patching prescribed for amblyopia in Toronto differed from those recommended by PEDIG studies, similar treatment efficacy was obtained.

PEDIATRICS 2

THURSDAY 28 JUNE

Paper #123
Structural and functional effects of anisometropic amblyopia on ganglion cell development

Michael D. O'Connor, Stuart Coupland, John Hamilton, Olga Plekhanova, Annick V. Fournier

Purpose Amblyopia is generally attributed to abnormal development of cortical visual pathways. However, some lines of evidence suggest that the retina, in particular receptive field development in retinal ganglion cells, may also be affected. It is not clear whether the underlying cause of amblyopia affects this process. We assessed retinal ganglion cell structure (by retinal nerve fiber layer (RNFL) thickness) and function (by photopic negative response (PhNR) amplitude), to uncover differences between amblyopic and non-amblyopic eyes with strabismus and anisometropia.

Study Design Prospective case series.

Methods Twenty-two volunteers (7 pediatric, 15 adult) with strabismic (13 eyes) and anisometropic amblyopia (9 eyes) were examined. Following a complete ophthalmic evaluation, RNFL was measured in the peripapillary region with the SLO/OCT-7 (OPKO). ERGs were recorded using the Espion e2 visual electrodiagnostic system (Diagnosys LLC), with the PhNR recorded using brief flashes of long-wavelength (red) light delivered over a rod-saturating (blue) background.

Results In strabismic amblyopic eyes there was no significant difference in RNFL thickness or PhNR amplitude compared to fellow eyes. In contrast, both RNFL thickness and PhNR amplitude were significantly larger in anisometropic amblyopic eyes compared to fellow eyes ($p < 0.05$). The increased RNFL thickness and larger PhNR amplitude suggest a greater ganglion cell population in the anisometropic amblyopic eyes.

Conclusions During normal postnatal visual development, retinal ganglion cell apoptosis thins the RNFL and reduces the PhNR amplitude. In strabismic eyes, images remain focused on the retina, which may allow this normal apoptosis to occur. However, our results suggest that in anisometropic amblyopic eyes, the lack of a focused image on the retina may disrupt apoptosis, resulting in an increased RNFL thickness and PhNR amplitude. The effect of amblyopia therapy on these parameters remains to be determined.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #124
A Prospective Study of Inflammatory Biomarkers and Risk of Diabetic Retinopathy in the Diabetes Control and Complications Trial

Rajeev H. Muni, Radha Kohly, Eudocia Quant, JoAnne E. Manson, Debra A. Schaumberg

Purpose To determine whether baseline levels of hsCRP and ICAM-1 predict development and progression of diabetic retinopathy (DR), clinically significant macular edema (CSME), retinal hard exudates, and proliferative DR in the Diabetes Control and Complications Trial (DCCT) cohort.

Study Design The DCCT was a large multicenter randomized controlled clinical trial of 1441 subjects with type 1 diabetes aged 13-39 years at study entry.

Methods We measured levels of hsCRP, ICAM-1, VCAM-1, and TNFR1 in stored baseline blood samples and assessed their association with incident DR endpoints ascertained from grading of standardized seven-field stereoscopic retinal color photographs taken at baseline and every 6 months during follow-up.

Results After adjustment for randomized treatment assignment and other factors, we observed a statistically significant association between hsCRP and risk of CSME, with a hazard ratio (HR) for the top versus bottom quintile of 1.83 (95%CI=0.94-3.55), P for trend=0.01. Similarly, for the development of retinal hard exudates, HR for the top versus bottom quintile of hsCRP was 1.78 (95%CI=0.98-3.25), P for trend=0.004; whereas for ICAM-1, the HR comparing the top versus bottom quintiles was 1.50 (95%CI=0.84-2.68), P for trend=0.05. There were no statistically significant associations between baseline VCAM-1 or TNFR1 and risk of any of the DR endpoints.

Conclusions We found that after adjusting for known risk factors, increasing quintiles of baseline hsCRP predicted higher risks of incident CSME and macular hard exudate in the DCCT cohort. Circulating levels of ICAM-1 were also associated with the development of retinal hard exudates.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #125
Retina Evaluations as Part of the Ontario Health Study

William Hodge, Cindy Hutnik, Yvonne Buys, Graham Trope, Yaping Jin, Stuart Coupland

Purpose To provide an overview of the methodology of the Ontario Health study emphasizing the role of retina conditions in the study.

Study Design This is the world's largest research study ever undertaken. It is a prospective cohort study where 100,000 patients will be followed at least 10 years by 20 different specialties including ophthalmology. The vision team is composed of over 20 eye care professionals and scientists as well as an international advisor.

Methods The prospective cohort study has a questionnaire phase that is web based. It is expected over 2 million people will answer the web based questionnaire. From this cohort, 100,000 people will be invited to the assessment center for a 4 hour detailed examination regimen. At least 10 years of follow up will occur.

Results To date over 80,000 people have done the on line questionnaire and a "pilot" recruitment study has finished at 3 sites which enrolled 8205 people from 3 Ontario sites. 51% were females, and the median age group was in the 60-64 age range. The race distribution closely reflected the Ontario population at large and median income of recruited patients was high with a household income of obver $100K on average. From the ophthalmology point of view 3 of the 5 major outcomes measured are retina related (optic nerve photos, AMD and diabetic retinopathy).

Conclusions The Ontario Health Study will have a major impact on ophthalmology in Canada and worldwide. Retina conditions will form the bulk of the eye related measurements and outcomes.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #126
10-year Framingham risk in patients with retinal vein occlusion

Zainab Khan, David Almeida, Karim Rahim, Michel J. Belliveau, Mark Bona, Jeffrey Gale

Purpose It is known that traditional cardiovascular risk factors predispose individuals to retinal vein occlusions (RVO). Yet the future risk of developing cardiovascular disease in patients with RVOs is uncertain. The Framingham Risk Score is a validated measure of estimating the 10-year risk of developing cardiovascular disease (e.g., coronary artery disease, myocardial infarction, angina pectoris, cerebrovascular disease, peripheral vascular disease). We performed a literature review and meta-analysis of studies to determine the 10-year Framingham risk for individuals with RVO.

Study Design Systematic review and meta-analysis

Methods A literature search was performed in MEDLINE and EMBASE. Studies were eligible if they included subjects with RVO and presented data on: age, sex, smoking status, systolic blood pressure, total cholesterol and high-density lipoprotein. The 10-year Framingham risk was calculated. Sensitivity analysis was performed using sex and smoking status variables. Hypothesis testing was carried out using the upper tail z-test with $\alpha = 0.05$ to compare the estimated Framingham risk in RVO patients with the risk in the general Canadian population. Sub-group meta-analysis was carried out by the Cochrane Collaboration RevMan 4.5 software. Quality assessment was carried out using the Newcastle-Ottawa Scale (NOS) for case-control studies and the Downs and Black instrument was applied to cross-sectional studies. PRISMA (Preferred Reporting Items in Systematic Reviews and Meta-Analyses) flow diagram was used to document the flow of studies throughout different phases of the review.

Results 408 abstracts were screened and 24 underwent full-text screening. A final list of 6 articles were included. The two case-control studies were found to be of moderate quality. The 4 cross-sectional studies had Quality Indices of 12, 14, 15 and 15. The estimated 10-year Framingham risk score in subjects with RVO was 10.1% (95% CI: 9.9, 10.2). The Framingham risk in subjects with RVO was significantly higher than the general Canadian population risk which is 6.0% ($p<0.0001$). Sensitivity analysis found FRS to be greatest in male smokers at 27.8% (95% CI: 27.7, 27.9) followed by male non-smokers at 17% (95% CI: 16.9, 17.1). In a sub-group analysis, the 10-year risk was significantly higher in subjects with RVO compared to controls (difference in % risk = 2.74; 95% CI: 2.56, 2.91).

Conclusions Patients with RVO have an increased 10-year risk of cardiovascular

disease. This risk is greatest for male smokers (high risk). These patients may benefit from therapy aimed at controlling their risk factors. Additionally, individuals sustain RVO when FRS exceeds 10.1% and should be cautioned about the possibility of vision loss from RVO.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #127
Combination therapy for perfused central retinal vein occlusion (CVO) using intravitreal ranibizumab and laser-induced anastomosis

Brian Leonard, Stuart Coupland

Purpose CVO reperfusion following successful laser-induced anastomosis occurs after a prolonged interval of vascular remodeling, during which an irreversible pigmentary maculopathy frequently occurs prior to the eventual reversal of macular edema. We examined the potential for intravitreal ranibizumab to control CVO macular edema during this evolution interval, and thereby inhibit or limit pigmentary maculopathy.

Study Design Retrospective case series

Methods Consecutive cases with macular edema from perfused CVO that were managed with various combinations of intravitreal ranibizumab and laser-induced anastomosis, were reviewed retrospectively.

Results Twenty three eyes of 23 patients were studied. Following multiple attempts, at least one functioning anastomosis site was eventually present in each eye. No major hemorrhagic or neovascular treatment complications were encountered. All eyes retained perfused CVO status. Reversal of macular edema with mild or no pigmentary maculopathy occurred in 18 eyes.

Conclusions In this small study, intravitreal ranibizumab was useful in minimizing the pigmentary maculopathy frequently associated with successful laser-induced anastomosis reperfusion therapy. Intravitreal ranibizumab appeared to modulate the extent and duration of CVO macular edema during the evolution of the reperfusion anastomosis and did not appear to inhibit the angiogenic growth factors required for anastomosis formation.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #128
Incidence and severity of ROP in extremely premature infants

Sourabh Arora, Alexander Kaplan, Gloria Isaza

Purpose To analyze incidence and severity of retinopathy of prematurity (ROP) among extremely premature infants

Study Design Retrospective, longitudinal study.

Methods Data was extracted from The Canadian Neonatal Network that maintains clinical information about neonates and confirmed by reviewing medical charts. Infants were classified into two groups: Group 1 infants were GA equal or less than 25 weeks and Group 2 infants were GA 26 or 27 weeks. Incidence and severity of ROP were assessed among the total screened population, and between groups. 207 infants were included with gestational age (GA) equal or less than 27 weeks, admitted to a NICU between July 2006 and July 2010.

Results The overall incidence of ROP was 64.7%, 88% infants in group 1 had ROP compared to 48% infants in group 2. The overall incidence of Type 1 ROP was 11.6%, in group 1 it was 24.4 %, compared to 2.5% in group 2. Type 1 ROP was significantly associated with BW ($p<0.001$, OR=8.20) and GA ($p<0.001$, OR=2.46). There was no difference in mean post-menstrual age (PMA) at first ROP onset between group 1 and group 2 (33.5 versus 33.9 weeks respectively). PMA at time of ROP diagnosis was not associated with development of type 1 ROP [$p=0.75$, OR=0.94(0.62-1.41)].

Conclusions Extremely premature infants with lower GA had higher incidence of type 1 ROP. Earlier presentation of ROP did not predict development of type 1 ROP. No infant with GA > 26 weeks at birth or BW greater than 1000g had type 1 ROP.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #129
Telemedicine screening for Retinopathy of Prematurity (ROP), three years experience in Ontario, Canada

Nasrin N. Tehrani

Purpose We investigated clinical outcomes of a Telemedicine ROP Screening Program between two Neonatal Intensive Care Units (NICU), a level II NICU and a modified level III NICU and a central reading site, using real-time 2 way audio-video connection.

Study Design Retrospective Chart Review

Methods Neonatology personnel at the two remote NICUs without access to ophthalmology services locally were given on-site training to use RetCam™. Live 2 way audio-video connection allowed monitoring of eye examinations by ophthalmologists at the central reading site to identify significant pathology and continue education and direct refining of imaging technique. Store-forward images were uploaded to a secure ftp server at the reading site and later reviewed by ophthalmologists with experience in management of ROP. Repeat examinations were scheduled according to current guidelines.

Results Fifty-nine infants underwent 1-6 telemedicine examinations each (total 145 exams). Images obtained were adequate for assessment on 139 examinations (96%). Repeat imaging was requested on the remaining 6 examinations to improve quality. Seven infants developed ROP, the greatest severity of disease encountered was stage 2 in zone II; all infants with ROP proceeded to show spontaneous ROP regression. All infants underwent binocular indirect ophthalmoscopy (BIO) after discharge home from NICU. ROP that was only identified at time of BIO developed in 3 infants (1 infant developed stage 1 ROP in anterior zone II; 2 developed stage 1 ROP in zone III), none required treatment.

Conclusions Acquisition of high quality images by NICU staff without prior imaging experience is a difficult skill to master. Continued education through real-time interaction during eye examinations can optimize the learning process, allowing personnel to acquire images with sufficient quality for ROP screening. An in-person BIO is recommended after discharge from NICU to ensure ROP in zone III that may be more difficult to image is identified.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #130
Increased expression of immune response genes in the *harlequin* mouse as a mechanism for early retinal degeneration

Justin Mayers, Kathleen A. Hill, Cindy Hutnik

Purpose Age-associated vision loss is a growing concern in Canada as demographics shift and there is a larger percentage of older Canadians. Human retinal diseases are explored with mouse models acting as an effective mimic. The *harlequin (hq)* mouse is a model of premature aging featuring early retinal functional deficits at 2 months and structural losses at 4 months. The genotype is caused by an 80% downregulation of the *Apoptosis inducing factor (Aif)* gene. This phenotype is hypothesized to result from early activation of the parainflammation response pathway caused by the *Aif* disregulation. Activation of this pathway includes an upregulation of the immune response genes known as the Major Histocompatibility Complex I offering a potential mechanism for human retinal parainflammation relevant to diabetic retinopathy.

Study Design Changes in gene expression were quantified for n=3 wild type compared to n=3 *hq* disease mice at 7 weeks, 4 months and 7 months of age for MHC-I genes *H2-K1* and *B2M*. *In vivo* imaging and retinal layer thickness measurements were performed with n=3 wild type and n=3 *hq* disease mouse subjects.

Methods Gene expression changes were quantified using the Taqman® real-time polymerase chain reaction assay. *In vivo* imaging was performed with the Heidelberg Spectralis® Spectral Domain Optical Coherence Tomography (SD-OCT). Image analysis was performed with the Heidelberg Eye Explorer® software.

Results *H2-K1* is upregulated 2-fold (compared to wild type) in the *hq* disease retina at both 7 weeks and 4 months of age ($p > 0.05$) and *B2M* is upregulated 2-fold only at 4 months of age ($p > 0.05$). At 7 months of age, *H2-K1* and *B2M* show significant upregulation of 10-fold and 5-fold respectively ($p < 0.001$). At 7 months of age, *in vivo* imaging shows significant thinning of the outer nuclear layer and total retina in the *hq* disease mouse compared to wild type ($p < 0.05$).

Conclusions Gene expression and *in vivo* imaging data show that between ages 4 and 7 months, MHC-I complex is upregulated indicating an active immune response. *In vivo* imaging shows significant thinning of the *hq* disease retina correlating with increased MHC-I gene expression. This period of genetic and structural change is ideal for identifying potential drug targets relevant to activation of the immune response degeneration of the retina.

