TORONTO

ANNUAL MEETING & EXHIBITION
CONGRÈS ANNUEL ET EXPOSITION

METRO TORONTO CONVENTION CENTRE | PALAIS DES CONGRÈS DU TORONTO MÉTROPOLITAIN

Canadian Ophthalmological Society | Société canadienne d'ophtalmologie
EYE PHYSICIANS AND SURGEONS OF CANADA | MÉDECINS ET CHIRURGIENS OPHTALMOLOGISTES DU CANADA

2018 MAY 31 MAI – JUNE 3 JUIN

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2018 COS Annual Meeting | Congrès annuel de la SCO 2018
Abstract Booklet | Livre des résumés
Poster Presentations | Présentations d'affiches

Award Winning Posters | Lauréats des prix

Friday, June 1 | Le vendredi 1 juin

- Cataract Surgery | Chirurgie de la cataracte
- Neuro-ophthalmology | Neuro-ophtalmologie
- Oculoplastic & Reconstructive Surgery | Oculoplastie et chirurgie reconstructive
- Uveitis | Uvéite

Saturday, June 2 | Le samedi 2 juin

- Cornea, External Disease and Refractive Surgery | Cornée, maladies externes et chirurgie réfractive
- Retina | Rétine
- Vision Rehabilitation | Réadaptation visuelle

Sunday, June 3 | Le dimanche 3 juin

- Glaucoma | Glaucome
- International and Public Health Ophthalmology | L'ophtalmologie internationale et santé publique
- Pediatric Ophthalmology and Strabismus | L'ophtalmologie pédiatrique et strabisme

🎖 First Prize, COS Awards for Excellence in Ophthalmic Research 🎖

Cornea, External Disease and Refractive Surgery – Presented on Saturday, June 2

Title: Bioactive protein-conjugated silica nanoparticles as a drug delivery system for dry eye disease

Authors: Xinyi Li, Mitchell Ross, Cindy Hutnik, Wankei Wan

Abstract Body:

Purpose: The aim of this study is to explore the possibility of using protein-conjugated silica nanoparticles as a drug delivery system to treat dry eye disease.
Study Design: Experimental studies. SiNPs were made and used as the protein carrier. Lysozyme was selected as the model protein to demonstrate the adsorption and desorption capability of our system due to its similarity to other bioactive human tear components.
Methods: SiNPs were synthesized by the Stöber method and subsequently loaded with the model protein lysozyme. The release profile of lysozyme was studied in the phosphate buffered saline (PBS) at 37 ° C for a period over 3 days. Ultraviolet (UV) spectrophotometry was used to quantify the lysozyme concentration in solution. Dynamic light scattering (DLS) was used to measure the hydrodynamic diameter of the silica and lysozyme-silica conjugates. Scanning electron microscopy (SEM) was carried out to acquire morphological information. Fourier-transform infrared spectroscopy (FTIR) was used to confirm lysozyme loading and characterize the silica-lysozyme interaction.
Results: Spherical SiNPs with an average size of 270 nm were synthesized using the Stöber process. A loading capacity of 0.016 ± 0.003 (mg lysozyme/mg SNPs) was achieved by incubating SiNPs in 5 mg/mL lysozyme solution for 48 hours. The adsorbed lysozyme interacted with the silica matrix, and altered the hydrodynamic diameter of the silica-protein conjugates.
The release kinetics of lysozyme was also determined. For an initial lysozyme concentration of 0.18 mg/mL lysozyme-silica conjugates, a burst effect in the first 6 hours with a release rate of 0.018 mg/h was observed. Within this period, 52% of the total lysozyme was desorbed from the SiNPs, 80% total release was achieved within 3 days. The release kinetics was better described by the Peppas-Sahlin model (R2=0.89) over the diffusion model.
Degradation of SiNPs in PBS was also examined. Rougher, more porous morphological features with a reduced particle size were observed under the SEM after soaking the as-made bare SiNPs in the PBS for 20 days, indicating the degradability of our protein carrier.
Conclusions: In summary, our data suggests that protein-conjugated SiNPs have the potential to be used as an ophthalmic drug delivery system for conditions such as dry eye disease. The promising degradability of the silica matrix with the diverse biological properties of the proteins could expand its application into injectable hydrogels, therapeutic contact lenses and ocular implants.

🎖 Second Prize, COS Awards for Excellence in Ophthalmic Research 🎖
Retina – Presented on Saturday, June 2

Title: CITED1: A potential regulator of metastasis in uveal melanoma

Authors: Jade Marie Lasiste, Sabrina Bergeron, Pablo Zoroquiain, Ana Beatriz Dias, Tadgh Ferrier, Miguel Burnier

Abstract Body:

Purpose: Uveal melanoma (UM) is the most common primary intraocular malignancy in adults. Referred to tumor dormancy, up to half of patients develop metastasis years after effective control of the tumor. Cellular markers to prognosticate UM according to this risk are already in clinical use. However, because of the existing gap in knowledge about the mechanisms underlying UM metastasis, methods for its early diagnosis and treatment have yet to be developed. It is this gap into which this projects seeks to initiate inquiry.
Studies have shown that mesenchymal tumor cells metastasize and enter systemic circulation primarily through a process called mesenchymal-to-amoeboid transition (MAT). The TGFb-SMAD2-CITED1 axis has been shown to regulate MAT in cutaneous melanoma. Neither MAT nor this signaling pathway have been studied in UM. This study therefore aims to assess the expression of CITED1 in UM and its association with clinicopathological features.
Study Design: This is an immunohistochemical study of the expression of CITED1 in UM tissues and cell lines.
Methods: Twenty-two cases of UM and four UM cell line blocks (MEL 270, OMM2.5, MEL285, and OCM-1) were retrieved from the ocular pathology laboratory archive. Automated immunohistochemistry for CITED1 was performed, and whole digital slides were acquired using the Philips IntelliSite scanner. For cases, clinicopathologic features, such as age at diagnosis, tumor dimension, prior radiation treatment, follow-up and immunoreactivity scores (IRS; percentage of positive cells multiplied by intensity) for CITED1 were evaluated for all cases. Statistical correlations were performed using the SPSS software.
Results: CITED1 was expressed in 100% of malignant cells, regardless of prior radiation treatment (5/22 cases) and tumor dimension (mean = 12 mm). Kaplan-Meier survival curves using the Log-rank test showed a positive correlation between CITED1 IRS and the occurrence of metastasis (p=0.04). In contrast, normal choroidal melanocytes adjacent to the tumor did not express CITED1.
All of the UM cell lines also expressed CITED1. A higher CITED1 IRS was observed in the metastatic cell line OMM2.5 and its parent primary tumor cell line MEL270, while a lower CITED1 IRS was associated with MEL285 and OCM-1, which were derived from tumors that did not metastasize.
Conclusions: These results demonstrate an association between increased CITED1 expression in UM and metastasis. Moreover, the lack of correlation between levels of CITED1 expression and tumor dimensions shows that CITED1 is not directly linked to growth of the tumor.
The expression of CITED1 only in malignant melanocytes suggests a mechanism by which UM cells undergo MAT to initiate metastasis. In vitro and in vivo characterization of the TGFb-SMAD2-CITED axis and its regulation of MAT in UM must be undertaken to further explore this phenomenon.

Third Prize, COS Awards for Excellence in Ophthalmic Research
Retina – Presented on Saturday, June 2

Title: Fibrin glue and internal limiting membrane abrasion for optic disc pit maculopathy

Authors: Parnian Arjmand, Eric K. Chin, Vinit B. Mahajan, David R. P. Almeida

Abstract Body:

Purpose: Optic disc pit (ODP) is a rare congenital anomaly of the optic nerve that may result in maculopathy and severe vision loss. Current techniques - pars plana vitrectomy (PPV) with or without laser, gas tamponade and internal limiting membrane (ILM) peel - are associated with recurrent maculopathy. We describe a novel surgical technique using PPV with ILM abrasion and intravitreal fibrin glue for the treatment of optic disc pit maculopathy.
Study Design: In vitro surgical technique and in vivo case series.
Methods: Scanning electron microscopy (SEM) of human post-mortem eyes was performed to identify the status of the optic nerve and vitreous fragments following PPV. Three patients with ODP-maculopathy underwent PPV with ILM abrasion and intravitreal fibrin glue.
Results: Using SEM, we demonstrate the persistent adherence of vitreous fragments to the optic disc following induction of posterior vitreous detachment in human post-mortem eyes. We describe a surgical technique using PPV, Tano Diamond Dusted Membrane Scraper for ILM abrasion, intravitreal fibrin glue (Tisseel), and gas-air exchange to seal optic disc pits. We report successful long-term visual and anatomical outcomes in three patients.
Conclusions: Intravitreal fibrin glue, when combined with Tano-assisted ILM abrasion, is a viable treatment option for ODP-maculopathy with good long-term visual acuity outcomes. SEM shows that ILM abrasion removes vitreous fragments, which are persistently adherent and may lead to failure with other interventional techniques

CATARACT SURGERY | CHIRURGIE DE LA CATARACTE

Title: Development of bilateral cataracts following electrocardioversion

Authors: Sonam Maghera, Parnian Arjmand, Rama Behki, Michael O'Connor

Abstract Body:

Purpose: Electrical injury is a rare cause of cataract. Both cortical and nuclear sclerotic cataracts have been reported following exposure to high voltage alternating or direct current (AC/DC), lightning, and conducted electrical weapons. To our knowledge, this case represents the first report of bilateral cataract formation following electrocardioversion.
Study Design: Case report
Methods: The patient's clinical and surgical charts were reviewed, including patient history, clinical and diagnostic exams and relevant investigations. A thorough review of the literature was also performed.
Results: A 62-year-old man presented to the emergency department with severe biventricular failure, cardiogenic shock and monomorphic ventricular tachycardia (VT). He underwent electrocardioversion, and was subsequently intubated secondary to cardiogenic shock. Upon extubation, two weeks status-post cardioversion, the patient complained of bilateral vision loss (OS worse than OD). Examination disclosed a visual acuity (BCVA) of 20/200 OD and hand motion (HM) OS. Anterior segment examination revealed 3+ posterior subcapsular cataract OD, and 4+ white cortical cataract OS. Two-weeks later, BCVA OD was reduced to 20/400, with white cataracts OU. Bilateral laser peripheral iridotomies were performed for narrow angles. Visual acuity was successfully restored with subsequent cataract extraction and intraocular lens placement, despite significant zonular weakness noted intraoperatively. No posterior segment injury was observed.
Conclusions: Although cataract formation is a known complication of electrical injury, electrocardioversion to our knowledge has not been documented as a cause of intraocular injury. Clinicians should consider electrocardioversion as a potential etiology for rapid development of bilateral cataracts in the absence of a history of trauma. As electric cataracts may be accompanied by zonular weakness, posterior capsular rupture, and optic nerve or retinal pathology, careful pre- and peri-operative planning is warranted for suspected cases.

Title: Mapping the landscape of cataract surgery teaching assessment in Canadian residency programs

Authors: Rosanna K. Martens, Nawaaz Nathoo, Andrea Gingerich, Ravi Sidhu

Abstract Body:

Purpose: Cataract surgery is one of the most common procedures trainees are expected to learn in ophthalmology residency. As the Royal College transitions to competency-based medical education, programs will need to determine how best to assess and then demonstrate that trainees have attained competence in this procedure. Given this reality, a critical first step is to determine the landscape of current methods used for assessment. The purpose of this study is to document current assessment approaches for cataract surgery in all Canadian ophthalmology residency programs in preparation for the implementation of competency-based assessment.
Study Design: Cross-sectional survey
Methods: An online survey of all Canadian ophthalmology residency program directors and residents was used to collect descriptions of the current state of assessment of cataract surgery within each program. Both qualitative and quantitative trends in survey results were examined. Data from program directors and chief residents was compared to evaluate differing viewpoints of the same assessment system.
Results: Cataract surgery teaching occurs in numerous settings including didactic sessions, wetlabs, and in the operating room; multiple assessment tools are used to assess these activities including in-training evaluation reports (ITERs), surgical logbooks, surgical checklists, and global rating scales; various models are being employed in the provision of formative feedback; and that there are differing combinations of formative and summative assessments and minimum standards for training that vary by institution.
Conclusions: Documenting our current assessment landscape for ophthalmology surgical training is a vital first step as we prepare to implement the Competence-By-Design initiatives of the Royal College and fulfil the mandate of competency-based assessment.

Title: Management of recurrent uveitis-glaucoma-hyphema syndrome by intraocular lens repositioning

Authors: David Plemel, Matthew Benson, Michael Dorey

Abstract Body:

Purpose: To present a technique that can be used as an alternative to lens exchange in eyes with a sutureless scleral fixated intraocular lens (SFIOL) causing uveitis-glaucoma-hyphema (UGH) syndrome.
Study Design: Case report of surgical technique.
Methods: A patient presented with UGH syndrome after placement of a SFIOL. A novel technique, whereby the haptics were released from the scleral tunnels and fixed to the iris using a modified McCannell suture, was utilized to reposition the SFIOL lens. Ultrasound biomicroscopy (UBM) imaging was used prior to SFIOL insertion, after SFIOL insertion and after the described intraocular lens (IOL) repositioning technique to assess ocular dimensions and IOL placement.
Results: The technique described brings the iris and IOL into close proximity. This may cause them to move a single unit and decrease friction. The resulting IOL position resolved the UGH syndrome.
Conclusions: UGH syndrome secondary to IOL malposition is a common reason for lens exchange. The authors suggest lens repositioning with two-point iris fixation might be a suitable alternative when treating UGH syndrome secondary to SFIOL malposition.

NEURO-OPHTHALMOLOGY | NEURO-OPHTALMOLOGIE

Title: Stereotactic radiotherapy for presumed oculomotor nerve schwannoma masquerading as ophthalmoplegic migraine

Authors: Rami Abo-Shasha, Glenn Bauman, Alexander Fraser

Abstract Body:

Purpose: To present a unique case of an oculomotor nerve schwannoma masquerading as ophthalmoplegic migraine.
Study Design: Case Study
Methods: Retrospective Chart Review
Results: A 49 year old male presented to the neuro-ophthalmology service for a second opinion, for a diagnosis of right sided "ophthalmoplegic migraine". He reported a 20-year history of recurrent, intermittent, unilateral right sided headaches accompanied by ipsilateral eye pain, pupillary mydriasis, and ptosis which has been refractory to oral prednisone therapy. He had undergone three magnetic resonance imaging and angiography (MRI/MRA) studies, which had been reported as normal. Clinical examination, between acute attacks, revealed a best corrected visual acuity of 20/20 in each eye. Intraocular pressure was 25mmHg in the right eye and 24mmHg in the left eye. Ocular motility was full. Ocular alignment examination revealed a right sided 10 prism diopter exophoria. Pupillary assessment revealed 0.5 mm of aniscoria in bright light with a larger right pupil. There was no relative afferent pupillary defect. Lid assessment revealed a 1 mm right ptosis. Slit lamp examination was unremarkable aside from a posterior subcapsular cataract in the right eye. A critical re-review of his prior MRIs identified a previously-unreported nodularity along the course of the right third nerve. A Repeat contrast-enhanced MRI head and orbits with dedicated thin-slice cuts which revealed a focal, nodular 4 mm enhancing lesion within the right oculomotor nerve at the level of the anterior clinoid process. The patient was treated with fractionated stereotactic radiotherapy at a dose of 25 Gy in 5 daily fractions using Aktina frame stereotactic immobilization. The patient reported an 80% reduction of symptoms and a reduction of daily prednisone from 60 mg to 4 mg at the 6 month follow up period and a 90% reduction of symptoms and a complete discontinuation of prednisone at 18 months. Follow up clinical examinations revealed stability of the aniscoria, reduction of the exophoria to 6 prism diopters and resolution of the ptosis. Repeat contrast-enhanced MRI revealed stability of the lesion.
Conclusions: This case highlights that oculomotor nerve schwannomas can mimic as ophthalomoplegic migraine. Moreover, this case highlights the potential for improvement in symptoms with fractionated stereotactic radiotherapy: our patient reported a 90% reduction of symptoms 1.5 years after radiation and was able to completely discontinue prednisone therapy and avoid any further steroid-associated side effects. In addition, this study suggests that inflammatory control may be more important than reduction in tumor size with regards to symptomatic control of cranial nerve schwannomas. Finally, this study highlights that incorrect medical terminology can have a long term impact on patient care. RPON was initially named "ophthalmoplegic migraine" and this misnomer encouraged physicians to think of this entity as a primary headache syndrome and not look more deeply for an underlying structural mimic.

Title: Spectral domain optical coherence tomography (SD-OCT) in children with papilledema due to idiopathic intracranial hypertension (IIH)

Authors: Mansoureh Bagheri, Katelyn MacNeill, Michael Wan

Abstract Body:

Purpose: Our aim was to investigate peri-papillary retinal nerve fiber layer (rNFL) thickness in spectral domain optical coherence tomography (SD-OCT) in children with papilledema caused by idiopathic intracranial hypertension (IIH).
Study Design: Observational retrospective case series
Methods: Medical records of 20 patients with pediatric IIH were reviewed. Visual acuity, fundus photography and SD-OCT imaging on presentation and after resolution of papilledema were evaluated.
Results: The study was approved by the Research Ethics Board. The study group was composed of 12 girls and 8 boys. The mean age on presentation was 11.6 years (range 5.1-17.7 years). At diagnosis, average opening pressure was 44 cm H20 on lumbar puncture (range 34-60). Average rNFL thickness was 246 µm at diagnosis (range 120-433 µm) and 97.1 µm after resolution (range 64-150 µm) ($p < 0.0001$). The average change of rNFL from diagnosis to resolution was a decrease of 149 µm (range 29-323 µm). On linear regression, there was a trend between higher opening pressure and lower final rNFL, but this did not reach statistical significant ($p = 0.08$). Only one patient had visual acuity of less than 20/40 (20/60 in one eye) at final follow-up.
Conclusions: Average rNFL thickness on SD-OCT may be a helpful marker in the diagnosis and follow up of children with papilledema due to IIH.

Title: The yield of temporal artery biopsy for suspected giant cell arteritis: A meta-analysis

Authors: Etienne Benard-Seguin, Dani Wang, Edsel Ing

Abstract Body:

Purpose: To determine the expected yield (utility rate) of temporal artery biopsy (TABx) for giant cell arteritis (GCA).
Study Design: Random effects meta-analysis
Methods: The PubMed, Embase and Google Scholar databases were reviewed in All Fields for the words ("temporal artery biopsy" OR "giant cell arteritis" OR "temporal arteritis") AND "positive".
Inclusion criteria were all English language articles from 1981 to October 1, 2017 concerning TABx for suspected GCA. Pathology reviews were excluded if they only considered positive TABx, or only cases of known GCA. Where possible the specimen length, unilateral vs bilateral biopsy, country of origin, and age of the patients was recorded for sub-analysis.
Meta-analysis was performed using Stata 14.2 and the metaprop command.
Results: All articles were reviewed by two authors, and discrepancies were settled by the third author. Nine hundred and fifty giant cell arteritis studies were identified. After duplicate records were removed, 687 records remained. After screening 545 studies were removed. One hundred and forty-two articles were assessed for eligibility with 17 subsequent exclusions. Quantitative synthesis of the 125 remaining articles was performed.
On random effects analysis, the utility rate of TABx was 27% (95%CI 25%-29%). The I^2 was 92.9%.
Conclusions: The expected yield of a positive TABx in subjects undergoing biopsy for suspected GCA is 27%. Institutions with a markedly lower yield might be performing too many biopsies, and those with a markedly higher yield might be under-diagnosing cases of biopsy-proven GCA. Although TABx remains the criterion standard for the diagnosis of GCA, the utility rate may also be useful in decision analysis and economic reviews. Emerging non-invasive alternatives to TABx such as ultrasound and MRI are being investigated and for comparison purposes, the expected utility rate of TABx should be known.

Title: Availability of FL-41 lens tint services in Canadian metropolitan areas

Authors: Elizabeth Lee, Seema Emami, **Ryan Cho**, Edsel Ing

Abstract Body:

Purpose: Fluorescent-41 (FL-41) filter is a rose-coloured tint that blocks green-to-blue hues of the visible light spectrum. There is evidence that FL-41 lens tints are effective adjunct therapies for various photophobic disorders such as benign essential blepharospasm and migraine. Difficulty accessing FL-41 lenses has been previously reported. We conducted a survey in the two largest Anglophone Canadian cities to assess the availability, cost and potential of FL-41 lens tint services and barriers to its provision.
Study Design: Cross-sectional survey.
Methods: A short anonymous telephone survey investigated FL-41 lens tint services at commercial optical shops in Toronto, Ontario and Vancouver, British Columbia. We extracted contact details for optical shops in an automated fashion from the Yellow Pages using the search term "optical shop" in each city using IQUALIF software. In the Greater Toronto and Greater Vancouver areas, a total of 633 and 254 optical shops were identified, respectively. Ten percent of identified optical shops were surveyed in Toronto (n=63) and Vancouver (n=25). Researchers conducted a brief anonymous phone interview using a standardized questionnaire. The questionnaire assessed availability, cost, and barriers to FL-41 lens tint services. Results are presented using descriptive statistics.
Results: Responses were collected from 88 optical shops. Of these shops, 55.6% had an optometrist on site for at least one half-day per week. Only 7 optical shops (8.0%) provided FL-41 lens tint services. The most frequent barrier to FL-41 provision was lack of awareness of the lens tint (62.0%). Other reasons included low customer demand (13.9%) and lack of lens tinting equipment (11.4%). Most optical shops (88.7%) had zero customers requesting FL-41, and only one (1.4%) reported at least 10 customers annually. Optical shops owned by chain retail corporations represented 37.5% of total respondents; none of them provided FL-41 lens tints. There was no significant difference between Toronto (n=4) and Vancouver (n=3) for the provision of FL-41 lenses ($p=0.082$, $X2=3.018$).
Conclusions: FL-41 lens tint services are difficult to access even in metropolitan Canada. Overall, FL-41 lenses are not well known to optical shops, despite demonstrated benefit in the management of common photophobic conditions. Increased education about the treatment potential of FL-41 lenses among eye professionals may facilitate access to this non-invasive adjunct therapy for patients with neurologic causes of photophobia.

Title: Proptosis in optic pathway gliomas associated with NF1: Response to chemotherapy

Authors: Imran Jivraj, Alyssa Nguyen-Phuc, Dmitry Khrichenko, Tamara Feygin, Robert Listernick, Simone L. Ardern-Holmes, Robert O. Hoffman, Roger J. Packer, Rosalie E. Ferner, David H. Gutmann, Robert Avery, Grant Liu

Abstract Body:

Purpose: Neurofibromatosis type 1 (NF1) is a genetic disorder associated with optic pathway gliomas (OPGs) which may cause vision loss and proptosis. Chemotherapy is the treatment of choice for OPGs causing progressive loss of visual function. A multi-institutional retrospective study by Fisher et al (Neuro-Oncology, 2012) revealed that 55% of subjects with pre-existing proptosis demonstrated subjective improvement after receiving chemotherapy. We sought to quantify the change in proptosis and tumour volume after chemotherapy.
Study Design: Retrospective chart review.
Methods: The pre- and post- chemotherapy MRI studies of subjects who had proptosis in a multicenter study of NF1-OPG were examined. The degree of proptosis was measured using established radiographic methodology. Each MRI was aligned three-dimensionally along a common plane and volumetric measurements of the intra-orbital tumors were taken using signal-to-noise ratio to determine tumor edge. The change in measured proptosis and tumor volume after chemotherapy was evaluated.
Results: All patients demonstrated a reduction in proptosis following chemotherapy ($n=11$, $p<0.01$) with a mean decrease of 1.74mm (56%). Mean tumor volume also decreased with treatment by 0.88mL (23%). There was no correlation between change in proptosis and tumour volume.
Conclusions: A clinically significant reduction in proptosis and tumour volume was observed among patients with NF1-OPG who received chemotherapy.

Title: A big miss: Inappropriate imaging in Horner syndrome

Authors: Prima Moinul, Ryan Rebello, Amadeo R. Rodriguez

Abstract Body:

Purpose: We report a case of Horner Syndrome whose etiology was initially missed due to inappropriate imaging despite clinical presentation suggestive of preganglionic involvement of the oculosympathetic chain.
Study Design: Case Report
Methods: A 31-year-old female with a 2-year history of right-sided ptosis and miosis was seen in clinic. On specific questioning she endorsed right-sided facial anhidrosis. Apraclonidine 0.5% testing was positive for Horner Syndrome. Otherwise, her neuro-ophthalmological exam was normal. She had been previously seen by another physician and was investigated with an MRI-MRA of the head which included up to the level of C4. As the clinical presentation was suggestive of preganglionic involvement and it had not been completely investigated, further imaging with MRI-MRA targeted to the neck and upper chest was requested.
Results: A 5 cm mass in the right upper mediastinum in close proximity to the expected location of the oculosympathetic pathway was found. The patient underwent a CT-guided biopsy, which revealed a schwannoma. Subsequently, the mass was resected but Horner Syndrome persisted post-operatively.
Conclusions: Horner Syndrome results from disruption of the oculosympahtetic chain anywhere along its long and complex course. Knowledge of the anatomy and possible associated clinical symptoms and signs depending on the location of the underlying lesion is essential to appropriately investigate patients with this condition. Although pharmacological localization is often recommended, hydroxy-amphetamine is rarely available and its usefulness has been questioned. Thus clinicians must relay in clinical symptoms and findings which, when present, help to localize the lesion and appropriately target imaging studies. Anhidrosis is not commonly reported by affected individuals, but our patient clearly described complete, right sided facial anhidrosis which suggested pre-ganglionic Horner Syndrome. However, her previous investigations did not completely include the anatomical region of the second order neuron, and thus it lead to a delay in the diagnosis. We acknowledge that in many cases of "isolated Horner Syndrome" imaging of the entire oculosympathetic chain is warranted. However, when clinical localization is possible, imaging studies should be targeted accordingly.

Title: Cabin pressures on commercial aircraft and non-arteritic ischemic optic neuropathy

Authors: Maleeha Syed, Samir Nazarali, Henry Liu, Anna Ter-Zakarian, Alfredo A. Sadun, Rustum Karanjia

Abstract Body:

Purpose: To investigate the variations in cabin pressurization of commercial aircraft at cruising altitude. Current United States Federal Aviation guidelines suggest cabin pressures less than 8,000 ft. Commercial aircraft are commonly pressurized between 6,000 to 8,000 ft depending on the type of aircraft and composite materials of the fuselage. However, this variability can significantly impact patients with NAION, who may be predisposed to hypoxia induced complications, thus resulting in transient changes in vision from lower partial pressures of oxygen at higher altitudes.
Study Design: Cross-sectional study
Methods: Altimeters were used to measure the internal altitude and cabin pressure at cruising altitude aboard 106 commercial aircraft flights, including 47 narrow-body and 59 wide-body planes. Narrow body aircraft was characterized as single-aisle aircraft with a fuselage width of 10-13 ft, while twin-aisle aircraft with a fuselage width of 16-20 ft were considered wide-body. There were seven types of narrow-body and seven types of wide-body aircraft studied.
Results: The mean cabin pressure among all flights was 6,355 ± 863 ft. Narrow-body aircraft had a significantly greater mean cabin pressure of 6,864 ± 750 ft compared to wide-body aircraft with a mean cabin pressure of 5,951 ±725 ft. ($p < 0.001$). With respect to service date, newer generation aircraft (service date later than 1990) had a mean cabin pressure of 6,082 ± 830 ft, which was lower than the mean cabin pressure of older aircraft at 6,757 ± 754 ft ($p <0.001$).
Conclusions: The innovation of composite material within aircraft fuselage has offered the ability to fly at greater altitudes, while maintaining lower cabin pressures. All flights studied maintained pressurization below suggested guidelines, however, the newest generation of wide body aircraft studied, B787 and A350, were found to cruise at the lowest mean cabin pressure of all groups. Those at risk of ischemic events such as patients with NAION may want to consider aircraft type when air travel is required.

OCULOPLASTIC AND RECONSTRUCTIVE SURGERY
OCULOPLASTIE ET CHIRURGIE RECONSTRUCTIVE

Title: Nasal pepsinogen and pH levels in primary acquired nasolacrimal duct obstruction

Authors: Ahsen Hussain, David Armstrong, John Harvey

Abstract Body:

Purpose: There is recent evidence of an association between gasto-esophageal reflux disease (GERD) and primary acquired nasolacrimal duct obstruction (PANDO). Inflammation provoked by reflux of gastric contents has also been found to be related to dental and upper airway disease. The purpose of this study was to investigate nasal pepsinogen and pH levels in patients with PANDO.
Study Design: Prospective case-controlled study
Methods: The Mayo Clinic Reflux Disease Questionnaire (RDQ) was used to assess for the presence of GERD in this study. Following REB approval, three patient groups were formed - a control group with no history of PANDO or GERD; patients with PANDO who were positive for GERD on the RDQ; and patients with PANDO who were negative for GERD on the RDQ. Patients who had undergone dacryocystorhinostomy for PANDO and those with PANDO planned for surgery were included. Control patients were chosen prospectively as they attended clinic and were negative on the RDQ with no history or complaint of tearing. Consenting patients completed the RDQ and then underwent placement of a strip of pH litmus paper along the nasal floor for one minute. This was followed by irrigation of the nasal floor on the chosen side with 3cc of normal saline injected with a syringe attached to the tubing of an 18 gauge angiocatheter. The returning fluid was collected and at least 1cc submitted as a frozen specimen for pepsinogen assay. The pH values were determined from a colour grading system. Demographic data collected included patient sex, age, RDQ score and any treatment for GERD.
Results: A total of 52 patients were studied: 21 control patients, 15 patients with PANDO plus GERD (P+G) and 16 patients with PANDO minus GERD (P-G). 65% of patients with PANDO were female. Median age of all patients was 65 years; 62 years in the control group and 67 years in patients with PANDO. Median pH levels were 9 in the control group and 8 in both P+G and P-G groups ($p<0.058$). The pepsinogen range was 1.7-136.3ng/ml across all patients. We found no statistically significant association between patient group and median pepsinogen value ($p=0.055$). Of significance was the use of medication to treat GERD in 10 out of 15 patients. This may have affected retrieved pepsinogen and pH values.
Conclusions: Our study provides information on the feasibility of nasal pH and pepsinogen assessment in patients with PANDO. Larger studies controlling for the use of GERD remedies may provide further insight into the contribution of these variables to the pathogenesis of PANDO.

Title: Retrobulbar hemorrhage following tooth extraction: Case report & anatomical correlate

Authors: Aaron Rosen, Georges Nassrallah, Omar Abdullah Suhaym, Julia Pompura, Shawn L. Cohen, Bryan Arthurs

Abstract Body:

Purpose: We report the unique case of a unilateral retrobulbar hemorrhage secondary to upper third molar extraction presenting with intermittent visual disturbance and diplopia.
Study Design: Case-report.
Methods: The patient's medical and surgical chart was reviewed. A comprehensive literature review was also conducted.
Results: A 27-year-old female presented with left facial swelling, unilateral intermittent blurred vision, pain and diplopia that began and progressively worsened following extraction of the left upper third molar. Computed tomography scan revealed fat stranding with subcutaneous emphysema extending from the left masticator space into the left orbit through the inferior orbital fissure and a 1.3 x 1.3 cm extraconal hemorrhage. Urgent ophthalmologic consultation revealed left-sided periocular ecchymosis, subconjunctival hemorrhage, intraocular pressure of 23 mmHg and exophthalmometry measuring 29 mm OS (OD 20 mm). Based on these findings, a diagnosis of retrobulbar hemorrhage was established.
Conclusions: This case represents an unusual cause of retrobulbar hemorrhage causing visual symptoms and is the first in the literature to radiographically suggest the anatomical route of hemorrhage tracking into the orbit.

