
# 2024 COS Annual Meeting | Congrès annuel de la SCO 2024

## Abstract Booklet | Livre des résumés

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- Retina | Rétine
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- Vision Rehabilitation | Réadaptation visuelle

## Cataract surgery | Chirurgie de la cataracte

**Paper** | Article 4478

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**Author disclosure block**: S. Arshinoff: Employment/honoraria/consulting fees: Alcon, BVI, Bohus Biotech, Rayner, Zeiss, Cima, Arctic Dx. RB. Shi: none., BK Tao: none.

**Title**: Intracameral moxifloxacin dose and administration after posterior capsule rupture

**Abstract body:**

**PURPOSE**: To devise an appropriate method and dose of intracameral moxifloxacin (ICM) to prevent post-operative endophthalmitis (POE) after posterior capsule rupture (PCR) during cataract surgery. Haripriya et al., reviewing the ARAVIND experience with over two million eyes, revealed a statistically significant increase in incidence of POE after posterior capsule rupture, even after administering intracameral moxifloxacin using their currently suggested ICM protocol.

**STUDY DESIGN**: Literature review and mathematical modelling

**METHODS**: We adapted our previous mathematical ICM injection model for standard cataract surgery to the unique parameters of PCR. In the revised model, we determined a revised administration method and dose of ICM, such that the risk of POE after PCR can be lowered to be more similar to after uncomplicated cataract surgery

**RESULTS**: Once PCR occurs, the effective volume of the space requiring antibacterial prophylaxis expands, thus requiring an increased corrected ICM dose for prophylaxis. Furthermore, in cases where a PC IOL is placed, its positioning has an effect on the distribution of ICM, and therefore its prophylactic efficacy. Different possible scenarios were studied and a method to enhance current results including all studied scenarios was arrived at.

**CONCLUSION**: The dose and administration of ICM can be modified in the event of PCR to reduce the risk of POE, without risking drug toxicity. The dose and administration recommendation will be explained. Generally, a two-step injection of low dose moxifloxacin (150mg per 0.1 mL) is advised and will be explained in detail.

**Paper** | Article 4339

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**Author disclosure block**: D. Solish: None. M. Popovic: None., H. Kaur: None., J. Shenchu Xie: None., K. D'Szouza: None., J. Kantarevic: None., L. Sibley: None., R. Kohly: None.

**Title**: Sex Disparities in Operating Room Utilization among Cataract Surgeons: A 10-Year Retrospective Population-Based Analysis

**Abstract body**:

**Purpose**: To evaluate sex differences in OR time and case volumes among comprehensive cataract surgeons in Ontario, Canada's most populated province.

**Study Design**: Retrospective, population-based analysis.

**Methods**: Ontario Health Insurance Plan billing data between 2010 and 2019 were analyzed using the E140 billing code, which covers a single cataract extraction and intraocular lens implantation. Using dates of billing submissions, the number of cataract surgeries per day and number of OR days were extracted. Data were then stratified by surgeon sex and career stage (defined as early: 45, middle: 45-55; and late: 55 years of age).

**Results**: Between 2010 and 2019, 1.05 million cataract surgeries were performed in Ontario. There was an average of 195 ± 3 comprehensive cataract surgeons per year, of which 39 ± 5 were female. The proportion of females increased from 16.8% of all surgeons in 2010 to 24.4% in 2019. The greatest proportion of male surgeons were in the late phase of their career, whereas the greatest proportion of female surgeons were in the early stage of their career. On average, males had 44.9 + 1.90 OR days per year and females had 32.5 + 1.90 OR days per year, resulting in females averaging 12.45 + 1.90 fewer OR days every year. This OR distribution remained consistent across career stages. The greatest number of OR days per year for both sexes occurred during mid-career. Case volumes per OR day were similar across sexes, but males performed on average 172.7 ± 30.6 more surgeries per year.

**Conclusions**: Despite performing similar case volumes per OR day, female surgeons had less OR time compared to their male counterparts, and this remained consistent across career stages and over the 10-year period. Metrics used to determine OR allocation should be well-defined and transparent

Paper | Article 4316

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**Author disclosure block**: W. Yu: None., Y. Jin: None., R. Muni: Consultant- Alcon, Apellis, AbbVie, Bayer, Bausch Health, Roche; Financial Support (to institution) - Alcon, AbbVie, Bayer, Novartis, Roche.; Research is supported by the Silber TARGET Fund., P. Kertes: Honoraria: Novartis, Bayer, Roche, Boehringer Ingelheim, RegenxBio, Apellis; Advisory board – Novartis, Bayer, Roche, Apellis, Novelty Nobility, Viatris, Biogen; Financial support (to institution) – Roche, Novartis, Bayer, RegenxBio., M. Popovic: Financial support (to institution) – PSI Foundation, Fighting Blindness Canada.