RETINA 2- RETINA VASCULAR

THURSDAY 28 JUNE

Paper #131
Copy number variant analysis in choroideremia

Jonathan Chi, Ian M. MacDonald, Stacey Hume

Purpose To test for copy number variants in the CHM gene. Choroideremia (CHM) is an X-linked progressive chorioretinal degenerative disease that affects 1 in 50,000 males. Clinically, patients with choroideremia present with nightblindness and progressive loss of peripheral vision; however, typically central vision and colour vision is maintained. Choroideremia arises from a dysfunctional Rab escort protein-1 (REP-1) which is encoded by the CHM gene. The absence of REP-1 in the eye, results in the gradual degeneration of the retina, retinal pigment epithelium, and choroid causing the ocular manifestations common in affected individuals. The exact pathogenesis, however, has yet to be determined. Through genetic studies, we have determined that choroideremia can arise from deletions in the CHM gene but deletions alone do not account for all cases of choroideremia. Our study delves into the biochemical genetics of the CHM gene to determine whether other genetic mutations such as copy number variants play a role in choroideremia pathogenesis.

Study Design Case control, non-randomized.

Methods We identified eight males and one female subject who had clinical features consistent with a clinical diagnosis of CHM. In all cases, previous sequencing of the coding region and adjacent intronic splice sites had not found a mutation. We designed a multiplex ligation-dependent probe amplification (MLPA) assay kit for the detection of copy number variants in the CHM gene. Using our MLPA assay kit, we tested the DNA of several choroideremia patients that screened negative for genetic deletions in their CHM gene.

Results A duplication of consecutive exons 3 to 8 of the CHM gene was determined in one particular patient DNA sample.

Conclusions Prior to this study, only deletions in the CHM gene have been linked to choroideremia pathology. The duplication in the CHM gene observed in this study represents a novel pathological mutation and potentially a novel mechanism of pathogenesis. Based on our results we would conservatively estimate that copy number variants in the CHM gene are likely to be found in no more that 10 per cent of cases in which no mutation is found by sequencing. We hope that this observation will help us further understand the pathogenesis of choroideremia. Futhermore, MLPA or an array based test may serve as a useful first pass test for future CHM cases in which molecular genetic testing is considered. These tests will have the utility of excluding copy number variants in the gene as the cause of choroideremia.

CORNEA-CONTROVERSIES IN REFRACTIVE SURGERY

THURSDAY 28 JUNE

Paper #132
Does modified Micro-Monovision correct presbyopia?

Christoph Kranemann, Marcelo Stevenson

Purpose To verify that modifiect Micro-Monovision can correct presbyopia consistently and with lasting effect.

Study Design A population of 120 patients were analyzed retrospectively with a follo-up for up to 18 months after having undergone Laser vision correction with a non-linear increase in negative corneal asphericity and an application of Micro-Monovision.

Methods Corneal and whole eye wavefronts as well as refractions were recorded pre and post-operatively. The data were submitted for statistical analysis.

Results The follow up ranged from 6-18 months with a mean of 11.4 months. Binocular uncorrected distance and near vision were a mean of 20/20. 5% of patients required a touch up to achieve the final result. The mean refractive difference between distance and near eye was -1.35 diopters, though the mean uncorrected distance vision in the near eye was 20/32. 99.2% of patients were able to perform all visual functions without glasses.

Conclusions Micro-Monovision with aspheric modification of the cornea appears to hold promise for presbyopia correction.

CORNEA-CONTROVERSIES IN REFRACTIVE SURGERY

THURSDAY 28 JUNE

Paper #133
Hyperopic photorefractive keratectomy versus myopic photorefractive keratectomy post laser-assisted in situ keratomileusis

Stephanie A. Low, Alfonso Iovieno, Dan Rootman, Sonia N. Yeung, Alejandro Lichtinger, David S. Rootman

Purpose Photorefractive keratectomy (PRK) can be used to revise myopic and hyperopic refractive errors in patients with prior laser-assisted in situ keratomileusis (LASIK) surgery. In this study, we compared the effectiveness of myopic PRK (mPRK) and hyperopic PRK (hPRK) in post-LASIK patients.

Study Design Retrospective case-control study.

Methods Subjects with PRK revisions post-LASIK (PL) surgery were included in this study. Outcome measures included uncorrected and best-corrected distance visual acuity (UCDVA, BCDVA), mean refractive spherical equivalent (MRSE), and keratometry.

Results Thirty-five eyes from 25 patients (12 male 13 female; mean age 39.1 ± 11.2, range 22-65) were included in the study, of which there were 21 hPRK PL and 14 mPRK PL cases. At 3 months post-PRK, mPRK PL showed significant improvement in BCDVA from baseline compared to hPRK PL (mPRK PL 0.07±0.47 LogMAR; hPRK PL -0.09±0.89 logMAR, p=0.016). MRSE also improved significantly in mPRK PL compared to hPRK PL (mPRK PL 0.21±0.48; hPRK PL 0.78±0.83, p=0.023). There was no significant difference found in other outcome variables. At 3 months, 62.5% mPRK PL patients achieved an UCDVA of 20/20 or better versus 38.1% in the hPRK PL group (p=0.12). At 6 months, the percentage of mPRK PL patients with 20/20 or better UCDVA reached 80% versus 31.3% of the hPRK PL patients (p=0.533).

Conclusions While both mPRK and hPRK are useful techniques in post-LASIK revisions, mPRK PL showed greater improvement in BCVA and MRSE, and may have higher success rates compared to hPRK PL.

CORNEA-CONTROVERSIES IN REFRACTIVE SURGERY

THURSDAY 28 JUNE

Paper #134
Mirror symmetry of the right and left eyes 3D corneal shape

Georges M. Durr, Edouard Auvinet, Jeb A. Ong, Marina Gilca, Marie-Eve Choronzey, Jean Meunier, Isabelle Brunette

Purpose To characterize and measure mirror symmetry (enantiomorphism) between both corneas using Orbscan corneal topography 3D atlases analysis.

Study Design Cross-sectional study

Methods This study was conducted on 7752 eyes of 3876 normal consenting subjects, including 1883 females and 1992 males (1 missing information), with no history of ocular disease, ocular surgery, or recent contact lens wear. Orbscan II (Bausch and Lomb, Rochester, New York, USA) corneal topography was performed on all eyes and several topographic parameters were analyzed. A 3D shape atlas was created for all right corneas and another atlas for all left corneas. Using a left-right (naso-temporal) mirror transformation, left corneas were then numerically swapped into "right corneas" and difference maps were generated to compare right and swapped-left corneal atlases, with corresponding p-value maps (paired two-tailed Student's t-test).

Results The right and left 3D corneal atlases showed remarkable mirror symmetry. Although statistically significant mainly because of the large sample size, most of the observed differences between the right (OD) and the left corneas transformed into "right corneas" (OSt) ranged below the threshold of clinical significance: Thinnest corneal pachymetry (TCP) (mean±SEM: OD: 585±0.6 µm; OSt: 585±0.6 µm; $p = 0.0178$), TCP "x" coordinate (OD: 0.29±0.01mm nasal to BFS apex; OSt: 0.33±0.01mm nasal to BFS apex; $p < 0.001$), TCP "y" coordinate (OD: 0.03±0.01mm below BFS apex; OSt: 0.11±0.01mm below BFS apex; $p < 0.001$), Mean anterior surface power in the 0-3 mm radius central zone (OD: 43.85±0.02 D; OSt: 43.80±0.02 D; $p < 0.001$), Mean anterior surface power in the 3-5 mm annular zone (OD: 43.58±0.02 D; OSt: 43.52±0.02 D; $p < 0.001$), Maximum keratometry (Max K) (OD: 44.38±0.02 D; OSt: 44.31±0.02 D; $p < 0.001$), Max K meridian (OD: 93.1±0.5°; OSt: 89.5±0.6°; $p < 0.001$), Keratometric astigmatism (OD: 1.03±0.01 D; OSt: 1.00±0.01 D; $p < 0.001$).

Conclusions Based on Orbscan corneal topography 3D atlas analyses, this study showed that corneas of the right and left eyes present mirror symmetry.
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CORNEA-CONTROVERSIES IN REFRACTIVE SURGERY

THURSDAY 28 JUNE

Paper #135

Is there a difference in outcome of femtosecond assisted LASIK performed by cornea fellows compared with that of experienced staff surgeons?

Rachel Wolff, Alejandro Lichtinger, Uri Elbaz, Judy Y. Ku, Sonia N. Yeung, Peter Kim, Allan R. Slomovic, David S. Rootman

Purpose To compare the outcome of femtosecond assisted LASIK procedures in patients between 18 and 40 years old done by supervised cornea fellows and their supervisors, experienced cornea staff surgeons.

Study Design Retrospective clinical cohort study.

Methods Retrospective review of all consecutive femtosecond assisted LASIK procedures performed over a 2 year period by fellows (2009-2010) and a 1 year period of staff surgeons (2009). Charts were reviewed and pre-operative K1 and K2, pachymetry, mesotropic pupil size and intra-ocular pressure and pre -and postoperative manifest refraction (sphere and cylinder), surgery time, flap diameter, complications during and directly after surgery, postoperative striae and aspect of interface were scored. Happiness and uncorrected distance visual acuity was assessed at 3 months follow-up. Patients were excluded if they have had previous refractive surgery or were lost to follow-up within 3 months.

Results 253 procedures were included in the study, 134 (mean age 28 yrs ± 5; 55% female) performed by a fellow and 119 (mean age 29 yrs ± 5; 55% female) performed by a staff surgeon. Pre-operative K1 and K2, pachymetry, mesotropic pupil size and intra-ocular pressure and pre -and postoperative manifest refraction (sphere and cylinder) were not significantly different between both groups. Flap diameter was significantly smaller in the fellow group. (mean 8.7 ± 0.17 mm vs. mean 8.8 ± 0.19 mm). Staff surgeons operated significantly faster (mean 5.7 ± 2.1 minutes vs. mean 7.4 ± 2.2 minutes) and had significantly less complications during the procedure (0/119 vs. 4/134, p=0.045). Comparing complications directly after surgery, presence of postoperative striae, the aspect of the interface showed no significant differences (p=0.751, p=0.375 and p=0.919 respectively. Three months after the procedure, no significant difference was found in patient happiness. (109/119 (91.6%) vs. 127/134 (94.8%), p= 0.322) or uncorrected distance visual acuity (-0.052 ± 0.0896 logMar vs. -0.053 ± 0.0890 logMar).

Conclusions Although staff surgeons create bigger flaps, operate faster with lesser per-procedural compications, final outcome of femtosecond assisted LASIK is comparable between cornea fellows and staff surgeons.

CORNEA-CONTROVERSIES IN REFRACTIVE SURGERY

THURSDAY 28 JUNE

Paper #136
Is topography-guided photorefractive keratectomy for keratoconus with simultaneous collagen cross-linking using the IVIS laser effective?

Simon Holland, David Lin

Purpose To evaluate efficacy and safety of simultaneous topography-guided photorefractive keratectomy (TG-PRK) with collagen cross-linking (CXL) using the IVIS laser.

Study Design Analytic study in a private clinic setting.

Methods 34 eyes of 25 patients with contact lens (CL) intolerant keratoconus (KC) underwent trans-epithelial TG-PRK with the IVIS laser using the CIPTA™ program for central corneal regularization followed by a maximum refractive correction based on a topographical neutralization technique (TNT) inputted to leave a predicted residual stromal bed of > 300µm. Standard collagen CXL (Dresden protocol) then performed with use of hypotonic dextran as needed to increase pachymetry to 400µm. Uncorrected vision (UCVA), best corrected vision (BSCVA), topography, manifest refraction (MR), symptom score, and keratometry were evaluated pre-operatively, 1, 3, and 6 months.

Results 25 eyes completed six months follow-up with sufficient data for analysis. Thirteen had UCVA of ≥20/40. Twelve showed improved BSCVA of ≥ 1 line, 8 no change, 5 with loss of ≥ 1 line. Three patients had delayed epithelialization beyond 5 days with no residual effects with no other complications. Mean refractive astigmatism decreased from 3.12 diopters (D) to 1.25D. Symptom scores improved in all but two with reduced glare and distortion.

Conclusions Early results of simultaneous TG- PRK with simultaneous collagen CXL with the IVIS laser show potential to improve both UCVA and BSCVA in CL intolerant KC patients with good efficacy and safety. The technique may have advantages over existing technologies by the central corneal regularization with the CIPTA™ program.

CORNEA-CONTROVERSIES IN REFRACTIVE SURGERY

THURSDAY 28 JUNE

Paper #137
Is topography-guided photorefractive keratectomy (TG-PRK) with simultaneous collagen cross-linking for post LASIK ectasia using iVIS and Allegretto effective?

Simon Holland, David Lin

Purpose To evaluate early efficacy and safety of topography-guided photorefractive keratectomy (TG-PRK) combined with simultaneous collagen cross-linking (CXL) in post-LASIK ectasia for correction of irregular astigmatism using the IVIS and Allegretto platforms.

Study Design Analytical study in a private clinic setting.

Methods Fourteen eyes of 9 patients with post-LASIK ectasia underwent TG-PRK with CXL with the Allegretto Wavelight laser using trans-epithelial technique. The IVIS laser was used in an additional 8 eyes of 5 patients using the CIPTA™ program. Treatment was adjusted by a topographical neutralization technique with both lasers to improve the refractive result leaving a residual stromal thickness of ≥300µm. Cross-linking as previously described in the Dresden protocol. Pre and post-operative symptoms, uncorrected visual acuity (UVA), best corrected visual acuity (BSCVA), manifest refraction (MR) predictability, and safety were evaluated with minimum follow-up of 6 months.

Results Grouped results for both lasers showed 16 eyes completed 6 month follow-up with sufficient data for analysis. 14 (87%) had UCVA of ≥20/40 compared to 5 before. Ten gained ≥2 lines of BSCVA with 1 losing 2 or more. Mean reduction in astigmatism was 2.9 diopters and all but two had improved symptoms. Complications included delayed epithelialization and 2 with increased irregular astigmatism. Comparing results from the two lasers showed no significant differences in the small sample sizes. The IVIS central corneal regularization does not induce as much myopia as the Allegretto when used with topographical neutralization.

Conclusions Early results of TG-PRK with simultaneous CXL using two laser platforms shows promise as an effective treatment highly symptomatic patients with post-LASIK ectasia, but requires further follow up to evaluate long term safety.

CORNEA-CONTROVERSIES IN REFRACTIVE SURGERY

THURSDAY 28 JUNE

Paper #138
Topography-guided ablation for optical zone enlargement and correction of decentered ablations

Tenley N. Bower, Eser Adiguzel, Mark Cohen, Avi Wallerstein

Purpose To examine the outcomes of symptomatic eyes receiving Topography Guided Customized Ablation Treatment (TCAT) for enlargement of small optical zones (OZ) and correction of decentered ablations.

Study Design Retrospective chart review

Methods Study examined patients with small OZ or decentered topographical ablation profiles, with concurrent subjective complaints. Outcomes were accuracy, efficacy, and safety. Unilateral cases were compared to non-TCAT contralateral eyes. Pre- to post-TCAT topography was compared. A subjective questionnaire was administered post-operatively. Paired t-tests and a significance threshold of p=0.05 were used.