Title: Ciliary body melanoma with metastasis to an extraocular muscle of the contralateral orbit

Authors: Jessica Ruzicki, Vladimir Kratky

Abstract Body:

Purpose: To report a rare case of a 55 year old man with a ciliary body melanoma of the left eye with metastasis to an extraocular muscle of the right eye 3 years after left enucleation.
Study Design: Observational case report.
Methods: Clinical records, including clinical examination, optical coherence tomography (OCT), fluorescein angiography, and fundus photos, as well as, a review of consultations by other specialists.
Results: A 55 year old man presented initially to the emergency department in March 2011 with decreased visual acuity (VA) of the left eye. The patient was otherwise well with no medical conditions and no constitutional symptoms. On examination, visual acuity was 20/25-2 in his right eye and CF in his left eye. Anterior segment exam demonstrated an irregular pupil, diffuse conjunctival hyperemia with a few dilated inferior conjunctival vessels. Fundus exam demonstrated a flat retina superotemporally, but a large inferonasal orange mass was also seen. A UBM and B-scan confirmed a ciliary body mass with a base diameter of 18 x 17.5mm and height of 9.14mm. The features were suggestive of a ciliary body melanoma and an enucleation was recommended and performed in May 2011. The diagnosis of a left uveal melanoma arising from the ciliary body was confirmed by pathology. A complete work-up detected no evidence of systemic metastases at the time. Postoperatively the patient was stable until January 2014. He then presented to the emergency department complaining of a headache; CT imaging found a enhancing mass within the belly of the right medial rectus muscle measuring 19 x 13mm. The rectus mass was biopsied and found to be a metastastatic melanoma. Systemic workup of the patient revealed metastatic melanoma in the lungs, liver, adrenals and lymph nodes. The right medial rectus mass was treated with radiation followed by subsequent debulking surgery for palliation of pain and proptosis. Chemotherapy was then instituted July 2014. The metastatic disease continued to progress and, as a result, Pembrolizumab was initiated in May 2015. A mixed response ensued, some systemic lesions shrunk, however, others slightly increased in size. The patient passed away from his metastatic disease January 2017.
Conclusions: Uveal melanoma is the most common primary malignant tumor of the eye in adults and ciliary body melanomas account for approximately 10% of these cases. A review of the literature reveals that uveal melanoma metastasizing to the contralateral orbit is exceedingly rare. This case exemplifies a rare disease process, and draws attention to the occurrence of metastases to the contralateral orbit years after treatment of the primary tumor.

Title: Benign reactive lymphoid hyperplasia of the left upper eyelid in a youth

Authors: Solin S. Saleh, Andre Ali-Ridha, Seymour Brownstein, Bruce Burns, Ronan Conlon

Abstract Body:

Purpose: To describe the clinical course and histopathological features of a rare presentation of benign reactive lymphoid hyperplasia in the left upper eyelid of an 11-year-old girl.
Study Design: Case report
Methods: An 11-year-old girl presented with a unilateral, diffuse and isolated mass of the left upper eyelid which underwent an excisional biopsy.
Results: An excision biopsy revealed a mixed lymphocytic infiltrate with germinal centers which stained positive with CD10 and Bcl-6 and negative with Bcl-2, consistent with a diagnosis of benign reactive lymphoid hyperplasia. At 6 months of follow-up, the left upper eyelid lesion remained relatively the same size yet the patient complained that the swelling was getting worst and she was having recurrent headaches. The patient was referred to a pediatrician to begin systemic steroid treatment based on the histopathological diagnosis. At her 3 month visit, the patient reported swelling of the opposite right upper eyelid for 1 week with bilateral lacrimal gland swelling. At this time she was treated with oral prednisone beginning with 40mg daily per week which was tapered down to 30mg daily per week and 20mg daily for 2 weeks with another referral to a pediatrician. The patient was then seen 7 months later after her prednisone therapy was discontinued with worsening headaches, nasal congestion and increased swelling of her right upper eyelid. The oral prednisone and ranitidine were restarted, but has since been lost to follow-up due to poor compliancy.
Conclusions: This lesion is rare in children with the clinical course and management not yet well-elucidated. We report for the first time in the reviewed English literature the natural history and progression of benign reactive lymphoid hyperplasia isolated to the eyelid of a child which may have a more aggressive and malignant potential.

Title: Immunohistochemical analysis of sebaceous cell carcinoma in comparison to basal cell carcinoma and squamous cell carcinoma

Authors: Tina Tang, Seymour Brownstein, Andre Ali-Ridha, Kailun Jiang, Bruce Burns, Paula Blanco, James Farmer

Abstract Body:

Purpose: Sebaceous cell carcinoma (SebCC) is the third most common eyelid malignancy after basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). The mortality rate for SebCC has been reported as 6-30%, which may be significantly reduced by early diagnosis and total excision. Identifying and classifying SebCC has been difficult for clinicians and pathologists, especially poorly differentiated SebCC, due to its masquerading properties as many other inflammatory lesions, and benign and malignant tumours of the eyelid, including BCC and SCC. The goal of our study is to compare the immunostaining profile of SebCC to that of BCC and SCC to design the most optimal panel of immunostains for early diagnosis of SebCC.
Study Design: We performed a retrospective case series to distinguish the immunostaining profile of SebCC of the eyelid from BCC and SCC.
Methods: We compared 8 sebaceous cell carcinomas to 8 basal cell carcinomas and 8 squamous cell carcinomas of the eyelid from the Ottawa Ophthalmic Pathology Laboratory from 2007 to 2013. Specimens with sufficient quantity and quality of tissue for processing were included. We stained each specimen with EMA, BER-EP4, adipophilin, androgen receptor (AR), p16, BCL-2, CK7, Ki67, BRST1, BRST2, p53, and CK20. We compared the extent of staining to that of normal surface and glandular epithelial tissue on each slide as normal internal controls. Two pathologists analyzed the quantitative intensity of immunolabelling for all the cases. The immunoreactivity data was then analyzed using a 2-tailed Kruskal-Wallis test. Significance was set at $p<0.05$.
Results: Analysis of sensitivity and specificity of each significant immunostain showed an optimal and effective panel of 4 immunostains (EMA, adipophilin, P16, and BER-EP4) with statistical significance ($p<0.05$) to differentiate the 3 groups of neoplasms. SebCC samples stained positively with EMA, adipophilin, P16, and (BER-EP4) in SebCC. BCC samples exhibited positive staining for BER-EP4, and SCC lesions showed positivity for EMA.
Conclusions: Our study helps clarify much of the controversy in the literature concerning immunostains to use for diagnosing SebCC. We have found that the most informative panel for differentiating SebCC from BCC and SCC consists of EMA, adipophilin, P16, and BER-EP4. This diagnostically optimal panel of immunostains may allow for earlier diagnosis and management of an aggressive and potentially lethal SebCC.

UVEITIS | UVÉITE

Title: Presumed immunotherapy-induced bilateral anterior and intermediate uveitis: A case series

Authors: Andre Ali-Ridha, Massimo Di Iorio, Hady Saheb, Karin Oliver

Abstract Body:

Purpose: Novel immunotherapy agents are currently being used more commonly in the treatment of metastatic carcinomas. We evaluate the clinical features and management strategies for the relatively rare presentation of presumed immunotherapy-induced anterior and intermediate uveitis in two patients with metastatic cutaneous melanoma.
Study Design: Case series and literature review.
Methods: Two patients receiving immunotherapy for metastatic cutaneous melanoma were evaluated. At the time of presentation, patient A was being treated with a PD-1 receptor blocker (pembrolizumab) and a combination of 2 signal transduction inhibitors (dabrafenib and trametinib) and patient B was receiving checkpoint inhibitor immunotherapy with nivolumab and ipilimumab.
Results: Patient A presented with a bilateral anterior and intermediate uveitis which was further characterized by bilateral optic disc staining and diffuse choroidal hyperfluorescence on fluorescein angiography. Patient B presented atypically, with a late capsular block syndrome in the right eye, 13 years after uncomplicated phacoemulsification, a mild bilateral anterior and intermediate uveitis and evidence of cystoid macular edema in the left eye. The ocular inflammation in both patients responded well to topical steroid therapy and the cystoid macular edema in patient B resolved with topical nonsteroidal therapy. Patient A continued treatment with pembrolizumab but discontinued treatment with dabrafenib and trametinib when she experienced an increase in subjective floaters and objective vitreous cells with reintroduction of these medications. Patient B continued treatment with nivolumab and ipilimumab. A systemic workup to eliminate other causes of uveitis (infectious and non-infectious) was performed for each patient.
Conclusions: With the presentation of these two cases we hope to further expand the knowledge of the unknown risks and safety profiles of these novel immunotherapy medications. We highlight the prompt evaluation and treatment of medication related ocular side-effects by an ophthalmologist. We also demonstrate the importance of close collaboration between the two specialities of oncology and ophthalmology when treating patients with novel immunotherapy agents.

Title: Treatment of CMV retinitis in patients with leukemia post bone marrow transplant: A case series

Authors: Fargol Mostofian, Irfan Kherani, Natasha Rupani, Ahsan Chaudhry, Parham Minoo, Amin Kherani

Abstract Body:

Purpose: We present two cases of cytomegalovirus (CMV) retinitis in patients with leukaemia, post bone marrow transplant, and concurrent Graft versus Host (GvH) disease. We expand on a novel CMV therapy (Brincidofovir) and a rarer presentation of menigoencephalitis with retinitis.
Study Design: Case report.
Methods: Patient charts, including all investigations were reviewed. Literature review was also performed using Pubmed and Ovid.
Results: In case one, a 65-year-old female with acute lymphoblastic leukemia post bone marrow transplant was referred due to a superior shadow in the right eye, during an episode of systemic CMV viremia, with viral load 5000IU/mL. On examination she had evidence of retinitis and retinal hemorrhages. She was initially treated with single intravitreal Gancyclovir followed by foscarnet weekly for 13 weeks with on-going systemic Foscarnet. However, she developed resistance to the conventional treatment and novel systemic Brincidofovir was initiated with good reduction in viral count and resolved CMV retinitis within 2 months. Case two is a 66-year-old female with acute myeloid leukemia, post bone marrow transplant, presented with reduced visual acuity in the left eye (20/80 OD). On examination the left eye revealed retinitis, vasculitis and OCT findings of subretinal hemorrhage. Anterior chamber tap confirmed the presence of CMV virus. Moreover, she presented with symptoms of meningitis with blood CMV count of 43,000IU/mL and cerebral spinal fluid CMV count of 35,000IU/mL. Systemic Foscarnet was initiated and the viremia reduced, but plateaued at 5-10,000IU/mL. At this time, systemic Gancyclovir was added to the Foscarnet with good response. Adjuvant treatment with intravitreal Gancyclovir injections weekly for 3 weeks and Foscarnet injections for 12 weeks resulted in improved vision to 20/50 OS and resolution of the hemorrhage.
Conclusions: These cases underscore the use of local as well as systemic antiviral therapies in the treatment of CMV retinitis. In case one consideration of resistance pattern in an immunecompromised patient lead to the successful use of systemic Brincidofovir, a new experimental antiviral. Case two highlight the need for early treatment to reduce rarer manifestation of CMV viremia, such as menigoencephalitis with retinitis. Additionally, treatment response based on blood and CSF viral count is underscored in cases of CMV retinitis. Although there is no standardized treatment for CMV retinitis consideration of resistance, immune reconstitution and systemic manifestations are essential.

Title: Safety and efficacy of single and multiple injections of Ozurdex in non-infectious uveitis

Authors: Yasmine Rabia, Marie-Josée Aubin, Marie-Lyne Bélair, Éric Fortin

Abstract Body:

Purpose: To evaluate the effect of a single and multiple injection(s) of dexamethasone intravitreal implant (IVT-DI; Ozurdex; Allergan, Inc.) on visual acuity, intra-ocular pressure and central retinal thickness (CRT) in patients with non-infectious uveitis.
Study Design: Retrospective study design
Methods: This study included 25 patients (33 eyes) with non-infectious uveitis receiving 77 IVT-DI during the period of May 2014 to May 2016 at a tertiary center (Maisonneuve-Rosemont Hospital, Montreal). The study group included eyes with either a history of steroid response from previous treatment, a partial response to intravitreal triamcinolone injection or both. The outcomes measured were the best corrected visual acuity, the intra-ocular pressure and the central retinal thickness at 1, 3 and 6 months after a single injection as well as 12 months after a single or cumulative injections of IVT-DI.
Results: Among eyes receiving IVT-DI in this study, 51% had a previous history of steroid response, 15% had partial response to intravitreal triamcinolone injection in the past and 24 % had both combined. The most common ocular diagnosis was Birdshot choroidopathy (24%). Mean visual acuity was 0.58 ± 0.41 logMAR (logarithm of the minimum angle of resolution) before injection with no statistically significant improvement after 1-3-6 months. Baseline intra-ocular pressure was 15.2 ± 4.2 mmHg, with a statistically significant increase ($p=0.0002$) of 4.6 mmHg at month 1 but subsequent decrease in months 3 and 6 comparable to baseline. None of the eyes required glaucoma surgery. The mean CRT pre-injection was 467.6 ± 193.1 microns and had a statistically significant decrease that was maintained in months 3 and 6 ($p < 0.0001$). After 12 months, 55% (18/33) of eyes had at least one reinjection and 27% (9/33) of eyes had ≥ 3 reinjections of IVT-DI. There was no statistically significant difference in visual acuity and intra-ocular pressure compared to baseline whereas CRT remained statistically significantly lower than baseline, at 310.8 ± 152.5 microns.
Conclusions: In this study of eyes with non-infectious uveitis and history of steroid-response or partial response to intravitreal triamcinolone injection, the use of dexamethasone intravitreal implant was efficient to reduce CME. Strict follow-up of intra-ocular pressure during the first month after injection is necessary. Reinjections are frequently needed to maintain clinical effect.

CORNEA, EXTERNAL DISEASE AND REFRACTIVE SURGERY
CORNÉE, MALADIES EXTERNES ET CHIRURGIE RÉFRACTIVE

Title: Ex-vivo imaging of posterior human corneal layers after big bubble DALK procedure with ultrahigh resolution OCT (UHR-OCT)

Authors: Murad Alobthani, Zohreh Hosseinaee, Ham Le, Cassandra Maxwell, Luigana Sorbara, Kostadinka Bizheva, Harminder Dua, Simon P. Holland

Abstract Body:

Purpose: To visualize ex-vivo the morphology of the posterior corneal layers after big-bubble deep anterior lamellar keratoplasty (BB-DALK) procedure by using Ultrahigh Resolution Optical Coherence Tomography (UHR-OCT). To understand the role of the endothelial cells' in contribution to the double-contour lie that appears on corneal images generated by commercially available OCT and attributed to either Descemets membrane (DM) and endothelium or to the banded and non-banded zones of DM.
Study Design: Laboratory Controlled Experiment.
Methods: An UHR-OCT system was used to image ex-vivo the morphology of the posterior human corneal layers. 29 human cadaver corneas were obtained from the Eye Bank of British Columbia. A BB-DALK was formed after intrastromal injection of air into the donor corneoscleral button in 24 corneas, while the remaining 5 served as controls. After the procedure, the endothelial layer was covered with Dispase at 4°C for (16-20 hours). then rinsed with buffer solution to remove the endothelial layer. Volumetric UHR-OCT images (512 A-scans x 512 B-scans) were acquired from 10 mm x 10 mm area of the central cornea with 0.95µm axial and ~5 µm lateral resolution before and immediately after the BB-DALK procedure and after 18hr treatment with Dispase. Custom, Matlab-based image processing algorithms were used to numerically dispersion compensate the UHR-OCT images and segment and measure the thickness of the posterior corneal layers.
Results: Out of 24 corneas injected with air, 10 corneas had Type-1 BB (Dua's Layer (DL) with Descemets membrance (DM)), 3 corneas had Type-2 BB (DM alone) and 3 corneas had Mixed BB, the remaining 8 cornea were injected with Viscoat to create or maintain ruptured BB. UHR-OCT of the posterior corneal layers of both Type-1 BB and Type-2 BB showed double contour line. In Type-1 BB, the anterior line was thicker and more hyper-reflective. Re-imaging the posterior corneal surface after chemical removal of the endothelium with Dispase continued to show the double contour line, however, the posterior line was less hyper-reflective.
Conclusions: Imaging posterior corneal layers with UHR-OCT present distinct features which help understanding the structure BB-DALK. The double contour line is produced by changes in refractive index between stroma and DM/DL anterioly and the aqueous and endothelium/DM posteriorly and not by the anatomy of the structures. These finding will help development and interpretation of intraoperative UHR-OCT for lamellar corneal surgery.

Title: Topography-guided photorefractive keratectomy for correction of irregular astigmatism following penetrating keratoplasty

Authors: Murad Alobthani, David Lin, Simon P. Holland

Abstract Body:

Purpose: Post-keratoplasty eyes frequently have high and irregular astigmatism difficult to correct with rigid contact lenses possibly needing further surgery. We aimed to evaluate the alternative of topography-guided Photorefractive Keratectomy (TG-PRK) for correction of irregular astigmatism following penetrating keratoplasty (PK) using Schwind Amaris
Study Design: Retrospective, non-randomized, consecutive series
Methods: Contact lens intolerant eyes with irregular astigmatism following PK that underwent trans-epithelial TG-PRK with the Schwind Amaris 1050 SmartSurfACE Excimer Laser. Eyes with at least 12 months of follow-up were included. Data collected included pre-operative and post-operative uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), manifest refraction (MR), topographic cylinder and the number of Snellen lines gained or lost. Any complications were recorded.
Results: 35 of 65 eyes had sufficient data at 12 months for analysis. 13/35 eyes (37%) showed UDVA ≥20/40 post-operatively with none pre-operatively. 18 eyes (51%) had improved CDVA with 11 eyes (31%) gained ≥2 lines. 4 eyes (11%) lost ≥2 lines. Mean pre-operative topographic cylinder was 5.33±2.24D. Reduction in astigmatism (RIA) was 3.21±2.78D. Mean spherical equivalent improved from -3.35±3.92D to -1.24±2.29D. No patient showed regression up to 12 months post-operatively. There were no eyes with visually significant haze and no infection post-operatively. Five eyes had delayed epithelial healing without long term sequelae.
Conclusions: Early results of trans-epithelial TG-PRK showed satisfactory efficacy and safety for treatment of irregular astigmatism following corneal transplantation .More than 33% achieved ≥20/40 UDVA postoperatively but none before surgery. The technique appears to be a good alternative treatment for highly symptomatic contact lens intolerant patients.

Title: Superficial keratectomy: Indications and outcomes

Authors: Steven S. Bae, Clara C. Chan

Abstract Body:

Purpose: To evaluate the indications and outcomes of manual blade superficial keratectomy.
Study Design: Retrospective, nonrandomized, consecutive case series.
Methods: Database search of patients from 2012-2017 who underwent superficial keratectomy was conducted at a tertiary care hospital cornea clinic. Charts of 121 patients (156 eyes) were reviewed who had at least 4 weeks of follow-up and both preoperative and postoperative measurements of best-corrected visual acuity or corneal cylinder. Outcome measures included: patient demographics, surgical indication, prior ocular history, best-corrected visual acuity (BCVA) changes, corneal and refractive astigmatism changes, recurrence of symptoms or pathology, additional treatments required, and intraoperative and postoperative complications.
Results: Mean patient age at time of operation was 63.3 (±14.8), 39% were male. Indications included epithelial basement membrane dystrophy, recurrent corneal erosion syndrome, Salzmann nodular degeneration, band keratopathy, and suspected ocular surface neoplasia. In 83 eyes with epithelial basement membrane dystrophy, mean BCVA (20/47 to 20/40, P = 0.033), refractive astigmatism (1.76 ± 1.83 D to 1.15 ± 1.08 D, P = 0.010), and corneal astigmatism (1.44 ± 0.88 D to 1.06 ± 0.88 D, P = 0.022) significantly improved. Twenty-four percent (5/21) of eyes with recurrent erosions had symptoms return at a mean 6.5 months follow-up. In 42 eyes with Salzmann nodular degeneration, notable prior ocular histories included use of lubricants (45%), contact lens wear (19%), LASIK (10%), and rosacea (10%). Of 33 eyes that had cataract surgery following superficial keratectomy, corneal astigmatism (1.39 ± 1.02 D to 1.00 ± 0.51 D, P = 0.023) and refractive astigmatism (2.21 ± 2.04 D to 1.20 ± 0.83 D, P = 0.005) significantly improved following superficial keratectomy. No intraoperative complications were noted. The epithelium healed completely in all 156 eyes at final follow-up.
Conclusions: This is the largest series to date reviewing the indications and outcomes of superficial keratectomy, and the first to report improvements in astigmatism in eyes that later had cataract surgery. Superficial keratectomy is a simple, safe procedure that can be performed for a variety of conditions to improve visual acuity, reduce corneal astigmatism, and alleviate symptoms secondary to ocular surface pathology.

Title: Nomogram to predict graft thickness in Descemet's stripping automated endothelial keratoplasty: An eye bank study

Authors: Steven S. Bae, Isaac Menninga, Richard Hoshino, Christine Humphreys, Clara C. Chan

Abstract Body:

Purpose: In Descemet's stripping automated endothelial keratoplasty (DSAEK), ultrathin grafts have been associated with improved visual outcomes. However, preparation of ultrathin grafts can be challenging. The purpose of this study was to develop a nomogram to predict post-cut thickness of corneal grafts prepared at an eye bank for DSAEK.
Study Design: Retrospective chart review
Methods: Charts were reviewed of consecutive DSAEK graft preparations by three experienced technicians from April 2012 to May 2017 at the Eye Bank of Canada - Ontario Division. Variables collected included: donor demographics, death-to-preservation time, death-to-processing time, pre-cut tissue thickness, post-cut tissue thickness, microkeratome head size, endothelial cell count, cut technician, and rate of perforation. Linear regression models were generated for each microkeratome head size (300 and 350 µm). To do this, 80% of the data was randomly selected to create the linear regression model based on two predictor variables: donor age and pre-cut tissue thickness. The remaining 20% was used to test the accuracy of the model. Nomograms were created based on the regression models.
Results: Seven hundred and eighty grafts were processed during the study period. Of these, 474 (60.7%) were male and 306 (39.3%) were female. The mean age of the donors was 59.9 ± 11.5 (range: 15 to 78). Mean death-to-corneal preservation time was 18.8 ± 5.5 hours (range: 3.3 to 28.3 hours). Mean death-to-corneal processing time was 5.1 ± 1.7 days (range: 2 to 12 days). Twelve preparation attempts resulted in perforation (1.5%) and were excluded. Mean pre-cut tissue thickness was 510 ± 49 µm (range: 363 to 670 µm). Mean post-cut tissue thickness was 114 ± 22 µm (range: 57 to 193 µm). Seventy-nine percent (608/768) of grafts were ≤130 µm. The linear regression models included pre-cut thickness and donor age as predictor variables of post-cut thickness. Pairwise t-tests revealed no statistically significant difference in post-cut thickness between technicians ($p>0.05$), or between donor eyes with a history of LASIK ($p>0.05$). These variables were excluded from the linear models we created. Models for both the 300 µm and 350 µm microkeratome were able to predict the thickness to within 25 µm 80% of the time.
Conclusions: We report the first nomogram to predict thickness of DSAEK corneal grafts prepared in an eye bank setting, which was accurate to within 25 µm 80% of the time. Other eye banks could consider performing similar analyses.

Title: A review of ocular involvement in epidermolysis bullosa

Authors: Soumiya Bouhout, Marie-Claude Robert

Abstract Body:

Purpose: Epidermolysis Bullosa (EB) is a heterogynous group of skin disorders characterized by formation of blisters and erosions of the skin in response to minor trauma. Subtypes include EB simplex (EBS), Junctional EB (JEB), dystrophic form of EB (DEB) and finally Kindler syndrome (KS). In addition to dermal manifestation, patients can present with various ophthalmic pathologies.
Study Design: Literature review
Methods: We reviewed the pathobiology, epidemiology and management of ocular manifestations as well as current and future innovative therapies for EB.
Results: The severity and incidence of ocular involvement were the highest in the Recessive DEB-generalized severe and JEB-generalized severe subtypes. Recurrent corneal erosions and blisters were the most common finding and seem to correlate with skin disease. Other manifestations include corneal scaring, blepharitis, ectropion and symblepharon. Baseline medical therapy with topical lubricant is essential to prevent corneal scarring. Further surgical treatments such as symblepharon or ectropion repair, lamellar keratectomy, amniotic membrane transplant or corneal transplant can be used in severe cases.
Conclusions: Ophthalmology consult as well as regular follow-up are essential in the multi-disciplinary approach of this disease. Indeed, parents' and patients' education as well as early diagnosis and treatment are crucial to prevent permanent and long-term visual disabilities.

Title: A Canadian-based population survey of dry eye disease prevalence

Authors: Clara C. Chan, Barbara Caffery, Sruthi Srinivasan, Aren Fischer, David Cappadocia, Csaba Siffel, Christopher J. Reaume

Abstract Body:

Purpose: Dry eye disease (DED) is a chronic ocular surface disease commonly encountered by eye-care professionals, with symptoms including ocular discomfort and visual disturbance. It has been shown to reduce health-related quality of life. This study estimated the current prevalence of DED and associated risk factors among adults in Canada.
Study Design: Cross-sectional, population-based survey.
Methods: The clinically validated 5-Item Dry Eye Questionnaire (DEQ-5) was completed (March-April, 2017) by adult patients (age ≥18 years) in the QuintilesIMS E360 database, which contains de-identified data from patients in the Ontario-based Appletree Medical Group. Inclusion criteria were: 2 or more visits to an Appletree clinic, with at least 1 visit in the 12 months before the study, and an email address linked to the patient's database record. DED was defined by a DEQ-5 score >6/22. Prevalence estimates were age/sex adjusted using the direct method to obtain national prevalence estimates for the 2016 Canadian population. Logistic regression analysis was used to determine the association between suggested DED risk factors and the prevalence of DED. Risk factors included: diagnosis of hepatitis, nutritional/vitamin deficiencies, keratitis/corneal ulcer, conjunctiva disorders, blepharitis/obstruction of the lacrimal duct, and rheumatoid arthritis/Still's disease; and prescriptions related to diabetes, thyroid disease, gout, and human immunodeficiency virus (HIV).
Results: The survey was received by 124,469 patients. Of the 5,163 (4.2%) patients that completed the survey, 3071 (59.5%) were female, with a median age of 46 years, and 2088 (40.4%) were male, with a median age of 56 years (for 4 patients, sex information was unavailable). There were 1,135 patients identified as having DED, resulting in an unadjusted prevalence estimate of 22.0% (95% CI, 20.8-23.1%). Prevalence by age group was: 18-24 years, 22.6% (95% CI, 17.7-27.5%); 25-34 years, 18.4% (15.9-21.0%); 35-44 years, 19.9% (17.3-22.5%); 45-54 years, 23.6% (20.8-26.3%); 55-64 years, 24.7% (22.1-27.3%); 65-74 years, 23.3% (20.1-26.5%); and 75+ years, 21.3% (17.3-25.2%). Prevalence was higher among women (24.7%; 95% CI, 23.2-26.2%) than men (18.0%; 95% CI, 16.4-19.7%). The age/sex adjusted national DED prevalence in the 2016 Canadian population was 21.3% (95% CI 19.8%-23.2%). Patients with DED were significantly older than those without DED ($P<0.05$), and significantly more likely to be female ($P<0.001$). Differences between the groups with DED and without DED were not significant for any of the other risk factors.
Conclusions: Our data suggests that DED may affect more than 21% of Canadian adults. Older people and females are more likely to have DED. Limitations of the survey were related to the measurement of DED prevalence independent of diagnosis, and the potential response biases inherent in self-selection of respondents. Our data provide a current estimate of the scale of DED prevalence in Canada and highlight the importance of maintaining awareness of this common condition.

Title: Descemet membrane endothelial keratoplasty (DMEK) favored among partial thickness corneal transplants at the University of Toronto

Authors: Sze Wah Samuel Chan, Yeni Yucel, Neeru Gupta

Abstract Body:

Purpose: To assess trends in surgical procedures and indications for all corneal transplants performed at the University of Toronto.
Study Design: This is a retrospective cross-sectional study of 1104 consecutive corneal transplants performed at the Kensington Eye Institute (KEI).
Methods: Research Ethics Board approval was obtained from St. Michael's Hospital (REB No. 13-225). Demographic, clinical, and pathological data retrieved from the Ophthalmic Pathology Laboratory on all corneal transplants performed at the KEI from January 2014 to December 2016. Data obtained from 971 patients included age, sex, year of corneal transplant, types of corneal transplant procedure, clinical indications for transplant, and pathological diagnosis. Indications were classified into broad categories of Fuchs' dystrophy, graft failure, keratoconus, bullous keratopathy, infection, corneal scarring, non-Fuchs' endothelial dystrophy, and other indications. Unpaired Student t-test was used to compare ages and used a Welch correction if variances differed according to a F test for equality of variances with a Bonferroni correction if there were multiple comparisons. Fischer's Exact test was used to assess proportions (by comparing with all other diagnoses or procedures). A Cochrane-Armitage test for trends was used to assess proportions over time.
Results: Over three years, partial-thickness lamellar keratoplasties were performed in 880 cases (80%) while full-thickness penetrating keratoplasties (PKP) accounted for 224 cases (20%). Leading causes of corneal transplant were Fuchs' dystrophy (42%), graft failure (17%), bullous keratopathy (15%), and keratoconus (15%). Graft failure (40%) and keratoconus (31%) were the leading causes for PKP. Descemet's membrane endothelial keratoplasty (DMEK) accounted for 37% of cases, Descemet's stripping automated endothelial keratoplasty (DSAEK) for 30%, and deep anterior lamellar keratoplasty (DALK) for 13%. By 2016, partial-thickness procedures had increased by 11% ($p = 0.0003$), accounting for 85% of all procedures. In addition, DMEK increased by 26% ($p < 0.0001$) DSAEK decreased by 13% ($p = 0.0002$), and PKP decreased by 11% ($p = 0.0003$). Fuchs' dystrophy remained the leading indication for DMEK (67%) and DSAEK (42%) procedures. In 2016, 73% of DALK procedures were for the treatment of keratoconus.
Conclusions: Partial-thickness corneal transplants now account for 85% of all current graft procedures and DMEK has emerged as the most commonly performed procedure. Graft failure continues to the leading indication for full-thickness grafts. Longitudinal studies are needed to determine whether these new trends persist, and their future impact on graft failures.

Title: Incidence of corneal transplant in keratoconus following the adoption of corneal cross-linking in BC

Authors: Kathryn Clapson, Colten Wendel, Murad Al Obthani, Daud Akhtar, Sonia Yeung, Alfonso Iovieno

Abstract Body:

Purpose: Corneal collagen cross-linking (CXL) is a technique which strengthens chemical bonds in the cornea using UV light and Riboflavin, a photosensitizer. There is a long track record of publications showing the efficacy of CXL in halting the progression of corneal ectatic disease, especially keratoconus. This study functions to evaluate if the introduction of corneal cross-linking for progressive keratoconus in 2011 in British Columbia resulted in a decrease in corneal transplants in keratoconus patients.
Study Design: Ecological study. The number of corneal transplants performed for keratoconus in British Columbia from 1998-2016 was obtained from the Eye Bank of British Columbia. Two periods were created: Period 1 from 1998-2011 prior to cross-linking, and Period 2 2011-2016 post-introduction of cross-linking. The number of corneal cross-linking procedures was obtained from the Ministry of Health.
Methods: The incidence of corneal transplants per year in keratoconus prior to, and following corneal cross-linking, was analyzed using descriptive statistics. The mean age per year, mean female to male ratio per year, and the mean percentage VA (the visual acuity of eyes undergoing cornea transplant per year divided into groups: >20/30, > 20/50, >20/70, >20/100, <20/200) were compared in both time periods. Statistical analyses were performed using IBM SPSS statistics version 1.0.0.7.0.1 and Microsoft Excel version 15.38.
Results: There was a gradual increasing trend in the number of keratoplasties for keratoconus per year in BC from 1998-2011 (82 mean/year), until 2012 where there was a steep decline following introduction of corneal cross-linking (58 mean/year). This decrease was statistically significant (P=0.03). There were a total of 8,151 corneal cross-linking procedures done from 2011-2016. There were no statistically significant differences in mean age per year, mean female to male ratio per year, and % VA when comparing Period 1 to period 2.
Conclusions: The number of corneal transplants for keratoconus decreased with statistical significance following the introduction of corneal cross-linking, indicating the benefit of cross-linking in delaying or preventing the need for a corneal transplant.