**Title**: Cataract surgery complications in individuals who previously received intravitreal injections: a population-based cohort analysis

**Abstract body**:

**Purpose**: To determine whether there are differences in the risk of cataract surgery complications in patients with retinal disease who have previously received intravitreal injections (IVI) compared to patients who have not previously received IVI.

**Study Design**: Population-based cohort study using health administrative data within a public, universal health care system.

**Methods**: Using physician billing data from the Ontario Health Insurance Plan (OHIP) for the population of Ontario, Canada, we identified adults (age ≥20 years) with retinal disease (ICD-9 codes 362 and 250) who underwent cataract surgery between January 1, 2009 to December 31, 2018. Cataract surgery was identified from records submitted by ophthalmologists with ICD-9 code 366 and fee code E140. IVI records were identified by OHIP fee codes E147 and E149. Patients who received bilateral IVI treatments (i.e. two IVI OHIP records within 20 days) prior to cataract surgery were considered the exposure group, whereas patients with retinal disease and no prior record of IVI were considered the unexposed group. Patients with unilateral IVI treatment were excluded. Patients were followed up to 2 years following cataract surgery to determine the risk of the following complications: non-clearing vitreous hemorrhage, retained lens fragments and retinal tear. Adjusted hazards ratio (aHR) with 95% confidence intervals (CI) were derived from the multivariable Cox proportional hazards regression model. Covariates in the model included age, sex, neighborhood income quintile, rurality and history of glaucoma and keratitis.

**Results**: There were 428,007 adults identified in our cohort with retinal disease who received cataract surgery. Of those, 6,635 were included in the exposed group and 421,372 in the unexposed group. The majority were female (54.4%) and 65 years of age or older (78.4%). There were 1,483

patients with non-clearing vitreous hemorrhage, 384 with retained lens fragments and 1,209 with retinal tears post-cataract surgery. Patients with a previous history of IVI had a significantly greater risk of cataract surgery complications of non-clearing vitreous hemorrhage (aHR 3.86, 95% CI 3.12–4.78, p<.0001), retained lens fragments (aHR 2.05, 95% CI 1.18–3.57, p=0.0113) and retinal tear (aHR 3.42, 95% CI 2.67–4.39, p<.0001) when compared to individuals without a history of IVI.

**Conclusions**: This population-based cohort study revealed that cataract surgery patients with retinal disease who previously received IVIs were more likely to have post-cataract surgery complications of non-clearing vitreous hemorrhage, retained lens fragments and retinal tear. These findings should be considered in the pre-operative counselling of cataract patients.

**Paper** | Article 4416

**Authors**: Natalia Binczyk, Heather Burnett *University of Alberta*, Christopher Rudnisky *University of Alberta*.

**Author disclosure block**: N. Binczyk: None., H. Burnett: None., C. Rudnisky: None.

**Title**: Lidocaine use in cataract surgery

**Abstract body**:

**Purpose**: There are several methods to achieve anesthesia during cataract surgery. Two of the routinely used methods at the University of Alberta include topical anesthesia (TA) with or without intracameral (IC) anesthesia. While intended to offer additional pain control during surgery, IC anesthesia with lidocaine may cause discomfort during injection and possibly decrease post-operative visual acuity (VA) due to corneal edema.

**Study design**: This was a prospective single blinded randomized controlled study. Patients were randomized to receive either intracameral lidocaine (ICL; the study group) or balanced salt solution (BSS; control group). Patients were not aware which group they were assigned to. Patients unable to speak English and those who required IV sedation were excluded from the study due to the need to communicate with the surgeon during the operation. Statistical analysis was done using SAS.

**Methods**: Prior to surgery, all patients received lidocaine jelly and tetracaine drops. Patients were offered optional oral lorazepam. The surgeon asked patient at the time of ICL or BSS injection whether they have any pain. Those who experienced pain were asked to rank it on a scale from 0 to 10; 0 being no pain and 10 being the worst pain they ever experienced. At the end of the surgery, the same question was asked about the overall pain experienced during the surgery. Eyes were assessed at same-day post operative visit.