Results 33 eyes (23 pts) had TCAT performed 10.6±10.3 mths after primary surgery with follow-up time of 3.0±3.8 mths. Pre-TCAT accuracy of ±0.25, ±0.5, and ±1.0D in 27%, 40% and 70%, respectively, increasing post-TCAT to 45%, 67%, and 88%, respectively. Pre-TCAT efficacy of 20/20, 20/30, and 20/40 or better UDVA in 30%, 57%, and 77%, increasing post-TCAT to 56%, 82%, and 82%, respectively. UDVA improved (0.21±0.20 vs. 0.13±0.22 logMAR, p=0.03) but was still below non-TCAT contralateral eyes (0.27±0.29 vs. 0.12±0.21 logMAR, p=0.04). Pre-TCAT, there was loss of 2 and 1 lines of CDVA in 3 and 4 eyes respectively, with all but one re-gaining lost lines post-TCAT. Post-TCAT safety: 1 eye lost 1 line, 29 eyes same or gained lines. Cylinder improved significantly post-TCAT (-0.83±0.69 vs. -0.19±0.33 D, p=0.001). 100% of eyes reported subjective improvement in symptoms.

Conclusions TCAT normalized topographic irregularities resulting in improved outcomes of accuracy, efficacy, and safety, as well as subjective complaints in both small OZs and decentered ablations.

RETINA 3-MACULAR DISEASE

THURSDAY 28 JUNE

Paper #139
Choroidal Neovascular Membrane Recurrence Rate in Wet AMD Patients Stable on Three Month Ranibizumab Dosing

Mark A. Mandell, Michael H. Brent

Purpose To determine the choroidal neovascular membrane recurrence rate in patients with wet age-related macular degeneration previously stable on every three months Ranibizumab dosing (treat-and-extend regimen), who begin a period of observation.

Study Design Prospective, single centre, clinical, randomized controlled trial.

Methods Study patients were those greater than 50 years of age, with primary or recurrent choroidal neovascularization secondary to age-related macular degeneration, who were previously stable on an ‘every three month' treatment regimen with Ranibizumab. Approximately 54 patients were randomly assigned 1:1 to two study groups. Patients in group 1 continued to receive Ranibizumab injections every 3 months, with follow-up assessments at each visit. Patients in group 2 did not receive futher Ranibizumab injections and were observed closely with monthly assessments. At each follow-up visit, patients underwent an ocular history and examination including Snellen visual acuity testing, dilated fundus examination and imaging with spectral-domain optical coherence tomography +/- intravenous flourescein angiography (performed at the discretion of the ophthalmologist to aid in management decisions). Six months of follow-up assessment were completed.

Results We will provide outcome results for approximately 54 patients with at least 6 months of follow-up data.

Conclusions We will indicate conclusions that may be drawn from this study.

RETINA 3-MACULAR DISEASE

THURSDAY 28 JUNE

Paper #140
Should paracenthesis be performed after intraocular Anti-VEGF injection?

Rani N. Al Karmi

Purpose Purpose: To measure the change in intraocular pressure (IOP) after intraocular Anti -vascular endothelia growth factor (Anti-VEGF) injection therapy.

Study Design Randomized clinical trial.Patients are not known to have glaucoma or being on anti-glaucoma medicine.

Methods Twelve patients (13 eyes) with wet type of Age -related macular degeneration were given the standard dose of intraocular Anti-VEGF of 0.05 ml at 3.5-4.0 mm from the temporal limbus of the affected eye. The IOP was recorded for all patients at base line, 5 and 20 minutes after the injection was administered.

Results So far, 12 patients were treated (13 eyes). 2 patients had Lucentis and 10 had Avastin. One patient had 2 injections of Avastin in the same eye. Baseline IOP ranged from 10 to 19mmHg (mean14.23 + 3.6).Range of IOP at 5 minutes after the injection was from 10 to 70mmHg (mean 36.23+ 19.01) and at 20 minutes was from 10 to 41mmHg (mean 20.61+8.44). Only 2 patients (16.6%) had their baseline IOP higher than their IOP 5 minutes after the injection. Average IOP climb from base line was 27.27mmHg and 8.81mmHg at 5 and 20 minutes after the injection respectively. Average IOP drop from 5 minutes measurement was 18.45mmHg (67.6% reduction).

Conclusions Significant IOP increase was observed in 84.4% of cases. However, the drop in IOP was quick in the first 20 minutes after the injection. These results support the need for anterior chamber paracenthesis as a prophylactic procedure , more importantly in patients with glaucoma and AMD.

RETINA 3-MACULAR DISEASE

THURSDAY 28 JUNE

Paper #141
Intravitreal Lucentis for the Treatment of AMD Related Pigment Epithelial Detachment

Yiannis Iordanous, AnneMarie Powell, Alexander Mao, Philip Hooper, Carol Schwartz, Peter Kertes, Thomas Sheidow

Purpose Exudative age-related macular degeneration (AMD) results in a significant and severe visual loss if left untreated. Despite numerous trials studying the effect of anti-VEGF agents on AMD, there is an absence of literature on clinical outcomes for pigment epithelial detachments (PED) as most previous AMD trials have excluded patients with lesions composed of primarily blood or PED. The purpose of this study is to determine the response of predominantly PED type lesions to intravitreal Lucentis, the current gold standard therapy in AMD treatment.

Study Design This was a non-blinded prospective study. Patients were selected from the practices of three retinal surgeons' between August 2008 and December 2010.

Methods Patients with predominantly fibrovascular PED type lesions (as classified on IVFA and OCT) secondary to AMD were eligible for inclusion. Patients received monthly intravitreal Lucentis injections for 6 months. At 6 months, patients were evaluated based on ETDRS visual acuity and OCT to determine response to Lucentis therapy. Patients not experiencing a visual improvement from baseline ETDRS acuity or not showing a reduction in the height of the fibrovascular PED were deemed Lucentis non-responders. These patients received no further Lucentis injections, but underwent re-evaluation at 12 months. Patients deemed responders continued with OCT-guided active treatment on an as-needed basis for an additional six months.

Results Thirty-one patients were enrolled in this study, with two being lost to follow-up. Twelve males and 17 females with a mean age of 79.3 years (range: 57-94) were included in this study. The baseline visual acuity for all patients was 63.3 +/- 12.8 letters, and at twelve months was 66 +/- 18.9 letters ($p= 0.45$). Twenty-three patients (79.3 percent) were deemed Lucentis responders. For these patients, the mean visual acuity at baseline was 65.7 +/- 12.6 letters, and improved to 71.9 +/- 11.7 letters at twelve months ($p<0.05$). Their average PED height (as measured by OCT) changed from 311.41 +/- 163.15 µm at baseline to 230.00 +/- 114.13µm at twelve months ($P <0.05$). Seven Lucentis responders (30 percent) had complete resolution of their PED by twelve months of treatment.

Conclusions Most patients with predominantly PED type lesions secondary to AMD responded to monthly intravitreal Lucentis therapy. Patients who had an initial response

to Lucentis had a significant improvement in visual acuity and PED size at twelve months of treatment. This suggests that monthly intravitreal Lucentis may serve an important role in the treatment of predominantly PED type lesions in AMD.

RETINA 3-MACULAR DISEASE

THURSDAY 28 JUNE

Paper #142
The use Of OCT and Autofluorescence in the diagnosis of early anti-malarial maculopathy

Mihael Easterbrook, Michael H. Brent

Purpose In 2011, the American Academy of Ophthalmology revised recommendations on screening for chloroquine and hydroxychloroquine retinopathy.The panel recommended baseline screening with one or more of thee tests, although the panel states that there are limited studies comparing sensitivity and specificity of these procedures to automated visual field testing

Study Design 20 patients with early retinopathy (bilateral relative reproducible scotomas), 9 patients with more advanced disease, (absolute scotomas) and 12 patients on hydroxychloroquine for 10 years plus without field defects were tested.

Methods All patients were examined-vision, colour vision (Ishihara), Humphrey 10-2 red and white automated threshold testing, OCT Zeiss and Heidelberg OCT and autofluorescence

Results Asymptomatic patients on hydroxychloroquine with normal fields had normal OCT's and autofluorescence. Patients with absolute scotomas showed loss of the inner/outer segments in all cases. 5 patients showed autofluorescence
The results in the early cases of retinopathy will be presented

Conclusions Whereas objective tests for antimalarial retinopathy confirm the diagnosis of macular toxicity in late cases, early retinopathy with relative scotomas by Humphrey visual field testing could not be confirmed in most patients by present objective testing by OCT and autofluorescence

RETINA 3-MACULAR DISEASE

THURSDAY 28 JUNE

Paper #143

The effect of repeated topical fluoroquinolone use post intravitreal injection for neovascular Age-related Macular Degeneration (AMD) on ocular surface flora

Vivian Yin, Daniel Weisbord, Ken Eng, Efrem Mandelcorn, Radha Kohly, Carol Schwartz, Wai-Ching Lam, Andrew Simor, Peter Kertes

Purpose To determine if repeated use of prophylactic topical fluoroquinolone post monthly intravitreal injections for AMD will change the antibiotic resistance profile of the ocular surface flora over time.

Study Design Prospective, multicenter, case-control study

Methods Patients 65 years and older with neovascular AMD undergoing treatment with monthly intravitreal injections of ranibizumab. Patients were excluded if they had active ocular or systemic infection, previously received intravitreal injections or were treated with topical or systemic antibiotics in the past three months. Patients were divided into two groups, those that received topical moxifloxacin for 3 days post injection (antibiotic group) and those that did not (no antibiotic group). Cotton tipped swabs of the inferior fornix were taken at baseline and at months 1, 2 and 3 prior to each injection. Samples were cultured and antibiotic sensitivity was recorded by MIC50 levels. The data was analyzed by multivariant regression for differences in antibiotic resistance.

Results Of 177 patients included in the study, 82 received antibiotics post injection and 93 did not. The mean age was 81 years. The culture positive rate at baseline was 28.0% in the antibiotic group and 14.5% in the no antibiotic group. In the antibiotic group, the culture positive rate increased monthly to 34.7% at month 1, 38.0% at month 2 and 41.8% at month 3. In the no antibiotic group, the culture positive rate was 22.2% at month 1, 8.8% at month 2 and 22.2% at month 3. The most common organism cultured was coagulase negative staphylococcus (75%) followed by diphtheroid (22.9%), staphylococcus aureus (6.3%) and streptococcus viridians (4.9%). In the antibiotic group, there was a significant change in MIC50 for moxifloxacin from 0.105 at baseline, to 0.549 at month 1, 0.184 at month 2 and 1.184 at month 3 ($p = 0.0106$). In the no antibiotic group, the MIC50 for moxifloxacin was 0.439 at baseline, 0.469 at month 1, 0.0052 at month 2 and 0.687 at month 3 ($p = 0.102$). There were no cases of endophthalmitis.

Conclusions Patients treated with repeated use of topical moxifloxacin post intravitreal ranibizumab showed a significant increase in antibiotic resistance of the ocular surface flora at 3 months compared to those not given prophylactic topical antibiotics.

RETINA 3-MACULAR DISEASE

THURSDAY 28 JUNE

Paper #144

A novel pre-clinical model mimics the clinical features of reticular drusen disease (RDD) and the junctional zone of advancing non-exudative age-related macular degeneration (AMD)

Shelley R. Boyd, Roxane J. Hillier, Xu Zhao, Hai Wang, Natalie Pankova

Purpose Advancing dry AMD is associated with hyperfluorescent fundus autofluorescence (FAF), particularly in the junctional zones. RDD is a unique entity amongst subtypes of dry AMD, found in up to 20% of patients, and is also associated with characteristic FAF change and high risk of progression. Presently, the pathogenesis of FAF and the associated optical coherence tomography (OCT) characteristics of dry AMD remains unknown. We therefore sought to develop and characterize, using in vivo multimodal imaging, a rodent model of dry AMD that mimics progressive dry AMD.

Study Design pre-clinical animal model

Methods FAF, near infra-red (NIR), red-free (RF) (Heidelberg Spectralis) and OCT (Bioptogen) were used to evaluate the en face and cross-sectional retinal change following systemic injection of an RPE toxin in Sprague Dawley rats. Data from over 100 animals were analysed over time, from 3 days to 4.5 months, and compared against published images of AMD disease. Tissue analysis using H&E was performed in a subset of animals.

Results Three phases of in vivo FAF change were observed. These were, (i) development of areas of isofluorescence with a hyperfluorescent FAF border, (ii) evolution of a reticular pattern of alternating hyper- and hypofluorescent FAF, and (iii) a reduction in the reticular signal leaving obvious active zones in the periphery. Patterns of FAF included scalloped rings, targets, halos, and "paw print" patterns. An inverse relationship was noted between FAF/NIR and RF images. OCT confirms outer retinal folds that conform to the curvilinear pattern detected on FAF. Inflammatory cells were found in the subretinal space.

Conclusions This study is the first to demonstrate a clinically relevant pattern of FAF in a rodent model of dry AMD, in particular the junctional or reticular drusenoid patterns of disease, patterns most closely associated with disease progression. These results provide a new powerful model for the study of novel therapies for this binding disease. Potential treatment options are under investigation.

RETINA 3-MACULAR DISEASE

THURSDAY 28 JUNE

Paper #145 - withdrawn

CORNEA: REFRACTIVE SURGERY SYMPOSIUM

FRIDAY 29 JUNE

Paper #146
What are the risks of corneal perforation after Corneal Crosslinking in Keratoconus?

Mayte Arino, Charlotte I. Wedge, Simon Holland, Martin McCarthy, Gregory Moloney, Valerie A. White, Alex Lange

Purpose To present the largest series of corneal perforation after collagen corneal crosslinking (CXL) in patients with progressive keratocones

Study Design Retrospective chart review

Methods 4 medical charts of corneal perforation in British Columbia and Ontario were reviewed. The correlation between the past medical history, the preoperative pachymetry and keratometry, the postoperative treatment and the corneal perforations were studied.

Results 3 of the 4 patients underwent penetrating keratoplasty and 1 patient was sealed with cyanoacrylate. The pachymetry was lower than 400 microns prior to the deepithelialazation in one of the patients. The maximum keratometry prior to the procedure was higher than 60 diopters in 2 of the patients. The final best corrected visual acuity improved in 2 patients including the patient that was sealed with cyanoacrylate.

Conclusions CXL with riboflavin and ultraviolet-A is a relatively new therapeutic approach to prevent progression of keratoconus. It is a safe procedure but not exempt of sight-threatening complications to be aware of. Following the standards previously described is recommended in order to prevent this type of outcome.

CORNEA: REFRACTIVE SURGERY SYMPOSIUM

FRIDAY 29 JUNE

Paper #147
Risks of cosmetic iris implantation.

John C. Lloyd, Jason Noble, Sherman Ho Yin Li

Purpose To present three year follow-up of a patient with cosmetic iris implants requiring explantation.