Title: Reductions in eye dryness score in response to lifitegrast 5.0% for the treatment of dry eye disease: Responder analysis from two phase 3 randomized controlled trials

Authors: Mahshad Darvish-Zargar, Edward J. Holland, Christophe Baudouin, Eric D. Donnenfeld, Kelly K. Nichols, Paul M. Karpecki, Mohamed Hamdani, Amir Shojaei

Abstract Body:

Purpose: Lifitegrast, a lymphocyte function-associated antigen-1 (LFA-1) antagonist, is the first FDA-approved treatment for the signs and symptoms of dry eye disease (DED) and has demonstrated safety and efficacy in five randomized controlled trials. We evaluated the proportion of subjects who achieved defined response thresholds for reductions in eye dryness in two trials of similar design.
Study Design: OPUS-2 and OPUS-3 are phase 3, twelve-week, randomized, double-masked, placebo-controlled trials of lifitegrast ophthalmic solution 5.0% conducted among subjects with DED at multiple sites in the United States (2012-2015). Criteria for enrollment in both trials was an eye dryness score (EDS, VAS [visual analogue scale], 0-100) ≥40, a corneal staining score ≥2.0 (0-4 scale), and a history of artificial tear use at entry. OPUS-2 included 358 subjects randomized to lifitegrast and 360 to placebo; OPUS-3 included 355 subjects randomized to lifitegrast and 356 to placebo.
Methods: The reduction in EDS was expressed as the absolute change from baseline (≥10-points, ≥15-points, ≥20-points) and the percent change from baseline (≥30%, ≥50%, ≥70%). This data was used to determine the proportions of subjects achieving these thresholds for reduction in EDS after 14, 42 or 84 days of lifitegrast/placebo treatment in the intent-to-treat population with last observation carried forward. All reported P-values are two-side P-values from a Chi-Square test comparing the proportion of responders to lifitegrast vs placebo.
Results: The proportion of subjects with a ≥15-points reduction in EDS (lifitegrast versus placebo) at day 14 was 56.1% versus 38.6% (P<0.0001) in OPUS-2, and 57.7% versus 42.5% (P<0.0001) in OPUS-3; at day 42, 67.6% versus 49.7% (P<0.0001) in OPUS-2, and 74.2% versus 56.7% (P<0.0001) in OPUS-3; and at day 84, 74.3% versus 56.9% (P<0.0001) in OPUS-2, and 79.9% versus 68.3% (P=0.0004) in OPUS-3. The proportion of subjects with a ≥30% reduction in EDS (lifitegrast versus placebo) at day 14 was 47.5% versus 30.6% (P<0.0001) in OPUS-2, and 52.6% versus 35.1% (P<0.0001) in OPUS-3; at day 42, 59.8% versus 41.1% (P<0.0001) in OPUS-2, and 67.1% versus 49.0% (P<0.0001) in OPUS-3; and at day 84, 68.7% versus 48.9% (P<0.0001) in OPUS-2, and 74.2% versus 60.1% (P<0.0001) in OPUS-3. For all other reductions in EDS thresholds evaluated at 14, 42 and 84 days, lifitegrast response was significantly better than placebo.
Conclusions: As early as 14 days after the initiation of treatment, a significantly higher proportion of adults with DED treated with lifitegrast achieved the defined response thresholds for reductions in eye dryness in the OPUS-2 and OPUS-3 trials, as compared with placebo. This trend was observed across multiple efficacy thresholds (point reductions of ≥10-points, ≥15-points and ≥20-points, and percent change from baseline of ≥30%, ≥50%, and ≥70%) and additional time points (day 42 and 84).

Title: Complications of ocular self-tattooing: A case report

Authors: Harald Gjerde, Wesley Chan, Darrell Lewis, Arif Samad, Paul Rafuse

Abstract Body:

Purpose: Body modification is the practice of deliberate alterations to the human body, such as tattoos, piercings, and scarification, to achieve self-expression or control over one's body. There has been an increasingly popular trend towards ocular tattooing, where ink is injected within the subconjunctival space. Complications reported range from conjunctival edema and nodules to more serious conditions, such as orbital cellulitis, scleritis, panuveitis, and secondary glaucoma. A case of ocular tattooing that resulted in numerous complications is presented, in order to highlight the dangers of tattooing the eye and the need for further laws and regulations.
Study Design: We highlight a case of a 41-year-old male presenting with globe penetration after injection of blue tattoo dye into his right eye during an attempt of self-tattooing. We also recognize the need for specific legislature surrounding ocular tattooing.
Methods: We describe the course of the ocular self-tattooing case that resulted in permanent corneal staining and edema, secondary glaucoma, zonular dehiscence, and lens luxation. A literature search was conducted to better delineate the biological effects of tattoo ink components. A wider internet search was done to research specific tattoo legislation in Canada and around the world.
Results: After several procedures to combat complications, the patient's status improved, with the last visual acuity measured at 6/120 (6/60 with pin-hole) in the right eye. Unfortunately, the patient was lost to follow-up due to complicated social situations. There are no laws regarding ocular or periorbital tattooing in Canada, and only certain states in the United States have any legislation restricting tattooing in or around the eyes.
Conclusions: This unique case of ocular self-tattooing has resulted in multiple complications and a guarded visual prognosis for the patient. In addition to the mechanical trauma caused to the eye, the likely source of ocular inflammation and corneal edema comes from the composition of the ink used. Rules and regulations surrounding tattooing are nebulous at best in Canada and around the world. With two other recent Canadian ocular tattooing cases in the last couple years, we as ophthalmologists have a responsibility to educate the public on the dangers of ocular tattooing, and there is a greater need for the COS to urge federal and provincial governments to include restrictions and regulations as part of their body art legislation.

Title: Topography-guided photorefractive keratectomy and collagen cross-linking for post-LASIK ectasia

Authors: Simon P. Holland, David T.C. Lin, Murad Al Obthani, Samuel Arba Mosquera

Abstract Body:

Purpose: To evaluate results of topography-guided Photorefractive Keratectomy (TG-PRK) with collagen cross-linking (CXL) for post-LASIK ectasia using the Schwind Amaris Excimer laser.
Study Design: Retrospective case series
Methods: Evaluation of the outcome of post-LASIK ectasia eyes that underwent treatment with the Schwind Amaris 1050 excimer laser with CXL with modified Dresden protocol. Preoperative and post-operative uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), manifest refraction (MR) and topographic cylinder were analyzed after 12 months of follow-up.
Results: 52 eyes of post-LASIK ectasia underwent treatment, 23 had sufficient data at 12 months for analysis. 13 of 23 (57%) showed UDVA ≥20/40 post-operatively. 11 (48%) had improved CDVA and 6 eyes (26%) gained two or more lines (p=0.03). 5 (22%) had lost CDVA with 1 (4%) lost more than 1 line. No case showed progression. Mean astigmatism was reduced from 3.05±1.41D to 1.25±1.05D (p=0.0008). Mean spherical equivalent was improved from -2.30±4.16D to -0.46±1.96D (p=0.05).
Conclusions: Early results of TG-PRK with CXL with the Schwind Amaris show efficacy and safety for post-LASIK ectasia eyes at one year. More than half had UDVA 20/40 or better post-operatively. CDVA improved two or more lines in 22%. The technique may be safe and effective for post-LASIK ectasia patients but longer follow up is needed.

Title: Efficacy and safety of cyclophotocoagulation in the control of glaucoma in patients with the Boston keratoprosthesis type 1

Authors: Samir Jabbour, Mona H. Dagher, Younes Agoumi, Harmanjit Singh, Marie-Claude Robert

Abstract Body:

Purpose: To assess the safety and efficacy of cyclophotocoagulation (CPC) in controlling intra-ocular pressure (IOP) and progression of glaucoma in eyes with the Boston keratoprosthesis (B-KPro) type I.
Study Design: Retrospective chart review
Methods: 19 eyes in 18 patients with the B-KPro who underwent CPC for glaucoma control were included. All CPC were done after B-KPro implantation. IOP, BCVA, number of glaucoma medications were recorded preoperatively and postoperatively at week 1, months 1-3, months 4-6 and at one year. All CPC-related complications and the need for other interventions were also recorded.
Results: The mean age of patients at CPC was 65 +/- 12.6 years with a mean follow-up period of 24 +/- 20.6 months. Mean pre-operative IOP was 24.4 +/- 4.6 mmHg and was reduced to 13.5 +/- 7.6 mmHg at week 1 post-operatively, to 14.6 +/- 4.4 mmHg at months 1-3 post-operatively, to 15.2 +/- 4.7 mmHg at 4-6 months post-operatively and to 15 +/- 4.3 mmHg at last follow-up. Number of glaucoma medications was 3.9 +/- 0.8 pre-operatively and remained relatively the same at 3.2 +/- 1.3 medications at 6 months post-operatively and 3.2 +/- 1.8 medications at last follow-up. Pre-operative BCVA was 1.2 +/- 1 logMar pre-operatively and was slightly reduced to 1.4 +/- 1.2 log Mar at 3 months post-operatively and to 1.3 +/- 1.2 logMar at last follow-up. The most common indication for CPC administration was uncontrolled IOP despite maximal tolerated medical therapy and glaucoma drainage device (n=9), followed by avoidance of surgery in an eye with poor visual potential (n=4). Overall 7/19 patients had evidence of glaucoma progression based on IOP and visual field testing despite CPC treatment. One patient had a late retrobulbar hemorrhage due to the administration of the retrobulbar block preceding CPC that required a canthotomy and cantholysis,. Two patients experienced hypotony during the first month following CPC. One patient had a bacterial endophthalmitis. Three patients required a second CPC for further control of the IOP.
Conclusions: CPC appears to be safe and efficacious in some cases in controlling IOP but not reducing number of glaucoma medications in refractory glaucoma in eyes with the B-KPro type 1. It should be considered when IOP remains high despite maximal glaucoma medications and GDD or in eyes with very limited visual potential. However, antiseptic precautions should be routine in all cases to prevent endophthalmitis.

Title: Immediate vision following photorefractive keratectomy with new high speed refractive laser

Authors: Simon P. Holland, **David T.C. Lin**, Murad Al Obthani

Abstract Body:

Purpose: Improvements in surface ablation with a new beam profile SmartSurfACE with Schwind Amaris 1050 (SA) laser has widened indications for photorefractive keratectomy. A limiting factor for wider acceptance of PRK is delayed visual recovery. We aimed to determine immediate vision after SA PRK, SA PRK with SmartSurfACE and Wavelight Allegretto (WA) laser.
Study Design: Retrospective, consecutive series.
Methods: Bilateral uncorrected visual acuity tested within 30 minutes of surgery in 882 patients having undergone transepithelial (TE) PRK for myopia using one of two laser platforms Schwind Amaris 1050 with and without SmartSurfACE/SmartPulse technology and the Wavelight Allegretto (WA) laser with wavefront optimised program. A sub group of patients treated with SA SmartSurfACE were asked if they read their smart phones and send a test message
Results: Within 30 minutes of treatment using SmartSurfACE with Schwind, 92% of patients were ≥20/40 uncorrected visual acuity (UCVA). Treatment with the Schwind Amaris 1050 (n=48), had less rapid visual recovery with 7% of patients ≥20/40 UCVA and with Wavelight Allegretto (n=44) 8% patients were ≥20/40 UCVA within 30minutes post-operatively. In the sub-group of SA SmartSurfACE treated patients, 92% able to read smart phones and 88% sent text messages
Conclusions: Immediate recovery of functional vision demonstrated by the Schwind Amaris 1050 SmartSurfACE may widen acceptance of PRK. 92% of patients were 20/40 within 30min of surgery with similar percentage of patients able to read their phones

Title: Design of analyses for the epidemiology and burden of dry eye disease in the United States from the AAO IRIS Registry

Authors: Flora Lum, Csaba Siffel, Mei Lu, Sepehr Farahbakhshian, Corey Joseph, Kevin Wood, Bhavya Burugapalli, Ipek Ozer-Stillman

Abstract Body:

Purpose: The American Academy of Ophthalmology (AAO) developed the IRIS Registry (Intelligent Research in Sight) as part of the profession's shared goal of continual improvement in the delivery of eye care. We describe methods for analyses of the epidemiology and clinical burden of dry eye disease (DED) from these electronic health records.
Study Design: The AAO IRIS Registry is a comprehensive clinical ophthalmic outpatient database of over 37 million unique patients and 148 million patient visits in the US. We are undertaking a study to analyse the registry data in terms of the demographics and clinical characteristics of patients with DED and to improve our knowledge on the current epidemiology, clinical management and overall clinical burden of DED. The main objectives of the study are to assess the prevalence and incidence of DED, and to examine patient characteristics, treatment patterns with approved DED medications and health care resource utilization. We present analysis methodologies for determination of DED diagnosis and estimation of prevalence and incidence of DED.
Methods: Using both medical history and data for ophthalmic visits, we are identifying all subjects who had at least one visit for eye care in each calendar year (annual prevalence estimate) and all subjects in the IRIS Registry with at least 1 year of ophthalmic follow up (overall prevalence estimate). We are using specific indicators of DED (i.e., ICD-9 and CPT codes) in an algorithm to identify diagnoses of DED in the adult population of patients (≥18 yrs), for overall prevalence (1/1/2013-6/30/2017), and annual incidence and prevalence (2014-2016). We are further stratifying these estimates by age group, sex, and geographic region.
Results: The methodology used to identify patients with DED and to estimate the overall and annual prevalence and incidence of DED from the IRIS registry database from 2013 through June 2017 described here was developed specifically for a condition that has a very diverse clinical presentation and management. Future analyses will delve deeper into patient demographics, clinical characteristics and comorbid conditions that commonly exist with DED. Analyses of treatment patterns of patients receiving ophthalmological medications, including concurrent medication use outside of the eye care specialty, and health care resource utilization (i.e., number of ophthalmic visits per month), will enable this study to provide an overview of the continuum of eye care patients receive.
Conclusions: The IRIS Registry is a unique ophthalmic outpatient database that links the continuum of care from initial visit, through treatment intervention, to longitudinal post-treatment follow-up. Capitalizing on a wide range of opportunities to analyze the treatment patterns and disease management of DED from these available electronic health records can provide important insights into the epidemiology and burden of DED in the US.

Title: The effect of intense-pulsed light therapy on dry eye disease

Authors: Arjuna S. Maharaj, Saed Al-Habib, Aroon Yusuf, Narayanan Nandagopal, Rajiv Maini, Eric Tam, Sohel Somani

Abstract Body:

Purpose: Dry eye disease (DED) due to meibomian gland dysfunction (MGD) is among the most frequently diagnosed clinical conditions in ophthalmology with a prevalence of up to 70% in certain ethnic groups. Current treatment options alone often have limited effectiveness. This brings the need for a safe, efficient and more advanced treatment option for the symptoms of DED. Intense-pulsed light/BroadBand Light (IPL/BBL) has been used to treat a range of dermatological conditions and recently has been documented to treat dry eye syndrome caused by meibomian gland dysfunction. The aim of this study is to retrospectively analyze the effect of IPL/BBL treatment on qualitative and quantitative measures of DED.
Study Design: A retrospective IRB-approved comparative interventional case study was conducted with 29 patients who presented with DED and had received a series of 4 sessions of IPL/BBL therapy to the peri-ocular area over a 4-month period.
Methods: Baseline and 4-month follow-up metrics measured include: first/average non-invasive tear break-up time (NITBUT), bulbar redness scores (BR), tear meniscus height (TMH), Canadian Dry Eye Assessment Score (CDEA), and a meibography grade (MG) based off the standardized Gestalt rating scale. Mean values (± standard deviations) were tabulated for all metrics with differences between baseline and 4-month follow-up measurements compared using a paired samples t-test.
Results: Average patient symptom assessment scores on the CDEA questionnaire significantly decreased from 18.7 (± 10.6) to 8.6 (± 6.0) ($p=0.01$). Average MG rating scale scores significantly decreased in both the right eye from 3.9 (± 0.2) to 3.2 (± 0.7) ($p<0.001$), and left eye from 3.8 (± 0.4) to 2.8 (± 0.7) ($p<0.001$). Average BR scores decreased significantly from 1.7 (± 0.6) to 1.5 (± 0.4) ($p=0.02$) for the left eye and a decreasing trend that was non-significant occurred in the right eye from 1.6 (± 0.4) to 1.4 (± 0.6) ($p=0.25$). An improvement in TMH from 0.23 (± 0.09) mm to 0.28 (± 0.13) mm approached significance in the right eye ($p=0.07$) while there was no change in the left eye. There was no change in first/average NITBUT or for either eye. No adverse events were noted.
Conclusions: Based on this study, IPL/BBL appears to be an effective treatment option in reducing patient symptoms and improving meibomian gland quality in DED.

Title: Recurrent preseptal cellulitis in Boston keratoprosthesis type II implantation for ocular Stevens-Johnson syndrome

Authors: Michael Marchand, Mona Harissi-Dagher

Abstract Body:

Purpose: The Boston Keratoprosthesis (KPro) type II is an artificial device indicated for the visual rehabilitation of patients with corneal blindness in whom a standard corneal allograft would likely fail. It is mainly reserved for cases with abnormal lid function and tear secretion, forniceal foreshortening, and ocular surface keratinization. A complete tarsorrhaphy is performed and the polymethylmethacrylate (PMMA) optic of the device projects through an opening created in the upper eyelid. Herein, we report on recurrent preseptal cellulitis which occurred seven years after Boston type II KPro implantation in a patient with Stevens-Johnson syndrome.
Study Design: Case report.
Methods: The patient's clinical and surgical charts were reviewed including patient history, clinical examinations, and investigations. A thorough review of the literature was also performed. This study was conducted in compliance with the Declaration of Helsinki.
Results: A 52-year-old woman with severe ocular and systemic Stevens-Johnson syndrome secondary to cloxacillin underwent 6 months later a complete anterior surface reconstruction of her left eye with amniotic membrane and cadaveric limbal transplantation. Advanced ankyloblepharon and loss of vision required implantation of Boston type II KPro with pars plana vitrectomy, Ahmed tube placement and tarsorraphy 10 years later. 20/20 visual acuity was achieved. Due to progressing glaucoma, a second Ahmed tube was implanted 2 years later. Seven years after KPro surgery, she presented with preseptal cellulitis involving the upper and lower eyelids around the KPro optic. She was successfully treated with intravenous antibiotics (vancomycin, ciprofloxacin, metronidazole) over a 3-week period. Antibiotics choice was first limited by severe β-lactam intolerance, and changed to daptomycin and tobramycin because of a sustained drug-induced fever. One month later, recurrence of a milder preseptal cellulitis occurred, again treated effectively with selected intravenous antibiotics.
Conclusions: The Boston Keratoprosthesis type II is a viable option to salvage vision in patients with corneal blindness from severe autoimmune ocular surface diseases. Preseptal cellulitis can rarely complicate the postoperative period, and should be treated aggressively with broad-spectrum intravenous antibiotics to prevent endophthalmitis and vision loss.

Title: 3 cases of Paecilomyces lilacinus treated with therapeutic penetrating keratoplasty

Authors: Marie-Pier Matton, Julia Talajic, Johanna Choremis, Michèle Mabon

Abstract Body:

Purpose: To examine the evolution and optimal management of Paecilomyces lilacinus keratitis
Study Design: Retrospective, observational case series
Methods: We reviewed the charts of 3 patients with culture confirmed Paecilomyces lilacinus keratitis, between 2007 and 2017 at Hospital Maisonneuve-Rosemont, Montreal.
Results: The first is a 57-year old female patient with a P. lilacinus ulcer in the left eye, and a history of contact lens wear, topical corticosteroid use and probable HSV keratitis. She was treated with topical voriconazole and miconazole, intracameral voriconazole and amphotericin B, subconjonctival fluconazole, and oral voriconazole for two months. Amniotic membrane and histoacryl glue failed to prevent perforation. The patient underwent therapeutic penetrating keratoplasty. She developed secclusio pupillae post-operatively and graft failure occurred 16 months later. Evisceration was eventually performed to relieve pain.
The second is a 54-year old male patient with a right P. lilacinus ulcer, and a history of contact lens wear, topical corticosteroid use, probable HSV keratitis and diabetes mellitus type 2. He was treated with topical voriconazole and posaconazole, intrastromal voriconazole, subconjonctival voriconazole, and oral voriconazole and posaconazole for two months. When a descemetocele was impending, crosslinking and therapeutic penetrating keratoplasty were performed.
The last case is a 72-year old male patient who developed a P. lilacinus ulcer in his left eye after traumatic endophthalmitis with a nail. He was treated with topical voriconazole and micafungin, intracameral, intrastromal and subconjonctival voriconazole, and oral voriconazole and posaconazole. After two weeks of treatment, the infiltrate was getting larger and denser, and a therapeutic penetrating keratoplasty was performed.
None of these patients experienced recurrent disease in their graft. The first patient evolved to evisceration six years after penetrating keratoplasty, but the second and last patients ended up with best corrected visual acuity of 20/150 (and 20/60 with pinhole) in their involved eye at 8 and 2 months post-operatively respectively.
Conclusions: Therapeutic penetrating keratoplasty performed after aggressive medical treatment is an appropriate management for Paecilomyces lilacinus ulcer with a low rate of infection recurrence. A low threshold for therapeutic PK should be used if the ulcer is rapidly responsive to medical treatment.

Title: Explantation of bilateral BrightOcular artificial iris implants

Authors: Zale Mednick, Tanguy Boutin, Devin Betsch, Allan Slomovic

Abstract Body:

Purpose: To alert the ophthalmologic community on the continued practice of cosmetic iris implantation, in spite of the body of evidence amassed over the last decade to support contraindication of this procedure.
Study Design: Case Report
Methods: The details were reviewed regarding a case of bilateral artificial iris implants that required explantation.
Results: A 41-year-old male presented with decreased vision in both eyes, approximately two years following bilateral BrightOcular cosmetic iris implantation performed in Mexico. On initial consultation, he was found to have bilateral corneal decompensation, with stromal edema and a significantly reduced endothelial cell count (ECC). He expressed reservations about undergoing surgery at that time. On follow up 5 weeks later, his vision and corneal edema had significantly worsened. One week later, he underwent explantation of the cosmetic iris in the left eye, with plans to remove the right implant in a few weeks times. Likely, he will require bilateral Descemet's stripping automated endothelial keratoplasty (DSAEK) to replace his severely damaged posterior cornea.
Conclusions: Despite numerous reports in the literature of the significant ocular complications that can arise secondary to cosmetic iris implantation, individuals continue to willingly undergo this surgery. Our intention with presenting this case to the ophthalmologic community is three-fold: 1) to highlight the ongoing clinical risk that BrightOcular devices pose, despite being marketed as safer than the older NewColourIris models, 2) to stress the urgency with which cosmetic iris implants should be removed from the eye and 3) to present a video detailing how these iris implants can be safely removed in the operating room.

Title: Lattice corneal dystrophy unmasked by corneal trauma

Authors: Harrish Nithianandan, Armand Borovik, Nir Sorkin, Adi Einan-Lifshitz, Connie Chao-Shern, Larry DeDionisio, Tara Moore, Clara C. Chan

Abstract Body:

Purpose: To describe two cases of lattice corneal dystrophy in a mother and son - both with a rare TGFB1 variant mutation. The corneal dystrophy was unmasked by traumatic corneal events in both patients.
Study Design: This is a retrospective case series reporting on two patients.
Methods: A complete ophthalmic history and examination as well as genetic testing with whole exome sequencing (WES) and real time - polymerase chain reaction (RT-PCR) were completed. Genetic testing was conducted on epithelial tissue collected from the inner cheek with an iSWAB collection kit (Mawi DNA Technologies, Hayward, CA, USA). Genomic DNA was extracted with a QIAGEN QIAamp® DNA blood mini kit (Hilden, Germany), and WES was carried out with the ACE platform™ (Personalis Inc., Menlo Park, CA, USA).
Results: The adult male presented with symptoms of recurrent corneal erosions 4 years after a tree branch injury in the right eye. He had a maternal family history of corneal transplantations to treat corneal dystrophies. Slit lamp examination revealed three epithelial defects within areas of lattice-like corneal changes in his right eye and an unremarkable left eye. His best corrected visual acuity (BCVA) was 20/25 bilaterally. WES revealed a mutation (H626R A>G) in the TGFBI gene. The result was verified with RT-PCR (Avellino Lab USA, Inc., Menlo Park, CA, USA). His mother had an ophthalmic history positive for bilateral LASIK. Examination in the mother revealed bilateral lattice-like changes at the corneal flap interfaces. Her BCVA was 20/20 in the right eye and 20/70 in the left eye. Genetic testing in the mother revealed the same mutation in the TGFBI gene as her son.
Conclusions: We believe these to be the first cases of lattice corneal dystrophy potentiated by trauma. Genetic testing prior to laser refractive surgery may prove to be beneficial in patients genetically susceptible to an inherited corneal dystrophy.

Title: Outcome of trans-epithelial photorefractive keratectomy for high myopia with high speed excimer laser and advanced laser beam profile

Authors: Simon P. Holland, **Chanut Nithithanaphat**, David T.C. Lin, Murad Al Obthani, Samuel Arba Mosquera

Abstract Body:

Purpose: To evaluate 12-month post-operative outcomes of moderate and highly myopic eyes with transepithelial photorefractive keratectomy (TE-PRK) corrections using SCHWIND AMARIS (SA) 1050 with advanced laser beam profile
Study Design: Retrospective consecutive case series.
Methods: The outcomes of 2431 myopic TE-PRK treatments performed with the SA1050 excimer laser with SmartSurfACE beam profile were evaluated at 12 months postoperatively. Analysis was divided into moderate (up to -8D, N=2089) and high myopia (from -8D, N=342). Refractive and visual comparisons of manifest refraction, uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), and safety (change of CDVA from baseline).
Results: At one year follow up, 696 cases in moderate myopia and 111 cases in high myopia have sufficient data for analysis. The results show UDVA ≥20/20 achieved by 88% and 63% of the moderate and high myopia subgroups ($p<0.05$); ≥20/40 achieved by 99% and 93% of the moderate and high myopia subgroups ($p<0.05$). CDVA ≥20/20 achieved by 97% and 89% of the moderate and high myopia subgroups ($p<0.05$); 19% and 23% of the moderate and high myopia subgroups gained lines of CDVA. No ≥2 lines loss of CDVA in high myopia group and 0.29% (2 eyes) in moderate myopia group. No retreatments were required.
Conclusions: Myopic transepithelial PRK with Schwind Amaris (SA) 1050 SmartSurfACE showed good outcomes with 88% achieving 20/20 UCDVA in moderate myopia (≤ -8D), 63% in high myopia (> -8D). Good results with TE-PRK using the SA1050 are possible for moderate and high myopia using an advanced beam profile, offering an alternative to LASIK.

Title: VEGF expression in superior limbic keratoconjunctivitis

Authors: Debra-Meghan Sanft, Sabrina Bergeron, Ana Beatriz Dias, Pablo Zoroquiain, Miguel N. Burnier Jr.

Abstract Body:

Purpose: Superior limbic keratoconjunctivitis (SLK) is a chronic and recurrent condition of unknown etiology. Clinically, SLK is described as chronic inflammatory disease of the superior bulbar conjunctiva, limbus and cornea. Current treatment options are aimed at reducing symptomatology via medications and/or surgery. Despite the wide array of treatments available, symptomatic relief is variable among patients and even after surgical removal, discomfort can recur. Previous studies done in our laboratory indicate that SLK has a rich vascular density as compared to controls. The purpose of this project is to determine if vascular endothelial growth factor (VEGF) expression is increased in SLK compared to patients without the disease.
Study Design: 12 eyes of 9 patients diagnosed with SLK were retrospectively identified. 6 eyes from 4 patients (no SLK) were used as a control.
Methods: Formalin-fixed, paraffin-embedded sections of the specimens were collected. Automated immunohistochemistry was performed using the Ventana benchmark machine per the manufacturer´s recommended protocol (Ventana Medical Systems, Inc., AZ, USA). The slides were then digitalized using the Aperio AT Turbo Scanner (Leica, Ontario, Canada). Levels of VEGF expression in the epithelium was scored using a customized pixel count algorithm and results were compared to VEGF expression level in normal conjunctival epithelium.
Results: Histopathological findings observed in all cases (12/12) include acanthosis, hyperkeratosis and a decrease in the number of goblet cells, as classically described in SLK. Increased vascularization was observed in 75% (9/12) of SLK cases and three samples presented clusters of vessels. As well, levels of VEGF expression were noted to be significantly elevated in the epithelium for all cases of SLK (46.65%) compared to normal human eyes (8.03%, p=0.009) regardless of vascular density.
Conclusions: In the SLK patient population that was studied, VEGF was noted to be highly expressed as compared with normal controls. As a result of its unknown etiology, current conservative treatments for SLK have mixed outcomes and there is a lack of ubiquitous treatment that completely resolves SLK-related symptoms and avoids recurrences. Our data indicate that anti-angiogenic therapies may be beneficial in the treatment of SLK to reduce vascularization, improve patient symptoms and minimize recurrences.

HOT TOPIC | SUJET PIQUANT

Title: Quarter-Descemet membrane endothelial keratoplasty (Quarter-DMEK) for Fuchs endothelial dystrophy: 6 month clinical outcomes

Authors: Maya Tong, Vasiliki Zygoura, Lamis Baydoun, Isabel Dapena, Gerrit J. Melles

Abstract Body:

Purpose: To assess the clinical outcomes of the first consecutive series of Quarter-Descemet membrane endothelial keratoplasty (Quarter-DMEK), a potential hybrid technique between Descemet membrane endothelial transfer (DMET) and conventional, circular DMEK.
Study Design: Prospective interventional case series.
Methods: Twelve eyes of twelve patients with central Fuchs endothelial dystrophy underwent Quarter-DMEK at a tertiary referral centre. Quarter-DMEK eyes were evaluated for best corrected visual acuity (BCVA), endothelial cell density (ECD), and complications up to 6 months postoperatively.
Results: At six month postoperatively, 12/12 (100%) eyes reached a BCVA of ≥20/40 (≥0.5), 11/12 (91%) were ≥20/25 (≥0.8) and 6/12 (50%) were ≥20/20 (≥1.0). Mean central ECD decreased from 2867 (±161) cells/mm2 preoperatively to 1255 (±514) cells/mm2 at one month postoperatively, 1058 (±455) cells/mm2 at three months postoperatively, and 970 (±427) cells/mm2 at six months postoperatively. Central pachymetry decreased from 662 (±100) µm preoperatively to 545 (±40) µm at six months postoperatively. Re-bubbling was performed in 4/12 eyes (33%) within the first two months. Benign ocular hypertension was reversed in 3/12 (25%) eyes.
Conclusions: Quarter-DMEK may be a feasible, alternative procedure that allows for visual outcomes similar to conventional, circular DMEK. The relatively large drop in ECD within the first month may have resulted from more extensive endothelial cell migration and/or measurement error (at the graft edges). If long-term outcomes resemble those of conventional DMEK, Quarter-DMEK may potentially quadruple the availability of endothelial grafts available for transplantation.

RETINA | RÉTINE

HOT TOPIC | SUJET PIQUANT

Title: Visual outcomes and risk prediction model for patients with proliferative vitreoretinopathy

Authors: Parnian Arjmand, Eric K. Chin, Kunyong Xu, David R. P. Almeida

Abstract Body:

Purpose: Proliferative vitreoretinopathy (PVR) is a devastating cause of ocular morbidity which remains poorly understood. We performed a cross-sectional study to characterize the clinical profile of patients who develop PVR. Furthermore, we developed a novel risk scoring model to predict the final visual acuity outcomes of patients with PVR based on their systemic medical and ocular profile.
Study Design: Retrospective cohort study; multivariable logistic regression analysis to develop a risk prediction model.
Methods: All patients with a diagnosis of PVR between January 2015 and December 2016 were reviewed at a single large private practice. Relevant preoperative and intraoperative variables were reviewed with specific inclusion and exclusion criteria. The t-test, or Chi-square/ Fisher's Exact Test were performed for continuous and categorical data, respectively, where applicable. Logistic multivariate regression analysis was utilized in developing a risk score model.
Results: A total of 300 eyes of 300 patients were identified who met our study criteria. A past or current history of smoking, as well as anxiety or depression, were associated with a doubling of PVR risk , though neither variables correlated with the final BCVA. Prior history of cancer in PVR patients was approximately quadruple that of the general population. A history of appendectomy and/or hernia repair were 8 times more common in patients with PVR. A history of arthritis (odds ratio [OR] 4.14, 95% confidence interval (CI) 4.141 - 1.162, p = 0.0284), worse baseline BCVA (20/60 or worse, OR 4.244, CI 4.24 - 1.742, p = 0.0015), macula off status (OR 0.395, CI 0.395 - 0.163, p = 0.0401) and need for multiple retinal detachment repair surgeries (OR 2.672, CI 2.672 - 1.408, p = 0.0027) were associated in a statistically significant manner to poor (20/60 or worse) final visual acuity outcomes.
Conclusions: Smoking, mental health disease, and chronic inflammatory conditions occur with a higher frequency in PVR patients. A novel risk prediction model was created that shows history of arthritis, worse baseline visual acuity (</=20/60), macula-off status, need for multiple surgeries, and absence of retinal pathology in fellow eye predict worse final visual outcomes. Our model may guide clinicians in the counseling, evaluation and treatment of patients with retinal detachment.