**Results**: 106 eyes from 82 patients were included. 53 eyes were in the ICL group and 53 in the control group. The overall pain score was lower (p=0.004) in the ICL group (0.43/10) than in the control group (1.25/10). There was no difference in the pain experienced during injection of lidocaine or BSS between groups (p=0.270); the average pain on injection overall was 0.54/10. Pain scores were higher (p=0.002) in more myopic eyes (IOL power <16.5D, (1.80/10)) than less myopic eyes (0.50/10). A controlled analysis, which included variables that could affect pain scores (higher lorazepam dose, IC phenylephrine), and variables where comparison analyses yielded a p<0.1 (ie sex, myopia), revealed that ICL is an independent predictor of lower pain scores (p=0.018).There was no difference in same-day post-operative logMAR visual acuity (p=0.837) or degree of corneal edema (p=0.900) between groups.

**Conclusions**: ICL decreases pain during cataract surgery compared to BSS, but the effect is small. Scenarios where ICL may be especially helpful include high myopia because IOL power <16.5D was an independent predictor of higher pain scores. Use of ICL did not cause significant pain at the time of injection compared to BSS. Additionally, there were no observed negative postoperative effects in eyes that received ICL. Overall, ICL is an effective method of supplementing TA during cataract surgery, and while the effect is small, less pain is never a bad thing

**Paper** | Article 4189

**Authors**: Angelica Hanna, Diana Lucia Martinez *Prism Eye Institute*, Marko Popovic *University of Toronto*, Iqbal Ahmed *Prism Eye Institute*, Joshua Teichman *Prism Eye Institute*.

**Author disclosure block**: A. Hanna: None., DL. Martinez: None., M. Popovic: Financial support (to institution): PSI Foundation, Fighting Blindness Canada., I. Ahmed: Consultant/Consulting Fees: . Aequus, Ace Vision, Aerie Pharmaceuticals, Akorn, Alcon, Allergan, Aquea Health, Inc, ArcScan, Avellino Lab USA, Inc. Speaker Honoraria: Alcon, Allergan. Research Grant/Support: Aerie Pharmaceuticals, Alcon, Allergan., J. Teichman: Advisory board member: Aequus, Alcon, Allergan, Labtician Thea, Novartis, Santen. Consultant: Aequus, Alcon, Allergan, Bausch and Lomb, Novartis. Grant/Reseach support: Alcon, Bausch and Lomb.

**Title**: The Impact of Virtual Follow-Ups on Patient Outcomes after Cataract Surgery: A Systematic Review

**Abstract body**:

**Purpose**: The purpose of this review was to examine the current literature on the association between virtual post-operative follow-up care and patient outcomes after cataract surgery.

**Study Design**: Systematic review.

**Methods**: Medline, Embase and CINAHL were searched in October 2023 for relevant articles containing original data. Studies that: 1) included patients that were seen in a virtual follow-up (i.e., telephone or video call) for postoperative appointments after cataract surgery, and 2) reported patient outcomes were included. Descriptive statistics were used to summarize findings.

**Results**: The search yielded 1710 records, and a total of 1174 underwent title/abstract screening after de-duplication. Twenty-three full texts were assessed for eligibility and seven studies were included in the review. The seven included studies reported on 2113 cataract surgeries in 1994 patients. The studies ranged in date between 2004 and 2020. Most of the studies (6/7) included only patients who had uncomplicated cataract surgery. The telephone follow-up calls were made at varying timepoints including post-operative day 1 (n= 3), post-operative day 7 (n=2) and post-operative day 14 (n=1). Virtual follow-ups were conducted by telephone with either ophthalmologists, nurses or ophthalmic technicians making the calls. Three studies directly compared patients who had a telephone follow-up to a control group of patients who had an in-person follow-up. There were no significant differences in complication rates or visual acuity between these follow-up groups. None of the studies reported serious adverse outcomes as a result of replacing in-person follow-ups with telephone follow-ups. One study used virtual follow-ups on postoperative days 1, 4, 10 and 20 in conjunction with in-person visits for elderly patients, which was associated with decreased surgical recovery time and patient feelings of anxiety and worry. Three of the seven studies reported on patient perceptions about the use of telephone follow-ups. A common theme was that patients preferred telephone reviews and found them to be more convenient than in-person follow-ups.

**Conclusions**: For patients with uncomplicated cataract surgery, virtual follow-ups seem to be a safe alternative to in-person visits and are well-liked by patients. Given the limited literature base, further study is needed.