Study Design Case report.

Methods The chart of a 19 year old patient who underwent cosmetic iris implantation in Panama was reviewed. The iris implants were explanted at our facility at the patient's request. Three years of follow-up were reviewed. The literature regarding the complications of cosmetic iris implants was also reviewed. Surgical video of the removal of the iris implants will be presented.

Results Our patient has developed endothelial cell loss to less than 800 cells/sq.mm and elevated intraocular pressure from angle closure. Literature review confirms several other cases of similar complications and eventual corneal decompensation.

Conclusions Iris implants carry risks of major vision threatening complications and should not be used for cosmetic purposes.

PEDIATRICS: CLINICAL UPDATE

FRIDAY 29 JUNE

Paper #148
Website Update 2012-Pediatric and Adult Strabismus: An Online Information Resource

Michael Flanders

Purpose This educational Website is designed to teach principles of strabismus in a case-based, interactive fashion to ophthalmologists, orthoptists, neurologists and residents. It also demonstrates surgical techniques for the correction of strabismus using high resolution intraoperative audiovisual recordings. This Website was demonstrated at the CAPO subspecialty meeting at the COS in 2007, but the Site was extensively updated in 2011. The presentation will highlight these updates and emphasize their educational value.

Study Design The website and its navigation are displayed as an educational tool.

Methods Audiovisual and Website software used in construction of this interactive Website include Adobe Dreamweaver, Adobe Photoshop, Fireworks, and Camtasia. Case studies are constructed in stepwise fashion beginning with a history and proceeding with grids of eyes (and some videos), displaying misalignments and motility defects. The observer can assess each photograph before displaying the findings related to each image. The preoperative findings are followed by surgical and post-operative images and information. A relevant Powerpoint link is provided in most cases as well as a review of the strabismus abnormality presented. Surgical techniques and operations are included in the site.

Results Twenty-five additional case studies, video recordings of abnormal eye movements and powerpoint presentations relevant to individual case studies have been added to the Website. The added material includes many unusual cases of restrictive, paralytic and traumatic nature.

Conclusions This online educational Website on Strabismus offers an interesting and relevant addition to the educational tools available for the student of strabismus .

PEDIATRICS: CLINICAL UPDATE

FRIDAY 29 JUNE

Paper #149

The rare case of Optic nerve glioma with intraocular seeding in a child with Neurofibromatosis Type 1 (NF-1).

Vasudha Gupta, Kaitlyn Whelan, Kourosh Sabri

Purpose To report a case of rare intraocular seeding of an optic nerve glioma in a 3 year old child with Neurofibromatosis Type 1(NF-1).

Study Design The case report involved a patient chart review (consultations, imaging, genetic analysis, and follow-up) and review of literature.

Methods Case report and review of literature.

Results A 3 year old girl was diagnosed with Neurofibromatosis Type 1 (NF1) and referred for an ophthalmology examination. Her best corrected visual acuities (BCVA) were 20/40 in the right eye and <20/400 in the left eye. External ocular examination revealed left eye proptosis and grade II left relative afferent pupillary defect (RAPD). Slit lamp examination revealed iris Lisch nodules bilaterally. Fundoscopic examination of the left eye disclosed an elevated sub-retinal mass extending from the disc with associated sub-retinal fluid.
CT head showed a large mass extending from the disc with no evidence of calcification. A follow-up MRI was performed and the findings were in keeping with a large left optic nerve glioma and multiple cerebral hamartomas. A smaller low-grade right optic nerve glioma was also reported.
The patient was started on chemotherapy which consisted of weekly vinblastine over a period of 70 weeks.
She was seen by genetics and diagnosed with Neurofibromatosis- Noonan syndrome variant (NNS).Genetic testing identified a mutation c.3721C>T (p.Arg1241X) in the NF1 gene.
She continues to receive weekly chemotherapy, repeat brain imaging and ophthalmic follow up. At her most recent ocular examination (15 months post initial diagnosis of intraocular tumor), her best corrected visual acuities are no light perception left eye and 20/30 right eye. Fundoscopy shows a healthy disc and macula in the right eye, whilst the left optic nerve head has become pale and atrophic.

Conclusions The remarkable feature of our case is the rare intraocular seeding of the optic nerve glioma. To our knowledge only a handful of cases of optic nerve glioma with intraocular extension have been reported in the literature .We also emphasize the importance of prompt recognition, effective treatment and collaboration of healthcare providers in diagnosis and treatment of optic pathway gliomas for preventing visual deficits.

PEDIATRICS: CLINICAL UPDATE

FRIDAY 29 JUNE

Paper #150
An update on the Seminal Canadian Recommendations for Evidence based Examination of Neonates for ROP (SCREEN-ROP) Study

Kourosh Sabri, Sandesh Shivananda, Forough Farrokhyar, Kaitlyn Whelan, Wendy Seidlitz, Anna Ells, Shoo Lee, Canadian Neontal Network

Purpose Retinopathy of Prematurity (ROP) is a leading cause of preventable blindness and visual impairment in the developed world. There is currently no nationally accepted protocol for inclusion in a screening program or frequency of screening. Examination of the published literature reveals that, of the 2000 newborns that are screened nationally per year, < 10% require treatment for ROP. ROP screening is painful, stressful for parents, time consuming and causes an increased risk of morbidity.
The goal of our study is to formulate and implement the first ever evidence-based recommendations for ROP screening in Canada. The aim for these recommendations is to minimize the amount of screening and related morbidities whilst still ensuring that all those who develop severe disease needing treatment are captured.

Study Design This is a population-based, prospective study that will enroll all infants screened for ROP, treated for ROP and/or who have become visually impaired from ROP in Canada over a 24-month period. Data collection will involve all 30 level-3 NICUs in Canada, the Operating Room and PCCUs' databases at these centres, and the CNIB. Most information will be collected through collaboration with the Canadian Neonatal Network™.

Methods We are currently in the process of assigning local principal investigators and obtaining REB approvals for each of the participating hospitals. The 2-year study period will be divided into two 12-month phases. Phase 1 will involve data collection on all infants born in 2012, who are enrolled into ROP screening at level 3 NICUs in Canada. This data will be used to define new ROP screening guidelines. Phase 2 data collection will occur in the same manner as phase 1 on patients born in 2013. The phase 2 data will subsequently be used to validate the newly defined guidelines drawn up following analysis of phase 1 data.

Results We expect to be halfway through data collection by June 2012. At this point we will be able to determine the status of data collection and the progress of the study.

Conclusions It is anticipated that analysis using the identified risk factors will allow us to develop three risk models for the likelihood of a neonate developing severe ROP, and then formulate a different screening strategy for each risk group. This more detailed screening strategy will be sensitive to the overall risk for each neonate, allowing us to

minimize the number of examinations without missing any cases needing treatment. Extensive knowledge translation will subsequently occur to ensure the new screening guidelines are adopted.

PEDIATRICS: CLINICAL UPDATE

FRIDAY 29 JUNE

Paper #151
Change in vision as a result of chemotherapy in children with Optic Pathway Gliomas

Evan Kalin-Hajdu, Monia Marzouki, Jean-Claude Decarie, Anne-Sophie Carret, Albert Labrisseau, Linda Hershon, Ellen Freeman, Luis H. Ospina

Purpose The main goal of this study is to determine the utility of chemotherapy in preserving vision in children diagnosed with Optic Pathway Gliomas (OPGs). OPGs represent roughly 5% of all pediatric cerebral tumors and 65% of all optic pathway tumors. Despite the fact that chemotherapy has become the primary therapeutic option in pediatric OPGs, there is a lack of well-documented outcome studies analyzing the effect chemotherapy has on vision in children with OPGs.

Study Design This project is a retrospective study.

Methods A retrospective analysis was done on all patients seen at Montreal's Sainte-Justine Pediatric Ophthalmology clinic, between 1991 and 2007, who were treated with chemotherapy for an OPG. Patients who received radiation therapy or gross surgical resection prior to chemotherapy were excluded.

Results Of the 17 children studied, 41% were Neurofibromatosis-1 (NF1) positive and 59% NF1 negative. Mean age at OPG diagnosis was 2.62 years. Mean age at the start of chemotherapy was 3.24 years. Mean follow-up time of survivors from the start of chemotherapy was 8.16 ± 4.69 years and the mean age at LKFU was 11.88 ± 4.36 years. Three patients (18%) died as a result of their OPG. Chemotherapy was initiated due to radiologic deterioration in a clinically stable child in 24% of cases, solely due to ophthalmologic signs and symptoms in 24% of cases and due to a combination of factors (radiologic, neurologic, ophthalmologic, general health decline) in 52% of cases. The most common chemotherapy regime was Carboplatin+Vincristine, followed by Carboplatin alone, Cyclophosphamide alone and then Carboplatin+Vinblastine. Disease progression after the first chemotherapy regimen occurred in 76.4% of cases at a mean time of 1.96 years. Radiation therapy was required after chemotherapy in 47% of cases at a mean age of 6.79 years. Prior to chemotherapy, vision in both the best and worst eye was highly variable; ranging from 20/20 to NLP. When compared to just before chemotherapy, visual acuity just after chemotherapy improved in 5.9% of eyes,

remained stable in 64.7% of eyes and decreased in 29.4% of eyes. Visual acuity did not significantly change from the end of chemotherapy to last known follow-up.

Conclusions Chemotherapy is minimally effective at preserving vision in children suffering from OPGs. Disease progression, at times many years following chemotherapy, occurs in the majority of cases and a significant number of children eventually require radiation therapy.

PEDIATRICS: CLINICAL UPDATE

FRIDAY 29 JUNE

Paper #152
A New Presentation of Cherry Red Spot in Infant Botulism

Naveen Mysore, Sheila Huang, Ayesha Khan, Robert K. Koenekoop

Purpose Clostridium botulinum is a ubiquitous spore forming gram positive anaerobic bacilli. The ingested spores germinate in the intestine, and subsequently, the bacilli can produce a neurotoxin, which binds irreversibly to presynaptic cholinergic receptors inhibiting the release of the acetylcholine. Infants can present with global weakness, poor feeding, constipation and respiratory failure. We describe a unique presentation of a retinal "cherry red spot" in a neonate with botulism and its resolution with treatment.

Study Design Case Report

Methods A seven-day-old baby boy, born at 37 weeks, presented to the emergency room with a three-day history of constipation and recent onset of difficulty to arouse, weakness and perioral pallor. The pregnancy and delivery was uneventful and he had been bottle-fed since birth. He was immediately intubated due to poor respiratory effort. In the intensive care unit, his pupils became fixed and dilated.

Results Imaging did not reveal intracranial hemorrhage and septic workup was negative. The patient continued to deteriorate over the next four days with diffuse hypotonia, loss of spontaneous movement, and reflexes. Electromyography was not specific for botulism. In addition to the pupils, a fundus exam revealed a "cherry red spot" bilaterally. A genetics workup was negative. The patient was treated with botulin intravenous immunoglobulin (IVIG). After two days of treatment, the patient was extubated, spontaneously moving all his limbs and the pupils were reactive. Botulinum toxin was isolated from the stool. We saw the patient at twenty-first day of life and the "cherry red spot" had resolved.

Conclusions "Cherry red spot" is an ophthalmological finding due to edema or buildup of storage products in the layers of the retina. Its differential diagnosis includes metabolic storage diseases (e.g., Tay-Sach's, Sandhoff's, Mucopolysacharides,

Neimann-Pick, Gaucher disease, GM1 Gangliosidosis), central retinal artery occlusion, quinine or dapsone toxicity and carbon monoxide or methanol poisoning. A review of the literature showed that this is the first case of "cherry red spot" and infant botulism. Acetylcholine receptors are found in amacrine cells and acetylcholine can modulate the firing of ganglion cells. We hypothesize that the neurotoxin could cause a slowing of neuronal transport, resulting in edema and decreased retinal transparency. Also, the dilated pupils were due to decreased parasympathetic tone secondary to decreased acetylcholine release. With IVIG treatment, we saw that pupils became reactive, and resolution of the cherry red spot as the retinal circuitry was restored to normal function. We recommend an ophthalmological exam in all cases of botulism.

PEDIATRICS: CLINICAL UPDATE

FRIDAY 29 JUNE

Paper #153
Utilization of anti-VEGF agents in retinopathy of prematurity (ROP): Results of a North American survey

Kamiar Mireskandari, Megan E. Collins, Nasrin N. Tehrani

Purpose Anti-vascular endothelial growth factor (VEGF) agents represent a promising new treatment option for ROP. Currently there are no guidelines on how to educate or consent parents for the use of these agents. We aimed to provide recommendations for the informed consent process based on survey information from the ROP community.

Study Design We developed a web-based survey for ROP practitioners in the United States and Canada to obtain information about using anti-VEGF agents in their ROP practice, details of the administration protocol and how they were addressing consent and parental education.

Methods The survey was distributed to 2479 pediatric ophthalmologists and vitreoretinal specialists. Approximately 20% of ophthalmologists manage ROP and we anticipated a proportional response rate. Those who acknowledged participation in the screening and/or treatment of ROP were annonymously surveyed regarding their clinical experience with anti-VEGF agents, as well as their institutional guidelines for using anti-VEGF in children and the consent process.

Results A total of 212 respondents (125 pediatric ophthalmologists and 87 vitreoretinal specialists) completed the survey. Anti-VEGF agents were used by 35.8% of respondents, with the majority (72.5%) reporting experience in less than 5 eyes. Most practitioners had used anti-VEGF agents as first line treatment in select cases as determined by the severity of ROP or patient considerations, i.e. medically unstable or diffcult view and 28.9% reported having a treatment failure or recurrence after using

anti-VEGF agents. The majority of respondents (77.6%) did not have an institional policy for the use of anti-VEGF agents in ROP. The four elements most frequently included in the consent process were its off-label status (83%), unknown long-term data (80%) with anti-VEGF agents in children, personal experience with anti-VEGF (57%) and published data from the BEAT-ROP study (53%). Pediatric ophthalmologists divulged more information whilst consenting compared to retina specialists.

Conclusions This is the first large-scale survey to report on the current use of anti-VEGF to treat ROP. Only a few institutions had guidelines regarding the use of anti-VEGF in ROP. Based on the survey results, we have developed consent and educational guidelines that may be utilized by ROP practitioners.

PEDIATRICS: CLINICAL UPDATE

FRIDAY 29 JUNE

Paper #154 - withdrawn

VISION REHABILITATION

FRIDAY 29 JUNE

Paper #155
Chromatic Potential Visual Acuity in patients with age-related macular degeneration

Stephen Dorrepaal, Samuel Markowitz

Purpose To compare chromatic and achromatic potential visual acuity in patients with bilateral low vision due to age-related macular degeneration (AMD).

Study Design Prospective, nonrandomized, observational case series.

Methods Fifty-five patients, representing a consecutive series of patients all presenting with bilateral AMD and visual acuity of 0.4 logMAR (20/50) or worse in both eyes were included. Best-corrected visual acuity of each eye was measured using an Early Treatment in Diabetic Retinopathy Study (ETDRS) chart with appropriate near correction. Achromatic and chromatic potential visual acuity were measured in each eye using white on black and red on yellow flooding E charts at 50cm in controlled lighting conditions.