Title: Identifying gaps in patient access to diabetic screening eye examinations in Ontario: A provincially representative cross-sectional study

Authors: Brian G. Ballios, Varun Chaudhary, Bernard Hurley, Stephen Kosar, Tom Sheidow, Michael Brent, Richard Glazier, David Wong

Abstract Body:

Purpose: In 2016, there were an estimated 3.5 million Canadians with diabetes. This represented a 46% increase from 2008. It is estimated that the prevalence could increase to 4.9 million by 2026. The risk of blindness in diabetics is up to 25-times higher than non-diabetics. Diabetes is the leading cause of acquired blindness in Canadians under the age of 50, and diabetic retinopathy affects an estimated 500,000 Canadians. Meanwhile, the percentage of Ontario residents age 40-65 years with diabetes who received a general eye examination within a 2-year period from 1998 to 2010 demonstrates a significant decrease from 70% to 55%, regardless of level of income. Early identification of diabetic retinopathy with screening eye examinations allows for secondary prevention of the complications of diabetic eye disease. To better understand the need for resource allotment in diabetic screening across populations in Ontario, we undertook a study of key demographics and geographics characteristic of both screened and unscreened patients in the province.
Study Design: Provincially representative cross-sectional study.
Methods: We used OHIP records derived from both physician and optometry billing, matched with patients age > 19 with prevalent diabetes between 2011-2013. Data was analyzed through the Institute for Clinical Evaluative Sciences (ICES), to cross-correlate with demographic covariates including age, sex, income quintile, immigrant-status, as well as geographic co-variates such as rurality and patient LHIN.
Results: Of almost 1,146,000 patients included in the analysis, approximately 406,000 were unscreened. Of note, this included 234,000 (43%) of adults age 40-64 years. Approximately 818,000 diabetic patients lived in large cities, and 301,000 (37%) were unscreened. At a provincial level, the rates of unscreened individuals with diabetes was constant across the income quintiles (35%). However, when Toronto was analyzed as a large urban area with the highest density of unscreened prevalence, autocorrelation between percentage of eye exams among diabetics age >40 and low-income measure revealed large areas of Toronto Central correlated for low exam rates and low-income. The majority (13/22) of Community Health Centres are present in these areas, revealing a potential opportunity to meet the screening needs of an at-risk population with intervention targeted at improving access to general eye examinations.
Conclusions: Large cross-sectional population statistics for diabetes prevalence and ophthalmic examinations provides a geographic and socioeconomic profile for populations of middle-age adults in large urban areas at-risk for developing diabetic retinopathy, who might benefit from interventions to improve the rates of screening eye exams.

Title: Induction of rod and cone photoreceptor-specific progenitors from retinal stem cells

Authors: Brian G. Ballios, Saeed Khalili, Kenneth Grise, Laura Donaldson, Gilbert Bernier, Jeff Liu, Gary D. Bader, Molly S. Shoichet, Valerie Wallace, Derek van der Kooy

Abstract Body:

Purpose: Adult retinal stem cells (RSCs) give rise to all retinal cell types. Transplantation of RSC-derived photoreceptors contributes to retinal functional recovery. Clonal RSC progeny treated with taurine and retinoic acid (T+RA) increases the number of rods to 95%, while coco (BMP/Wnt/TGFβ triple-inhibitor) increases cones to >60%. RSC progeny produce 10% rods and <1% cones when differentiated in 1%FBS. We hypothesized that exogenous factors act on RSC progeny instructively to produce rods, and permissively to produce cones, through induction of lineage-specific progenitors - no markers for photoreceptor-specific progenitors have yet been identified and literature is divided on their existence in vivo during development.
Study Design: Experimental/pre-clinical
Methods: RSCs were clonally isolated from adult mice. We used limiting dilutions (<1 clone/well) of a fluorescent retrovirus to label single progenitor clones in vitro. In addition, single-cell sorting isolated non-pigmented and pigmented cells, which were treated with rod- and cone-inducing factors. Gene expression of RSC-derived and endogenous rods/cones was compared by RNAseq.
Results: Retroviral labeling revealed enrichment in rod-only clones between 1%FBS (13%) to T/RA (>70%), without affecting clone size or cell survival. This strongly argues against selective survival of rod progenitors or differential survival of post-mitotic rods. In 1%FBS, clones derived from single non-pigmented progenitors were mostly non-rod and mixed clones (n=24/28). In T+RA, all clones derived from non-pigmented progenitors (n=34) were rod-only clones, while those from pigmented progenitors (n=47/48) were almost all non-rod clones. Survival of non-pigmented cell derived clones was similar in T+RA, coco and 1%FBS. Differentiation of non-pigmented cells in coco gave rise to >95% cone-only clones, likely via a permissive mechanism by continuously suppressing signals promoting alternative fates. When early progenitors primed in T+RA for brief periods (3-days) are exposed to coco, the rod fate bias is unaffected; furthermore, T+RA can instruct progenitors to a rod fate in the presence of coco. We used RNAseq on RSC-derived and endogenous rods/cones isolated by FACS from photoreceptor-specific reporter mice to compare gene expression. This was also compared with photoreceptor lineage-specific progenitors derived from embryonic neural retinal precursors, which show similar differentiation potential for rods/cones when differentiated in T+RA or coco. Pathway and network analysis highlighted clustering of stem cell-derived and endogenous cones, as well as candidate markers which might enrich for photoreceptor-specific progenitors.
Conclusions: Our study suggests a critical role for exogenous signals instructing early lineage decisions among fate-restricted retinal progenitors. RSC-derived photoreceptors show promise for retinal regeneration.

Title: A novel approach to imparting long-term clinical proficiency in ophthalmoscopy to medical students

Authors: Etienne Benard-Seguin, Jason Kwok, Walter Liao, Stephanie Baxter

Abstract Body:

Purpose: To determine if practice using an online fundus photograph program results in a long-term increase in proficiency with the direct ophthalmoscope in medical students.
Study Design: This study was a prospective medical education trial. Students were enrolled to participate in an Objective Structured Clinical Examination (OSCE) using 5 patients with ocular findings. Students who matched a minimum of 6 discs 17 months prior to the study were assigned to the intervention group and were compared to students who did not participate in the exercise.
Methods: Forty-six second-year medical students at Queen's University: 15 in the intervention group, 31 in the control group. Students were evaluated using the Queen's University Ophthalmoscopy OSCE Checklist (QUOOC). Students were asked to calculate the cup-to-disc ratio, comment on disc margins and if there was any macular pathology. Students participated in a summative OSCE as part of the curriculum in which all students attempted to match fundus photographs.
Results: Students in the intervention group performed significantly better on the QUOOC with a mean score of 78.3% (+/-4.2) compared to the control who had a mean score of 69.4% [+/- 4.2 (p=0.005)]. The intervention group was significantly more accurate at matching optic nerve photographs with 100% (15/15) of the students correctly identifying the correct optic nerve on first attempt compared to 53.3% (16/30) in the control group (p=0.0014).
Conclusions: The use of an online peer fundus photograph program leads to a long-term increase in examination technique, proficiency in ophthalmoscopy and accuracy at matching optic nerve photographs.

Title: Acute annular outer retinopathy preceded by invasive ductal breast carcinoma: A case report

Authors: Harry Dang, Danah Albreiki, Michael L. Dollin, Bonnie Weston, Chloe C. Gottlieb

Abstract Body:

Purpose: Acute annular outer retinopathy (AAOR) is an uncommon disease. To date, there are few documented cases in the literature. Our study is the first to describe a case of acute annular outer retinopathy associated with invasive ductal breast carcinoma.
Study Design: Retrospective case report.
Methods: Clinical examination and multimodal imaging including spectral domain optical coherence tomography and fundus autofluorescence were performed, and the findings are presented.
Results: The patient presented with photopsias and visual loss approximately 3 weeks prior to a diagnosis of invasive ductal breast carcinoma. We have documented the outer annular white ring seen in the acute phase of this disease and correlate it anatomically with SD-OCT imaging. We identified atrophy and nodular hyperreflectivity of the RPE and ellipsoid layer within the white annular ring with corresponding visual field loss. Fundus autofluorescence correlated with structural alterations seen on SD-OCT and showed both presumed active hyperautofluorescent zones with patchy hypoautofluorescent zones of atrophy and a classic annular hyperautofluorescent border.
Conclusions: The authors report a single case of acute annular outer retinopathy with the corresponding SD-OCT, fundus autofluorescence and visual field findings, during the acute phase of the disease. This case provides additional information about the natural history of this rare entity and its prognosis and varied presentation.

Title: Incidence of rhegmatogenous retinal detachments following intravitreal injections

Authors: Harry Dang, Rajeev H. Muni, Robert G. Devenyi, Wai-Ching Lam, Kenneth T. Eng, Carol E. Schwartz, Radha P. Kohly, Peter J. Kertes

Abstract Body:

Purpose: To report the incidence of rhegmatogenous retinal detachments (RD) after intravitreal injections.
Study Design: Retrospective case series.
Methods: A multicentre, retrospective case series measured the incidence of rhegmatogenous RD in patients receiving intravitreal injections. The number of injections was determined from billing code and electronic medical records from seven ophthalmology practices. The indications for injection included age-related macular degeneration, central and branch retinal vein occlusion, diabetic macular edema, and miscellaneous causes. The primary outcome measure was the incidence of rhegmatogenous RD after intravitreal injection.
Results: A total of forty thousand three hundred twenty-two intravitreal injections were identified for 9525 patients between January 2000 and September 2013. The mean age of the cohort was 68.6 years (range 25-100) and the mean follow-up duration was 32.27 months (range 0-120.4). Of the 9525 patients reviewed, 6 eyes of 6 patients with rhegmatogenous RD after injection were reported. Time from first injection to rhegmatogenous RD was a mean of 1.5 years (range 0.9-2.0). The overall incidence of rhegmatogenous RD was 6 in 40322 (0.015% per injection).
Conclusions: Rhegmatogenous RD is an important and potentially devastating complication of intravitreal injections but the risk is low (1 per 6721 injections).

Title: Measurement of normative foveal avascular zone parameters in adults using optical coherence tomography angiography

Authors: Rami Darwich, Rayan Alshareef, Hasenin Al-khersan, Karnati Bharath, Ayesha Jabeen, Asiya Jabeen, Jay Chhablani

Abstract Body:

Purpose: The purpose of this study was to quantify retinal capillary density, the foveal avascular zone (FAZ) area, and the index measurement of the morphology of the FAZ as a circle or "acirculatory index" in normal subjects according to age, using optical coherence tomography angiography (OCTA).
Study Design: Cross-sectional descriptive study
Methods: OCTA (DRI-OCT, Topcon Corp., Tokyo, Japan;) was performed on right eyes of all healthy subjects in this study. The OCTA scans were analyzed and processed; and vessel density, FAZ dimensions, and the acirculatory index were calculated for both SCP and DCP.
Results: A total of 88 normal right eyes from 88 subjects were included (48 males, 40 females; mean 42 ± 13 years of age). Mean FAZ area for SCP and DCP was 3.37±1.28 and 2.31±1.12 mm2 respectively. Mean acircularity index for SCP and DCP was 1.76±1.58 and 1.60±0.90 respectively. In the superficial retinal capillary plexus (SCP), male sex was correlated with lower FAZ values; however, there was no correlation with age or refractive error. For the deep retinal capillary plexus (DCP), male sex and increasing age correlated with lower FAZ values, but there was no correlation with refractive error. FAZ areas decreased 0.0225 mm2 per year in the DCP. The acirculatory index both the deep and superficial retinal capillary plexus was not correlated with sex, age, or refractive error.
Conclusions: Male sex and increasing age were correlated with lower FAZ values in the DCP while only male sex was correlated with lower FAZ values in the SCP. There was no correlation between sex, age, or refractive error with the acirculatory index for both the deep and superficial retinal capillary plexus.

Title: Surgical repair of a persistent full-thickness retinal fold through the fovea secondary to hypotony

Authors: Douglas S. M. Iaboni, Mark E. Seamone, R. Rishi Gupta

Abstract Body:

Purpose: To report a case of the successful repair of a persistent full-thickness retinal fold with base-to-base photoreceptor apposition through the fovea secondary to hypotony from trabeculectomy surgery and postoperative laser suturelysis.
Study Design: Case Report.
Methods: Laser suturelysis was performed on a patient to relieve an elevated intraocular pressure (IOP) post-trabeculectomy surgery. This resulted in chronic hypotony. Dilated fundus examination revealed a prominent retinal fold involving the fovea, and spectral domain optical coherence tomography (SD-OCT) demonstrated that it was of full-thickness with base-to-base photoreceptor apposition. Vision had declined to CF. The patient was referred for management and underwent a pars plana vitrectomy with internal limiting membrane peeling, subretinal injection of balanced saline solution, fluid-air exchange, injection of F-Decalin, peripheral retinotomy, endolaser photocoagulation, and instillation of 15% C3F8 gas endotamponade.
Results: Anatomic improvement was documented with multimodal imaging, including SD-OCT, and by six months post-operatively, the best corrected visual acuity had returned to the pre-operative level of 20/30.
Conclusions: Although there are very few reports in the literature describing this complication, rarely, full-thickness retinal folds with base-to-base photoreceptor apposition may occur secondary to hypotony from trabeculectomy surgery. In this work, we describe our surgical approach and review the management options previously reported in the setting of both hypotony and following rhegmatogenous retinal detachment repair. We also provide support for the active management of appositional full-thickness retinal folds involving the fovea in cases that do not resolve spontaneously and demonstrate that surgical correction can significantly improve visual acuity even after 4 months of hypotony.

Title: A new genetic mechanism for LCA due to a complete homozygous CRX deletion; and mild foveal phenotypes in heterozygous carriers

Author: Maryam T. Ibrahim

Abstract Body:

Purpose: To report a homozygous, complete deletion of CRX in Leber Congenital Amaurosis (LCA) and to study the consequences of CRX haplo-insufficiency in carriers of the deletion.
Study Design: We identified a Lebanese family with 3 affected LCA cases. The proband was sequenced on the inherited retinal dystrophy panel (www.molecularvisionlab.com) by NGS. Quantitative PCR, array comparative genomic hybridization, and long range PCR were then performed. Full eye examinations, including OCT and photography were performed on the 3 affected cousins, and the four unaffected parents.
Methods: We identified a Lebanese family with 3 affected LCA cases. The proband was sequenced on the inherited retinal dystrophy panel (www.molecularvisionlab.com) by NGS. Quantitative PCR, array comparative genomic hybridization, and long range PCR were then performed. Full eye examinations, including OCT and photography were performed on the 3 affected cousins, and the four unaffected parents.
Results: We identified a homozygous 56K bp deletion that includes the entire CRX gene, plus two flanking genes. The deletion co-segregates in the pedigree and is heterozygous in the four parents. The blind children with LCA manifest severe retinal degeneration, with a striking atrophic maculopathy in the three kids, and one with the Coats reaction. We hypothesized that a single copy of CRX (haplo-insufficiency) in the heterozygous parents may cause mild foveal disease, but not LCA. Two parents were perfectly normal, while two parents had significant foveal, perifoveal photoreceptor layer abnormalities (ellipsoid zone), foveal avascular zone (FAZ) and umbo changes.
Conclusions: This is the first reported case of a homozygous, complete CRX deletion in the world literature. Absence of CRX (nullizygosity) causes LCA with poor macular development, while haplo-insufficiency of CRX causes abnormal foveal and perifoveal development, but not LCA. Our data suggest a new disease mechanism for CRX.

Title: Vascular perfusion density mapping using optical coherence tomography angiography comparing normal and optic disc pit eyes

Authors: Collier (Shangjun) Jiang, Bryen Turco, Netan Choudhry

Abstract Body:

Purpose: Optic disc pits (ODP) are a rare congenital deformity of the optic nerve with a prevalence of 1 in 11,000 people. These defects are typically a detected incidentally as small, gray, unilateral, oval-shaped excavation in the temporal optic disc on routine fundus examination. Many individuals with ODP are asymptomatic, however the main complication associated with ODP is serous maculopathy that results in macular schisis-like changes. The exact mechanisms causing macular edema secondary to ODP are not fully understood; therefore many different medical and surgical treatment modalities have been attempted, to varying degrees of success. In this study, we report optical coherence tomography angiography (OCT-A) findings in patients with unilateral optic disc pits in order to describe changes in vessel perfusion associated with ODP.
Study Design: This is a cross-sectional retrospective case series review.
Methods: A total of 8 eyes (4 normal and 4 with optic disc pit) were included in this study. Patients were excluded if any other optic disc abnormalities were present. Spectral domain OCT-A (AngioVue; Optovue, Fremont, CA) imaging was conducted to map the vascularization of three layers in the optic nerve over a 4.5 x 4.5 mm region. The radial peripapillary capillaries, the nerve head capillaries, and the choriocapillaris were automatically segmented based on the OCT system software, and the capillary perfusion density (CPD) was quantified for each layer. Kruskal-Wallis one-way ANOVA was used to compare CPD in normal and optic disc pit eyes of 4 patients with monocular optic disc pit.
Results: Overall, CPD was lower in eyes with ODP compared to the contralateral normal eye in the radial peripapillary capillary (0.4521 ± 0.08 vs. 0.5505 ± 0.03, P = 0.08) and nerve head capillary layers (0.5461 ± 0.08 vs. 0.5989 ± 0.01, P = 0.08). Further stratification of the entire scan into nine sub-regions revealed significantly lower CPD values in ODP eyes within the inside disc region (p=0.04), inferior nasal region (p = 0.04), and temporal region (p = 0.02) at the level of the peripapillary capillaries, and within the inside disc region (p = 0.04) of the nerve head layer. Visual acuity was also decreased in ODP eyes (0.4 ± 0.3 LogMAR) units compared to normal eyes (0.1 ± 0.1 LogMAR units).
Conclusions: ODP is associated with decreased vascular density in some regions of the optic disc, and reduced visual acuity.

Title: Same-day bilateral intravitreal anti-VEGF injections: Experience of a large Canadian retina center

Authors: Verena Juncal, Carolina Francisconi, David Chow, Alan Berger, Rajeev Muni, Louis Giavedoni, Filiberto Altomare, David Wong

Abstract Body:

Purpose: Intravitreal injections are one of the most commonly performed ophthalmic procedures and bilateral anti-VEGF injections are frequently necessary in clinical practice, since many retinal diseases requiring this treatment occur bilaterally. This study evaluated the outcomes and complications of bilateral same-day intravitreal anti-VEGF injections.
Study Design: Retrospective consecutive study.
Methods: This series included 524 eyes of 262 patients who received concomitant bilateral intravitreal anti-VEGF injections in the office between September 2010 and January 2017 at St. Michael's Hospital, Toronto. Medical records were reviewed for diagnosis, type of anti-VEGF agent, pre and post injection visual acuity (VA) and intraocular pressure (IOP), post injection complications, newly developed systemic conditions throughout follow-up or any patient's intolerance of simultaneous bilateral injections. Everyone received bevacizumab, ranibizumab or aflibercept and had a separate povidone-iodine preparation, speculum, needle and syringe for each eye.
Results: A total of 9,798 intravitreal anti-VEGF injections (4,899 bilateral injection sessions) were performed in 524 eyes of 262 patients. The average number of bilateral injection sessions per patient was 18.7 + 14.1 (range 1-71), and the mean follow-up time was 27.4+18.8 months (range 1-76). Ranibizumab was the most commonly used anti-VEGF drug (83.8%) and 96 patients (36.6%) had the initiating anti-VEGF agent switched throughout their follow-up. Seventy-five patients (28.7%) required an AC tap due to an episode or history of acute rise in IOP following intravitreal injections or due to uncontrolled glaucoma. The diagnosis of glaucoma was significantly associated with the need for an AC tap (p=0.001). The incidence of endophthalmitis was 0.01% (1 case in 9,798 injections), and there were two episodes of acute intraocular inflammation among the 9,798 injections (0.02%). All 3 cases occurred after ranibizumab injections. None of the patients had vascular related systemic adverse events following injections, and two deaths (0.76%) due to nonvascular causes were reported. Thirteen patients (4.9%) required extra follow-up visits throughout their treatment due to clinically relevant complaints, such as blurry vision, floaters and redness, but none had clinically relevant findings on eye exam.
Conclusions: This large retrospective study reinforces that same-day bilateral intravitreal anti-VEGF injections present a low rate of complications and are well tolerated by patients. This practice reduces the burden on the health care system and on the patients. Appropriate safety precautions should be equally taken for both eyes and the patients should be well aware of the risks of bilateral injections.

Title: Bilateral exudative retinal detachment in vasculitis: A case report and literature review

Authors: Irfan Kherani, Fargol Mostofian, Amin Kherani

Abstract Body:

Purpose: Anti-neutrophil cytoplasmic antibody (ANCA) vasculitis is a small vessel disease with ocular inflammatory manifestations affecting the sclera, conjunctiva, nasolacrimal and rarely the retina. We report to the best of our knowledge, the first case of bilateral retinal detachment in an ANCA positive patient successfully treated with a combination steroid and and Rituximab, a biologic commonly used to treat rheumatoid arthritis and hematological cancers.
Study Design: Case Report.
Methods: The patient's clinical and surgical charts were reviewed including patient history, clinical examinations, and investigations. Literature review was also performed using Pubmed and Ovid.
Results: A 24-year-old asian female with ANCA positive vasculitis and related chronic kidney disease presented with reduced vision of 20/80 OD and 20/30 OS for three days. On exam there was right sided peripapillary and retinal flame shaped haemorrhages at the posterior pole in addition to cells and flare. Left sided assessment revealed dot haemorrhages and Roth spots inferonasal to the disc. OCT confirmed serous macular detachments bilaterally. The initial macular detachments responded well to high-dose oral prednisone treatment and subtenon Kenolog; a subsequent flare and relapse five months later was also stabilized with the previous treatment. Maintenance was achieved with novel use Rituximab IV infusion of one gram every six months. The patient reached a visual acuity of 20/20 post treatment.
Conclusions: This is the first reported retinal manifestation of ANCA positive vasculitis successfully treated with a combination steroid and biologic therapy. Initial presentation and subsequent flares can be achieved with steroids. Rituximab should be subsequently used for maintenance in persistent cases. Further investigation into steroid and Rituximab combination immunosuppressive therapy for ANCA positive vasculitis is warranted.

Title: Final analysis of LIGHTSITE I: A double-masked, randomized, sham-control study with photobiomodulation in dry age-related macular degeneration subjects

Authors: Lina Chen, Monica Daibert-Nido, Beatriz Patino, **Samuel N. Markowitz**, Robert G. Devenyi, Cindy L. Croissant, Stephanie E. Tedford, Marion Munk, Rene Ruckert, Michael G. Walker, Clark E. Tedford.

Abstract Body:

Purpose: Photobiomodulation (PBM) uses wavelengths of light in the 500 nm to 1000 nm range to stimulate beneficial cellular activities. Recent evidence suggests that PBM improves visual and anatomical impairments observed in ocular disease states. Dry age-related macular degeneration is a prevalent ocular condition that results in significant visual dysfunction and blindness. Current treatment strategies are limited to dietary changes and antioxidant vitamins. LIGHTSITE I evaluated benefits of PBM therapy in dry AMD subjects.
Study Design: The LIGHTSITE I study was a Double-Masked, Randomized, Sham-Controlled Study with PBM conducted in dry AMD Subjects.
Methods: Thirty subjects with dry AMD were enrolled into the study and randomized (1:1) into PBM or sham treatment groups. Subjects received PBM or sham treatment with the LT-300 delivery system during 9 treatment sessions over 3-4 weeks with a second series initiated 6 months from baseline (BL). The LT-300 uses a multi-wavelength treatment comprised of 590 nm, 670 nm and 850 nm applied to the subject's eyes for a total of 4-5 minutes per treatment per eye. Outcome measures included clinical (visual acuity (VS) and contrast sensitivity (CS)) and anatomical (central drusen thickness and volume) endpoints. Quality of Life (QoL) was also assessed using the Visual Function Questionnaire-25 (VFQ-25). Assessments were conducted at selected study visits before and after initiation of treatment.
Results: A total of 46 eyes were evaluated from 30 subjects. High numbers of subjects were enrolled with AREDs category 4. Interim analyses conducted at 3 months demonstrated improvement in VA and CS and reductions in drusen volume and thickness ($p<0.05$, linear mixed effects model using ranks). Subjects were further categorized into high (HV) or low vision (LV) groups based on BL scores. PBM-treated HV subjects demonstrated a greater increase in VA letter score. Improvements in selected questions from VFQ-25 QoL assessments were also observed. LIGHTSITE I study results will be discussed.
Conclusions: The LIGHTSITE I findings demonstrate PBM improves clinical outcomes, provides anatomical benefits, and enhances QoL and should be considered a therapeutic treatment option for dry AMD patients.

Title: Optical density of subretinal fluid in rhegmatogenous and tractional retinal detachment

Authors: Mikel Mikhail, Fatma Zaguia, Michael Kapusta

Abstract Body:

Purpose: To assess the reflectivity and optical density profile of the subretinal fluid (SRF), derived from optical coherence tomography (OCT) scans, in eyes with rhegmatogenous and tractional retinal detachment, and correlate these measures with pre- and post-operative visual acuity
Study Design: Retrospective cohort study
Methods: 238 eyes were reviewed. 39 eyes presenting with a RRD or TRD (21 and 18 respectively) were included. Optical density measurements were obtained by manual segmentation using an open source platform (Fiji/ImageJ) and standardized by producing optical density ratios to allow for accurate comparison between eyes. Correlations were assessed for significance through univariate and multivariate regression analyses
Results: The optical density ratio measurement of the SRF was significantly lower in the RRD group (0.738 +/- 0.258) compared to the TRD group (1.34+/- 0.8). In the RRD group, the duration of detachment was found to significantly correlate with the optical density ratio of the subretinal fluid (ODR-SRF) ($R=0.9$, $p<0.05$) In the TRD group, the duration of diabetes was found to significantly correlate with the ODR-SRF ($R=0.8$, $p<0.05$). Peak, postoperative logMAR visual acuity was found to significantly correlate with the ODR-SRF in the TRD group, with higher ODR values predicting a poorer postoperative visual outcome
Conclusions: OCT-derived optical density values may be used as reliable, non-invasive and clinically useful measures of the SRF composition in eyes with retinal detachment. These may provide useful prognostic information in patients undergoing surgery.

Title: Development of a second-order texture analysis algorithm for fundus optical coherence tomography images

Authors: Damien Pike, James Whelan

Abstract Body:

Purpose: Conventional Optical coherence tomography (OCT) image analysis focuses on quantifying the thickness of retinal layers and it has been established that changes in retinal layer thickness measurements are related to ophthalmic disease. However, measuring retinal layer thickness alone quantifies only one component of the information obtained in retinal OCT images. Very early or small pathological changes in the retina that precede gross disease may not be represented by quantitative changes in retinal thickness. However, such pre- or sub-clinical retinal pathology may manifest as changes in the signal intensity in the retina on OCT images. In light of this, in this abstract we propose a novel method to measure retinal texture as a method to evaluate retinal structure and pathology. Second-order texture analysis is a quantitative image analysis technique that quantifies the relationship between adjacent pixel pair signal intensities in an image. Texture analysis has been widely exploited in radiological studies of different areas of medicine to quantify and phenotype disease, monitor response to treatment and predict morbidity and mortality. However, to date it has not been widely used in ophthalmology for retinal OCT analysis.
Study Design: In this study our objectives were 1) to develop a rapid and robust semi-automated texture analysis algorithm and 2) to test the efficiency of the algorithm on a dataset of 20 OCT images.
Methods: The texture analysis algorithm was developed in MATLAB R2016b. The algorithm consists of four image processing steps; 1) reading the OCT image into the program, 2) selection of a region of interest (ROI) within the fundus for analysis, 3) automated generation of a grey-level co-occurrence matrix (GLCM) and 4) mathematical extraction of texture measurements from the GLCM. Of the many second-order texture measurements that have been described, for this proof-of-concept analysis we chose to extract seven texture features (correlation, entropy, inertia, inverse different moment, energy, cluster shade and cluster prominence) based on observations made in other studies which established their clinical significance.
Results: The mean run time for the algorithm on twenty OCT images was on average 10 seconds/image.
Conclusions: In this work we developed a novel texture analysis algorithm which can provide seven quantitative texture measurements from OCT images in approximately ten seconds per patient. Future work will be focused on investigating the clinical relevance of second-order texture OCT measurements in pathologic states such as retinopathy of prematurity, diabetic retinopathy and wet-age related macular degeneration.

Title: Sedation during vitreoretinal surgery: Practice patterns in Canada

Authors: Jenny Qian, Scott McCusker, Tania Ligori, Philip Blew, Michael Y. K. Mak, Joshua Barbosa, Varun Chaudhary

Abstract Body:

Purpose: To determine the preferred methods of intravenous sedation used by anesthesiologists during vitreoretinal surgery in Canada.
Study Design: A nation-wide survey of Canadian academic anesthesiologists.
Methods: A nation-wide anonymous online survey was distributed to practicing staff anesthesiologists affiliated with Canadian academic centres. Given the survey anonymity, the local Research Ethics Board waived the requirement for ethics approval. The survey consisted of ten questions regarding anesthesia during vitrectomy surgeries, focusing on types of regional blocks, medications used for sedation and their mode of delivery, as well as titration variables.
Results: Out of 114 respondents, 26 did not perform sedation for vitrectomy and were excluded. Thus, analysis was performed on the remaining 88 respondents. Retrobulbar block was the most commonly employed regional technique for vitrectomy (58.6%), whereas 26.4% used a sub-tenon block and 14.9% used another method or were unsure. During regional block, the most common method of medication administration was by bolus (88.0%), of which 70% preferred midazolam as the sedative, followed by fentanyl (40%), remifentanil (33%), and propofol (27%). For respondents preferring the use of an infusion technique during the regional block, propofol (4 respondents) and remifentail (2 respondents) were the drugs of choice.
During the vitrectomy, a bolus technique was most popular (91%) compared to infusion (33%) (respondents were able to select more than one option). Midazolam was the most commonly bolused agent (69%) followed by fentanyl (45%). For those using an infusion technique, propofol and remifentanil (67% and 37% respectively) were preferred (respondents were able to select more than one option).
Patient movement was the most commonly used parameter to titrate sedation, followed by respiratory rate and patient awareness. Blood pressure and heart rate then followed as nearly identical in terms of importance.
Conclusions: The survey study demonstrates the current spectrum of practice patterns of anesthesiologists at Canadian academic centres and is the first specifically focused on sedation during vitrectomy procedures. With the unique complications associated with inadequate and excessive sedation during vitreoretinal surgery, the current state of sedation for vitrectomies is important to consider. The results will assist anesthesiologists choose sedation methods when performing vitrectomy procedures. Moreover, this survey may assist in the development and planning of future studies to explore which technique is superior with respect to adequate sedation, safety, and patient satisfaction.

Title: Increased detection of colour vision defect using the Colour Assessment and Diagnosis device

Author: Naima Rahman

Abstract Body:

Purpose: The Colour Assessment and Diagnosis (CAD) device is a computer-based test used for colour vision evaluation (http://www.city-occupational.co.uk/cad/) that measures red-green and yellow-blue colour thresholds. The purpose of this study is to determine whether CAD is a useful tool for colour vision assessment in a clinical population and if CAD is more likely to detect colour deficiencies in individuals with retinal defects than conventional colour vision testing (Farnsworth D15, HRR Pseudodichromatic plates, Mollon-Reffin Minimalist test).
Study Design: Prospective cross-sectional study with 20 patients with any retinal disease (mean age 25.5 ± 17.5, range 7-59 years) and 19 controls (mean age 20.4 ± 8.7, range 9-46 years).
Methods: Participants were seated 1.4 metres from a display screen in mesopic conditions. Participants identified the orientation or location of the stimulus by pressing a button on a response pad. The stimulus varied randomly in luminance every 50 - 80s depending on performance. The primary outcome measure was luminance threshold (measured in CAD units) for Red-Green (RG) and Yellow-Blue (YB) colour axes. Abnormal thresholds for RG and YB axes were determined by calculated thresholds in a large sample reported by Barbur et al. 2006. Testing was monocular in patients using the eye with the lower visual acuity. The right eye of all controls was tested. All participants underwent the conventional clinical colour vision testing. The results of the conventional clinical colour vision testing were identified as normal/abnormal based on clinical procedure.
Results: The mean RG CAD values were 16.51 ± 14.1 units in patients and 1.81± 0.45 units in controls. A t-test showed that the groups are significantly different from each other (t-test p= 0.003). The mean YB CAD values were 5.62± 3.87 units in patients and 2.04±0.38 units in controls. A t-test showed that the groups are significantly different from each other (t-test p= 0.002). Importantly, the 8 patients identified with a colour vision defect on conventional colour vision testing, all had abnormal CAD results. Of 12 patients identified without colour vision defect on conventional colour vision testing, 6 had CAD values within normal limits, and 6 abnormal for CAD values.
Conclusions: Patients with a retinal disease show abnormalities in CAD testing in comparison to controls on the RG and YB colour axes. This study is of importance to evaluate patients with retinal disease and may lend to the applicability of CAD in the clinical setting.

Title: Role of OCT angiography in the detection of retinal vascular abnormalities in subjects with asteroid hyalosis

Authors: Padmaja K. Rani, Reena C. Prajapati

Abstract Body:

Purpose: To study the role of OCT angiography to detect retinal vascular and macular abnormalities in comparison to FFA
Study Design: Prospective Study
Methods: A prospective study was done in patients with AH. All patients underwent comprehensive eye examination, OCT angiography and FFA. AH is graded as grade 1(optic disc and second order vessels are visible), grade 2(optic disc and 1 order vessels are visible), grade 3(optic disc is hazily seen) and grade 4(no view of fundus).
Results: A total of 20 subjects (25 eyes) were included in the study. Mean age of the subjects was 61.8+/-5 years. Indications for investigations included ruling out Diabetic retinopathy in 20 eyes, macular abnormalities in 5 eyes (2 -Choroidal neovascular membrane (CNVM), 1- central retinal artery occlusion and one eye of IPCV). AH Grade 1 was seen in 8 eyes, grade 2 in 4 eyes, grade 3 in 11 eyes and grade 4 in 2 eyes. OCT angiography was able to detect and delineate neovascularization in DR cases in comparison to FFA in 2 eyes of grade 1 and grade 3 AH each. OCT angio was able to detect other DR changes like microaneuyrisms, capillary dropout and foveal avascular zone (FAZ) , CNVM complex in comparison to FFA. OCT angio could delineate more accurate FAZ morphology in a case of grade 4 dense asteroid hyalosis .
Conclusions: OCT angiography as a noninvasive imaging tool could pickup various retinal vascular and macular abnormalities in subjects with all grades of AH in comparison to FFA.