**Paper** | Article 4446

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**Author disclosure block**: A. Hatamnejad: None., S. Somani: None., E. Tam: None., A. Higham: None., E. Lim: None., S. Khavandi: None., N. de Pennington: None., H. Chiu: None.

**Title**: Feasibility of an artificial intelligence phone call for post-operative week 1 assessment following cataract surgery in a diverse population in Canada

**Abstract body**:

**Purpose**: Dora is an artificial intelligence (AI) telephone call used for clinical-grade conversations with patients, which is used in the UK in lieu of the post-operative week 4 follow-up after routine cataract surgery. We investigate the safety, acceptability and efficacy of an automated Dora call at post-operative week 1 (POW1) for patients undergoing surgery in Canada.

**Study Design**: Prospective single arm study

**Methods**: Any patient having routine surgery was eligible for inclusion if they, or a nominated relative, could have a conversation in English. Patients were recruited from a high-volume surgical centre in Ontario, Canada between July-September 2023. Dora called patients the evening before their POW1 face-to-face assessment. Dora identified any clinical concern based on symptom assessment over the phone. We compared outcomes from the Dora call to the clinician assessment the following day. Dora asked every patient for a Net Promoter Score (NPS) of the likelihood they would recommend the automated service. Telehealth Usability Questionnaire (TUQ) was used to measure the quality of Dora's interface on a scale of 1-5 with 1 being strongly disagree and 5 being strongly agree.

**Results**: A total of 198 patients were recruited. 132 (67%) successfully completed the authentication checks, and among them, 124 (94%) finished their call with Dora. The predominant reasons for not completing identity checks were linguistic differences in confirming identity, and concerns about spam calls. Dora passed 81(69%) patients, indicating they had no clinical concerns. At face-to-face POW1, 7 (9%) reported symptoms like dry eye and visual concerns, but no patient had a change in management that would have led to a serious risk of harm. Conversely, of the patients Dora did identify clinical concerns, 6 (14%) had no clinical issues identified at POW1. Patients gave Dora a mean NPS of 8/10. As for TUQ, patients stated that "It was simple to use Dora." (mean 3.71, median 4), "It was easy to learn to use Dora" (mean 3.73, median 4), "Dora is simple and easy to understand." (mean 3.68, median 4). While patients stated that "visits provided over Dora are the same as in-person visits." (mean 2.76, median 3).

**Conclusion**: At POW1 Dora can safely identify patients who are recovering as expected following routine cataract surgery which may help reduce unnecessary appointments. This increases clinical capacity and can help the healthcare labor shortage. It is also convenient for patients, who can save travelling and receive calls at times that are convenient to them.

**Paper** | Article 4127

**Authors**: Lindsay Ong-Tone

**Author disclosure block**: L. Ong-Tone: None

**Title**: Practice patterns of the Canadian Ophthalmological Society members in cataract surgery. Survey 2024

**Abstract body**:

**Purpose**: This will be the sixteenth annual survey on the practice patterns of the Canadian Ophthalmological Society (COS) members in cataract surgery.

**Study Design**: Web based

**Methods**: This survey will be conducted in January 2024 when an e-mail with a link to Red Cap will be sent to all the COS members who have indicated that their practice focus is on Cataract and Intraocular lens (IOL) implant. Two reminder e-mails will be sent at 2 weeks interval.

**Results**: In 2023, there was quite a range in the length of time patients had to wait for cataract surgery. The majority waited between 3 to 6 months (64.2%) for their surgery. When we first started recording the wound sizes in 2012, the most popular wound size was 2.75 mm (31.3%). This has been getting smaller over the years. In 2023, the most popular wound size was 2.4mm (37%). The most popular phacoemulsification technique used was Stop and Chop (31.5%) followed by Divide and Conquer (29.6%). 85.2% of the respondents corrected astigmatism at the time of cataract surgery. The majority (93.5%) used a Toric IOL to do so. In 2023, one new question was the use of a capsular tension ring when inserting a toric IOL. 5.9% of respondents did so. They all used it in long eyes only. There was a marked increase in the use of an intracameral antibiotic (63%) as well as an increase in the number of respondents performing Immediately Sequential Bilateral Cataract Surgery (ISBCS) (48.1%) in this last survey.

**Conclusion**: This annual survey has highlighted some trends in the practice patterns of the Canadian Ophthalmological Society members in cataract surgery and gives the membership valuable information as to how their peers are practising.

**Paper** | Article 4423

**Authors**: Mahraz Parvand, Steven Bae MD *University of British Columbia*, Sonia N. Yeung MD, PhD *University of British Columbia*, Jean Y. Chuo MD *University of British Columbia*.