Results One hundred and seven eyes from 55 patients were included in the analysis. Mean achromatic and chromatic potential visual acuity were 0.69 ± 0.26 logMAR, and 0.65 ± 0.22 logMAR respectively. Overall, patients had a significantly higher chromatic than achromatic PVA with a median difference of 0.1 logMAR, ($p<0.05$). Patients with ETDRS visual acuity worse than 0.9 logMAR also had a significantly higher chromatic than achromatic PVA, with a median difference of 0.1 logMAR ($p<0.05$). Patients with ETDRS visual acuity between 0.4 and 0.9 logMAR had a trend towards a higher chromatic than achromatic visual acuity that was not significant, with a median difference of 0.1 logMAR ($p = 0.8539$).

Conclusions Patients with low vision due to AMD can discern smaller targets when a red on yellow colour scheme is used than when using traditional white on black charts.

VISION REHABILITATION

FRIDAY 29 JUNE

Paper #156
Effect of font on reading with age-related macular degeneration

Luminita Tarita-Nistor, Dianne Lam, Michael H. Brent, Martin J. Steinbach, Esther G. Gonzalez

Purpose This study examined the reading performance of patients with age-related macular degeneration (AMD) using four available fonts that were either mono spaced or proportionally spaced, with serifs or sans serifs.

Study Design Cross-sectional study

Methods Reading performance [reading acuity, critical print size (CPS), and maximum reading speed] was measured for 24 patients with bilateral AMD, using four versions of the MNRead charts. These charts were printed in the following fonts: Times New Roman (serif, proportionally spaced), Arial (sans serif, proportionally spaced), Courier (serif, mono spaced), and Andale Mono (sans serif, mono spaced).

Results Reading acuity was significantly better on the Courier chart (.58 ± .21 logMAR) and significantly worse on the Arial chart (.69 ± .20 logMAR) than on any of the other charts ($p < .05$). A larger proportion of patients were able to read one or more sentences on the Courier chart than on any of the other charts. However, font had no effect at larger print sizes: there was no difference in maximum reading speed with the four fonts, and differences in CPS failed to reach significance ($p = .052$).

Conclusions Font has an effect on the reading performance of patients with AMD at print sizes close to their reading acuity, but not at larger sizes. Courier was the most advantageous and Arial the worst font for reading print at the patients' acuity limit.

CORNEA-UPDATE ON CORNEA MEDICAL

FRIDAY 29 JUNE

Paper #157
A comparison between anterior segment optical coherence tomography and ultrasound biomicroscopy in the imaging of amelanotic iris lesions.

Ronaldo Santiago, Hatem Krema, Jose Efren Gonzalez-Monroy, Charles J. Pavlin

Purpose Since light energy in Optical Coherence Tomography (OCT) has limited penetration potential to visualize melanotic lesions, we compare the imaging quality between Anterior Segment OCT (AS-OCT) and Ultrasound Biomicroscopy (UBM) in amelanotic iris lesions.

Study Design Retrospective observational case series

Methods Electronic chart and images of all consecutive patients with amelanotic iris tumours who underwent simultaneous UBM and AS-OCT, between June 2008 and November 2011 were reviewed. In all patients iris lesions were imaged with Zeiss© Spectral- domain OCT and Paradigm© prototype UBM machine. Comparison included tumour imaging definition at: anterior margin, , margin at the iris root, posterior margin internal echogenicity, ciliary body component of the iridociliary lesions. Measurement of tumour height was performed using the built-in electronic calliper of UBM.

Results Thirty eyes of 30 patients with amelanotic iris tumours met the inclusion criteria. Iris colours were varying degrees of blue in all patients. Thirteen (43%) of the lesions were entirely amelanotic while 17 (56%) showed areas of partial pigmentation. On comparison of definition of tumour margins (UBM vs AS-OCT) showed that both techniques were equivalent in clearly defining anterior lesion margin (100%). The iris root tumour border could be better delineated from the iris root and angle structures with UBM (86% vs. 70% respectively). Posterior lesion margins were poorly delineated with OCT in all lesions thicker than 1.2 mm (25%). Internal echogenicity of the lesions (stroma, blood vessels, cystic changes) were better defined with UBM than AS-OCT (100 % vs. 40% respectively). One patient showed ciliary body component that could be defined with UBM and was not visible with AS-OCT. Overall Image quality was considered informative with UBM in 90%versus 40% with AS-OCT.

Conclusions UBM provides overall better visualization in amelanotic iris lesions. Although AS-OCT provides a non-contact method for imaging iris lesions, yet it does not provide reliable definition of the posterior margin of an amelanotic lesion or resolution of its internal structures, if the lesions >1.2mm in height, located at iris root, or extends to ciliary body.

CORNEA-UPDATE ON CORNEA MEDICAL

FRIDAY 29 JUNE

Paper #158
Surgical technique and outcome of partial iris cerclage in patients with atonic pupils

Toby Chan, Ike Ahmed

Purpose Suture pupilloplasty is often indicated in patients suffering from an enlarged atonic pupil with significant photophobia or cosmesis concerns. Our objective is to report and discuss our technique of partial iris cerclage, as well as review the post-operative results.

Study Design Small retrospective interventional case series.

Methods Consecutive patients who received partial iris cerclage for atonic pupils between July to December 2011 were included. Pre-operative and post-operative pupil size and slit lamp photos are examined. Surgical videos are reviewed.

Results Two patients who received partial iris cerclage were identified. Patient #1 had an atonic 6 mm pupil after blunt trauma with a golf ball. Photophobia was minimal but patient was concerned regarding the asymmetric appearance compared to the opposite eye. Using micro-forceps, partial cerclage was performed using a 10-0 polypropylene suture weaving through the inferior pupil margin in a purse-string manner. Knots were tied in the anterior chamber using a microtying forceps. Post-operatively, a 3mm central round pupil was achieved and patient was satisfied with the cosmetic results. Patient #2 had a 7 mm atonic pupil resulting from a previous intraocular pressure spike related to uveitic glaucoma. Severe photophobia was reported by patient (Grade 4 out of 4). Due to the friable iris tissue inferiorly, there was insufficient tissue to achieve a full pupil cerclage, and there was concerns of a peaked pupil result or cheese-wiring of iris tissue with only simple interrupted sutures. Partial cerclage was performed using the technique described above to the inferior pupil margin, combined with 2 interrupted sutures superiorly. Post-operatively, pupil size was 4 mm, and subjective photophobia was completely resolved (Grade 0 out of 4). No acute surgical complication was noted in both cases.

Conclusions Partial iris cerclage technique is particularly useful in cases where the atonic pupil is ectopic towards one side, or when insufficient iris tissue is available for a full cerclage. It has the following potential advantages: 1) achieving an evenly distributed closure rather than using a single interrupted suture, which may result in a peaked pupil. 2) Compared to a 360 degree complete pupil cerclage, it preserves some unsutured parts of pupil for mydriatic function in the future. 3) It can be reversible by

laser suture lysis. We propose this partial iris cerclage as an effective technique in reducing pupil size and resolving photophobia from atonic dilated pupils.

CORNEA-UPDATE ON CORNEA MEDICAL

FRIDAY 29 JUNE

Paper #159 - withdrawn

CORNEA-UPDATE ON CORNEA MEDICAL

FRIDAY 29 JUNE

Paper #160
Trends in Bacterial Keratitis in Toronto: An 11 Year Review.

Alejandro Lichtinger, Sonia Yeung, Peter Kim, Alfonso Iovieno, Uri Elbaz, Judy Y. Ku, Rachel Wolff, Jackie Slomovic, David S. Rootman, Allan R. Slomovic

Purpose To review the incidence and distribution of bacterial keratitis in Toronto, and to examine any changing trends in corneal isolates and their susceptibility to common antimicrobials during the last 11 years.

Study Design Retrospective Database review.

Methods All patients with suspected bacterial keratitis that underwent a diagnostic corneal scrape and cultures from 2000-2010 were included in the study. Culture results and antibiotic sensitivity tests were reviewed and analyzed.

Results A total of 1701 corneal scraping in 1413 patients were taken. The average number of corneal scraping per year was 154.6. A pathogen was recovered in 977 (57.4%) samples, with bacterial keratitis accounting for 897 of the positive cultures (91.8%). The total number of gram-positive and gram-negative isolates was 684 and 213 respectively (odds ratio 3.2). We identified a decreasing trend in gram-positive isolates (p= 0.0165). The most common isolate overall was Coagulase negative Staphylococcus (CNS) and the most common Gram-negative bacteria isolated was Pseudomonas aeruginosa. Methicillin resistant staphylococcus aureus (MRSA) was present in 1.3% of the Staphylococcus aureus isolates while Methicillin resistant Coagulase negative staphylococcus (MRCNS) was present in 43.1% of the (CNS) isolates. A non statistically significant increase in the percentage of Methicillin resistant isolates was found, increasing from 28% during the first 4 years to 38.8% during the last 3 years of the study (p= 0.1336). When analyzing the sensitivities of MRSA and

MRCNS isolates to other antibiotics, we found 100% resistance to Cefazolin and 100% sensitivity to Vancomycin, while resistance to other antibiotics was variable.

Conclusions Bacterial keratitis is the most common cause of infectious keratitis in Toronto. We documented a decreasing trend in the percentage of Gram-positive microorganisms recovered over the years with an increasing trend in the percentage of gram-negative microorganisms. The sensitivity of Gram-negative isolates to tested antimicrobials was excellent with over 97% response with reported antibiotics; This was not the case for Gram-positive isolates in which resistance to the different antibiotics was more common. Methicillin resistant organisms accounted for 29.1% of all Gram-positive cultures in our series, suggesting that the empiric use of Vancomycin in the setting of severe suspected bacterial keratitis may be justified.

CORNEA-UPDATE ON CORNEA MEDICAL

FRIDAY 29 JUNE

Paper #161
Epidemiology of infectious corneal ulcers in Vancouver, British Columbia: The 2007-2011 report

Andrea L. Butler, Sachiko Sasaki, Diane Roscoe, Peter Tilley, Martin McCarthy, David F. Rollins, Sonia Yeung, Francis C. Law, Christopher J. Lyons, Simon Holland

Purpose To study the epidemiology of cultured infectious corneal ulcers in Vancouver, BC, Canada. To identify the distribution and current trends of risk factors, microorganisms, and treatment outcomes of corneal ulcers identified and cultured at two sites: Vancouver General Hospital Eye Care Centre and BC Children's Hospital.

Study Design Multicentre, retrospective, observational case series. Ethics approval for this study was obtained from the University of British Columbia Research Ethics Board.

Methods Predetermined search terms were entered into the electronic microbiology databases of the two named centres to create a cohort of patients that had undergone corneal scrapings for ulcers from January 2007 to April 2011. All specimens were plated on culture media. Growth of microorganisms (bacterial, fungal, and parasitic) were identified, and sensitivities were performed. Clinical charts were then reviewed to identify associated risk factors and management. Treatment outcomes, as defined by response to medical therapy and need for surgical management, were assessed.

Results 173 patients were identified through the Vancouver General Hospital microbiology database search, and 5 through the BC Children's Hospital search, then confirmed as having clinical corneal ulcers by chart review. Positive culture results in

the Vancouver General Hospital Eye Care Centre population were most commonly Gram positive bacteria, followed by Gram negative bacteria, then fungi, and finally parasites. A single culture result was positive in the BC Children's Hospital site population (H. influenzae). Potential risk factors were: poorly controlled underlying ocular surface disease, namely blepharokeratoconjunctivitis; contact-lens wear; trauma with subsequent recurrent corneal erosion syndrome; prior ocular surgery; and immunocompromised status. A total of 51 eyes at the Vancouver General Hospital Eye Care Centre site underwent surgical management for either therapeutic or symptomatic reasons. None of the patients at the BC Children's Hospital underwent surgical management.

Conclusions Infectious corneal ulcers continue to be an important cause of morbidity and visual loss in a large Canadian city. Of adult patients, 29.48% required surgical intervention. The main potential risk factor for pediatric patients was ocular surface disease, while a variety were identified for adult patients. It is imperative to appreciate common risk factors in order to effectively counsel patients who are at risk for developing an ulcer. It is also helpful in triaging referrals and creating appropriate follow-up plans for acute ulcers. If managed promptly and appropriately, the visual potential of an affected eye can be promising.

CORNEA-UPDATE ON CORNEA MEDICAL

FRIDAY 29 JUNE

Paper #162
Boston keratoprosthesis type 1: Microbial colonization and antibacterial resistance

Marie-Claude Robert, Elie P. Eid, Pierre Saint-Antoine, Mona Harissi-Dagher

Purpose While the overall prognosis following Boston Keratoprosthesis type 1 (KPro) surgery has improved over the last decade, eyes with KPro remain vulnerable to severe ocular infections such as bacterial keratitis and endophthalmitis. Because of the presence of a KPro-donor cornea interface, this risk is life-long. The chronic use of topical antibiotic prophylaxis may also promote the growth of aggressive and resistant organisms. The purpose of this study is to characterize the bacterial and fungal flora colonizing the ocular surface of patients with a KPro and to determine the prevalence of resistance to antibiotics.

Study Design Prospective non-randomized comparative study

Methods Twenty-five eyes with KPro were recruited from the Centre Hospitalier de l'Université de Montréal (CHUM) cornea subspecialty clinic. Twenty-five eyes with PKP and 25 normal eyes were included as age-matched controls. After stopping topical

antibiotics for 24 hours, the inferior conjunctiva was sampled using calcium alginate swabs and cultures on blood, chocolate, MacConkey and Sabouraud agar as well as thioglyocalate broth were performed. Colonies were identified in subcultures using typical protocols and antibiograms were obtained. Patients also completed a questionnaire to assess observance to antibiotic prophylaxis.

Results Bacterial cultures were positive in 65% (95% confidence interval [CI] 41-84%) of KPro eyes, 88% (CI 47-99%) of PKP eyes and 82% (CI 56-95%) of normal eyes ($\chi 2=0.33$). Fungal cultures were negative in all cases. The most common isolates were Staphylococcus epidermidis, other coagulase-negative Staphylococci and Corynebacterium species. Staphyloccocus epidermidis was found in 60% of KPro eyes, 38% of PKP eyes and 59% of normals ($\chi 2=0.53$). Other coagulase-negative Staphylococci species were found in 30% of KPro eyes, 63% of PKP eyes and 41% of normals ($\chi 2=0.28$). Corynebacterium species were found in 5% of KPro eyes, 13% of PKP eyes and 12% of normal eyes ($\chi 2=0.71$). Staphylococcus aureus (12%) and Streptococcus viridans were found in 12% ($\chi 2=0.28$) and 6% ($\chi 2=0.43$) of normal eyes. Coagulase-negative Staphylococci resistant to fourth generation fluoroquinolones were found in 50% (CI 30-70%) of eyes with KPro, 13% (CI 1-53%) of eyes with PKP and 12% (CI 2-38%) of normal eyes ($\chi 2=0.02$).