Title: Identifying patients appropriate for treatment with fluocinolone acetonide (ILUVIEN®). When do we switch from anti-VEGF in diabetic macular oedema? A retrospective audit in a UK single-centre setting

Authors: Dilraj Sahota, Hussein Ibrahim, Ramesh Sivaraj

Abstract Body:

Purpose: Research shows that a notable proportion of patients with diabetic macular oedema (DMO) remain insufficiently responsive to anti-VEGF treatment. NICE has approved the use of ILUVIEN® when standard therapies show insufficient response. We aim to identify patients insufficiently responsive to anti-VEGF treatment, who could then benefit from treatment with ILUVIEN®.
Study Design: Retrospective audit of patients receiving anti-VEGF for treatment of DMO in a UK single-centre setting, June 2009 to December 2016.
Methods: Search conducted using electronic patient record system Medisoft. Including all pseudophakic DMO patients who have received anti-VEGF therapy. Excluding patients with current or previous steroid treatment, macular oedema not of diabetic aetiology and deceased patients. Data collection of demographics, BCVA and central macular thickness (CMT) at three timepoints: 1. before anti-VEGF therapy, 2. at date of best recorded BCVA 3. after final anti-VEGF injection. Insufficient response defined as a gain in BCVA <10 or <15 letters as per NICE guidelines. Data analysed with paired sample T-test and $p<0.05$ deemed statistically significant to identify patients with insufficient response.
Results: Search yielded 190 eyes (147 patients). 140 eyes (104 patients) after exclusions.Mean patient age 70.26 years. Mean number of anti-VEGF injections 10, mean injection number at date of best BCVA 5. Patients receiving anti-VEGF included: a) 109 (77.9%) eyes received ranibizumab ; b) 4 (2.9%) eyes received aflibercept; and c) 27 (19.3%) eyes received both. Baseline mean BCVA 51.49 letters, mean CMT 417.26µm. At date of best reponse mean BCVA 68.42 letters and mean CMT 310.73µm. After final anti-VEGF injection, mean BCVA 58.87 letters and mean CMT 297.09µm Before anti-VEGF therapy to date of best BCVA: mean change in BCVA +16.93 letters ($p<0.0001$), mean change in CMT -110.70µm ($p<0.0001$). Before anti-VEGF to after anti-VEGF: mean change in BCVA +7.38 letters ($p<0.0001$) and mean change in CMT -121.53µm ($p<0.0001$). Defining insufficient response as “<10 letter gain in BCVA”, 43/140 (31%) eyes at best BCVA response and 84/140 (60%) eyes after final anti-VEGF injection are insufficiently responsive. Stricter criteria of insufficient response being “<15 letter gain in BCVA”, 65/140 (46%) eyes at best BCVA response and 101/140 (72%) eyes after final anti-VEGF injection are insufficiently responsive.
Conclusions: Between 31-72% of pseudophakic patients with DMO receiving anti-VEGF therapy at Heart of England NHS Foundation Trust are suitable for switching to ILUVIEN®. The figure depends on the definition of 'insufficient response to treatment' employed. We also show how electronic patient records can be used to efficiently and effectively identify relevant patients. Limitations apply, and thorough documentation of current lens status and ocular comorbidities is necessary for the effective identification of suitable patients. A significant number of pseudophakic patients with DMO receiving anti-VEGF may benefit from switching treatment from anti-VEGF and we have constructed and recommended a listing proforma to help identify such patients in the eye clinic to help optimise their care.

Title: Fixation stability dynamics in AMD: binocular and monocular viewing

Authors: Saba Samet, Esther G. González, Mark S. Mandelcorn, Michael H. Brent, Martin J. Steinbach, Luminita Tarita-Nistor

Abstract Body:

Purpose: The fovea normally provides sharp central vision and serves as the reference position of the ocular motor system. With age-related macular degeneration (AMD), patients adapt to central vision loss by developing 'pseudo-foveae' in the eccentric functional retina, termed preferred retinal loci (PRLs), which can be located with a fixation task. PRL location and fixation stability are factors that affect visual performance in these patients. In this study, we examined change in fixation stability over time during binocular and monocular viewing in patients with AMD.
Study Design: Retrospective consecutive case series.
Methods: Data from 17 patients with AMD (mean age 78.6 ± 8 years) and 17 control subjects (mean age 31 ± 13 years) were reviewed from our research database. All had participated in studies for which approval was obtained from the institutional research ethics board. For patients, better-seeing (BE) and worse-seeing (WE) eyes were identified based on visual acuity. Participants fixated on a 3 deg cross, viewed at 60 cm. Fixation stability was recorded binocularly with an infrared eyetracker. During monocular viewing, the fellow eye was covered with an infrared filter, allowing for continued recording of its position. Three-15s viewing conditions (binocular and monocular with each eye) were recorded. Recordings were divided into 5 consecutive 3s-intervals and fixation stability quantified for each interval with a bivariate contour ellipse area (BCEA).
Results: For each group, separate 2 (eye) x 5 (time interval) repeated-measures ANOVAs were performed on the BCEAs of each viewing condition. During binocular viewing, there were no main or interaction effects for both groups. During monocular viewing with the BE for the AMD group and during both monocular conditions for the control group, there were no time interval main or interaction effects, but fixation stability of the viewing eye was better than the covered eye. ANOVA failed to reach significance for monocular viewing with the WE. In the WE, fixation stability was constant during the first three time intervals but improved for the last two (i.e., last 6s), one-tail $t(15) = 2.04$, $p = 0.03$. The average BCEA of the first interval was 1.50 times larger than the last time interval.
Conclusions: In patients with AMD, fixation stability stays constant over consecutive time intervals during binocular and monocular viewing with the BE. Monocular fixational control with the WE is worse, but improves over time.

Title: Optical coherence tomography angiography of dissociated optic nerve fiber layer appearance after internal limiting membrane peeling for full thickness macular hole

Authors: Nathan Schuck, Morgan Heisler, Sherry Han, Marinko Sarunic, Eduardo Navajas

Abstract Body:

Purpose: To determine the retinal vascular and structural changes associated with dissociated optic nerve fiber layer (DONFL) appearance after internal limiting membrane (ILM) peeling for full thickness macular hole (FTMH) utilizing optical coherence tomography angiography (OCTA).
Study Design: Prospective cohort study.
Methods: Nine patients with idiopathic FTMH (2 males and 7 females, mean age 71.2±8.4 years) were enrolled in the study. Patients were treated with pars plana vitrectomy, ILM peeling and gas tamponade. Subjects were evaluated at baseline, 1 month, 3 months, and 6 months follow-up visits. At each visit, patients were evaluated with a complete ophthalmologic exam and OCTA.
Results: Mean logMAR visual acuity was 0.88±0.18 at baseline and 0.71±0.27 at 6 months follow-up. DONFL appearance started at 1 month after surgery. DONFL total median area and number of associated dimples were 0.64±0.46mm2, 22±17.59 at 1 month, 2.39±0.73mm2, 71±23.46 at 3 months and 3.139±0.55mm2, 120±31.22 at 6 months follow-up. The median central macular thickness (CMT) change from baseline was +2±11.50µm, -1±4.74 µm and -7±5.14µm at 1, 3, and 6 months follow-up. The outer macula thickness increased at 1 month follow-up as a result of nerve fiber bundle (NFL) swelling and decreased thereafter. Median perifoveal superficial vascular complex (SVCD) density was 37.3±2.44%, 38.5±2.52%, 34.1±4.09%, and 39.2±3.35% at baseline, 1, 3, and 6 months follow-up. This result was not statistically significant.
Conclusions: The present study did not show SVCD reduction in patients with DONFL appearance after ILM peel for FTMH. This may be due to our inability to separate the radial peripapillary capillaries that would most likely be damaged during ILM peel from the superficial capillary plexus during segmentation for vessel density analysis. NFL edema in the early postoperative period may be associated with the development of DONFL appearance.

Title: Quantifying amyloid beta in the Alzheimer's disease retina using the curcumin biomarker

Authors: Ahmad M. Sidiqi, Sijia Cao, Jing Cui, Eleanor To, Sieun Lee, Marinko Sarunic, Daniel Wahl, Shyh-Dar Li, Wellington Pham, Joanne Matsubara

Abstract Body:

Purpose: Alzheimer's disease (AD) is a chronic progressive neurodegenerative illness that is the commonest cause of dementia. A hallmark of AD is amyloid beta (Aβ) plaques detected on neuropathology, or expensive clinical tests in patients who are in advanced stages of disease. A non-invasive method of screening for these plaques could allow for early detection and treatment of asymptomatic patients. While the eye is an extension of the brain, and an excellent organ to image in vivo, a fluoroprobe is required in order to visualize the ocular Aβ deposits. Aβ deposits in the eye can act as surrogate marker for early-stages of AD. In this study, we use a mouse model of AD in order to develop the fluroprobe methods of ocular Aβ detection.
Study Design: Transgenic (Tg) AD mouse models overexpressing human Aβ were compared to their age-matched wild-type controls. Curcumin (a fluorophore that binds to Aβ) has many important features that make it amenable to visualizing ocular Aβ in vivo. The bioavailability and neuroprotective effects of aerosol-administered curcumin was compared to that of intravenous (IV) and oral (PO) routes, in mice using semi-quantitative scoring techniques.
Methods: Curcumin formulations were designed and targeted Aβ in vivo and ex vivo on human AD and Tg brain and eye tissues. Curcumin staining of Aβ was determined using scanning confocal microscopy imaging, and immunohistochemistry assays.
Results: Aerosol delivery of curcumin demonstrated significantly enhanced bioavailability in mice, compared to IV and PO administration. Funduscopic detection of Aβ deposits using curcumin in the mouse eyes correlated with the scanning confocal microscopy imaging of the eye cups from the 15-month-old Tg mice. Curcumin staining of Tg mouse eye tissue showed positive staining in the inner layers of the retina.
Conclusions: The retina and brain of the Tg mice readily express APP and Aβ deposits, which are then stained by curcumin and detected using funduscopy, confocal microscopy, and immunohistochemistry. Aerosol delivery of biomarkers has many advantages over IV (invasive) and PO (gastrointestinal side effects and bioavailability) delivery. These findings suggest that assessing the posterior eye using inhalable curcumin may be a novel and non-invasive method of detecting amyloid beta in the eye and by extension, the brain.

Title: Assessing patient awareness about diabetic retinopathy and disease progression at the Hamilton Regional Eye Institute

Authors: Nirojini Sivachandran, Afreen Malik, Jenn Qian, Prima Moinul, Joshua Barbosa, Varun Chaudhary

Abstract Body:

Purpose: To establish the current state of baseline knowledge of diabetes and diabetic retinopathy (DR) in new patients referred to a tertiary retina service from their primary eye care provider.
Study Design: This is a single centered, prospective, observational study.
Methods: Patients were recruited from HREI retina clinic, a major tertiary referral center to answer a 35-item questionnaire regarding diabetes and associated complications. All data were coded and analysed using SPSS Software Version 22 (IBM Inc).
Results: In the interim analysis of 56 patients, we had 30 males and 26 females, with 45 patients (80.4%) being Caucasian. We found that 62.5%(35) of patients did not know the meaning of HbA1C and only 30.4% of patients sampled were aware of their DR status (CI95: 17.9% to 42.8%). Bivariate analysis revealed that patients who had post-secondary education were more likely to know their DR status (p=0.041). More importantly, it was found that 60.7% patients expressed interest in a future diabetes seminar (CI95: 47.5% to 73.9%).
Conclusions: It is evident that a significant proportion of patients, 62.5% to 69.6%, do not have adequate knowledge of diabetes or DR, and this is related to their level of education. The results of this study may guide secondary prevention initiatives by primary eye care providers to create a more informed state about diabetes and DR to prevent complications including blindness.

Title: Techniques to promote sutureless closure of 23-gauge vitrectomy sclerotomies

Authors: Vincent Sun, Errol Chan, Mohab Eldeeb, Ernst Jans Van Rensburg, John Chen

Abstract Body:

Purpose: To describe surgical strategies to promote self-sealing of 23-gauge sclerotomies.
Study Design: Prospective observational study of consecutive 23-gauge vitrectomies at the McGill Academic Eye Centre from 2014 to 2015
Methods: Trocar insertion was attempted parallel to the underlying scleral surface and the surgical limbus. During fluid-air exchange, a leaking sclerotomy was defined by air emerging from the sclerotomy and an intraocular pressure (IOP) <8. Leaking sclerotomies were managed with a standardized step-wise strategy. Initially, massage of incision sites was performed. If leakage continued, vitreous at the sclerotomy opening was trimmed as a secondary step; if unsuccessful, infusion pressure was lowered to prolapse vitreous away from the sclerotomy. Thirdly, the sclerotomy was enlarged with a 20-gauge microvitreoretinal (MVR) blade. Lastly, the opposite site of the sclerotomy was cut with the 20-gauge MVR blade to create greater scleral apposition. The surgical videos were reviewed to identify features of trocar insertion favouring self-sealing sclerotomies.
Results: 50 cases were recorded, comprising 150 sclerotomies. With attention to trocar insertion alone, more than 60% of sclerotomies were sealed without further manipulation. With further strategies to manage leaking sclerotomies, less than 5% eventually required suturing. Most sclerotomies with the trocar insertion parallel to the underlying sclera produced incisions perpendicular to the sclera
Conclusions: Modifications to wound construction and a stepwise approach to managing initially leaky sclerotomies achieves good self-sealing rates in 23-gauge sclerotomies.

Title: Evaluating changes in scleral quadrant thickness following repeated intravitreal injections of anti-vascular endothelial growth factor agents

Authors: Yao Wang, Wei Sim, Jacob Rullo, Sanjay Sharma

Abstract Body:

Purpose: To compare changes in scleral thickness as measured by optical coherence tomography (OCT) between eyes injected with intravitreal anti-vascular endothelial growth factor (anti-VEGF) agents and injection-naïve fellow eyes of the same patient.
Study Design: Retrospective case control study.
Methods: After ethics approval, patients attending retina clinics at Hotel Dieu Hospital in Kingston, Ontario who met inclusion criteria (i.e. age ≥ 18, received at least three injections of anti-VEGF agents in one eye only for conditions including age-related macular degeneration (AMD), diabetes and retinal vein occlusions (RVOs)) and exclusion criteria (i.e. conditions interfering structurally with measurements of scleral thickness including glaucoma filtrating surgery, scleral buckling surgery) were consented to participate. An anterior segment attachment on the OCT was used to image the inferotemporal scleral thickness (site of injection) 3-4 mm from the limbus of both eyes in each patient. Scleral thicknesses were measured using the integrated caliper tool on the OCT.
Results: Of the recruited patients: 79 patients had successful scleral images suitable for measurement. Indications for anti-VEGF injection were as follows: 40 patients for exudative AMD, 19 patients for macular edema secondary to diabetes, 16 patients for macular edema secondary to RVOs and 4 patients for other reasons (ex. ocular histoplasmosis, central serous chorioretinopathy). Injected eyes had a mean measured scleral thickness in the injected quadrant of 590 µm versus 622 µm in injection-naïve eyes ($p = 0.018$). Stratifying by injection number found a mean scleral thickness in the injected quadrant of 585 µm for 3-10 injections ($n = 32$) versus 615 µm in the injection-naïve eye ($p = 0.091$); 617 µm for 11-20 injections ($n = 24$) versus 637 µm in the injection-naïve eye ($p = 0.113$); and 573 µm for >20 injections ($n = 23$) versus 604 µm in the injection-naïve eye ($p = 0.141$).
Conclusions: Repeated intravitreal injections of anti-VEGF agents to the same scleral quadrant may lead to scleral thinning when compared to fellow injection-naïve eyes. Alternating injection quadrant sites should be considered to mitigate such possible changes.

Title: Real-world outcomes for treat and extend treatment regimen with anti-VEGF agents for neovascular age-related macular degeneration - A review of 4940 injections

Author: Geoff Williams

Abstract Body:

Purpose: Intravitreal anti-vascular endothelial growth factor (VEGF) therapy is considered the gold standard for the treatment of various retinal disorders. Despite significant progress in retaining vision for neovascular age-related macular degeneration (nAMD) there is no universally accepted anti-VEGF treatment regimen that defines the frequency of treatment needed to achieve the optimal visual outcomes while simultaneously balancing the burden of long-term, frequent treatment. As well, treatment regimens employed by physicians in clinical practice have typically not reflected those reported in clinical trials. Treat and extend has been used by retina specialists to minimise the treatment burden to their patients. This review of 4940 intravitreal injections presents real world evidence on the utilisation and outcomes of treat and extend with anti-VEGF intravitreal injections in nAMD.
Study Design: Retrospective case series
Methods: This was a retrospective cohort study based on review of patients' data from the electronic medical record (EMR) database from a single centre and single vitreoretinal specialist in Calgary, Alberta. The study included patients with a diagnosis of nAMD who started treatment with anti-VEGF between December 2007 and May 2012. Patients were included if they received two or more intravitreal injections of anti-VEGF agents ranibizumab or bevacizumab during the review period.
Results: 4940 intravitreal injections (32.5% bevacizumab/67.5% ranibizumab) performed on 468 eyes were included in the analysis. The mean number of injections was 10.58 per eye and ranged from 2 to 46 during the follow up period. Mean visual acuity prior to first injection was LogMAR 0.74 (20/110) ranging from light perception to LogMAR 0.0 (20/20). The mean interval between first and second injections was 7.15 weeks (range 2.4-26). The mean interval between fifth and sixth injections was 8.7 weeks (range 2-26), with 28.5% being greater or equal to 12 weeks. 310 eyes (66.2%) had 6 or more injections. Mean visual acuity after 6 injections was LogMAR 0.54 (20/70). 168 eyes (35.9%) had 12 injections or more. The interval between 11th and 12th injections was 8.2 weeks (range 2-43), with 21.1% being 12 or more weeks. Mean visual acuity after 12 injections was LogMAR 0.48 (20/60).
Conclusions: This real-world single centre, single physician study demonstrates the variability, but also the effectiveness of an anti-VEGF treat and extend regimen. The data suggest that a treat and extend regimen is beneficial to patients and resource burden in clinical practice.

Title: Acute idiopathic blind spot enlargement syndrome following measles, mumps and rubella vaccination

Authors: Melody E. Wong, Maria Campos-Baniak, Kevin Colleaux

Abstract Body:

Purpose: To report a case of acute idiopathic enlargement of the blind spot (AIBSES) after a measles-mumps-rubella vaccination (MMR); to review the etiology of AIBSES and other primary inflammatory choriocapillaropathies (PICCP)
Study Design: Case report
Methods: Case report
Results: A 29-year-old female presented after experiencing one-week of new floaters and a temporal scotoma. Past medical history, past ocular history and family history was unremarkable, except that the patient received an MMR vaccination 20 days prior to the onset of her symptoms. On examination, visual acuity was 20/20. Slit lamp examination and dilated fundus examination were unremarkable. Humphrey 24-2 visual field testing confirmed an enlargement of the blind spot. OCT of the nerve and macula were normal. Autofluorescence revealed hyperfluorescence in the peripapillary retina and fluorescein angiography showed staining of the peripapillary retina.
Conclusions: To our knowledge, acute idiopathic enlargement of the blind spot has not been reported after MMR vaccination. Vaccine related sequelae, although rare, are an important consideration in the differential diagnosis of a chorioretinal inflammatory syndrome.

VISION REHABILITATION | RÉADAPTATION VISUELLE

Title: Quality and utility evaluation of top rated visual assistive smartphone apps by a patients

Authors: Monique Munro, Samir Nazarali, Cynthia Mardinger, Feisal Adatia

Abstract Body:

Purpose: To investigate if patients find previously top rated Apps for visual assistance useful and easy to use in the real world setting.
Study Design: Prospective single center clinic-based study.
Methods: In 2013, our group performed a systematic search of major smartphone platforms for low vision applications (Apps). From a list of 200 Apps, quantitative evaluation using the Quality Component Scoring system produced two top-rated magnifying visual assistive Apps (Magnifying Glass and Flashlight; Magnifier), which were selected for this study.
Patients with a minimum best corrected visual acuity (BCVA) of 20/50 or less in both eyes were included. Patients completed intake questionnaires assessing their demographic, educational, socioeconomic status, technology literacy and attitudes. Patients received standardized descriptions and tutorials of the App, and individual time to use them. The primary outcome was the quality rating awarded to Apps by patients.
Results: 26 patients with retinal pathology were recruited from November 2016 to July 2017. Average age was 78 years with a range of 58 to 73 years; 54% of patients had age-related macular degeneration. The average BCVA of the right eyes was 0.95 logMAR and 1.1 logMAR of the left eyes. Level of visual functioning was rated using a 1-10 rating scale (10 being no impact to daily functioning). The average was 4.8, ranging from 1-10. Twenty of the 26 patients reported requiring aid with daily tasks.
14 patients stated they would use both of the tested Apps. Seven patients had prior smartphone exposure, 9 owned cellular phones and all patients had more positive attitudes towards technology use in healthcare compared to the remaining 12 patients. Degree of visual loss did not significantly influence opinion. Reasons for not using the apps included: small screen buttons, preference for hand-held magnifiers, and subjective poor visual acuity. Each app had equal scoring regarding ease of use, font readability, functioning, and requiring help for teaching and installation. Subjective comments reported by patients included the need for assistance exiting pop-up advertisements in each App and nine recommended apps that had freeze frame image capture to allow for stable reading.
Conclusions: Visual assistive Apps have the potential to improve patients' quality of life. Challenges of implementing Apps include difficult learning curves, high up-front costs, and small buttons and advertisements associated with free Apps. Literature examining Apps for low vision patients is limited. This study offers insight into the patient experience with existing Apps, and considerations for improvement.

GLAUCOMA | GLAUCOME

Title: Risk factors for secondary surgical intervention after glaucoma filtration surgery: A population-based study

Authors: James J. Armstrong, Blayne Welk, Vinay Kansal, Cindy Hutnik

Abstract Body:

Purpose: To identify factors associated with secondary surgical intervention after glaucoma filtration surgery.
Study Design: Population-based retrospective cohort
Methods: Consecutive physician billing claims for glaucoma filtration surgery (spanning a twelve-year period from April 2003 to March 2015) and specific post-operative procedures related to secondary surgical interventions within the patient's first post-operative year were identified. Baseline characteristics encompassing patient demographics, concomitant operative procedures, ocular surgical history and ocular medication history were compared between patients requiring secondary surgical intervention and those who did not. A multivariable Cox proportional hazards model was used to generate hazard ratios.
Results: There were 349 (3.46%) instances of secondary surgical intervention within a cohort of 10,097 patients who underwent primary filtration surgery. Surgeries that included a seton, phacoemulsification or both had lower secondary surgical intervention than solo-filtration procedures without a seton, with adjusted hazard ratios of 0.48 (95%CI, 0.28-0.84), 0.34 (95% CI, 0.21-0.54) and 0.15 (95%CI, 0.05-0.48) respectively. Patients with prior surgeries of the iris had significantly reduced risk of secondary surgical intervention with an adjusted hazard ratio of 0.69 (95%CI, 0.49-0.98). Patients with perioperative aminoglycoside and mydriatic exposure had significantly increased risk of secondary surgical intervention (adjusted hazard ratios of 3.13 (95%CI, 1.86-5.27) and 2.36 (95%CI, 1.51-3.68) respectively). No significant difference in the rates of secondary surgical intervention was observed for patients with exposures to different classes of glaucoma medications or to higher amounts of the preservative benzalkonium chloride.
Conclusions: The overall rates of secondary surgical intervention within the first post-operative year are low but significantly higher in certain patient populations. This population based study can be used to guide patient-surgeon decision making and its findings may be used as a benchmark for quality improvement initiatives and future prospective clinical studies. Further work is required to address the higher rate of secondary surgical intervention in patients with a recent history of certain perioperative eye drop prescriptions.

HOT TOPIC | SUJET PIQUANT

Title: Corneal rim and Tackdriver training models for minimally invasive glaucoma surgery

Authors: Anish Arora, Samir Nazarali, Brett Poulis, Lauren Sawatzky, Malcolm Gooi, Matthew Schlenker, Bryce Ford, Iqbal (Ike) Ahmed, Patrick Gooi

Abstract Body:

Purpose: To report experiences on two novel training models, "K-RIM" and "Tackdriver", for training multiple minimally invasive glaucoma surgical (MIGS) procedures.
Study Design: Experimental Training Protocol
Methods: Both training models use human cadaveric corneoscleral rims as the basis and require minimal preparation. In K-RIM, the corneal rims were trephinated with a 9mm large diameter trephine and fixated upright on a Styrofoam base placed at a 30-degree angle. Medical lubricant filled the anterior chamber and served as an optical coupler. In the Tackdriver model, 1-2 tacks secured the apex of an inverted corneoscleral rim. Water-based medical lubricant also filled the anterior chamber. In both models, various MIGS procedures are performed under Gonioscopy. To maximize procedures per tissue, iStent placements occurred prior to Gonioscopy Assisted Transluminal Trabeculotomy (GATT).
Results: Both training models allowed for high volume of surgical training in MIGS techniques. The K-RIM model was more difficult to prepare compared to the simple single step preparation of Tackdriver, which facilitated tissue consistency and stability. Both training models offered efficient and economical set up of training models for residents and surgeons. With Tackdriver, we could perform GATT in a 180, 270, or 360-degree fashion. GATT was more difficult in the K-RIM model due to buckling of Schlemm's canal. Relative to other training models, use of human cadaveric tissue offers realistic tactile feedback and allows for training of bimanual technique with gonioscopy yielding excellent angle visualization.
Conclusions: Utilizing the K-RIM and Tackdriver training models, MIGS techniques can be practiced in high volumes while recreating in vivo conditions, including tactile feedback and practice of bimanual technique. Our training models are efficient to set up and cost-effective. We have successfully deployed both models in large group sessions such as the Surgical Skills Transfer Courses at COS. Currently, there are a limited number of training models for MIGS techniques and a small sub-cohort of those using human cadaveric specimens. Thus, we present two innovative approaches to training MIGS techniques.

Title: The association between glaucoma and health related quality of life (HRQOL): A population-based study from the United States

Authors: Ayman M. Baabdullah, Raed Alomair, Suliman Alghnam

Abstract Body:

Purpose: In the United States (US), glaucoma is the leading cause of irreversible blindness, accounting for 11% all cases. Limited visual abilities may extremely affect individual's quality of life by restricting daily activities. Little is known about the impact of glaucoma on self-reported health; thus, this study aimed to investigate the association between glaucoma and Health Related Quality of Life (HRQOL) among the US population.
Study Design: A population-based study
Methods: This study used the Medical Expenditure Panel Survey (MEPS), a nationally representative household survey of the US population. Participants aged 40 years or above with and without glaucoma diagnosis were included. The study population were then divided into two age groups (40-64) and (65 and above). Outcomes were the mental and physical components of short form-12 (SF-12). The association between glaucoma and SF-12 was evaluated using a weighted multivariable linear regression model adjusting for gender, race, poverty status, insurance, smoking and diabetes.
Results: The weighted sample represents 148,007,416, of which (2.85%) had glaucoma. Glaucoma patients were more likely to be insured than those without glaucoma (98.4% vs. 91.8%, $P<0.01$). Younger individuals (40-64 years) with glaucoma reported physical component scores that were 2.1 lower than older individuals with glaucoma ($P<0.01$).
Conclusions: We found that glaucoma significantly affects the physical components of HRQOL. Younger individuals with glaucoma may find it difficult to use aids or other strategies to overcome their limited visual abilities. Thus, early support for younger individuals newly diagnosed with glaucoma may promote and improve their quality of life.

HOT TOPIC | SUJET PIQUANT

Title: Repair of eroded glaucoma drainage devices using buccal mucous membrane grafts: Long-term outcomes

Authors: Avner Belkin, Adi Einan-Lifshitz, Yvonne M. Buys, Graham E. Trope, David Mathew, Clara C. Chan, David S. Rootman

Abstract Body:

Purpose: Glaucoma Drainage Devices (GDDs) are an invaluable tool in the surgical management of refractory glaucoma. Late exposure of the device is one of the most serious complications of this surgery, as it can lead to vision threatening endophthalmitis. The rate of late device exposure has been estimated to be between 2.5% and 8.9%. Once device exposure has been found, it must be promptly surgically repaired. The repair should be bi-layered, with a free patch graft covering de-epithelialised tube and sclera, followed by superficial coverage with conjunctiva. This latter part can be challenging as the overlying conjunctiva is often scarred and retracted due to previous surgeries. The current study aims to assess the long-term outcomes of GDD exposure repair with corneal lamellar patch graft covered by a buccal mucous membrane graft sutured to residual conjunctiva.
Study Design: Case-control retrospective study
Methods: The charts of all patients who underwent buccal mucous membrane grafts combined with corneal lamellar patch grafts for eroded GDDs between the years 2006 to 2013 were reviewed. A minimum follow-up of 4 years was required for inclusion. Primary outcomes were categorized as complete success: adequate coverage throughout the study period without further intervention after 1 buccal mucous membrane repair; qualified success: adequate coverage despite minor additional procedures (eg. suturing); failure: re-erosion of the GDD tube despite the above interventions.
Results: 27 GDD exposures of 25 patients were included in the analysis. Average time from GDD insertion to first erosion was 49 ± 38.58 months (range 5-120). Complete success was achieved in 20 cases (74.1%) and qualified success in 2 cases. 5 cases ended in failure (18.5%). Overall success (complete + qualified) after 1 or more buccal mucous membrane graft repairs was achieved in 22/27 cases (92.6%). Average follow-up time for the successful cases (complete + qualified) was 73.23 ± 27.36 months (median 82.5, range 36-124). There was no difference in time to first erosion between the success (complete + qualified) and failure groups: 50.95 ± 37.22 months (range 5-120) and 40.4 ± 47.28 months (range 5-105), respectively (P=0.66).
Conclusions: Buccal mucous membrane grafts in combination with a lamellar corneal patch graft is a viable surgical strategy for eroded GDDs, providing good long-term outcomes.

Title: The effect of postural changes on the trans lamina cribrosa pressure difference - A pilot study

Authors: Avner Belkin, Rana A. Greene, Graham E. Trope, Yaping Jin, Fred Gentili, Yvonne M. Buys

Abstract Body:

Purpose: Intraocular pressure (IOP), the only modifiable risk factor for glaucoma, is thought to be a surrogate measure for trans-laminar pressure difference (TLPD), defined as IOP-intracranial pressure (ICP). A recent meta-analysis has found a higher TLPD in glaucoma patients as compared to healthy controls. This same study found that a higher TLPD was associated with larger optic disc changes in glaucoma patients. It has been suggested that sleeping with ones' head slightly elevated decreases the postural IOP rise, and could therefore be considered in progressive glaucoma with 'normal' daytime pressures. If however, ICP and IOP are similarly influenced by posture, this recommendation may be flawed. This study aims to evaluate the effect of changes in position on TLPD by measuring ICP and IOP simultaneously in the seated and supine positions.
Study Design: Prospective cohort study
Methods: Patients admitted to the neurosurgery unit at Toronto Western Hospital with an External Ventricular Drain (EVD) placed for ICP monitoring were recruited after obtaining informed consent. Exclusion criteria were any ophthalmic surgical procedures within the preceding 6 months, history of glaucoma and corneal abnormalities affecting IOP measurement. IOP and ICP were recorded in both the supine and seated positions with the order of positions randomized. Measurements were made 10 minutes after assuming each position. TLPD was calculated for the sitting and supine positions.
Results: Our interim results include 7 patients (expected final n = 20). The average age was 48. Data is shown for right eyes only, and both IOP and ICP are given in mmHg. Average sitting and supine IOP's were 15.9 ± 3.7 and 14.9 ± 3.1 respectively. Average sitting and supine ICP's were 12.4 ± 7.3 and 11.7 ± 4.7 respectively. Average TLPD was 3.5 ± 4.6 in the sitting position, and 3.2 ± 4.7 in the supine position, p=0.68. In 5 of the 7 patients the posture response of IOP and ICP was in the same direction - a supine increase in 3 patients, and a supine decrease in 2.
Conclusions: Our interim results suggest that TLPD is unaffected by body position.

Title: Prospective randomized crossover trial comparing effectiveness and tolerability of generic and brand name travoprost in patients with primary open angle glaucoma, normotensive glaucoma, and ocular hypertension

Authors: David Ta Kim, **Patrick Daigle**, Marjorie Carbonneau

Abstract Body:

Purpose: The primary goal is to determine if generic travoprost is as effective as brand name travoprost in lowering intraocular pressure. The secondary goal is to determine if generic travoprost is as well tolerated as brand name travoprost.
Study Design: Prospective randomized crossover trial comparing effectiveness and tolerability of generic and brand name travoprost in patients with primary open angle glaucoma, normotensive glaucoma, and ocular hypertension.
Methods: To demonstrate equivalence between generic and brand name travoprost, a sample size of 69 patients would be necessary to determine a difference of 1.5 mmHg with a power of 80% and an alpha of 0.05%, using a standard deviation of 3.5 mmHg. Patients are randomized into two arms: (1) Start with brand name travoprost then cross over to generic travoprost; (2) Start with generic travoprost then cross over to brand name travoprost. Patients use each medication for 3 weeks after which they have their intraocular pressure measured and a questionnaire on the tolerability is filled out with the patient. At that point, the patient is given the second version of travoprost and they are seen 3 weeks later, after which they again have their intraocular pressure measured and a questionnaire on the tolerability is filled out with the patient. All patients used the two versions of travoprost in both eyes. The IOP in both eyes were measured and was always measured within 1 hour of the when it was measured during the first visit and by the same person.
Results: 70 patients completed the study. No difference in intraocular pressure was seen after the usage of brand name and generic travoprost (18.2 ± 3.4 vs 18.4 ± 3.5 respectively, p=0.365). Regarding tolerability as measured with a questionnaire, the two versions of travoprost were found to be quite similar in terms of causing burning sensations, blurry vision, redness of the eyes, dry eyes, tearing and secretions, eye pain, and rashes of the eyelids.
Conclusions: Our study is the first to compare brand name travoprost with one of its generic versions. It is also the largest study comparing glaucoma drops that received no financial support from pharmaceutical companies. Previously in the literature, 4 randomized controlled trials have been performed, all on latanoprost with varying results on equivalence. Our study adds to the body of evidence that generic glaucoma drops are as effective and well tolerated as their brand name counterparts - at least in the short term. Studies with longer follow ups are necessarily to conclude on the bioequivalence of generic glaucoma drops.

Title: Standalone ab interno gelatin microstent implantation in glaucomatous eyes with narrow versus open angles: A retrospective cohort analysis

Authors: Georges M. Durr, Husayn Gulamhusein, Devesh Varma, Diamond Tam, Iqbal (Ike) Ahmed

Abstract Body:

Purpose: The Xen 45 implant is a novel bleb forming microstent that is implanted in an ab interno fashion. No publications to date have studied this implant in narrow angles. Our objective is to compare the efficacy and safety outcomes of narrow-angle (NA) vs open-angle (OA) eyes receiving standalone Xen and Mitomycin C (MMC).
Study Design: Retrospective cohort study
Methods: A review of all eyes operated with Xen 45 implant by 3 surgeons (IA, DT and DV) from February 2012 to July 2017 was performed. Baseline characteristics were compared including age, gender, visual acuity, type of glaucoma and mean defect. Primary outcome was median IOP at one, six, and twelve months post-surgery. Secondary outcome was medication use at the same time points. Complications, interventions, and reoperations were recorded.
Results: A total of 319 eyes in 269 patients received a Xen 45 within the study period. 125 implantations in OA eyes and 19 in NA eyes were examined. Mean ± SD follow-up time was 16.6 ± 13.7 months.
In NA eyes with standalone implantation, pre-operative IOP and medications were 25.5 ± 8.3 mmHg and 3.7 ± 0.8. One month post-surgery, IOP and medications were 16.4 ± 8.1 mmHg and 0.3 ± 0.7; six months post-surgery, 17.6 ± 7.6 mmHg and 1.3 ± 1.5; and twelve months post-surgery, 12.7 ± 2.9 mmHg and 0.7 ± 1.4.In standalone OA eyes, pre-operative IOP and medications were 23.0 ± 6.8 mmHg and 3.6 ± 0.9. At one, six, and twelve months post-operatively, they were 13.1 ± 6.8 mmHg and 0.2 ± 0.7; 14.7 ± 5.9 mmHg and 0.7 ± 1.2; and 14.1 ± 4.4 mmHg and 0.8 ± 1.3.Most complications were transient. Symptomatic hypotony was observed in 1 NA eye (5%) and 4 OA eyes (3%). Needling rates were 42% (8/19) of NA eyes and 38% (47/125) of OA eyes. 5 NA eyes (26%) and 15 OA eyes (12%) underwent reoperation.
Conclusions: These data suggest that among eyes with glaucoma, standalone Xen 45 implant can lower IOP and medication use in an effective manner with similar results in both narrow and open angles.

Title: The effects of phacoemulsification on intra-ocular pressure and glaucoma medication requirement in patients with pseudoexfoliation glaucoma: A systematic review and meta-analysis

Authors: Jeanie Z. Fei, Yalda Karimi, James J. Armstrong, Cindy Hutnik

Abstract Body:

Purpose: Glaucoma is the leading cause of irreversible blindness globally, and pseudoexfoliation syndrome is one of the common causes of glaucoma. Compared to primary open angel glaucoma (POAG), pseudoexfoliation glaucoma (PEG) patients are more resistant to IOP-lowering medical therapy and more often undergo surgical interventions. Several surgical procedures including trabeculectomy, cataract surgery (i.e. phacoemulsification), and combined surgeries are currently performed for PEG patients. As of now, the effects of cataract surgery alone on IOP in PEG patients show mixed results, making it difficult to establish a guideline for surgical approach to PEG. The purpose of this systematic review and meta-analysis is to examine, analyze, and summarize all available evidence on the effects of phacoemulsification and IOL implantation as a solo procedure on post-operative IOP and glaucoma medication requirement in patients with PEG.
Study Design: Systematic review and meta-analysis.
Methods: Database searches based on predefined search strategy were last run on July 10, 2017 to identify potential relevant studies. Identified articles were screened for relevance and information was extracted for meta-analysis. The main outcomes were post-operative mean difference and percentage reduction in IOP (IOPR%), as well as mean difference and percentage reduction in topical glaucoma medication requirement.
Results: The search strategy identified 852 records. After screening, 7 studies (613 subjects) were included in quantitative synthesis. A 13.2%, 32.1%, 26.3%, and 15.8% reduction in post-operative IOP from baseline was observed one, three, six, and twelve months after phacoemulsification respectively. A mean reduction of 0.80 and 0.79 medications per patient of glaucoma medication occurred one and twelve months after phacoemulsification.
Conclusions: Phacoemulsification and IOL implantation as a solo procedure does lower IOP in patients with PEG, and reduces requirement for topical glaucoma medications. The current available data allowed the demonstration of results up to 12 months after the operation, further studies are indicated to provide more information with regards to the lasting effect of phacoemulsification. Interestingly, our study showed greater reduction in IOP and glaucoma medication requirement after phacoemulsification in PEG patients as compared to POAG patients based on results from a previous meta-analysis.

Title: A case of pseudomonas orbital cellulitis following glaucoma device implantation

Authors: Jeremy Goldfarb, Imran Jivraj, Dan DeAngelin, David Yan

Abstract Body:

Purpose: Orbital cellulitis is a rare complication of aqueous tube shunt surgery. Eight cases have been described in the literature, though the microbiologic etiology is rarely reported. Management with intravenous antibiotics and/or explantation has been described.
Study Design: Case Report and Literature Review.
Methods: We present a single case and a review of all published cases of orbital cellulitis following glaucoma device implantation.
Results: A 64-year-old woman developed pain, periorbital swelling, limited extraocular motility, proptosis, and conjunctival injection three days following implantation of an Ahmed Glaucoma Valve. CT of the orbits with contrast demonstrated soft tissue fat stranding consistent with orbital inflammation. Initial medical management with topical and systemic antibiotic therapy with IV Ceftriaxone and Vancomycin was unsuccessful. Surgical removal of the implant was performed and intra-operative cultures demonstrated florid Pseudomonas Aeruginosa growth. Post-operative antibiotic coverage with intravenous Piperacillin Tazobactam facilitated clinical improvement.
Conclusions: We report the first case of orbital cellulitis after implantation of a glaucoma device associated with Pseudomonas. Failure of intravenous and topical antibiotics led to explanatation of the valve and clinical improvement with definitive antibiotic treatment.

Title: CyPass micro-stent implantation in glaucomatous eyes: A retrospective analysis

Authors: Husayn Gulamhusein, Georges M. Durr, Mandy Wong, Ayda M. Shahidi, Iqbal Ike K. Ahmed

Abstract Body:

Purpose: The CyPass Micro-Stent is a novel minimally invasive glaucoma surgery (MIGS) allowing drainage of aqueous humor through the supraciliary space. Our objective was to evaluate surgical outcomes and complications of the CyPass implant.
Study Design: Retrospective interventional study.
Methods: A review of all eyes operated with the CyPass implant from June 2008 to May 2017 was performed, including solo implantation, in combination with cataract surgery, and in eyes with previous surgery. Baseline characteristics were evaluated including age, gender, visual acuity, type of glaucoma, and mean defect. Primary outcome was mean intraocular pressure (IOP) at one, six, and twelve months post-surgery. Secondary outcome was medication use at the same time points. Complications, interventions, and reoperations were recorded.
Results: The CyPass device was implanted in 105 eyes of 90 patients within the study period; 10 had prior glaucoma surgery. 40 received solo microstent, and 65 were combined with phacoemulsification. Supraciliary viscoelastic expansion (Viscopass) was performed in 65 (62%) eyes. Mean ± SD follow-up time was 16.0 ± 18.4 months. Pre-operative IOP and medications were 20.3 ± 7.5 mmHg and 2.8 ± 1.4. One month post-surgery, IOP and medications were 13.9 ± 8.9 mmHg and 1.8 ± 1.7; six months post-surgery, 16.3 ± 6.4 mmHg and 1.6 ± 1.6; and twelve months post-surgery, 16.9 ± 6.3 mmHg and 2.1 ± 1.7. Seven eyes (8%) had an IOP spike (>30 mmHg) one day after surgery; eight eyes (8%) developed hyphema of <2mm immediately postoperatively and one eye (1%) developed late hyphema with subsequent failure. One eye (1%) developed transient choroidal effusions and one eye transient hypotony maculopathy. Twenty-nine eyes (28%) required additional surgery within the follow-up period.
Conclusions: These data suggest that the CyPass micro-stent modestly lowers IOP and the number of glaucoma medications post-surgery with few complications that were reversible.

HOT TOPIC | SUJET PIQUANT

Title: Ab interno gelatin microstent implantation with MMC and phacoemulsification versus trabeculectomy with mmc and phacoemulsification

Authors: Husayn Gulamhusein, Matthew B. Schlenker, Michael Kryshtalskyj, Iqbal Ike K. Ahmed

Abstract Body:

Purpose: To retrospectively compare outcomes of ab interno gelatin microstent implantation/MMC combined with phacoemulsification versus trabeculectomy/MMC combined with phacoemulsification in consecutive eyes from January 2011 to June 2017 in Mississauga, Canada.
Study Design: Retrospective interventional cohort study.
Methods: 122 eyes of 102 patients were identified; 10 eyes were excluded due to previous incisional surgery, atypical forms of glaucoma, or follow-up less than 1 month. Primary outcome was time to failure (IOP <6 with >2 lines of vision loss from baseline or >17 on no medications) on two consecutive visits after one month from surgery despite in-clinic interventions (including needling). Secondary outcomes included IOP cutoffs of 14 and 21 (with or without medications), interventions, complications, reoperations, visual recovery, and number of postoperative visits. Baseline characteristics were compared using Fisher Exact tests and Wilcoxon rank sum tests. A Cox proportional hazards model accounting for correlation between eyes was used to compare the hazard rate of the two interventions.
Results: 72 and 50 eyes received microstent and trabeculectomy, respectively. Baseline characteristics were similar, except more females in microstent eyes. Median follow-up was 13.8 months (IQR 7.3-29.4) for microstent eyes and 23.0 (IQR 8.1-36.3) for trabeculectomy eyes (p=0.17). The crude 12-month survival was 41.9% and 67.6% for IOP of 6-17 on no medications. The adjusted hazard rate for microstent relative to trabeculectomy was 1.8 (1.1-3.0) for complete success, 2.0 (0.9-4.5) for qualified success, and similar for the other outcomes with and without medications. Median IOP at last follow-up were 14.0 (13.0-16.0) and 12.0 (9.0-14.0); medications were 0.0 (0.0-2.0) for both. The most frequent intervention in microstent was needling in 38 (52.8%) eyes; in trabeculectomy it was LSL in 34 (68.0%) eyes followed by needling in 16 (32.0%). There were 12 and 30 distinct complications after one month in the two groups, though none serious or vision threatening. 5 (6.9%) microstent and 3 (6.0%) trabeculectomy eyes received reoperation (p=1.0). At last follow-up, 2.8% and 10.0% of eyes did not experience visual recovery to baseline (>2 lines of vision loss) (p=0.43). Trabeculectomy eyes underwent an average 1.5 (0.4-2.5) extra visits in the 1st month and 2.5 (0.4-4.6) in the first 3 months.
Conclusions: Trabeculectomy/MMC with phacoemulsification was associated with decreased risk of failure and similar rates of interventions (more LSL, fewer needlings) and reoperations compared to microstent/MMC with phacoemulsification. However, a higher rate of complications and more postoperative visits were seen in the trabeculectomy group.

Title: Evaluating efficacy and safety post XEN implantation

Authors: Ritesh Gupta, Tony Lin

Abstract Body:

Purpose: The XEN Gel Stent is an implant for the treatment of glaucoma. It was recently approved for use in Canada in November, 2016. As such, there is limited literature available regarding the XEN Gel stent. The purpose of our study is to evaluate efficacy and safety of the XEN implant.
Study Design: Retrospective chart review
Methods: All patients who underwent XEN implantation at the Ivey Eye Institute, London, Ontario since December, 2016 were included. Functional outcomes were recorded including best corrected visual acuity (BCVA), intraocular pressure (IOP) and number of IOP lowering medications pre and post-operatively (POday1, POweek1, POmonth1 and last follow-up). Safety was assessed including evaluating minor and major complications post surgery. The frequency of post-operative needling required was recorded.
Results: 42 eyes from 37 patients were included in the analysis. 16 (38%) cases were male and 22 (52%) cases had a diagnosis of primary open angle glaucoma. 30 (71%) cases were performed as XEN implantation alone while 12 (29%) were a combined phacoemulsification/XEN procedure. LogMAR BCVA showed a trend of worsening on POday1 with return to baseline by POmonth1. A mean IOP of 22.6 was recorded pre-operatively which reduced to 10.8 POday1 and was 14.3 at last follow-up. Mean number of IOP lowering medications was 3.17 pre-operatively which reduced to 0.07 POday1 and was 0.29 at last follow-up. 8 (19%) XEN implants failed requiring subsequent trabceulectomy/cyclophotocoagulation or had uncontrolled IOP on maximal medical therapy. The most common complications included 12 (29%) patients with hyperemia and foreign body sensation. 6(14%) patients had choroidal effusion and 2 (5%) patients each had hyphema and tube erosion. Needling of the bleb was required in 9 (21%) of cases.
Conclusions: XEN implant can help to reduce IOP as shown by the sustained decrease in intraocular pressure measurements at various timepoints as well as a decrease in the number of intraocular pressure lowering medications required. There is a failure rate of 19% in our study which is comparable to trabeculectomy. The XEN implant also requires ongoing monitoring and needling of the bleb was required in 21% of cases.
In terms of safety, the most common complications were that of hyperemia and foreign body sensation. More serious complications included choroidal effusions, hyphema and tube erosions. No suprachoroidal hemorrhage or pressure spikes were noted post-operatively and the choroidal effusions were mild resolving without long-term consequences to visual acuity. The XEN implant proved to be an effective and safe alternative in our study compared to previous studies on trabeculectomy and should be a surgical consideration for treatment of glaucoma.

Title: Efficacy of targeted versus non-targeted trabecular micro-bypass stents

Authors: Vinay Kansal, Yogesh Patodia, Matthew B. Schlenker, Devesh Varma, Iqbal (Ike) Ahmed

Abstract Body:

Purpose: In effort to improve intraocular pressure (IOP) reduction outcomes of trabecular micro-bypass stents, some operators are now employing a targeted placement technique where the device is implanted near large, pulsatile episcleral vessels draining Schlemm's canal. The purpose of this study was to compare the efficacy of targeted vs. non-targeted implantation of trabecular micro-bypass stents.
Study Design: Single-center, retrospective, investigational cohort study.
Methods: 170 eyes, 134 patients with ≥2 months follow-up that had micro-bypass stent implantation at Trillium Health Partners (Mississauga, Canada) from Jan. 2010 to September. 2017. 78 eyes targeted implantation, 99 non-targeted. Primary outcome: IOP≤21mHg and on fewer IOP-lowering medications on last follow up vs. baseline. Secondary outcomes: 1) IOP≤18, no medications, and 2) ≥20% IOP reduction, no medication increase. Baseline characteristics were compared with Fisher Exact tests and Wilcoxon rank sum tests. Generalized estimating equations adjusted for baseline characteristics and accounting for correlation between eyes were used to compare interventions.
Results: Baseline characteristics were similar between groups with these exceptions: targeted group had more IOP-reducing medications (2.9 vs 2.4, $p<0.01$), and longer median follow up (13.0 vs. 12.1 months, $p<0.05$). Median baseline IOP was similar between groups (17.4mmHg in targeted group vs. 16.0mmHg non-targeted, $p=0.08$). 92.3% (96.5-83.9) of targeted eyes achieved the primary outcome versus 81.8% (73.0-88.2) of non-targeted eyes, (adjusted OR 2.7 [95% CI 1.1-7.1]). There was insufficient evidence to conclude a difference in the percentage of patients achieving the secondary outcomes between groups.
Conclusions: Targeted micro-bypass stent implantation has the theoretical impact of improved IOP control by directing aqueous outflow toward segments of the trabecular meshwork that are more likely draining toward episcleral vessels with improved flow. In this investigation, targeted micro-bypass implantation was more likely than non-targeted to achieve IOP≤21mmHg on less medication. No difference was identified for other success criteria. While regression adjusted for baseline characteristics, unmeasured confounders cannot be accounted for. Future studies should be randomized, prospective, and assess washed out IOP.

Title: Evaluation of second-generation trabecular micro-bypass stents in patients with primary angle closure glaucoma (PACG)

Authors: Julie Lapointe, **Samir Jabbour**, Paul Harasymowycz

Abstract Body:

Purpose: To assess outcomes following implantation of two second-generation trabecular micro-bypass stents (iStent inject®) during cataract surgery in glaucoma patients with PACG.
Study Design: Retrospective cases study
Methods: Data were collected retrospectively from electronic files from a single ophthalmology clinic in Montréal. Patients with primary angle closure glaucoma. Treatment outcomes analyzed included intraocular pressure (IOP) and glaucoma medication usage at baseline (preoperative) compared to postoperative measures. The per-protocol analysis reports outcomes at 6 months to 1 year with longer term follow-up ongoing.
Results: 35 eyes of 19 patients were included in the analysis. The mean preoperative IOP was 15.9 mmHg on 2.9 glaucoma medications. 6 months follow-up showed a significant reduction of 1.4 drops [CI95% (-1.88,-1.27)] in the medication burden. The mean IOP was reduced to 14.2 +/- 1.02 mmHg (~13.2% reduction from preoperative). The required amount of topical ocular hypotensive medications was reduced by ≥1 in 89% of patients and by ≥2 in 54% of patients. All eyes were successfully implanted with no intraoperative complications. None of the eyes had IOP spike of ≥30mmHg in the follow-up visits. No eyes required secondary glaucoma surgery.
Conclusions: This retrospective case series demonstrates that combined cataract surgery and implantation of second generation trabecular micro-bypass (iStent inject) is an effective treatment modality for significantly reducing the medication burden in patients with PACG.

Abstract Title: Bio-modulation of primary human Tenon's capsule fibroblasts using a novel application of coated magnesium

Authors: Xiangji Li, Cindy Hutnik

Abstract Body:

Purpose: The purpose of this study was to evaluate the biocompatibility and antiproliferative potential of different coated magnesium alloys as a novel drainage device material in glaucoma surgery.
Study Design: The MTT and LDH assay was used to determine cellular metabolic activity and cytotoxicity during the logarithmic phase of HTCFs, respectively. The BrdU assay was used to evaluate cell proliferation. Western blot was used to assess the expression of alpha-smooth muscle actin (alpha-SMA).
Methods: The pure magnesium was cut into disks of 14.5 mm diameter and 1 mm thickness, coated with Hydroxyapatite, Dicalcium phosphate dihydrate and DCPD-Stearic acid, respectively. The primary HTCFs were seeded on DCPD, DCPD+SA, and HA disks in 24-well culture plates for Day 2 to Day 7. The glass was used as control.
Results: The trend of cellular metabolic activity of different coated magnesium alloys gradually decline during the logarithmic phase of HTCFs, and each type of coated magnesium alloy significant decrease metabolic activity of HTCFs to compare with control ($p=0.00$). The trend of cytotoxicity of different coated magnesium alloys slightly increase during the logarithmic phase of HTCFs, and the group of DCPD+SA is no significant different which compare with control ($p=0.932$).Significant inhibition of proliferation was observed for group of DCPD+SA($p=0.47$). The expression of α-SMA was decreased in the cells which seed on coated magnesium alloy disks.
Conclusions: Cellular activity of HTCFs will be modulated by direct exposure to coated magnesium metal. The coating of DCPD+SA could significantly inhibit fibroblasts proliferation and its cytotoxic profile was the same as glass. In comparison to titanium, coated magnesium alloy attenuates HTCFs proliferation. Coated magnesium alloys reduce the expression of alpha-SMA.

Title: RIED database: A quality indicator study

Authors: Carter W. Lim, Victor Puvanendran, Blayne Welk, Darek Gozdzik, Vlad Diaconita, Cindy Hutnik

Abstract Body:

Purpose: Health administrative databases provide tremendous sample sizes for "big data" retrospective studies. An example of such databases is the Ontario-based Institute for Clinical Evaluative Sciences (ICES) database, which currently includes health records for approximately 13 million people. Unfortunately, however, ICES has limited ophthalmology data. In response, the Hutnik team of London Ontario recently developed the Research Innovation and Experimentation Database (RIED): a cloud-based, glaucoma patient database that permits data entry and real-time analysis anywhere from a local to international level. Data accuracy has a direct impact on the clinical outcomes that RIED provides. The objective of this study was to evaluate the accuracy of RIED's data compared to data found in patient records.
Study Design: Retrospective validation study
Methods: 230 patients were randomly selected from RIED. To synthesize a gold standard to compare RIED data to, two data collectors independently extracted data from patient charts. This data included patient identification, initial intraocular pressure (IOP), and initial diagnoses. Differences between the two data sets were resolved by a glaucoma expert. RIED and gold standard were compared by percent agreement and kappa. For diagnostic accuracy, sensitivity, specificity, positive predictive values (PPV), and negative predictive values (NPV) were also calculated.
Results: Healthcare numbers and initial IOP demonstrated high levels of agreement, being 98% and 93% respectively. Initial diagnoses of glaucoma suspects based on IOPs, discs, pseudoexfoliation, or unspecified were accurate. Mean agreements of these diagnoses were: kappa = 0.80 (95% confidence interval (CI): 0.71-0.88), sensitivity = 0.85 (CI: 0.72-0.93), specificity = 0.97 (CI: 0.94-0.98), PPV = 0.81 (CI: 0.71-0.88), and NPV = 0.97 (CI: 0.95-0.98). Initial diagnostic accuracy of primary open angle glaucoma (POAG) were: kappa = 0.63 (CI: 0.53-0.73), sensitivity = 0.88 (CI 0.75-0.95), specificity 0.92 (CI: 0.89-0.94), PPV = 0.55 (CI: 0.47-0.63), and NPV = 0.98 (CI: 0.97-0.99), which highlights the need to improve false positive rates in initial POAG diagnoses.
Conclusions: This validation study demonstrated substantial to almost perfect agreement in regards to patient identification, baseline IOPs, and majority of diagnoses. Diagnostic accuracy is comparable to databases that populate ICES. The findings of this study have been valuable to identify refinements in the future data entry protocol as well as to indicate which areas are now sufficiently robust to permit its utilization in clinical outcome studies. Studies conducted on RIED will help us challenge and improve upon the current glaucoma treatment paradigm to provide optimal treatment for our patients.

Title: The association between falls and vision loss secondary to glaucoma: A systematic review

Authors: Kian Madjedi, Niranjan Vijay

Abstract Body:

Purpose: The purpose of this systematic review is to identify, critically appraise and summarize the available research examining the descriptive epidemiology and potential association between vision loss secondary to glaucoma and falls.
Study Design: A structured search was designed and executed across the following databases: MEDLINE, EBM Reviews, EMBASE, CINAHL and Web of Science with key words representing the concepts "glaucoma" and "falls".
Methods: A total of 253 studies were identified, of which 30 were selected for abstract review. Two reviewers independently reviewed the included papers and assessed trial quality and risk of bias using the Cochrane Risk of Bias Assessment.
Results: A total of 13 articles fulfilled inclusion criteria and were retained for narrative review. Patients with glaucoma (all sub-types excluding angle closure, with 12/13 articles focusing exclusively on open angle glaucoma) had worse balance and less steady gait than patients without glaucomatous visual field loss (VFL). Falls were found to occur more frequently in patients with a greater degree of visual impairment and interestingly, with inferior visual field loss in particular. In addition to magnitude of VFL, the rate of VFL was found to be associated with increased number of falls. Patients with glaucoma were shown to be anywhere from 2 to 6 times more likely to fall than patients without vision loss from glaucoma. Females with glaucoma were slightly more likely than males to have experienced falls, but the relative contribution of glaucomatous VFL can not consistently be described separately from other confounding factors. In most studies, results were standardized for age and sex, but in several studies this standardization was not conducted, leading to direct subgroup to subgroup comparisons being rendered impossible. Due to the technical challenges of determining true cases of falls, most data in these studies rely on self-report. No studies conducted direct comparisons on the risk of falls between vision loss secondary to glaucoma versus other eye diseases.
Conclusions: There is a clearly defined association between degree of glaucomatous visual field loss and falls. There is, however, a need in the literature for head-to-head comparisons of falls and risk of falls between vision loss secondary to glaucoma and from other eye diseases. Understanding the risk of falls from glaucoma is important as the number of individuals diagnosed with glaucoma is increasing and thus this represents a potential area for targeted falls prevention research.

HOT TOPIC | SUJET PIQUANT

Title: Long-term tube position changes in eyes with Ahmed glaucoma valve implants

Authors: David J. Mathew, Anindya Anuradha, Stephanie A. W. Low, Yvonne M. Buys, Graham E. Trope

Abstract Body:

Purpose: The consequences of glaucoma drainage tube movement include corneal endothelial damage, iris atrophy, iritis, pupil distortion and tube extrusion. We prospectively evaluated the long-term (4.5 to 6 years) changes in position of Ahmed Glaucoma Valve tubes using anterior segment Optical Coherence Tomography (AS-OCT).
Study Design: Prospective observational series
Methods: Patients aged ≥18 years and 6 weeks-3 months post-glaucoma drainage device implantation were included. Exclusion criteria were surgical revision or subsequent intraocular surgery. The tube position was evaluated using AS-OCT imaging. The following measurements were recorded: intracameral tube length (ICL), distance between the anterior surface of the tube (0.67 mm from the proximal end of the tube) and the posterior corneal surface (TC), angle between the posterior surface of the cornea and the tube (CTA), and axis of the scanning beam which was parallel to the longitudinal cross-section of the tube (TA).
Results: Thirty eyes of 26 patients were enrolled. 23 eyes were excluded (4 died; 4 had subsequent ipsilateral intraocular surgery; 8 were lost to follow up; 6 had poor baseline scan qualities). Thus, 8 eyes of 7 patients were considered for the long-term analyses. The mean duration of follow-up was 4.86 ± 0.63 years (4.4-6.1 years). The mean ICL increased from 1.53 ± 0.44 mm to 1.81 ± 0.65 mm. The mean TC decreased from 0.37 ± 0.14 mm to 0.30 ± 0.05 mm. The mean CTA decreased from 28.64 ± 6.61° to 27.59 ± 4.59°. Five out of 8 tubes showed an increase in ICL of more than 0.3 mm. These 5 tubes showed movement towards the cornea and decrease in the CTA. Two out of the 8 tubes showed no change in the parameters; these were noted to lie on the iris during both the baseline and postoperative visits. One tube alone showed retraction, movement towards the iris and an increase in the CTA. Three out of 7 tubes showed a change in the TA of ≥ 10°. Overall, 63% tubes moved towards the cornea over time (mean, 0.14 mm over 4.5-6 years) with a mean 0.50 mm increase (32.89% increase) in ICL. Those that did not show any changes over time were lying on the iris.
Conclusions: Tubes should be reasonably short and positioned away from the cornea to prevent anterior migration and endothelial contact. Improved methods of plate fixation should be explored to prevent forward movement of the tubes.

Title: Comparison of dynamic contour tonometry and non-contact tonometry

Authors: Evan Michaelov, Angela Zhang, Wendy Wang, Edsel Ing

Abstract Body:

Purpose: Dynamic contour tonometry (DCT) is one of the most accurate methods to determine intraocular pressure. Non-contact tonometry (NCT) may be the most common method to screen for intraocular pressure. We determine the agreement between DCT and NCT.
Study Design: Cross-sectional comparative study
Methods: Adult patients 50 years of age or older presenting with headache or vision loss were recruited prospectively. NCT (Nidek Tonoref II) and DCT (Pascal, Ziemer) measurements were obtained within thirty minutes of each other. Three NCT measurements were taken by an ophthalmic technician. DCT was measured by an ophthalmologist until a quality reading of 1 or 2 was obtained. The right eye intraocular pressure measurements were compared with paired t-test, and Bland- Altman plots. The left eye intraocular measurements were subsequently analyzed for confirmation of results.
Results: There were 106 subjects with complete right eye data, and 104 subjects with complete left eye data. The average age was 72 years, and 70% were female. The NCT IOP was on average 3.9 mm Hg lower in the right eye, and 3.5 mm Hg lower in the left eye compared with DCT. ($p<.001$) In the right eye the Bland-Altman analysis showed the 95% agreement interval between the two tonometers was -2.5 to 10.4 mmHg and in the left eye -3.0 to 9.9 mmHg.
Since pachymetry was not available, repeat limits of agreement analysis excluding the most myopic eyes, or patients with corneal surgery was performed, but results did not change.
Conclusions: The intraocular pressures from NCT and DCT should not be used interchangeably because their level of disagreement includes clinically important discrepancies of up to 10 mm Hg.

Title: Factors affecting outcome of laser peripheral iridotomy in a Canadian narrow angle population

Authors: Edward Moss, Sarah M. Simpson, Harmanjit Singh, Isabella Irrcher, Angela Moore, Daniel Warder, Delan Jinapriya

Abstract Body:

Purpose: To determine the efficacy of and ocular characteristic associated with greater angle opening following laser peripheral iridotomy for narrow angles in a Canadian population.
Study Design: Prospective, consecutive enrollment, cohort study of 200 adult patients with newly diagnosed primary narrow angles (360 degrees of Shaffer grade < 2).
Methods: Gonioscopic angle grading was completed by a tertiary glaucoma specialist and confirmed by a second glaucoma specialist in all cases prior to treatment. Spherical equivalent (SE) was calculated from autorefraction (iProfiler) at time of diagnosis. Ocular biometric parameters were determined by contact A-scan (lens thickness) and IOLmaster® (anterior chamber depth and axial length). All patients then received YAG:Nd peripheral iridotomy (LPI) as prophylactic treatment of narrow angles. Post-LPI gonioscopic grading was repeated and once again confirmed by a second glaucoma specialist.
Results: 200 eyes of 200 patients met inclusion criteria. The average age of patients was 59.8 years and the majority were female (63%). 191 (95.5%) self-identified as Caucasian. The average SE was 0.82 + 2.0 D with a range of -8.63 D to +8.12 D. The average pre-LPI angle grade, anterior chamber depth, lens thickness, and axial length were 0.57 + 0.51, 2.84 + 0.29 mm, 4.75 + 0.45 mm, and 23.02 + 0.99 mm, respectively. There was significant angle opening post-LPI of 0.82 + 0.65, $p < 0.001$. Following LPI 60.3% of patients continued to meet the criteria for narrow angles upon repeat gonioscopy. Of these patients 30.2% were grade 1 or less and 10.6% were grade slit (0.5) or less. There was no difference in angle opening between genders or ethnicities, $p > 0.25$. Pre-treatment axial length (ß = 0.146 + 0.58, $p = 0.13$) and anterior chamber depth (ß = -0.374 + 0.179, $p = 0.38$) were predictive of angle opening, $R2 = 0.63$, $F = 4.202$, $p = 0.003$. Patients who no longer met criteria for narrow angles following treatment had significantly greater anterior chamber depth and longer axial length than those remaining narrow, $p = 0.008$ and $p = 0.020$, respectively.
Conclusions: Despite statistically significant angle opening following LPI, the majority of patients continue to meet criteria for narrow anterior chamber angles with 1:10 patients having a grade slit or less following treatment. Our results suggest that patients with deeper anterior chamber depth and longer axial length have greater angle opening after LPI and are more likely to be classified as having open angles following treatment. Overall the majority of patients with narrow angles, and especially those with shorter axial length and shallow anterior chamber, will continue to be narrow following LPI treatment. Based on this, close follow-up of all patients post-LPI should be employed to allow detection of and treatment for early glaucomatous change.