Conclusions Eyes with KPro were as likely to yield positive cultures than eyes with PKP or normal eyes. Eyes with KPro were more likely to be colonized with fluoroquinolone-resistant coagulase-negative Staphylococci. Chronic prophylaxis with low-dose fluoroquinolones is probably responsible for this increased antibiotic resistance. Modifications in the prophylaxis regimen may be helpful in preventing further emergence of resistant pathogens.

CORNEA-UPDATE ON CORNEA MEDICAL

FRIDAY 29 JUNE

Paper #163
Long-term Follow-up Of Implanted Boston Type I Keratoprosthesis And Angle Structural Changes Using Anterior Segment Optical Coherence Tomography

Cynthia X. Qian, Salima I. Hassanaly, Mona Harissi-Dagher

Purpose The need to better visualize the assembled Boston Keratoprosthesis (KPro) postoperatively is becoming increasingly pertinent, particularly in the detection of glaucoma, a frequent complication and the most common cause of progressive secondary visual loss despite surgical and optical success. We undertook this study to evaluate the role of anterior segment optical coherence tomography (OCT) as a standardized method of imaging the KPro postoperatively.

Study Design Prospective interventional case series

Methods We followed up 20 patients over a mean of 13.3 months (range 9 months-19 months). A thorough review of the patients' ophthalmic, glaucoma, surgical and medication history was performed. After aphakic KPro implantation, the patients were imaged following an imaging protocol that allowed juxtaposition and comparison of the same imaging coordinates obtained pre-operatively and at 3 months, 6 months and 12 months post-operatively. The results were compared to the clinical progress.

Results 14 patients improved clinically after surgery, two remained stable and four patients deteriorated. The average pre-op VA for patients was 1.91 ±0.47. Post-operatively, VA improved and achieved an average best VA around 3 months of 0.71 ±0.36 ($p<0.0001$) before settling at an intermediate level ($P=0.0001$). Of the patients who deteriorated, one progressed to terminal glaucoma and three experienced severe hypotony. No imaging characteristics predicting predispositions to these complications were identifiable upon review of serial OCTs. 14/20 patients were already known to have glaucoma pre-op. OCT imaging detected de novo anterior chamber narrowing and synechial changes in 10/20 patients. This compares to 5 diagnoses of glaucoma progression based on clinical investigation alone. Only two glaucoma progressions were corroborated using both clinical and imaging methods. Thus, in 8 patients, imaging data on angle changes preceded clinical glaucoma progression. Synechial and angle closure changes occurred most frequently in the 0-180 degree axis on OCT imaging.

Conclusions Our study suggests that use of anterior segment OCT postoperatively is useful in complementing tools already implemented for glaucoma investigation, doubling the number of glaucoma progression cases picked up before clinically detectable deterioration. The pattern of synechiae location along the horizontal poles adjacent to the graft is striking. If correlated with the shape and position of KPro grafts within the host-graft interface, this may dictate a major impact on future changes in the design, sizing and fit of the Boston KPro.

NEURO-OPHTHALMOLOGY-1

FRIDAY 29 JUNE

Paper #164
What clinical, imaging and surgical characteristics may predict visual function following resection of anterior visual pathway meningiomas?

Nataly Pesin, Edward Margolin, Edward Kassel, Daniel Mandell, Jonathan Trobe, Hilary Grabe

Purpose Suprasellar meningiomas represent approximately 3-10% of intracranial meningiomas. Patients may present with a decline in visual acuity and/or a visual field deficit, however such symptoms are often present for a year or more prior to diagnosis. Management of these tumors often involves surgical excision. Although no consistent predictors of visual recovery following surgery have been noted in prior studies, the duration of symptoms and tumor size are two characteristics that have been documented to predict better visual outcomes following surgery in some studies. Unfortunately, previous reviews have minimal detail of pre-and post-op ophthalmic examinations, and of imaging studies. Additionally, the prognosis varies widely between various studies, with some authors stating that the outcomes following surgery are not better than the natural history of these meningiomas, and others noting visual improvement in 40-65% of patients undergoing excision. The number of patients whose visual function worsens following surgery also varies among reports, from none to 40%. The objective of this study was to investigate, in detail, the predictors of visual function following resection of suprasellar meningiomas.

Study Design A retrospective review of patients that have undergone surgical excision of suprasellar meningiomas from 2006-2011 and have had documented pre- and post-op neuro-ophthalmic examinations was conducted.
This was a multicentred study involving patients from the University of Toronto and the University of Michigan.
A total of 20 patients were included in the review. All neuroradiology images of patients in Toronto and Michigan were reviewed by the same neuroradiologists in both cities to avoid inter-observer differences.

Methods The following clinical, radiological, and surgical information was collected and analyzed for each patient to determine which factors significantly predicted the likelihood of visual improvement at 6 months following surgical excision: A) clinical characteristics including age, gender, duration of symptoms, visual acuity, presence of afferent pupillary defect, humphrey visual field mean deviation, presence of disc pallor; B) imaging characteristics including size, location, relation to optic nerve, presence of optic nerve displacement, meningiomas in the optic canal, signal characteristics, grade of degree of enhancement on a scale of 1-5, relation to vasculature; and C) surgical characteristics including intraoperative features, consistency of the tumor, percentage of

tumor resected, relation to vasculature and surgical complications.
Results were analyzed to determine which clinical, imaging and surgical characteristics could predict visual function following resection of anterior visual pathway meningiomas.

Results To be announced.

Conclusions To be announced.

NEURO-OPHTHALMOLOGY-1

FRIDAY 29 JUNE

Paper #165
Retinotopic Organization of the Visual Cortex Before and After Decompression of the Optic Chiasm in a Patient with Pituitary Macroadenoma

David A. Nicolle

Purpose To optimize the clinical management and surgical decisionmaking of patients with pituitary tumors, we need a better understanding of the relationship between the effects of compression on neural activity in the visual cortex and the decline, and eventual recovery,
of visual function.

Study Design Using fMRI, we mapped the retinotopic organization of the visual cortex in a 68-year-old righthanded woman before and three months after her surgery for a recurrent pituitary macroadenoma.

Methods Similar to standard retinotopic procedures for polar mapping, the stimulus consisted of a high-contrast checkerboard wedge back-projected on a screen located at the back of the bore of the fMRI scanner. The display was viewed by means of a mirror. During fMRI scanning, one eye
was always patched and each eye was tested separately.We used functional magnetic resonance imaging (fMRI) to map the retinotopic organization of the visual cortex in a 68-year-old righthanded woman before and three months after her surgery for a recurrent pituitary macroadenoma.

Results We show that fMRI charted the recruitment of the visual cortex after decompression of the optic chiasm in a
way that matched gains in visual-field perimetry.

Conclusions On the basis of this case study, we propose that fMRI can chart neural plasticity of the visual cortex on an individual basis and that it can also serve as a complementary tool in decision making with respect to management of patients with chiasmal compression.

NEURO-OPHTHALMOLOGY-1

FRIDAY 29 JUNE

Paper #166
Using star-pattern scans with spectral-domain optical coherence tomography: a new approach to the evaluation of papilledema.

Mazen Choulakian, François Evoy

Purpose To assess papillary thickness (PT) of the optic nerve head (ONH) in patients with papilledema, using a spectral-domain optical coherence tomography (SD-OCT) star-pattern scan (SPS) acquisition protocol. Past studies have used peripapillary total retinal thickness (PRT) for ONH edema. We postulate that measurement of PT provides a more accurate baseline measure for diagnosis of papilledema.

Study Design A comparative case series.

Methods We studied 8 eyes from 4 patients with newly diagnosed papilledema and 8 eyes from 4 healthy subjects. PRT and PT were both evaluated with SD-OCT: for PRT we used a macular cube acquisition protocol centred on the optic disc, and for PT we used a SPS consisting of forty-eight radial slices through the ONH. PT was measured from the end of Bruch's membrane to the top of the ONH. Mean Thickness values were calculated in four quadrants and compared between them and with the control group.

Results For papilledema patients, mean PT were 647±87.7 µm, 441±83.7 µm, 609±104.7 µm and 614±92.8 µm for the superior (S), temporal (T), inferior (I) and nasal (N) quadrants, respectively. These PT values were significantly higher than PRT values in all quadrants (S: +75 µm, T: +65 µm, I: +82 µm, and N: +125 µm, P=0.012 - 0.036). When compared with the control group, PT was significantly higher in all four quadrants (average thickness: 577±120 µm vs 357±70 µm for control, P=0.001). The difference between PT and PRT values in the papilledema group vs the control group was significantly higher in the S (P=0.009), T (P=0.005), and N (P=0.001) quadrants; the inferior quadrant had a tendency towards statistical significance (P=0.074).

Conclusions PT measured with SD-OCT SPS acquisition protocol is significantly higher than PRT when compared with a control group. We speculate that PT is a more sensitive sign to monitor disease progression and response to treatment than PRT since it represents more accurately the clinical evaluation of papilledema. This is a pilot study to validate the measurement method of our future prospective studies that will compare the changes in PT and PRT during the evolution of papilledema.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #167

Refractive predictability of intraocular lens (IOL) power calculations in eyes with small anterior chamber depths and average axial lengths

Mikel Mikhail, Nir Shoham-Hazon, Garfield Miller, Devesh Varma, Ike Ahmed

Purpose To evaluate the predictability of IOL power calculation in eyes with anterior chamber depths (ACD) ≤ 3 mm and axial lengths (AL) > 20 mm

Study Design Retrospective chart review

Methods Retrospective review of 75 pseudophakic eyes of 73 patients. Holladay 1 formula was used for preoperative IOL calculation. All eyes underwent uncomplicated phacoemulsification with IOL implantation through temporal clear corneal incisions.

Results Mean preoperative ACD was 2.54 +/- 0.3 mm, mean AL was 22.8 +/- 1.5 mm, mean target refraction (TRx) was 0.25 +/- 0.59 D, mean spherical equivalent was -0.54 +/- 1.01 D and mean spherical deviation (SD) from TRx was 0.65 +/- 0.57 D. TRx and SE were positively correlated ($r=0.6$, $p<0.05$). There was no correlation between ACD or AL and SD from target. SD from target was greater in eyes with ACD ≤ 2.25 mm compared to ACD > 2.25 mm ($p=0.02$). The largest differences were found with TRx ≥ 2.0 D.

Conclusions There is a higher incidence of postoperative refractive surprises in eyes with small ACD. Small ACD can serve as a predictor of greater deviation from target refraction.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #168
Comparison between Three Types of Aspheric Toric IOLs for the Treatment of Astigmatism During Cataract Surgery

Nir Shoham-Hazon, Brian J. Chan, Amandeep S. Rai, Ike Ahmed

Purpose To compare visual outcomes, residual astigmatism and rotational stability in cataract patients treated with AcrySof IQ Toric, Rayner T-flex and Tecnis Toric Aspheric IOLs.

Study Design The study design is a retrospective chart review

Methods This single surgeon retrospective observational study analyzed baseline and postoperative uncorrected distance visual acuity (UCVA), astigmatism and IOL rotational stability

Results For the AcrySof IQ-Toric (n=16), Rayner T-flex (n=12) and Tecnis-Toric (n=10) mean UCVA in logmar improved significantly in all three groups to a logmar of 0.37 (p=0.01), 0.47 (p=0.02) and 0.36 (0.01) respectively. Meanwhile, mean corneal astigmatism was 1.37D, 3.8D and 1.51D at baseline and was reduced to a residual refractive astigmatism of 0.68D (p=0.007),1.77 (p=0.024) and 0.44 (p=0.08) respectively. Preoperative and postoperative IOL axes were similar. The mean for deviation from intended IOL axis was 2.9 degrees (p=0.26), 0.8 degrees (p=0.71) and 1.8 degrees (p=0.41) in the groups respectively.

Conclusions Aspheric toric IOL of all three groups significantly improved UCVA and astigmatism. All three IOLs showed rotational stability over time. There was no difference detected between the three types of intraocular lenses.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #169
Toric IOL in the setting of a posterior capsule tear.

Devesh Varma, Amandeep S. Rai, King Chow, Ike Ahmed

Purpose Toric intraocular lenses (IOL) are used for astigmatic correction during cataract surgery. Exact placement of the IOL is important, as rotated IOLs result in loss of correction, or potentially a net increase in astigmatism. Due to concern of IOL fixation and post-operative rotation, Toric IOLs are often avoided in the setting of a posterior capsule (PC) tear.

Study Design Small retrospective case series.

Methods We completed a retrospective chart review, reviewing patients' surgical videos and slit lamp photographs. All patients had a PC tear, 3 of which the surgeon was still able to place the IOL in the bag. In one case, a reverse optic capture of the IOL optic was performed. Demographic information was collected along with pre- and post-operative visual acuity, automated refraction, and intraocular pressure (IOP). We made note of the intraoperative axis that the IOL was implanted at, and the postoperative axis as determined by dilated slit lamp examination. Operative videos and postoperative slit lamp photographs will be shared.

Results We identified four patients with a mean age of 65.6 years who received a Toric IOL in the setting of an intraoperative posterior capsule tear. Patient 1 had an intraoperative axis of 165°, and was at 170° at the three weeks. Patients 2 and 3 had intraoperative axes of 95° and 10°, and remained at 95° and 10° at one week, respectively. Patient 4 had an intraoperative axis of 90° and remained at 90° at one month. There was no significant change in IOP, as it went from 14.5 to 14 ($p=0.81$). Uncorrected visual acuity improved from 20/70 to 20/40 ($p=0.26$).

Conclusions These early results suggest that it may be possible to attain good results with a Toric IOL in the setting of a posterior capsule tear.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #170
Study of visual function and self-reported outcomes after implantation of aspheric diffractive multifocal toric IOL

John F. Blaylock, Zhaomin Si, Sandi Aitchison, Chari Bosko, Cheryl Prescott

Purpose To evaluate visual function and patient self-reported outcomes after bilateral or unilateral implantation with the AcrySof® ReSTOR® Toric intraocular lens (IOL).

Study Design Prospective study

Methods This prospective study included 43 eyes of 23 consecutive patients with ≥0.50 diopters of preexisting corneal astigmatism and implantation of ReSTOR model SND1TT IOL for cataract surgery or refractive lensectomy, which were performed by one surgeon during Feb and May 2011. The corneal curvatures were obtained by manual keratometer. Manifest refraction, distance, intermediate and near visual acuity (VA) were measured at 1, 3, and 6 months postoperatively. Manual keratometry, axis meter of the biomicroscope and contrast sensitivity (CS) were performed and a questionnaire designed for multifocal IOL's was answered by patients 6 months postoperatively.

Results The mean (± SD) preoperative and postoperative corneal k-reading were 0.98 ± 0.41 D (range, 0.50 to 2.50 D) and 1.06 ± 0.81 D (range, 0.00 to 2.88 D), respectively. Six months postoperatively, the mean (± SD) spherical equivalent and cyl were +0.19 ± 0.34 and +0.54 ± 0.23 D, which was smaller than the preoperative corneal k-reading (P=0.0009). The mean uncorrected unilateral distance, intermediate and near VA were 20/22.8, 20/30.7 and 20/24.3, respectively. The mean (± SD) degree of axis misalignment was 3.00 ± 1.96 (range, 0 to 6) 6 months postoperatively. Postoperative CS function with best distance-corrected vision was within normal range under mesopic, mesopic glare or photopic condition. On a scale of 1 to 10, the mean satisfaction (± SD) was 8.56 ± 1.25. On a scale of 0 to 5 for vision problems or activity difficulty, the mean scores (± SD) between 0.10 and 0.99 (no to minimal) included halos, blurred near vision, near work, using a computer and driving in rain; the mean scores between 1.00 and 1.99 (minimal) included glare (1.80 ± 1.81), night vision (1.67 ± 1.58) and driving at night (1.33 ± 1.58). No mean scores were ≥ 2 (moderate to severe).

Conclusions The ReSTOR® Toric IOL significantly reduced cylinder refraction and provided excellent uncorrected distance, intermediate and near vision. Minimal problem on night vision existed.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #171
Predictability and optical analysis of three types of intraocular lenses.

Kailun Jiang, Guillermo Rocha

Purpose Innovations in modern cataract surgery present an assortment of choices for intraocular lens (IOL) selection. The purpose of this study was to compare the predictability and optical performance of three types of IOLs following cataract surgery.

Study Design Retrospective chart review from a single clinical setting.

Methods Otherwise healthy eyes undergoing cataract surgery with <1.00D of corneal astigmatism were examined. Uncorrected (UCVA) and best-corrected (BCVA) visual acuity, mean spherical equivalent (MSE), high order aberrations (HOA; iTrace, Tracey Technologies) and Strehl ratio were measured. Three IOLs were compared: spheric PMMA (LX10BD, n=11, 5.0 mm incision), aspheric hydrophilic acrylic (MI60, n=19, 1.8 mm incision) and aspheric hydrophilic acrylic (SofTec, n=32, 2.2 mm incision) at 6-weeks postoperatively.Data was analysed with the Kruskal-Wallis and Mann-Whitney tests. Significance was taken at $p<0.05$.

Results At 6-weeks, all eyes (n=62) improved in UCVA and BCVA. There was no statistically significant difference among the groups in terms of UCVA (PMMA 0.116±0.026 logMAR, MI60 0.229±0.050 logMAR, SofTec 0.158±0.033 logMAR, p=0.169), BCVA (PMMA -0.008±0.044 logMAR, MI60 0.043±0.051 logMAR, SofTec -0.022±0.018 logMAR, p=0.756), surgically induced corneal spherical aberration (PMMA -0.004±0.009 µm, MI60 -0.015±0.031 µm, SofTec -0.010±0.017 µm, p=0.222), HOA (Total p=0.622, Astigmatism p=0.691, Coma p=0.377, Spherical p=0.237, Secondary Astigmatism p=0.131, Trefoil p=0.613, Total High Order p=0.446), and Strehl ratio at 2 mm (PMMA 0.740±0.044, MI60 0.698±0.049, SofTec 0.712±0.035, p=0.9716) or 6 mm pupil diameter (PMMA 0.401±0.077, MI60 0.349±0.058, SofTec 0.329±0.043, p=0.774). Predictability of target vs. achieved based on MSE was superior for the SofTec (PMMA 0.387±0.114D, MI60 0.654±0.122D, SofTec 0.195±0.066D, p=0.003). Eyes implanted with MI60 were found to have significantly smaller pupils (PMMA 3.625±0.242 mm, MI60 2.868±0.152 mm, SofTec 3.281±0.103 mm, p=0.018) compared to the other groups. This difference may confound the results with respect to HOA.

Conclusions In the undilated eye, the three IOLs were comparable in terms of UCVA, BCVA, HOA, and Strehl ratio. The SofTec showed the highest predictability, possibly due to the smaller diopter steps (0.25D vs. 0.50D) available. In spite of the varying incision sizes, corneal spherical aberration did not differ significantly between groups. Based on literature, aspheric IOLs reduce HOA and increase contrast sensitivity. In this

study we utilized Strehl ratios to describe retinal image quality. Our data suggests that, clinically, aspheric IOLs performed similarly to spherical IOLs in the undilated eye. Weaknesses of this study include a small sample size and varying pupil diameters.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #172
Treatment of Astigmatism in Cataract Patients: Comparison Between Multifocal Toric Intraocular Lenses versus Multifocal Intraocular Lenses with Limbal Relaxing Incisions

Brian J. Chan, Nir Shoham-Hazon, Ike Ahmed

Purpose This study aims to compare the visual outcomes of patients undergoing cataract extraction with intraocular lens (IOL) insertion with either AcrySof IQ ReSTOR Multifocal Toric IOL (ReSTOR Toric) or AcrySof IQ ReSTOR Multifocal IOL with limbal relaxing incisions (ReSTOR LRI).

Study Design This is a retrospective consecutive case series study of a single surgeon.

Methods All IOL implantations were performed using an identical surgical technique. Pre and post-operative near and distant uncorrected visual acuity (UCVA) were assessed. Meanwhile, pre and post-operative astigmatism were assessed by IOL-Master and manifest refraction at 3 months follow-up.

Results There were 32 eyes (n=29) and 27 eyes (n=24) in the ReSTOR Toric and ReSTOR LRI groups respectively. Pre and post-operative near UCVA went from J16 to J2 for ReSTOR Toric and J12 to J2 for ReSTOR LRI. Pre and post-operative distant UCVA went from 20/150 to 20/40 for ReSTOR Toric and 20/80 to 20/30 for ReSTOR LRI. For ReSTOR Toric, pre-operative astigmatism went from 1.4D ± 0.1D to a residual 0.5D ± 0.1D. Meanwhile for ReSTOR LRI, pre-operative astigmatism went from 1.3D ± 0.1D to a residual of 0.8D ± 0.1D. Both ReSTOR Toric and ReSTOR LRI groups showed significant improvement in near and distant UCVA and were effective in reducing residual astigmatism ($p<0.001$). However, the ReSTOR Toric group was more predictable and effective at achieving minimal residual refractive cylinder compared to ReSTOR LRI ($p=0.007$).

Conclusions Both ReSTOR Toric and ReSTOR LRI are effective treatments for improving uncorrected near and distant visual acuity, and astigmatism in cataract patients. In our study, ReSTOR Toric was more predictable and effective at reducing residual refractive cylinder compared to ReSTOR LRI.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #173
Safety and efficacy of iris claw lens implantation

Amandeep S. Rai, Mahmoud Rateb, Vanessa Vera, Diamond Tam, Ike Ahmed

Purpose The objective of this retrospective chart review is to evaluate the visual outcomes and safety after secondary iris-claw lens implantation for aphakia or lens exchange, and also to determine potential complications. There is limited research previously completed on this topic.

Study Design The study design is a retrospective chart review.

Methods A retrospective chart review analyzing the records of adult patients who underwent secondary iris-claw Artisan lens implantation in our practice between February 2007 and May 2011, inclusive. Outcome measures were pre- and post-operative visual acuity (VA), intraocular pressure (IOP), manifest refraction, and endothelial cell count (ECC). Eyes requiring a combined glaucoma surgery and eyes with pre-existing retinal pathology were excluded.

Results Final analysis included 53 eyes of 51 patients, with a mean age of 62.9 years (±20.7), and mean follow-up of 247 days (± 170). The two most common indications for surgery were aphakia (43.4%) and subluxed intraocular lens (39.6%). Corrected visual acuity improved from 20/150 to 20/50 (p=0.003). Mean spherical equivalent improved from 1.46 (±6.56) to -1.33 (±1.22) (p=0.006). Mean intraocular pressure (IOP) reduced from 16.4mmHg (±5.1) to 14.5mmHg (±3.3) (p=0.028). Endothelial cell count was reduced from 1981cells/mm2 (±707) to 1655cells/mm2 (±654) (p=0.015), a mean decrease of 326cells/mm2, or 16.4%, from baseline. The most common postoperative complication was elevated IOP (26.4%), which was managed by glaucoma medications or anterior chamber paracentesis.

Conclusions Patients demonstrated a significant improvement in visual acuity and spherical equivalent. We noted a mean decrease of 16.4% in endothelial cells. This is the largest report comparing preoperative and postoperative endothelial cell counts in eyes undergoing Artisan lens implantation for aphakia or lens exchange. With a favourable safety and efficacy profile, and an endothelial cell decrease comparable to other techniques, the Artisan aphakic iris-claw lens is a good option for eyes without adequate capsular support.

REFRACTIVE CATARACT SURGERY

FRIDAY 29 JUNE

Paper #174
Novel Device for identifying visual axis in intraocular surgery

Christoph Kranemann, Marcelo Stevenson

Purpose To test the effectiveness of a novel device for the identification of the visual axis during intraocular surgery

Study Design It was a prospective randomized clinical trial.

Methods Patients were randomized to have the visual axis marked manually with a 3-pronged marker or to further have the visual axis verified during the procedure using a novel design of a fixation light during surgery. The latter was attached to the operating room microscope. The video images of the surgeries were analysed for centration and the visual axis/IOL alignment were checked postoperatively.

Results Apparent centration of the IOL on the visual axis was achieved in 90% of cases using the novel fixation light vs. 75% of cases with manual marking only ($p<.01$). In 42% the apparent visual axis was deviated from the centre of the pupil by more than 0.2 mm ($P<.03$).

Conclusions An intraoperative fixation light appears to improve the ability to centre the IOL on the apparent visual axis.

CORNEA-UPDATE ON SURGICAL CORNEA

FRIDAY 29 JUNE

Paper #175
Simultaneous Descemet Stripping Automated Endothelial Keratoplasty and Phacoemulsification with Intraocular lens insertion through sutureless clear corneal incision: Effect on post-operative astigmatism

Ahmed R. Al-Ghoul, Jagdeep Doulla

Purpose To analyze the refractive outcomes of simultaneous Descement Stripping Automated Endothelial Keratoplasty(DSAEK) and Phacoemulsfication with Intraocular lens (IOL) insertion performed through a sutureless clear corneal incision.

Study Design Retrospective chart review

Methods Retrospective chart review of 10 patients undergoing DSAEK and Phacoemulsification with IOL insertion via sutureless 4 mm clear corneal incision was performed. Pre-operative keratometry and visual acuity was compared to postoperative keratometry, refraction, and visual acuity (corrected and uncorrected).

Results 10 patients underwent this surgery with an average preoperative astigmatism of 1.6 diopters. Following surgery the average postoperative astigmatism was seen to be 1.7 diopters. A t-test analysis was also conducted and showed no statistical significance ($p=0.17$) between the preoperative and postoperative astigmatism. All patients in the study group showed improvements in visual acuity with 1 patient returning to an uncorrected visual acuity of 20/20 and 7 patients improving to an uncorrected visual acuity of 20/50 or higher.

Conclusions Sutureless clear corneal incision for Descemet Stripping Automated Endothelial Keratoplasty can be effectively performed with accepted level of astigmatic change postoperatively.

CORNEA-UPDATE ON SURGICAL CORNEA

FRIDAY 29 JUNE

Paper #176
Phototherapeutic keratectomy vs. mechanical epithelial removal followed by corneal collagen cross linking for keratoconus

Mustafa Kapasi, Jasrajbir Baath, George Mintsioulis, W. Bruce Jackson, Kashif Baig

Purpose To compare the visual outcomes of keratoconus patients treated with either phototherapeutic keratectomy (PTK) or mechanical epithelial removal prior to corneal collagen cross linking (CXL).

Study Design Retrospective, comparative study for evaluation of visual outcomes following CXL.

Methods 17 eyes who had mechanical epithelial removal prior to CXL were compared with 17 eyes treated with PTK epithelial removal prior to CXL. Manifest Refraction Spherical Equivalent (MRSE), sphere, cylinder, best-corrected distance visual acuity (CDVA), and pachymetry were measured and compared pre-operatively and in follow-up.

Results The mean change between the pre- and post-operative MRSE for the PTK and mechanical groups was 1.68 ± 0.80 and 0.26 ± 0.90, respectively ($p<0.05$). The mean change between pre- and post-operative cylinder for the PTK and mechanical groups was 0.53 ± 0.28 and 0 ± 0.18, respectively ($p<0.05$).
The mean number of lines of improvement in the PTK and mechanical groups were 0.33 ± 0.82 and -0.58 ± 0.45 lines respectively ($p>0.05$).

Conclusions Early results suggest that CXL with laser epithelial removal is superior to CXL with mechanical epithelial removal, by reducing refractive error for qualified patients. Although not statistically significant, there was also a trend for PTK CXL patients to have better visual outcomes.

CORNEA-UPDATE ON SURGICAL CORNEA

FRIDAY 29 JUNE

Paper #177
Corneal collagen cross-linking using riboflavin and UVA for the treatment of progressive keratoconus

Marie Eve Légaré, Alfonso Iovieno, Sonia Yeung, Peter Kim, Alejandro Lichtinger, Simon Hollands, Allan R. Slomovic, David S. Rootman

Purpose To evaluate the safety and efficacy of corneal UVA/riboflavin collagen cross-linking (CXL) in patients with mild to moderate keratoconus

Study Design Retrospective cohort study

Methods Clinical charts for keratoconus patients that had undergone CXL alone from November 2008 to February 2011 were reviewed for preoperative and postoperative uncorrected and best-corrected distance visual acuity (UDVA and BDVA), manifest refraction, topographical and Scheimpflug imaging as well as ultrasound pachymetry and haze were recorded from the charts. Mean and steepest keratometry (K), central corneal thickness (CCT) and root-mean-square (RMS) from corneal aberrations were extracted from the topography. CCT and Thinnest corneal thickness (TCT) were extracted from the Scheimpflug imaging.

Results Thirty-nine eyes from 30 patients who underwent CXL alone for progressive mild and moderate keratoconus were included. A significant improvement in UDVA was seen at 3, 6 and 24 months with an average change in logMAR of 0.39 ($p=0.003$) at 24 months compared to baseline. Change in BDVA failed to reach significance but subgroup analysis showed that a baseline BDVA worse than 0.1 logMAR was associated with better improvement. Stability of refraction, keratometry and aberrations was demonstrated. Presence of haze was statistically significant up to 12 months ($P \leq .001$) and being maximal at 3 months then insignificant by 24 months. No complications were observed during the entire follow-up period.

Conclusions CXL is a safe and effective stabilizing strategy for progressive mild to moderate keratoconus with significant improvement of the UDVA. There was a trend toward improvement of BDVA in patients with lower preoperative BDVA value.

CORNEA-UPDATE ON SURGICAL CORNEA

FRIDAY 29 JUNE

Paper #178
Corneal morphological changes of corneal collagen crosslinking in Canada.

Victor Penner, Adam Muzychuk, Guillermo Rocha

Purpose To use Scheimpfulg imaging to describe the effect of riboflavin and ultraviolet-A-induced collagen crosslinking (CXL) on corneal morphology in patients with progressive keratoconus.

Study Design Ongoing retrospective chart review of patients having undergone CXL. The Oculus Pentacam was used to evaluate corneal morphology. Patient data was collected from a single clinical site.