Title: Comparing surgical outcomes between iStent and gonioscopy assisted transluminal trabeculotomy (GATT)

Authors: Samir Nazarali, Anish Arora, Patrick Gooi

Abstract Body:

Purpose: To compare the efficacy and safety of iStent and gonioscopy assisted transluminal trabeculotomy (GATT).
Study Design: Retrospective Cohort Study.
Methods: The study adhered to the Declaration of Helsinki and Health Research Ethics Board was processed. Patients with open-angle and closed-angle glaucoma undergoing iStent or GATT procedures were included. The primary outcome was percentage of patients achieving IOP ≤21 mmHg at 6 months on no medications or an IOP reduction of ≥20% with no medication at 6 months. Secondary outcomes included intraocular pressure (IOP) and number of medications at various time points (1 month, 3 months, 6 months).
Results: 57 patients underwent GATT while 89 patients received iStent; 18 GATT and 45 iStent patients had undergone previous glaucoma surgery. The mean age for iStent patients was 71 (46-85) years (42 male/47 females) while the mean age for GATT patients was 57 (15-85) years (32 males/25 females). Some patients received concurrent procedures including cataract extraction, intraocular lens exchange or reposition, anterior vitrectomy, and hyphema washout. The mean visual field deviation was -7.69dB for iStent patients and -15.43dB for GATT patients. The mean logMAR best correct visual acuity for iStent patients was 0.45 and 0.43 for GATT patients. iStent patients had mean IOP at baseline of 19.3±5.5mmHg, which decreased to 13.8±3.8mmHg($p<0.001$) at 1 month, 13.7±3.3mmHg($p<0.001$) at 3 months, and 13.2±0.9mmHg($p<0.0001$) at 6 months post-operatively. Glaucoma medications decreased from 1.1±1.2 at baseline to 0.9±1.1($p=0.134$) at 6 months. Comparatively, GATT patients had a mean IOP decrease from 22.8±9.3mmHg at baseline to 13.0±4.4mmHg($p<0.001$) at 1 month, 13.0±9.3mmHg($p<0.001$) at 3 months, and 13.2±4.9mmHg($p<0.001$) at 6 months post-operatively; mean number of glaucoma medications decreased from 2.1±1.5 at baseline to 1.4±1.2($p<0.001$) at 6 months post-operatively. Directly comparing GATT and iStent at 6 months, patients receiving iStent required fewer glaucoma medications($p=0.004$). However, IOP changes at 6 months were not significantly different between groups. Corneal edema (38%) in iStent and hyphema (9%) in GATT were the most common complications. The success rate for iStent was 52% and for GATT was 74%.
Conclusions: There was a significant decrease in mean IOP for both GATT and iStent at 6 months. Performing GATT with a suture (approximately $100 CDN per case) may result in considerable savings to compared to different MIGS devices that range from $1000-1500 CDN per case. Limitations of the study are the small size, length of follow-up, and potential differences between GATT and iStent populations. Further investigation, with longer follow-up and prospective design are warranted.

Title: Cost-effectiveness of supraciliary micro-stent glaucoma implant concurrent with cataract surgery to manage primary open-angle glaucoma (POAG) from the Canadian payer perspective

Authors: Dominik W. Podbielski, Pinar S. Bilir, Stacey Kowal, Christine Bouchet, Rav Gill, Leighton Morris, Iqbal (Ike) Ahmed

Abstract Body:

Purpose: The COMPASS trial recently showed that a supraciliary microstent (microstent) combined with cataract surgery led to lower IOP and fewer medications required at 24-months than cataract surgery alone. This analysis therefore evaluates the cost-effectiveness of a microstent with cataract surgery vs cataract surgery alone from the Canadian payer perspective.
Study Design: A semi-Markov model
Methods: A semi-Markov model built in MS Excel using Early Manifest Glaucoma Trial natural history data, with corresponding need for additional interventions. The model transitioned a population reflecting the COMPASS trial (mean VFL -3.47) through health states by glaucoma stage and number of medications for 15 years, simulating post-COMPASS-trial cost and health outcomes. 24-month COMPASS trial data informed intervention-specific distributions of medications, impacting time to trabeculectomy following four failed lines of medication. Risk of progression was conservatively assumed equivalent between strategies. Costs (e.g. interventions, medications) reflect 2017 Canadian Dollars. Incremental cost-effectiveness ratios (ICERs) were estimated for four potential real-world care scenarios: 1) COMPASS trial medication benefit only (base case); 2) poorer adherence for 2+ medications; (3) trabeculectomy performed after two failed medications; 4) 25-year horizon.
Results: Across scenarios, incremental costs ranged from $1,867 (earlier trabeculectomy) to $2,237 (medication-usage only); incremental QALYs were 0.057 to 0.134. ICERs were $13,916/QALY (earlier trabeculectomy), $32,496/QALY (25-year horizon), $38,983/QALY (lower adherence), and $43,450/QALY (COMPASS medication-benefit only). In univariate sensitivity analysis performed on base case scenario, model results were most sensitive to assumptions on medication use trends but remained robust.
Conclusions: Given results across likely real-world treatment scenarios, this analysis indicates a microstent combined with cataract surgery may be cost-effective to manage mild-to-moderate POAG in Canada.

Title: Preference-based glaucoma-specific health-related quality of life instrument: Development of the health utility for Glaucoma

Authors: Dominik W. Podbielski, Sergei Muratov, Kevin Kennedy, Susan M. Jack, Julia Pemberton, Iqbal (Ike) Ahmed, Monika Baltaziak, Feng Xie

Abstract Body:

Purpose: To develop a descriptive system for a glaucoma-specific preference-based health-related quality of life (HRQoL) instrument: the Health Utility for Glaucoma (HUG-5)
Study Design: An exploratory sequential mixed methods design
Methods: A literature review of HRQoL assessment of glaucoma was conducted using a comprehensive search strategy. Relevant items were presented to glaucoma patients with face-to-face, semi-structured interviews. Patients recruited for the interview were sampled using the maximum variation technique. Framework methodology was applied to analyze interview content. The framework matrix was structured according to items organized into themes. The matrix was modified to accommodate the emergence of new items from subsequent interviews. The recurring themes identified through an iterative interview content analysis represented topics of most importance and relevance to patients. These themes formed domains of the HUG-5's descriptive system. Three versions of the descriptive system were pilot tested within a focus group. After completing each version, patients filled out an evaluation form and participated in a group discussion of the strengths and weaknesses of the descriptive system.
Results: The literature search yielded 1,566 citations for screening. Nineteen articles containing 266 items were included for the full text review and were used to develop an interview guide. Through interviewing twelve patients twenty two themes were identified as most important and relevant. These themes formed five domains that were converted into questions of the descriptive system. The questions cover the domains of visual discomfort, mobility, daily life activities, emotional well-being, and social activities. Each question has five response levels, where patients identify their glaucoma to have had no, slight, moderate, very much, or severe impact. The pilot test focus group consisted of seven patients who did not participate in the interviews. The three versions of the descriptive system, differing in explanatory detail were completed by all focus group patients. The pilot test identified the descriptive system with more specific examples explaining each question as having the most clarity and readability.
Conclusions: A 5-domain descriptive system of a glaucoma-specific preference-based instrument, the HUG-5 was developed. The next steps are to validate the instrument and develop a preference-based scoring algorithm.

Title: Cyclodialysis cleft repair: A multi-centered, retrospective case series

Authors: Marko Popovic, Shakeel Shareef, Juan J. Mura, Felipe Valenzuela, Julio G. Martín-Moro, Francisco Muñoz-Negrete, Keith Barton, M. Reza Razeghinejad, Iqbal (Ike) Ahmed

Abstract Body:

Purpose: A cyclodialysis cleft is the detachment of the longitudinal ciliary muscle from the attachment at the scleral spur. In this study, we describe the outcomes following the medical, laser and surgical treatment of cyclodialysis clefts at five centers internationally.
Study Design: Multi-centered, retrospective case series.
Methods: In this case series, patients with a confirmed traumatic injury resulting in a diagnosed cyclodialysis cleft from 2003-2017 were recruited. The primary outcomes of intraocular pressure (IOP) and uncorrected distance visual acuity (UDVA) were compared between treatment regimens.
Results: A total of 40 patients were included from 6 centers internationally. The mean cohort age was 43 ± 18 years, and a total of 33 (82.5%) patients were male. There was no significant difference between surgery, laser and combined surgery with laser for the primary endpoint of IOP>12mmHg ($p=0.86$). The same conclusion was reached for both stabilized IOP ($p=0.41$), change in IOP ($p=0.96$) pre- to postoperatively, postoperative uncorrected visual acuity ($p=0.70$) and change in acuity ($p=0.94$). A significantly greater proportion of eyes receiving surgery had a successful cleft closure relative to laser treatment ($p<0.001$).
Conclusions: Surgery performed superiorly to laser treatment in the rate of cleft closure. There was no statistical difference between laser, surgical and combined treatment in postoperative visual acuity and IOP.

Title: Evaluation of a subconjunctival biomicroshunt in the management of glaucoma: Effectiveness and safety at one year

Authors: Saama Sabeti, Sangsu Han, Garfield Miller, Robert Chevrier, David Marshall, Ralf Buhrmann

Abstract Body:

Purpose: The XEN implant offers a minimally-invasive ab-interno approach to subconjunctival drainage in the surgical management of glaucoma. The goal of this study is to describe the effectiveness and safety of the XEN implant one year after implantation.
Study Design: Interventional cohort study
Methods: A consecutive series of 89 eyes in 83 patients undergoing XEN implantation for the management of primary open angle glaucoma (OAG), pseudoexfoliation glaucoma, pigmentary glaucoma, secondary OAG (excluding uveitic), or glaucoma suspects with refractory intraocular pressure (IOP) elevation were followed for one year. Data was collected on demographic and other baseline characteristics, as well as pre- and post-operative variables including IOP, glaucoma medications, and visual acuities. Data was also collected on post-operative complications. Outcomes include post-operative IOP, mean reduction in IOP, and change in number of glaucoma medications used. Secondary outcomes include intra- and post-operative complications. Statistical tests were adjusted for interocular correlation.
Results: A total of 89 eyes from 83 patients were included in this analysis. Mean pre-operative IOP was 22.9 mm Hg (95% CI 21.1, 24.4). Mean change in IOP compared to baseline was -6.7 mm Hg (95% CI -8.7, -4.5), -6.4 mm Hg (95% CI -9.3, -3.6), -7.7 mm Hg (95% CI -10.5, -5.3), and -9.4 mm Hg (95% CI -13.9, -4.2), at 1, 2, 6, and 12 months respectively ($p<0.05$ for all, paired t-test). Mean IOP at 12 months was 13.1 mm Hg (95% CI 10.8, 15.5). To date, 18 eyes have completed 1-year follow-up. Of these, 5 eyes (27.8%) required glaucoma medications at 1 year. The median number of classes of glaucoma medications needed at baseline was 4.0 (IQR 3.0-4.0) and 0.0 (IQR 0.0-1.5) at 1-year follow-up. There were 47 needling events in 38 eyes. Three eyes developed choroidal effusions within 2 weeks post-operatively but these resolved within 2 weeks. There were no cases of endophthalmitis.
Conclusions: The XEN implant is effective at lowering IOP and reducing the use of glaucoma medications at one year post implantation.

Title: Repeatability assessment of a novel non-invasive method to measure the volumetric flow rate of the choroid

Authors: Diane Sayah, Wenzhen Zuo, Javier Mazzaferri, Luke Beaton, Santiago Costantino, Mark R. Lesk

Abstract Body:

Purpose: No technique is currently available to quantitatively and reliably measure choroidal blood flow in vivo. While a variety of non-invasive techniques have been developed in the past, their limitations and lack of standardization have hindered their adoption in clinical practice. Other techniques like OCT-A and traditional dye-based angiography give anatomical data without quantitative measurements of flow. The method we propose is based on video-rate OCT imaging followed by the automated segmentation of the choroid. This allows the measurement of the pulsatile choroidal volume change. The repeatability of this technique will be demonstrated in this study.
Study Design: The pulsatile choroidal volume change was measured on fifty-eight subjects recruited from the Maisonneuve-Rosemont Hospital. Two measurements per eye were carried out using our technique within the same session and by a single examiner. Repeatability was assessed using the Bland-Altman plot, Intraclass correlation coefficient (ICC) and Pearson correlation as calculated with SPSS.
Methods: Adapted from our earlier work (Beaton et al. (2015)), this novel method uses video-rate OCT with enhanced depth imaging and automated segmentation of the choroid to measure the pulsatile choroidal volume change. Choroidal thickness (CT) for each frame is measured by a segmentation algorithm based on graph cuts using an edge-probability weighting scheme. The algorithm also computes the CT change corresponding to choroidal filling over the time-series. It subsequently derives the pulsatile choroidal volume change through an approximate model of the eye.
Results: The average measures ICC for the repeated measurements of pulsatile choroidal volume change was 0.931, 95% CI [0.883, 0.959], showing good to excellent repeatability. The Bland-Altman plot and Pearson coefficient (r=0.874) showed agreement and a strong correlation respectively between intra-session measurement of OR in all examined eyes.
Conclusions: The high repeatability of pulsatile choroidal volume change measurements obtained with our optical method is confirmed. This will allow further study of choroidal blood flow in ocular diseases such as glaucoma and age-related macular degeneration.

Title: Subconjunctival anesthesia for micropulse cyclophotocoagulation

Authors: Dani Wang, Matthew Schlenker, Kevin Warrian, Chris Hanson, Patrick Gooi

Abstract Body:

Purpose: Micropulse transcleral diode laser cyclophotocoagulation (MPCPC) is a cycloablative laser treatment option that is becoming increasing popular in patients with refractory glaucoma. Retrobulbar anesthesia is typically used to achieve analgesia prior to MPCPC procedures, but is associated with the risk of severe complications including retrobulbar hemorrhage and brainstem anesthesia. We have routinely been using subconjunctival anesthesia for MPCPC and show that it adequately provides pain control in most patients with few complications.
Study Design: Retrospective case series.
Methods: A retrospective chart review was performed for all consecutive patients that received subconjunctival anesthesia prior to MPCPC at a single centre in Calgary, Alberta between September 2015 and May 2017 with at least 1 month of follow-up. The number of eyes that successfully achieved pain control under subconjunctival anesthesia, and the treatment duration and area was quantified. Baseline information was collected including demographics (age, gender, eye), glaucoma diagnosis, mean deviation, prior glaucoma procedures, best corrected visual acuity, IOP, and glaucoma medications. Follow-up data was assessed at 1 week and 1 month following the procedure. Data analysis was done on SPSS software v23.0. This study adhered to the Declaration of Helsinki and Health Research Ethics Board was processed.
Results: 145 eyes in 92 patients were identified. 138/145 (95.2%) of eyes successfully underwent subconjunctival anesthesia prior to MPCPC with no complications. Out of the 7 eyes that failed, 1 experienced pain, 1 experienced a vasovagal response, 1 required IV sedation due to a comorbid behavioural disorder, and 4 received sub-Tenon's/retrobulbar anesthesia. Baseline characteristics and treatment parameters in these 7 eyes were assessed for trends. For all eyes, the median age of patients was 68 years (range 13 to 97), 55 (38%) were female, the majority (46%) had a diagnosis of primary open angle glaucoma, and 90 (62%) had prior glaucoma procedures. 11% had a diagnosis of mild glaucoma, 15% moderate, 73.7% advanced, and the mean deviation was -14.8 (SD=9.6) decibels. Mean preoperative VA (logMAR) was 1.5 (SD=1.2) and patients were on a median of 3 (range 0 to 6) medications. The median duration of laser treatment was 80 seconds (range 50 to 500), and the treatment area was either to the superior 180 degrees (12%), inferior 180 degrees (51%), or the entire 360 degrees (37%). The mean preoperative IOP was 25.8 mmHg (SD=10.4), 20.1 mmHg (SD=9.5) 1 week postoperatively, and 19.6 mmHg (SD=9.1) 1 month postoperatively. Logistic regression found no correlation between baseline characteristics or treatment parameters with the success or failure of anesthesia.
Conclusions: Subconjunctival anesthesia is well-tolerated for the majority of patients for pain control during MPCPC procedures, easier to administer, and is not associated with vision-threatening complications. More investigation is needed to identify predictors of anesthetic complications, but can be made on a case-by-case basis.

Title: Results of trabeculectomy bleb needling

Authors: Melody E. Wong, Maria Campos-Baniak, Paul Murphy

Abstract Body:

Purpose: To assess the success rate of in office slit lamp bleb needling with the use of 5-fluorouracil (5-FU) performed by a single surgeon
Study Design: Retrospective chart review
Methods: All patients presenting to a single ophthalmologist's clinic at the Saskatoon City Hospital Eye Centre undergoing bleb needling between the years 2010 - 2016 were included. Demographics, surgical history and data, intraocular pressure monitoring, medications given, bleb characteristics, previous interventions, needling procedure data, repeat needlings and complications were recorded. Cases with less than 1 month follow-up were excluded. Medians were compared using the Wilcoxon rank sum test; proportions were compared using Chi-square or Fisher's exact tests.
Results: Forty-nine charts were included. Median age was 72 years, and 55.1% were female. Average pre-needling intra-ocular pressure was 31.1 mmHg. Median time to needle was 84 days from trabeculectomy (interquartile range [IQR] 30, 770 days). Median follow-up time was 798 days (IQR 376, 1330).
40.8% of patients had successfully revitalized blebs following needling, and an additional 38.8% attained qualified success. The time from initial trabeculectomy was not found to have a negative impact on the success rate of needling (remote needling, defined as greater than 1 year from initial trabeculectomy, had a success rate of 10/18 full success and 7/18 qualified success). There was no evidence that blebs undergoing repeat needling were less likely to be successful (72.7% versus 81.6%, p = 0.67). For those who failed (n = 10), median time to failure was 241 days (range 0 - 874 days) from the date of procedure.
Conclusions: Bleb needling performed at the slit lamp with adjuvant 5-FU is a successful technique and may be considered even in cases of remote trabeculectomy or repeat needling.

Title: Intermediate term outcome of iStent and iStent Inject in combination with phacoemulsification

Authors: Jithin Yohannan, Yogesh Patodia, Vinay Kansal, Devesh Varma, Iqbal (Ike) Ahmed

Abstract Body:

Purpose: The second generation iStent inject device (G2) allows for perpendicular insertion of two devices into schlem's canal.This is thought to be technically less challenging than the first generation iStent (G1) which requires sideways slanting for canal insertion. Although use of the G1 device is supported by a randomized clinical trial, there are no published comparative data assessing efficacy of G1 and G2 devices at lowering IOP. In this retrospective longitudinal case series, we attempt to compare the efficacy of these two devices in patients with glaucoma.
Study Design: Single-centre, retrospective, investigational cohort study
Methods: 185 eyes of 148 patients with a diagnosis of glaucoma and cataract underwent iStent implantation at a single institution. Of these, 145 eyes had two G1 stents implanted and 40 eyes had two G2 stents implanted. Primary outcome was mean IOP ± standard deviation (SD) at the last follow-up visit. Secondary outcome was the mean number of glaucoma medications ± SD at the last follow up. A Mann-Whitney U test was used to compare mean change in IOP and mean change in number of medications between the G1 and G2 groups.
Results: Mean follow-up time was 13.2±10.8 mos. Overall, pre-operative IOP was 16.9±4.4 mmHg and number of medications was 2.6±1.3. Mean IOP and number of medications decreased to 14.7±4.7 mmHg and 1.4±1.5 respectively at last follow-up. In the G1 group, pre-operative IOP and medications were 16.8±4.6 mmHg and 2.8±1.2 respectively. This decreased to 14.6±4.6 and 1.6±1.5 at last follow-up. In the G2 group, mean pre-operative IOP and medications were 17.3±3.4 mmHg and 1.85±1.3 respectively. This decreased to 15.0±5.1 and 0.6±1.2 respectively at last follow-up. There was no significant difference between the mean change in IOP or number of medications between the G1 and G2 groups ($p>0.05$ for all comparisons).
Conclusions: These data suggest that iStent can achieve a modest reduction in IOP and glaucoma medication use when used in combination with phacoemulsification. The efficacy of G1 and G2 device appears to be similar.

Title: Association of gabapentin or pregabalin use and incidence of acute angle-closure glaucoma

Authors: Mitch Browne, **Helena Zakrzewski**, Bruce Carleton, Mayhar Etminan, Frederick Mikelberg

Abstract Body:

Purpose: Gabapentinoids, such as gabapentin and pregabalin, are one of the most commonly prescribed classes of drugs in North America and are most often used for the management of chronic pain in adults. Recent case reports have suggested a potential link between the use of these drugs and the incidence of acute angle-closure glaucoma (AAG). We sought to determine the association of gabapentin or pregabalin use and the incidence of AAG.
Study Design: This was a nested case control study.
Methods: All adult (age > 18) patients who developed AAG between January 1st, 2006 and December 31st, 2016 and who were enrolled in the PharMetrics Plus database were eligible for inclusion. Cases were identified as per the first international classification for diseases 9th or 10th editions clinical modification codes for AAG. For each case 10 controls were randomly selected and matched by age, gender, follow-up and calendar time. A conditional logistic regression model was constructed and adjusted for steroid and bupropion use to assess the association between oral gabapentin or pregabalin use and the incidence of AAG.
Results: 1307 cases and 13070 controls were included in the analyses. The mean ± standard deviation age of the cohort was 57.0 ± 12.4 years and the majority (61.3%) of the cohort was female. Incidence of AAG was found to be statistically significantly associated with the use of oral gabapentin in the year prior to diagnoses (relative risk (RR) 1.42, 95% confidence interval (CI) 1.00 to 2.00). This association was not observed to be statistically significant with the current oral use of gabapentin (RR 1.28, 95% CI 0.77 to 2.12). Incidence of AAG was not found to be statistically significantly associated with either use of oral pregabalin in the year prior to diagnoses or current use (RR 1.00, 95% CI 0.51 to 1.93; RR 1.50, 95% CI 0.66 to 3.38, respectively).
Conclusions: Psychotropic agents have previously been reported to increase intraocular pressure by angle-closure mechanisms. To the best of our knowledge this is the first study to investigate the association between oral gabapentin or pregabalin use and the incidence of AAG. Oral gabapentin use in the year prior to diagnosis was found to be associated with the incidence of AAG. Although the current oral use of gabapentin was not observed to be associated with the incidence of AAG, the upper limit of the CI was observed to be consistent with a harmful effect. No association between pregabalin use and the incidence of AAG was found to be demonstrated; however, due to a small number of cases exposed to pregabalin a harmful effect may not be ruled out based on our data. Further investigation is required.

Title: Association of post-operative topical prostaglandin analog and/or beta-blocker use and incidence of pseudophakic cystoid macular edema

Authors: Colten Wendel, **Helena Zakrzewski**, Bruce Carleton, Mayhar Etminan, Frederick Mikelberg

Abstract Body:

Purpose: Pseudophakic cystoid macular edema (CME) remains a frequentcause of decreased vision following cataract surgery. Our purpose was to determine the association between post-operative topical prostaglandin analog and/or topical beta-blocker use and the incidence of pseudophakic CME.
Study Design: This was a nested case control study.
Methods: All adult (18 and older) patients who underwent cataract surgery between January 1 st, 2006 and December 31 st, 2016 and who were enrolled in the PharMetrics Plus database were eligible for inclusion. The PharMetrics Plus database primarily encompasses commercial insurance plans as well as commercial Medicare and commercial Medicaid. Patients with a previous diagnosis of diabetes mellitus were excluded. The association between post-operative topical prostaglandin analog (bimatoprost, latanoprost and travoprost/travoprost-z) and/or beta-blocker (betaxolol, levobunolol and timolol) use and the incidence of pseudophakic CME was assessed by conditionallogistic regression.
Results: The incidence of pseudophakic CME was found to be statisticallysignificantly associated with the current post-operative use of both topical prostaglandin analogs (relative risk (RR) 1.86, 95% CI 1.04 to 3.32) and topical beta-blockers (RR 2.64, 95% CI 1.08 to 6.49). Post-operative use of each of bimatoprost (RR 2.73, 95% CI 1.35 to 5.53%) and travoprost/travoprost-z (RR 3.16, 95% CI 1.42 to 7.03) in the year prior to diagnosis was demonstrated to be statistically significantly associated with the incidence of pseudophakic CME. This association was not observed to be statistically significant with the post-operative use of latanoprost (RR 1.55, 95% CI 0.84 to 2.88).
Conclusions: To the best of our knowledge this is the largest study to date thathas investigated the association between post-operative topical prostaglandin analogs and/or beta-blocker use and the incidence of pseudophakic CME. Post-operative use of both topical prostaglandin analogs and topical beta-blockers was found to be associated with the incidence of pseudophakic CME. Our findings suggest that other risk factors such as complicated cataract surgery must also undoubtedly be considered in the development of pseudophakic CME. It may thus be prudent to exercise caution in the use of topical prostaglandin analogs and topical beta-blockers following cataract surgery, most notably in high-risk eyes. Further investigation is required.

INTERNATIONAL AND PUBLIC HEALTH OPHTHALMOLOGY
L'OPHTALMOLOGIE INTERNATIONALE ET SANTÉ PUBLIQUE

Title: Prevalence of statistical methods in publications from the Canadian Journal of Ophthalmology: A comparison from 2000 and 2017

Authors: Lazar Joksimovic, Robert Koucheki, Marko Popovic, Yvonne Buys, Jonathan Micieli, Rajeev Muni, Matthew B. Schlenker

Author Body:

Purpose: A variety of statistical methods are used in medical publications. To help identify relevant statistical methods for readers of the Canadian Journal of Ophthalmology (CJO), the frequency of statistical methods in publications from the CJO was systematically analyzed.
Study Design: Systematic review.
Methods: Using Ovid MEDLINE, all original articles and correspondences published in the CJO in the years 2000 and 2017 were retrieved. The included articles were analyzed for the mean number as well as frequency of specific statistical methods and the results compared by year of publication.
Results: There were a total of 158 CJO articles, 40 from 2000 and 118 from 2017. Overall 65.2% (n=103) of articles did not use any statistical method or solely relied on descriptive statistics (58.5% in 2017 and 85.0% in 2000). The top three statistical methods utilized in 2017 articles were t-tests (n=23; 19.49%), non-parametric tests (n= 19; 16.10%) and contingency tables (n=18; 15.25%). In comparison [O1] [L2] the most common statistical methods in 2000 were t-tests (n=4; 10.00%) and contingency tables (n=3; 7.50%). The mean number of statistical methods per paper was 0.98 in 2017 compared to 0.28 in 2000. Upon exclusion of articles without statistics, there were 2.37 statistical methods per 2017 CJO paper (1.83 in 2000).
Conclusions: Compared to CJO articles published in 2000, articles published in 2017 employed statistical methods more frequently. More than half of articles published in the CJO did not use any statistical method or exclusively relied on descriptive statistics. Overall, the most commonly used statistical methods were contingency tables, non-parametric tests and t-tests.

Title: The incidence of giant cell arteritis in Kingston Ontario

Authors: Gabriela Lahaie Luna, Edsel Ing, Martin ten Hove

Abstract Body:

Purpose: Despite its importance to public health planning, the incidence of GCA in Canada is not well known. Although population census data is available, and Ontario has universal health care insurance, it is difficult to definitively determine the incidence of biopsy proven GCA from temporal artery biopsy data. The only available incidence figure for biopsy-proven GCA in Canada is 9.4 per 100,000 individuals over the age of 50 years, from a 2007 Saskatchewan study1.
Study Design: An IRB approved retrospective study of all temporal artery biopsies performed in Kingston was conducted.
Methods: A retrospective audit of all temporal artery biopsies performed at Kingston General and Hotel Dieu Hospitals in Kingston, ON from October 2011 to September 2015 was performed. The 2011 Canada census data was used to determine the population denominator served by the Kingston area hospitals. The population denominator was calculated from data using the 2011 census data for Kingston2 (given that the population of Kingston only increased by only 1% between 2011 and 2016) 3. Because GCA is rarely seen before the sixth decade of life, only individuals 50 years of age and over were tabulated in each electoral district.
Results: In Kingston, the population over age 50 years represented by the patient postal codes yielded a denominator of 217,745 individuals. Thirty-two biopsy proven GCA cases were retrieved over the 4 year study period, and the average age of the patients was 79.7 years, with 17 patients (53%) being women. The estimated cumulative incidence of GCA in Kingston was 3.67 per 100,000 persons over the age 50 years.
Conclusions: The minimum estimated cumulative incidence of GCA in Ontario, Canada is between 1.21 - 3.67 per 100,000 persons, which is lower than the figure reported from Saskatchewan in 2007. Ontario is the most heavily populated province in Canada with 38% of the national population, compared to Saskatchewan with only 3% of the population of Canada. Incidence studies in Ontario may be more representative of the national incidence of GCA, however further studies are necessary to collect province wide data to support this.

Title: Disinfection of the Goldmann applanation tonometer: A systematic review

Authors: Alex Ragan, Stephanie Cote, John T. Huang

Abstract Body:

Purpose: The Goldmann applanation tonometer is the gold standard for measuring intraocular pressure and a possible vector for the transmission of infectious diseases. The purpose of this study is to consolidate the evidence pertaining to the disinfection of Goldmann tonometers in an effort to facilitate an informed discussion regarding public policy in this important area.
Study Design: Systematic review.
Methods: An exhaustive literature review was undertaken to identify primary-level research that assesses the effectiveness of different agents used in the disinfection of Goldmann applanation tonometer prisms. Seven discrete databases were reviewed by two independent researchers and a symmetrical screening process was utilized to identify and review all pertinent studies.
Results: Our review identified only 19 primary-level studies that relate specifically to the disinfection of Goldmann tonometer prisms. These studies are largely heterogeneous in regard to the pathogens and disinfectants that were tested as well as the experimental protocols that were employed. Accordingly, definitive conclusions as to the optimal agent cannot be made on this basis. Further, the results of our review reinforce previous suggestions that only adenovirus has been transmitted between patients via the Goldmann tonometer.
Conclusions: The present state of the literature does not permit a definitive conclusion regarding optimal disinfection agent for Goldmann applanation tonometer prisms. Further well constructed studies are required to better delineate the effectiveness of disinfectants in the specific context of tonometer prisms.

Title: Herman von Helmholtz the renaissance man: Inspiring a conceptual framework for innovative medicine

Authors: Daniel Stojanovic, Cindy Hutnik, Shelley McKellar, Paul Potter

Abstract Body:

Purpose: This is a historical research project geared towards determining the keys to success of Herman Von Helmholtz the inventor of the ophthalmoscope. With specific interest to explore why his invention was successful when similar inventions by his predecessors (Purkinje and Babbage) had failed.
Study Design: Qualitative data analysis of historical documents through a grounded theory approach and analysis on NVIVO.
Methods: Through the analysis of Helmholtz's correspondences to his wife (translated by the author for this project), the transcripts of his public lectures, and the consolidation of several biographies, this presentation will provide a complete account of the disciplines which Helmholtz had utilized to create and propagate his invention, the ophthalmoscope. A translation algorithm was
Results: Helmholtz relied on his passions in the fields of medicine, physics, education, philosophy and business to usher in the success of the ophthalmoscope. Each of these fields reinforced his conviction and ultimately led to the propagation of the device.
Conclusions: This is the single most thorough account of the different fields which Helmholtz had utilized to bring about the success of the ophthalmoscope. It was this multidisciplinary approach that distinguished Helmholtz's ophthalmoscope from those of his predecessors who had invented similar tools decades earlier.

PEDIATRIC OPHTHALMOLOGY AND STRABISMUS
L'OPHTALMOLOGIE PÉDIATRIQUE ET STRABISME

Title: Use of Botox for the treatment of pediatric cyclic esotropia: A case report

Authors: Helya Aghazadeh, Nathan Carrell, Natashka Pollock

Abstract Body:

Purpose: To describe an alternative to strabismus surgery in the treatment of cyclic esotropia. Traditionally, cyclic esotropia was corrected with strabismus surgery that targeted the greatest measured angle of deviation. In many cases this strategy was successful, however, occasionally the patient would revert to a cyclic exotropia or fail to break the cycle entirely. Given the less predictable nature of surgical options, botulinum toxin (Botox) has been suggested as a lower risk alternative with only one pediatric case report published to date[1]. We describe the ease and efficacy of bilateral medial rectus (MR) Botox injections in the treatment of our pediatric patient with cyclic esotropia.
Study Design: This study is a prospective case report describing the efficacy of MR Botox injections in the treatment of a three-year-old diagnosed with cyclic esotropia.
Methods: Our patient presented with a four-month history of cyclic esotropia (48-hour cycle) and was examined on both orthotropic and esotropic days over a three-month period. The patients' family consented to treatment which involved a one-time injection of 5 units botulinum toxin type A to each medial recti. This was performed under general anesthesia. In follow-up, the patient's mother did not note any further manifest episodes of esotropia and we confirmed her observations with 2 sets of orthoptic measurements over a 6-month period to document continued orthotropia.
Results: Six-months post-injection, it is now apparent that these single Botox injections have successfully broken the patient's pattern of cyclic esotropia. Her visual acuity during follow-up visits has been 20/30 OU. She demonstrates excellent stereopsis and full extraocular movements with a well-controlled esophoria (E6). Interestingly, the patient's parents report an improvement in her sleeping pattern that seems to have coincided with the correction of her cyclic esotropia.
Conclusions: This is only the second publication to describe the successful use of Botox in the treatment of pediatric cyclic esotropia. We believe that chemical denervation is a good alternative to surgical repair for this rare form of strabismus as it minimizes risks of permanent overcorrection and lengthy exposure to anesthetics. Further follow-up is needed to determine efficacy and permanency of this treatment modality.

1. Jones BMedSci, A., & Jain FRCOphth, S. (2014). Botulinum toxin: A novel treatment for pediatric cyclic esotropia. Journal of AAPOS, 18, 614-615. http://doi.org/10.1016/j.jaapos.2014.07.155

Title: Do eyes with esotropia have a high prevalence of narrow angles

Authors: Ahmad Alali, Rosanne Superstein, Oscar Kasner

Abstract Body:

Purpose: The purpose of this study is to determine if there is a direct relation between Esotropia and narrow appearance of the eye's angles on gonioscopy exam " oocludable angles"
Study Design: This is a prospective single center cross sectional case series study.
Methods: the study was conducted in the Ophthalmology department at the Jewish General Hospital (Montreal,Quebec). Medical Chart review was conducted and the following informations were obtained: age, gender, type of strabismus, refraction error, intraouclar pressure, Gonioscopy, appearance of the optic nerve, past ophthalmology history, past medical history, and medications history.30 patients were included in this study, 21 patients with Esotropia and 9 patients with other types of strabismus.inclusion criteria included capable adults 18 years of age and older, willingness to participate, patient in the Jewish General Hospital, & diagnosed with strabismus. the exclusion criteria included history of eye surgery, unwillingness to participate, & pregnant and nursing mothers.
Results: 30 patients were included in this study, 21 patients with Esotropia and 9 with other types of strabismus. 28.5% of the Esotropia patients were found to have occludable angles compared 25% of the other strabismus patients. Only 19% of the Esotropia patients are Hyperopic , and 14.2% are plano.
Conclusions: To our Knowledge this is the first study that looks ate the direct relation between Esotropia and occludable angles. Significant number of the Esotropia patients have occludable angles although the majority of these patients are not hyperopic. this study is opening the door to look in more de path the relation between Esotropia and the angle appearance.

Title: Extraocular movement deficits secondary to granulomatosis with polyangiitis lesions in children

Authors: Andre Ali-Ridha, Majd Mustafa, Jia Yue You, Ayesha Khan

Abstract Body:

Purpose: To describe a small series of patients presenting with extraocular movement deficits secondary to rare orbital lesions that were biopsy proven positive for granulomatosis with polyangiitis (GPA).
Study Design: Case series and literature review.
Methods: The study is an observational case series of three children who presented with symptoms associated with GPA and were found to have variable degrees of binocular diplopia and extraocular motor deficits on initial examinations.
Results: Specific characteristics of the patients included one child who had binocular diplopia and a very mild (-1) restriction in elevation and abduction with ptosis and erythema of the upper eyelid with a small, firm, non-mobile mass on palpation. The second patient also had binocular diplopia with a mild to moderate (-2) restriction and pain in upgaze with ptosis and swelling of her upper eyelid. The last patient had very mild restriction in upgaze (-0.5) with proptosis and enlargement of the lacrimal gland. All three children had full resolution of their extraocular motor deficits and diplopia following treatment for their GPA lesions with systemic immunosuppression.
Conclusions: Orbital lesions that are less commonly encountered in children including granulomatosis with polyangiitis can cause differing degrees of impairment in extraocular movements with variable symptoms that often resolve with proper treatment of the underlying pathology. Due to the transient nature of extraocular motor deficits in vasculitis-related orbital lesions in children, these patients should be treated by addressing the primary cause of their lesions based on histopathological diagnosis which often leads to rapid resolution of any impairments without the need for further unnecessary medical or invasive surgical management.

Title: Anomalous lateral rectus muscle insertion in V-pattern exotropia

Authors: Vlad Diaconita, Inas Makar

Abstract Body:

Purpose: V pattern exotropia (XT) is often associated with inferior oblique muscle overaction. Current surgical intervention involves bilateral lateral rectus muscle recession and bilateral inferior oblique myectomy. Novel imaging research by Hao, Demer et al suggests that the lateral rectus muscle in V-Pattern XT can be displaced inferiorly in a significant subset of patients. There are no clear surgical guidelines for patients identified intraoperatively with inferiorly displaced lateral rectus muscle in the setting of a V pattern exotropia. The purpose of this study is to review a case series of patients receiving surgery for V-pattern exotropia including patients who were found intraoperatively to have inferiorly displaced lateral rectus muscle.
Study Design: Retrospective Chart Review of all patients who received surgery for V-Pattern Exotropia in the form of bilateral lateral rectus muscle recession with bilateral inferior oblique myectomy.
Methods: Surgical report was reviewed to identify patients with normal vs. anomalous lateral rectus insertion. We compared pre-operative clinical picture and post-operative findings in both groups and correlated surgical response.
Results: 44 cases were identified between 2008-2016. 10 were excluded and 34 were included for analysis. 19 were found to have downshifted lateral rectus insertion, 15 were found to have normal lateral rectus insertion. Baseline demographics were similar. Pre-operative deviations were not statistically significant between the two groups. Pre-op stereopsis was present in larger proportion of downshifted lateral rectus patients. Post-operative results showed that downshifted lateral rectus insertion patients had better motor and sensory outcome in both short and long-term follow-up.
Conclusions: 19/34 patients were found to have downshifted lateral rectus insertion. Patients found to have downshifted lateral rectus muscle insertion had better outcomes in short and long term follow-up and were more likely to have pre-op stereopsis.

Title: Benign episodic unilateral mydriasis in a 12-year old girl

Authors: Andrew Farag, Cecile Thuong-Cong, Marcele Falcao

Abstract Body:

Purpose: Benign episodic unilateral mydriasis (BEUM) is a rare neuro-ophthalmological condition involving isolated transient mydriasis. To date, literature on the subject has predominantly been descriptive in nature. It has been observed to have a strong association with a history of migraine in a given patient. This has led BEUM to be classified within the spectrum of migraine syndromes in recent literature. We report the unique case of a 12-year old girl who presented two episodes of BEUM within the span of 2 months.
Study Design: Case report and literature review.
Methods: The patient was evaluated at the outpatient ophthalmology clinic of the University of Sherbrooke. Clinical charts were also reviewed including patient history, clinical examinations by various specialists, and radiological imaging. A thorough review of pertinent literature was also performed. We have no conflicts of interest to report.
Results: A 12-year old girl was brought to the emergency room by her mother who had noticed that her daughter had developed an anisocoria. Upon questioning of the girl, she complained of two episodes of blurred vision in the right eye, which was worse when focussing on near objects. The patient was otherwise healthy. The episodes were not accompanied by headache, nausea, or vomiting. Complete ophthalmological workup (physical examination including orthoptic testing, as well as MRI and CT-angiography of the brain) was normal. The patient was discharged following her first episode with suspicion of incomplete third nerve palsy. The second episode, during which we examined the patient, had the same presentation. The mydriasis regressed in clinic during the pilocarpine 1% test. Given the normal imaging studies and extraocular movements, further opinion was sought from a specialist in neuro-ophthalmology. After a second set of normal radiological imaging results, the diagnosis of BEUM was elicited and the patient was instructed to observe her condition.
Conclusions: BEUM classically presents in middle-aged women with a prior history of migraines. The current case is particular because the patient is a young girl without a personal history of migraine. The report therefore instates BEUM among the multitude of differential diagnoses when faced with a pediatric patient with transient mydriasis, whilst eliminating the etiologies that may be more common and/or malignant (third nerve palsy, Adie's pupil, antimuscarinic exposure).

Title: Evaluating the clinical utility of minimally-invasive handheld ERG and OCT techniques to monitor for retinal toxicity in infants < 3 years of age undergoing vigabatrin therapy

Authors: Xiang Ji, Thomas Wright, Sabrina Dhaliwal, Arun Reginald, J. Raymond Buncic, Carol A. Westall

Abstract Body:

Purpose: Vigabatrin (VGB) is an effective drug for infantile spasms; however, it has been associated with retinal toxicity which may manifest as retinal nerve fiber layer (RNFL) thinning, and reduction in light-adapted electroretinogram (ERG) response. Retinal assessment can be difficult in children due to limited compliance often requiring sedation for standard ERG. We aim to investigate the reliability and clinical feasibility of minimally-invasive handheld (HH) ERG and optical coherence tomography (OCT) to monitor for VGB-related toxicity in infants ≤ 3 years of age.
Study Design: Prospective cross-sectional study. This study was approved by the Research Ethics Board at SickKids Hospital.
Methods: We first investigated the intra-visit reliability of HH-ERG in awake children. We then performed HH-OCT under sedation. The RNFL thickness was assessed using custom-built segmentation software, and intra-visit reproducibility of responses for both methods was calculated through intraclass correlation (ICC) statistics.
Results: The HH-ERG testing had a limited success rate in infants with only 7 out of 19 patients (12.0 ± 6.6 months) having successful recordings. Nevertheless, when successful, the HH-ERG showed high within-visit reproducibility with an ICC of 0.90 across the 30Hz light-adapted flicker response (μV). HH-OCT was successfully recorded in all 19 children (9.6 ± 6.2 months). Six children (age of testing at 2nd visit 13.7 ± 1.6 months) completed one longitudinal follow-up assessment within the study period, and the HH-OCT was successfully recorded in all 6 cases. The mean peri-papillary RNFL thickness in superior and inferior quadrants were 109.4 ± 20.0μm and 105.1 ± 25.5μm, respectively, and the nasal and temporal quadrants were 69.8 ± 17.5μm and 67.0 ± 14.8μm, respectively. High within-visit reliability of HH-OCT was demonstrated with an average ICC of 0.83 across all retinal quadrants. Longitudinal OCT assessments revealed a marked thinning of RNFL thickness at 11.1% reduction from initial visits across 3 quadrants (superior, nasal and inferior), while the temporal quadrant was relatively unaffected with a slight 2.4% increase.
Conclusions: In this cohort, the HH-ERG showed limited clinical utility in awake infants, but it has shown high within-visit reproducibility when compliance was adequate. A larger study may identify the factors limiting compliance (fasting, developmental delays, and young age). The HH-OCT demonstrated intra-visit reproducibility, accuracy and time efficiency, revealing potential clinical utility as structural biomarker for pediatric visual assessment. The average 11.1% decline in RNFL thickness may be indicative of detection of early retinal toxicity; Avery, 2014 recommended that a threshold of 10-15% reduction signified retinal disease. The relative sparing of only the temporal quadrant is consistent with previous findings from our group (Wright, 2017).

Title: Torsional augmentation surgery for ocular tilt reaction does not work in all cases

Authors: Henry Liu, J. Raymond Buncic

Abstract Body:

Purpose: Ocular tilt reaction (OTR) is a syndrome characterized by an abnormal synkinesis of head tilt and ocular torsion accompanied by skew deviation, with hypotropia of the eye ipsilateral to the direction of anomalous head positioning (AHP). OTR is typically a result of asymmetric disruption to the utriculo-ocular reflex in response to injury of the vestibular system, brainstem tegmentum or cerebellum. This imbalance often leads to a tilt in the ipsilateral direction of the perceived subjective visual vertical (SVV) with respect to the earth's graviceptive vertical plane. Reports of horizontal transposition of the vertical rectus muscles via the augmentation of the ocular torsion in the direction of the pathological head tilt have been shown to resolve the AHP in patients with ocular head tilt and a case of partial OTR with lateropulsion. Surgical cyclorotation of the eyes is performed with the intent of rotating the eyes in line with the tilted SVV, thereby eliminating the visual need for a compensatory head tilt. We report a pediatric patient with OTR, upbeating nystagmus and ataxia due to hemi-cerebellar hypoplasia. Using the same premise as Brodsky et al. (2012), torsional augmentation was performed but failed to alleviate the observed OTR or vertical nystagmus.
Study Design: Case report
Methods: All medical records of the patient were reviewed retrospectively.
Results: A 17 year old girl with OTR, vertical upbeating nystagmus and cerebellar hypoplasia was followed for strabismus at the Hospital for Sick Children since head tilt surgery at age 6 years. Current measurements were left esotropia of 10Δ and right hypotropia of 2-8Δ. Double Maddox rods test demonstrated 11° excyclotorsion of the right eye and 9° incyclotorsion of the left eye. Both ocular torsion and skew deviation were relieved after lying in supine position (upright-supine test). Fundus photography further substantiated these findings revealing an estimated 40° right excyclotorsion and 20° left incyclotorsion. Extraocular eye movements showed limited abduction of the right eye and adduction of the left eye. The vertical nystagmus was controlled by a variable head tilt (20-40°) and released in the erect position of the head. A T2-weight MRI imaging of the brain demonstrated a small vestigial right cerebellar hemisphere with associated hypoplasia of the right posterior fossa. Strabismus torsion surgery was performed at age 6 in 1993 by the senior author involving vertical rectus realignment to rotate both eyes ipsilateral to the direction of head tilt. Pre-operative AHP was moderately severe estimating up to 40° to the right and did not improve after surgery with follow-up of 13 years.
Conclusions: We postulate that OTR may not be a significantly visually driven phenomenon and the use of torsional augmentation, a procedure that further rotates the eyes in the direction of pathological head tilt, is unable to fully compensate for the erroneous SSV mediated by lesions of supranuclear origin. Torsional augmentation can be effective in correcting AHP of ocular origin, but not effective in all OTR cases. The differences in effectiveness illustrate the need to select cases carefully with consideration for the complexity of cause for the head tilt, its onset and duration, extent of lesion and the severity of accompanying ocular torsion.

Title: Baseline retinal findings in children with infantile spasms and its association with infantile spasm etiologies

Authors: Michelle T. McFarlane, Tom Wright, Blathnaid McCoy, J. Raymond Buncic, Carol A. Westall

Abstract Body:

Purpose: Infantile Spasms (IS) is an age-specific epilepsy of childhood sometimes associated with abnormal electroretinogram (ERG) before initiation of treatment with the antiepileptic drug vigabatrin (Westall et al., 2002). The aim of this study is to investigate the relationship between etiologies of IS and concomitant retinal defect prior to vigabatrin treatment.
Study Design: Retrospective observational study of 316 patients with IS (mean age 9.3 months ± 6.04, range 1.68- 46.08 months). All patients had a history of epileptic spasms, an EEG showing hypsarrhythmia, and were vigabatrin-naïve.
Methods: 30 Hz Flicker ERGs were recorded according to the International Society for Clinical Electrophysiology standards. Using our extensive pediatric normal database as a comparison, we calculated the z-score of each child's 30 Hz Flicker ERG amplitude. This z-score formed the age-adjusted primary outcome measure. Patients were classified into one of 8 etiologic subgroups identified by the National Infantile Spasms Consortium database (Wirrel et al, 2015) - (1) Genetic factors not associated with structural brain changes, (2) genetic-structural disorders associated with structural brain changes, (3) structural-congenital, (4) perinatal structural acquired brain changes, (5) postnatal structural acquired brain changes, (6) metabolic, (7) infections and (8) unknown causes. The effect of etiology on retinal responses with age were investigated within each etiologic subgroup using a univariate linear regression with z-score of the Flicker ERG amplitude as the dependent variable and patient age as the independent variable. An ANOVA was conducted across all 8 etiologic subgroups.
Results: There were no significant differences in the z-score of the Flicker ERG amplitude among the 8 etiologic subgroups (ANOVA $p = 0.27$). The z-scores of the Flicker ERG amplitude in patients with IS were no different than normal in each etiologic subgroup (univariate analysis p-value intercept >0.006, Sidak adjusted p-value for multiple comparisons). Descriptively 10 out of 42 patients (24%) in the structural congenital subgroup had significantly decreased z-score 30 Flicker ERG amplitudes outside the 95% CI.
Conclusions: There are no significant differences in the baseline ERG among the etiologies investigated in this study. Further, the baseline ERG is not significantly different from normal across the 8 etiologic subgroups, although some patients show ERG abnormalities in the structural congenital subgroup which includes children with hydrocephalus, schizencephaly, and corpus callosum defect. As the ERG is used to monitor vigabatrin toxicity, it is essential to understand the effect of IS etiologies on the vigabatrin naive 30 Hz Flicker ERG.

Title: Restrictive strabismus following implantation of glaucoma drainage device: Clinical observations and surgical management

Authors: Milad Modabber, Hady Saheb, Michael Flanders

Abstract Body:

Purpose: Incomitant strabismus with diplopia following implantation of a glaucoma drainage device (GDD) has been described in the literature (Munoz 1992, Smith 1993, Roizen 2008, Abdelaziz 2013). We present the clinical findings and surgical management of two patients with this complication.
Study Design: Retrospective case series and review of the literature.
Methods: Two patients with restrictive strabismus and diplopia following implantation of a GDD were reviewed retrospectively. Alignment and motility measurements were recorded before and after strabismus surgery and intraoperative findings and surgical procedures were documented.
Results: Both patients had a GDD implanted in the epibulbar, superotemporal quadrant of the affected eye, adjacent to the superior and lateral rectus muscles. Both had significant exohypertropias with moderate to marked limitation of adduction and depression subsequent to GDD placement. Both patients underwent adjustable strabismus surgery on the affected eye, performed under general anesthesia. Intraoperatively, the forced duction tests were strongly positive. The implant plates were surrounded by fibrous capsules. Adhesions were identified between the capsules, the adjacent sclera and the extraocular muscles. The capsule was surgically penetrated in one case, requiring reformation of the anterior chamber with sodium hyaluronate. Adjustable superior and lateral rectus muscle recessions were performed on the affected eye in both cases. Postoperative diplopia in the primary position was eliminated in one patient, and alignment and motility were improved in both patients. (Patient A: Pre-op LXT 23 PD, LHT 6 PD; Postop LXT12, LHT 0 PD; Patient B: Preop RXT 30 PD, RHT 35 PD; Postop RXT 20 PD, RHT 25 PD). The GDD's remained functional postoperatively and the intraocular pressure was within normal range at last follow up (patient A 15mmHg; patient B 15mm Hg).
Conclusions: Restrictive strabismus following implantation of a GDD is an uncommon but serious complication. Surgical intervention involves dissection of adhesions between the fibrous capsule encompassing the GDD and the extraocular muscles, sclera and surrounding tissues. Surgical treatment can improve ocular alignment and motility, albeit with limited success at times.

Title: Intravitreal injection of bevacizumab or laser photocoagulation for management of retinopathy of prematurity

Authors: Prima Moinul, Varun Chaudhary, Gloria Isaza

Abstract Body:

Purpose: To report the efficacy of Type 1 ROP treatment with intravitreal Bevacizumab (IVB) or laser photocoagulation.
Study Design: A retrospective, non-randomized interventional comparative study
Methods: This study analyzed 78 eyes of 40 infants who had undergone ROP treatment between July 2007 and February 2017, at a single Canadian NICU. Data were extracted from the Canadian Neonatal Network, which maintains clinical information about neonates, and were confirmed by reviewing medical charts. Patient information collected for analysis included: gender, gestational age (GA), birth weight (BW), postmenstrual age (PMA) at treatment, post-treatment complications, retreatment, and refractive error. Infants were classified into 2 groups (group 1 received laser photocoagulation and group 2 received IVB treatment) for analysis.
Results: Totally, 18 of 40 infants (45%) were in group 1. There were 35 eyes (45%) in group 1 and 43 eyes (55%) in group 2. Of 29 total males (72.5%), 12 males (67%) were in group 1. Mean GA, BW and PMA at treatment were not statistically significant between the two groups (24.5±0.2 vs 24.4±0.3 weeks, p=0.728; 669.1g±16.2g vs 641g±25.1g, p=0.355 and 36.2±0.7 vs 35.3±0.5 weeks, p=0.303 respectively). ROP regressed in 95% of infants in group 1 and 100% in group 2. There were 2 complications following treatment in group 1 and none in group 2. A greater myopic refractive range was observed in group 1 compared to group 2 (-19.25 to +5 D vs -9.5 to +4.5 D). The number of eyes with astigmatism was significantly higher in group 1 ($p<0.03$).
Conclusions: Laser photocoagulation and IVB therapy successfully regressed type 1 ROP. A higher degree of myopic refractive error, astigmatism and short-term ocular complications were found among infants treated with laser photocoagulation.

Title: Retinoblastoma pathways of care – Quality improvement by standardization

Authors: Raumil Patel, Kaitlyn Hougham, Stephanie Kletke, Jason Hu, Arshia Javidan, Wei Sim, Sameh Soliman, Brenda L. Gallie

Abstract Body:

Purpose: Based on the Canadian Retinoblastoma Guidelines for Care, The Hospital for Sick Children (HSC) Retinoblastoma (RB) program developed 27 Standard Operating Procedures (SOPs). This study aims to evaluate staff perceptions of SOPs and assess if implementation of an Examination Under Anesthesia (EUA) SOP could improve aspects of exam efficiency.
Study Design: Prospective quality improvement study.
Methods: This study was approved by the HSC Quality Management office. A pre-implementation survey was administered to evaluate RB team member perceptions of SOPs. An unbiased observer measured EUA procedural outcomes before SOP implementation, including EUA duration, frequency of disruptions and accuracy of medical record charting. A multidisciplinary group refined and implemented a checklist to guide future EUA procedures.
Results: Sixty-four percent (7/11) of the RB team completed the pre-implementation survey. Forty-five percent did not routinely use SOPs, however most believed SOPs would improve patient care (72%) and surgical team function (63%). Pre-implementation data was collected from 22 EUAs. Mean case time was 69 ± 49 minutes. Mean times (minutes) for patient changeover (24 ± 11), patient preparation and anesthesia (13 ± 4), EUA (24 ± 17), and EUA to patient exiting the room (26 ± 35) were recorded. Certain outcomes were favorable: time-out was performed in 86% of EUAs, the operative report was dictated immediately after 95% of EUAs and fundus diagrams were updated in 95% of EUAs. However, elements of a successful EUA occurring prior to patient arrival in the operating room, including preparation of EUA equipment, review of prior RetCam images, and sufficient pupillary dilation did not occur in 14, 22 and 21% of cases, respectively. The anesthesiologist was provided a 10-minute notice of EUA completion in only 14% of cases. A total of 13 equipment, miscommunication, or procedure-related disruptions occurred. EUAs commenced on time in only 47% of cases and RetCam imaging was performed by an ophthalmologist instead of an imaging specialist in 14% of cases. Post-SOP implementation data collection is underway.
Conclusions: This is the first study to prospectively evaluate SOPs for retinoblastoma care in Canada. RB team perceptions of SOP implementation are favorable. The EUA SOP may reduce equipment or communication-related disruptions and improve procedural efficiency, leading to important outcomes such as minimization of patient exposure to anesthesia, and facilitation of timely decision-making regarding treatment. The results will be used to create a protocol for the implementation and maintenance of SOPs in other RB clinical care pathways.

Title: Ophthalmic manifestations of French-Canadian Leigh syndrome

Authors: Faye Pesenti, Erica Doucet, Charles Morin, Marcele Falcao

Abstract Body:

Purpose: French-Canadian Leigh Syndrome is a rare genetic disorder described in early 1990, whose genetic mutation was isolated in 2003. There have been no studies based on ocular findings published for this disease. The purpose of this study is to describe ophthalmic findings in these patients.
Study Design: Non-experimental cross-sectional descriptive study as well as retrospective chart review.
Methods: Six patients genetically identified as having French-Canadian Leigh Syndrome were included in this study. Four patients had an ophthalmic exam with an ophthalmologist including evaluation of visual acuity, extraocular motility and lid position, orthoptic workup, evaluation of stereopsis, refraction, evaluation of pupils, color vision, slit-lamp biomicroscopy, measurement of intraocular pressure and fundoscopy. Two patients had a chart review.
Results: Visual acuity ranged from 0.00 logmar to 1.55 logmar. Extraocular motility abnormalities and ptosis was noted in half of the patients. Strabismus was present in the entire cohort and stereopsis was absent in half of these patients. Amblyopia was noted in 83% of individuals and suppression in 40%. Only one patient presented with nystagmus (16.6%). Refraction varied throughout patients. It included severe hyperopia, myopia, astigmatism and significant anisometropia. Pupils, anterior segment, fundus and color vision was normal in all patients. Intraocular pressure was slightly elevated in one patient, however this could be explained by the measurement having been done using an Icare tonometer.
Conclusions: Patients with French-Canadian Leigh Syndrome display a variety of clinically significant ophthalmic findings. Following these results, we recommend ophthalmic evaluations in all patients genetically identified as having French-Canadian Leigh Syndrome. This could lead to improve binocular vision and earlier medical intervention as well as surgical management of this disease.

Title: Population trends in adult strabismus surgery

Authors: Andrei-Alexandru Szigiato, Meggie Caldwell, Stephen P. Kraft, Yvonne M. Buys, Kamiar Mireskandari

Abstract Body:

Purpose: Surgical correction of strabismus in adults has been shown to have a positive impact on both visual function and psychosocial health. In Ontario strabismus surgery increased 38% in the paediatric population from 2000-2013 after a period of decrease the decade prior, which was attributed to changes in healthcare funding and an improved awareness of the functional and psychosocial benefits of correcting strabismus. However, there has been no data on surgical trends for the adult population in the province. Thus the aim of this study was to review the trends in adult strabismus procedures in Ontario from 2000-2014.
Study Design: Population based, retrospective data analysis.
Methods: Ontario Health Insurance Plan billing claims for strabismus procedures were collected and subdivided by number of muscles repaired, the use of adjustable sutures and repeat procedures, adjusted by the total adult population. The number of Ophthalmologists performing adult strabismus surgery was also analyzed, subdivided by high volume and low volume surgeons.
Results: From 2000-2014, per 100,000 adult population, the number of total strabismus surgeries in Ontario increased 29.1%; single muscle surgery increased 25.0%, two muscle surgery increased 46.3%, and three or more muscle surgery increased 8.3%. During the study period, strabismus procedures using adjustable sutures increased 26.1% and repeat procedures increased 65.1%. The number of surgeons performing adult strabismus surgery decreased 21.7% from 2000-2014. In 2014, 88.4% of surgeries were performed by 29.8% of all of surgeons who performed adult strabismus surgery.
Conclusions: From 2000-2014, more strabismus surgery was performed in adults by fewer surgeons. The number of adult strabismus surgeries in Ontario increased since 2000, including procedures using adjustable sutures and repeat procedures. These changes may be due to increases in healthcare funding and an increased awareness of the functional and psychosocial benefits of strabismus surgery.

HOT TOPIC

Title: ISEE ROP: Improving screening eye examination guidelines in retinopathy of prematurity

Authors: Dani Wang, Kyla Lavery, Stacey Dalgleish, Alixe Howlett, Stephanie Dotchin, Vivian Hill

Abstract Body:

Purpose: Screening eye examinations for retinopathy of prematurity (ROP) and administration of cyclomydril (cyclopentolate 0.2% and phenylephrine 1%) eye drops to achieve mydriasis prior to the exam have been shown to cause pain and adverse physiologic effects in newborns. Evidence is currently conflicting regarding comfort measures to use during the eye exam itself, and no studies to the best of our knowledge have assessed the use of comfort measures with administration of mydriatic eye drops. We aim to: 1) conduct a baseline study to better understand current practice for ROP screening and its effects on newborns, and 2) identify comfort measures that can improve clinical stability of patients around eye exams. This initial stage assessed the effect of introducing simple comfort measures with cyclomydril drops prior to ROP exams.
Study Design: Prospective quality improvement.
Methods: 50 infants admitted to the Neonatal Intensive Care Unit at the Alberta Children's Hospital in Calgary, Alberta from December 2016-November 2017 who met criteria for ROP screening were prospectively enrolled. Baseline data was collected from 38 infants, including demographics, neonatal vital signs (HR, O2 saturation, and FiO2), and Premature Infant Pain Profile (PIPP) scores during ROP eye exams by ophthalmologists. Vital signs were obtained from Medivision, which are already documented per clinical guidelines. PIPP scores were recorded by an observer and validated. NICU staff then underwent education to provide the following comfort measures during cyclomydril drops: post menstrual age-adjusted dosing of 24% sucrose 2 minutes prior to each eye drop, and human-facilitated tucking by a parent or staff. 12 infants then underwent screening with the introduced comfort measures. Data analysis was done using SPSS software v23.0. Ethics approval was provided by ARECCI (A Projects Ethics Community Consensus Initiative) as the study is under quality improvement.
Results: 50 infants were screened at a mean age of 38 3/7 weeks (SD=4.3). The mean birth weight was 820g (range=458-2640) and mean birth gestational age was 27 3/7 weeks (SD=3.2). There was no significant difference in birth weight, birth gestational age, or current gestational age between the two groups. Baseline data (N=38) showed that PIPP scores increased an average of 1.5 (SD=1.5) after cyclomydril administration, 4.0 (SD=3.6) during the eye exam, and 1.6 (SD=1.5) after the eye exam. After comfort measures were introduced (N=12), PIPP scores increased an average of 0.7 (SD=0.8), 4.0 (SD=4.5), and 0.9 (SD=1.0), respectively. The difference in PIPP scores following cyclomydril between the two groups was significant, $t(148)=3.1$, $p=0.002$ with a mean difference of 0.8 (95% CI 0.3-1.3). Vital signs were recorded over 24 hours, showing significant increase in HR and decrease in O2 sat around each eye drop and eye exam time, which improved with comfort measures. Additional comfort measures used in both groups included dimmed lights (94%), swaddling (86%), pacifiers (38%), pain medication during eye exam (4%), and cuddling (2%).
Conclusions: ROP eye exams and associated use of cyclomydril eye drops are distressing to newborns. Introducing simple comfort measures with cyclomydril administration can reduce pain, and in turn reduce patient and family stress levels surrounding eye exams.

Title: Congenital corneal opacities associated with trisomy 8 mosaic syndrome

Authors: Christopher Welsh, Sina Khalili, Kamiar Mireskandari

Abstract Body:

Purpose: The aim of this study was to describe congenital corneal opacities (CCO) in paediatric patients with trisomy 8 mosaic syndrome (T8mS) and describe novel clinical, anterior segment optical coherence tomography (OCT) and histological findings.
Study Design: Retrospective case series.
Methods: We reviewed the ocular and systemic findings, imaging, pathological specimen and treatment of corneal opacities in patients with T8mS. Patients provided written consent for academic and research publication.
Results: Two patients (11-month-old Caucasian male and 4-week-old Asian female) were initially seen for corneal opacities noted by their parents. Systemic manifestations included low set ears, frontal bossing, dermatoglyphic abnormities, hydroureteronephrosis, bilateral cryptorchidism and pulmonary valve stenosis. Corneal examination revealed opacities with an anterior stromal reticular pattern and blood vessels involving the para-axial (2 eyes) and central axis (1 eye) regions. OCT revealed opacity depth to a maximum of 103 micrometers. One eye required a superficial keratectomy to clear the visual axis. Both patients developed anisometropic amblyopia requiring treatment with glasses and part-time occlusion. Final visual acuity ranged from 20/20 to 20/80 in the affected eyes. Cytogenetic testing (microarray and fluorescence in-situ hybridization) diagnosed trisomy 8 mosaic syndrome in both cases. Histopathology staining/immunohistochemistry was negative for iron, inflammatory cell, cytomegalovirus (CMV), and herpes simplex virus (HSV) 1/2. Epithelial thinning (with focal pyknosis and hydropic basal cells) and a grossly absent Bowman's layer was also noted.
Conclusions: Trisomy 8 mosaic syndrome should be considered on the differential diagnosis for congenital corneal opacities in patients with unilateral or bilateral superficial stromal opacity in reticular patterns (with corneal blood vessels). Anterior segment OCT imaging may guide suitability for superficial keratectomy as a treatment option. Cytogenetics and systemic work up can identify systemic comorbidities requiring treatment.