Methods 23 eyes of 17 patients had complete pre and 6 month postoperative data. Data included best corrected (BCVA) visual acuity, keratometry, pachymetry, and elevation maps.

Results BCVA improved at 6 months by 2 lines or more in 17.5%, improved 1 line or was unchanged in 65%, and decreased one line or more in 17.5%.
Pentacam Index of surface variance(ISV), Index of vertical asymmetry(IVA), Keratoconus index(KI), Central Keratoconus Index(CKI), and Topographic Keratoconus Index(TKC) all decreased postoperatively, however none were statistically significant. The Index of Height Asymmetry(IHA) did decrease significantly by 7.58±14.4 (p=0.03) as did the Index of Height Decentration(IHD) by 0.016±0.039 (p=0.04).
Central keratometry(K) became flatter; Kmax decreased by 1.2±2.3 D (p=0.03), Kmin decreased 0.55±3.0 D (p=0.41). Further, the Minimum Radius of Curvature (Rmin) was found to be flatter by 0.15±0.45 mm(p=0.11). Also the anterior surface Enhanced Best Fit Sphere was flatter by 0.13±0.22 mm(p=0.01) along with the posterior Enhanced Best Fit Sphere being flatter by 0.06±0.30 mm(p=0.41).
Postoperatively, the central pachymetry decreased by 14.7±26.3 microns (p=0.014), apical pachymetry decreased by 13.0±34.6 microns (p=0.06), and the thinnest local pachymetry also decreased by 18.7±273 microns (p=0.002). The distance between the thinnest local point to the apical point increased by 0.11±0.71 mm (p=0.44). The Corneal Thickness Spatial Profile became thinner at a circle diameter of 2 and 4 mm by 8.9 microns (p=0.18) and 4.6 microns (p=0.46), respectively. It became thicker at 6 and 8 mm by 2.0 microns (p=0.74) and 7.6 microns (p=0.15), respectively. The Progression Index (PI) increased by 0.49 (p=1E-12). An increasing PI indicates a thinner central cornea with a thicker peripheral cornea post operatively.

Conclusions Although only two indices (IHA,IHD) showed statistical significance, all demonstrated improvement. Statistically significant flattening of the anterior surface of

the cornea (Kmax, Enhanced Best Fit Sphere) translates into improved BCVA due to decreased variation of the corneal surface. This flattening process is related to central corneal thinning (compaction) and peripheral thickening observed post CXL. A larger series of eyes, and longer follow-up are needed to further understand these findings.

CORNEA-UPDATE ON SURGICAL CORNEA

FRIDAY 29 JUNE

Paper #179
Immune rejection following corneal allograft transplantation: A 7 year comparative analysis of penetrating and lamellar keratoplasty

Sonia N. Yeung, Alejandro Lichtinger, Peter Kim, Maoz D. Amiran, Simon Hollands, Hussein Hollands, Allan R. Slomovic, David S. Rootman

Purpose To report the incidence, clinical patterns and outcomes, and risk factors for failure in immunologic corneal allograft graft rejection over a 7-year period at a single tertiary referral centre.

Study Design Retrospective comparative case series

Methods The clinical charts were reviewed for 1647 corneal allograft transplantations performed over a 7-year period (2004-2010) at Toronto Western Hospital (Toronto, Canada). The incidence and clinical characteristics of initial immunologic allograft rejection in patients treated with penetrating keratoplasty (PKP), endothelial keratoplasty (EK), and deep anterior lamellar keratoplasty (DALK) were retrospectively analyzed. Visual outcomes, graft survival, and risk factors for failure were also examined.

Results Immunologic allograft rejection occurred in 125 of 1647 corneal transplants during the study period. The incidence of rejection was significantly higher for PKP (9.4%) when compared to EK (3.5%, $p<0.01$) and DALK (3.5%, $p=0.034$). The mean time to first rejection episode following transplantation was 20.2 months for PKP (95% CI 1-64 months), 14.1 months for EK (95% CI 2-31 months), and 23 months for DALK (95% CI 10-39 months). Endothelial rejection was the most common type of rejection seen. Nearly 30% of rejections in the PKP and EK group were steroid responders. A large proportion of patients were not on topical steroid medications at the time of rejection (44.9% of PKP, 64.2% of EK, and 100% of DALK patients). Glaucoma was one of the most common co-morbid ocular conditions identified and a significant risk factor for failure following PKP and EK rejection.

Conclusions Immunologic allograft rejection is an important postoperative complication following corneal transplantation. Lamellar keratoplasty techniques (DALK and EK)

have a lower risk of immunological graft rejection compared to PKP. Prevention, early identification and management of graft rejection episodes are important measures particularly in PKP and EK grafts. Patients with glaucoma are at higher risk for rejection and subsequent failure, and may require closer monitoring.

CORNEA-UPDATE ON SURGICAL CORNEA

FRIDAY 29 JUNE

Paper #180
Limbal stem cell transplantation for soft contact lens wear-related limbal stem cell dysfunction.

Clara C. Chan, Edward J. Holland

Purpose To describe the outcomes after limbal stem cell transplantation (LSCT) in eyes with limbal stem cell dysfunction (LSCD) related to soft contact lens wear (CLW).

Study Design Retrospective case series.

Methods Database search revealed 9 patients (14 eyes) who underwent LSCT with systemic immunosuppression for soft CLW-related LSCD. Outcome measures included patient demographics, symptoms, visual acuity, ocular surface stability, adverse events, and additional surgeries required.

Results Four eyes (29%) underwent living-related conjunctival limbal allograft and 10 eyes (71%) underwent cadaver-donor keratolimbal allograft surgery. Topical and systemic immunosuppression was used in all patients. Average patient age at time of surgery was 47 years (range 20 to 60 years). Average duration of follow-up was 26 months (range 3 to 70 months). Preoperative visual acuity was 20/40 or worse in all eyes and patient symptoms included foreign body sensation, tearing, and/or pain. At final follow-up after LSCT, there was resolution of patient symptoms, visual acuity improved to 20/30 or better, and a stable ocular surface was achieved in 12/14 (86%) eyes. Two eyes from a patient with significant rosacea blepharo-conjunctivitis had an improved ocular surface but vision remained at 20/150 and 20/60, respectively. Adverse events included nausea in 1 patient which was resolved with over the counter anti-emetics, increased bilirubin levels in 1 patient which normalized after cessation of bactrim prophylaxis, and neutropenia in 1 patient which resolved after cessation of bactrim prophylaxis and treatment with filgrastim. Eight of 14 (57%) eyes had intraocular pressure elevation requiring topical anti-glaucoma treatment. Ten of 14 (71%) eyes underwent phacoemulsification cataract extraction after LSCT. No eyes required subsequent penetrating keratoplasty (PK).

Conclusions Limbal stem cell transplantation is a viable option for the management of soft CLW-related LSCD in young healthy patients. Early intervention prior to

subepithelial fibrosis can lead to good visual outcomes with no need for subsequent PK. Co-management with a transplant specialist is helpful for the monitoring and management of systemic adverse events. Monitoring for glaucoma and cataract formation secondary to topical immunosuppression is also important.

CORNEA-UPDATE ON SURGICAL CORNEA

FRIDAY 29 JUNE

Paper #181
Higher order aberration outcomes of corneal collagen crosslinking in Canada.

Adam Muzychuk, Victor Penner, Guillermo Rocha

Purpose To evaluate the effect of riboflavin and ultraviolet-A-induced collagen crosslinking (CXL) on high order aberrations (HOA) up to fourth-order, using wavefront aberrometry in patients with progressive keratoconus.

Study Design Ongoing retrospective chart review of patients having undergone CXL. The iTrace (Tracey Technologies) was used to evaluate HOA. Patient data was collected from a single clinical site.

Methods 23 eyes of 17 patients had complete pre and 6 month post operative data. Data included uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA), manifest refraction, and HOA data.

Results Postoperatively, UCVA (n=23) improved by 2 or more lines in 30% of eyes, stayed the same or improved by only one line in 65%, and decreased one or more lines in 5% of eyes. Pre operatively, 3 eyes had UCVA of 20/400 or worse, 14 eyes were between 20/300 and 20/40, and 6 eyes had vision of 20/30 or better. Post operatively, UCVA was 20/400 or worse in one eye, 13 eyes were between 20/300 and 20/40, and 9 eyes had vision of 20/30 or better. There was a 0.15±0.19 logMAR (p=0.006) average improvement in UCVA. BCVA (n=23) improved at 6 months by 2 or more lines in 17.5%, by 1 line or stayed the same in 65%, and decreased by one or more lines in 17.5%. There was a 0.06±0.23 logMAR (p=0.95) average improvement in BCVA, which was not statistically significant. The average mean refractive spherical equivalent became more hyperopic by 0.9±3.0D(p=0.18) and refractive astigmatism increased by 0.02±2.0D (p=1.0). Root Mean Square values increased in all aberrations, including: Total +0.61±1.54u (p=0.10), Low Order +0.57±1.53u (p=0.12), Astigmatism +0.13±0.90u (p=0.52), Total High Order +0.30±0.69u (p=0.08), Coma +0.18±0.58u (p=0.19), Spherical +0.04±0.35u (p=0.27), Secondary Astigmatism +0.07±0.30u (p=0.34), and Trefoil +0.01±0.42u (p=0.91).

Conclusions There was a statistically significant improvement in UCVA, with no

statistically significant difference in the pre and postoperative BCVA. Further, this study found no significant change in refractive error or any of the high order aberrations. This furthers the clinical picture of visual stability at the 6 month follow-up in CXL.

NEURO-OPHTHALMOLOGY-2

FRIDAY 29 JUNE

Paper #182
A Case of Blastomycosis Optic Neuropathy.

Dima Kalache, Radwan Ajlan, Mark Gans

Purpose Ocular manifestations of *Blastomycosis dermatitidis* are rare. We present a case of bilateral optic neuropathy in a 67 year old immunocompetent male being treated for blastomycosis. Given that this event occurred five months following treatment with both amphotericin B and voriconazole, the debate about second line agents for central nervous system(CNS) blastomycosis is discussed.

Study Design Case report.

Methods This case report involved a chart review of the patient.

Results A 67 year old immunocompetant man, with previously diagnosed and under ongoing treatment for blastomycosis, was referred to our ophthalmology clinic with a three week history of progressively worsening visual acuity in each eye. He was diagnosed with bilateral optic neuropathy secondary to blastomycosis. His treatment regimen was switched from amphotericin B and voriconazole to posacanazole, following which his vision improved significantly.

Conclusions To our knowledge, this is the first case of bilateral optic neuropathy as a first manifestation of a recurrence in a patient undergoing treatment for CNS blastomycosis. This case highlights the widespread systemic impact of blastomycosis and the occasional lack of effectiveness of amphotericina B and voriconazole as a treatment protocol for blastomycosis.

NEURO-OPHTHALMOLOGY-2

FRIDAY 29 JUNE

Paper #183
Random Dot Autostereograms and Neuro-ophthalmology

Edsel Ing, Galina Sholohov

Purpose Random dot autostereograms (single image random dot stereograms) do not require special viewing glasses, and can be custom generated using free online programs. We determine the potential utility of autosterograms in neuro-ophthalmology.

Study Design Prospective

Methods Using the free internet program (http://www.easystereogrambuilder.com/3d-stereogram-maker.aspx) autostereograms were genereated. The autostereograms were reviewed by eight masked ophthalmologists, and the most easily identified stereograms were employed in the study.
The autostereograms were laser printed at maximal resolution 1200 x 600 dpi. Visually healthy medical staff volunteers less than 50 years of age, with normal binocular acuity and appropriate near correction in place, were shown the autostereograms in a well lighted environment. Subjects were given appropriate instructions on how to view autostereograms. In addition Titmus graded circle stereoacuity was tested, and then retested with a neutral density filter over one eye. Subjects who were able to see the autostereogram were retested on the stereograms with a neutral density filter covering one eye.

Results 7/14 subjects could not see any of the autostereogram despite being given repeat instructions, viewing the stereograms for more than two minutes, and later being told what the embedded object was. Of these seven non-viewing subjects, 4 had stereoacuity of 40 seconds of arc, and three had stereoacuity of 50 seconds of arc. 7/14 subjects were able to see the autosterograms and had stereoacuity of 40 seconds of arc. Of the 7 subjects who could visualize the autostereogram three required more than 60 seconds to visualize the embedded object.
Of the 7 subjects who could the autostereogram, interposition of a 1.2 neutral density filter made the stereogram more difficult to visualize, but 6/7subjects could still discern the embedded object. (At least two subjects could still discern the autostereogram with a 1.8 optical density filter.)
In all 14 test subjects, a 1.2 neutral density filter degraded Titmus stereoacuity to 200 arc second range or worse.
Approximately half of the subjects in the stereogram cognizant and non-seeing group had an exophoria at near, of 8 prism diopters or less.

Conclusions The autostereograms used in this study appear to have limited application

in clinical neuro-ophthalmic practice. The study suggests that patients with grade III RAPD (1.1 neutral density filter RAPD, Bell, Archives of Ophthalmology, 1993) might still be able to see autostereograms. Neutral density filters degrade Titmus stereoacuity more than the ability to discern the embedded object in an autostereogram.

NEURO-OPHTHALMOLOGY-2

FRIDAY 29 JUNE

Paper #184
Effects of induced monocular blur versus anisometropic amblyopia on saccadic eye movements

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Purpose Anisometropic amblyopia is a visual impairment of one eye due to a significant difference in refractive error between the eyes. Patients with anisometropic amblyopia have prolonged and more variable saccade latency. We investigated whether the prolonged saccade latency is due to a loss of visual acuity alone, or due to a unique effect of amblyopia as a result of abnormal visual development during early childhood.

Study Design Experimental design

Methods Twelve patients with anisometropic amblyopia and 12 visually-normal participants were tested. Participants executed saccades to targets presented randomly at ±5 degrees and ±10 degrees on a computer screen during binocular and monocular viewing (fellow eye / amblyopic eye for patients, right / left eye for control subjects). Control subjects were tested before, immediately after, and 5 hours after artificially-induced monocular blur (to 20/50) using a plus contact lens. Latency, amplitude, and peak velocity of primary saccades were analyzed.

Results Patients with amblyopia had significantly longer ($p=0.006$) and more variable ($p=0.037$) saccade latency during amblyopic eye viewing (221±67 ms), compared to fellow eye (185±29 ms) or binocular viewing (189±52 ms). In contrast, induced monocular blur did not affect saccade latency or variability: normal vision (binocular: 169±29 ms; monocular left: 186±30 ms; monocular right: 193±32 ms), immediately after induced blur (binocular: 172±31 ms; normal acuity eye: 183±29 ms; blurred eye: 189±31 ms) and 5 hours after induced blur (binocular: 177±32 ms; normal acuity eye: 193±35 ms; blurred eye: 191±33 ms).

Conclusions Patients with amblyopia demonstrated significantly longer and more variable saccade latency during amblyopic eye viewing. This observation was not reproduced after artificially-induced monocular blur in visually normal subjects, suggesting that a loss of visual acuity alone could not explain the saccadic deficits seen in amblyopia.