**Author disclosure block**: M. Parvand: None., S. Bae: None., S. Yeung: None., JY. Chuo: None.

**Title**: Diplopia After Cataract Surgery: Retrospective Review of Orthoptic Assessments

**Abstract body**:

**Purpose**: In this study, we aimed to evaluate the causes and outcomes of patients with diplopia post-cataract surgery who were referred for orthoptic assessment.

**Study Design**: Retrospective observational study.

**Methods**: We conducted a retrospective review of patients who were referred for orthoptic evaluation at two tertiary care hospitals between January 1, 2019, and November 30, 2022. Patients eligible for inclusion displayed diplopia symptoms following cataract surgery, as documented in their referral history. Exclusion criteria encompassed cases involving simultaneous cataract surgery with other ocular procedures, individuals under the age of 18, those with pre-existing diplopia, or instances where the operative reports were inaccessible. The primary objectives were to determine the etiology of diplopia in these patients and assess the proportion of individuals who received interventions. Statistical significance was defined as a p-value of <0.05. We employed a one-way analysis of variance (ANOVA) test to investigate potential differences in patient characteristics among those with different underlying causes of diplopia.

**Results**: In this ongoing study, data has been collected from fifty-nine patients, with a mean age at assessment of 74.3 years and a 48% female representation. All patients underwent cataract surgery under topical anesthesia. In five cases (6.8%), periocular infiltrative anesthesia was employed for vitrectomy, either preceding or following cataract surgery. A single intraoperative complication, posterior capsular rupture, occurred in one patient (1.7%). The etiologies of diplopia encompassed various conditions, including decompensated esophoria/exophoria (23.7%), decompensated fourth nerve palsy (10.2%), monocular diplopia (8.5%), convergence insufficiency (8.5%), retinal diplopia (3.4%), periocular anesthetic myotoxicity (3.4%), and sixth nerve palsy (1.7%). The remainder had hypertropia (22.0%) or a combination of hypertropia and horizontal deviation (18.9%), for which the etiology could not be obviously discerned from the report. Neuroimaging was performed in 11.9% of cases but did not reveal any explanatory pathology. Interventions to address diplopia included prisms (42.4%), strabismus surgery (10.2%), updated refractive correction (5.1%), and convergence exercises (1.7%). A neuro-ophthalmologist was involved in 22.0% of cases, and in 30.8% of these instances, the neuro-ophthalmologist also served as the cataract surgeon.

**Conclusion**: Many causes account for diplopia after cataract surgery. The most common intervention was prisms, followed by strabismus surgery and updated refractive correction. The majority were evaluated and treated by the referring surgeon and orthoptist, without involvement of a neuro-ophthalmologist.

**Paper** | Article 4386

**Authors**: Sumana Naidu, Yvonne Buys MD FRCSC *University of Toronto Department of Ophthalmology and Vision Sciences*, Tanya Trinh MBBS FRANZCO *Sydney Eye Hospital*, David Yan MD FRCSC *University of Toronto Department of Ophthalmology and Vision Sciences*, Radha Kohly MD PhD FRCSC *University of Toronto Department of Ophthalmology and Vision Sciences*.

**Author disclosure block**: S. Naidu: None., Y. Buys: None., T. Trinh: None., D. Yan: None., R. Kohly: Dr Kohly's research is supported by the Silber TARGET fund.

**Title**: Sex-Based Disparities in Cataract Teaching Volumes and Operating Room Resources at the University of Toronto

**Abstract body**:

**Purpose**:Female ophthalmologists work fewer hours, spend more time with patients and have lower clinic and surgical volumes compared to males. It is unclear if this discrepancy also extends to cataract teaching volumes.The purpose of this study is to assess the distribution of operating room (OR) time and cataract volumes designated for teaching between staff sex, and the relationship between supervised cataract teaching by staff and resident sex and resident stage of training.

**Study Design**: Retrospective cohort study

**Methods**: Resident surgical logbooks were analyzed from July 1, 2015 to June 30, 2020 at the main teaching site (Kensington Eye Institute) at Canada's largest residency program, the University of Toronto (UoT). Data collected included staff sex, cataract complexity, stage of resident training and the degree of resident participation for each case. Participants included residents who completed cataract surgical training and teaching staff from 2015-2020 at UoT. Cataract surgical training during postgraduate (PGY)-4 and PGY-5 years were analyzed. The main outcome measure was median number of OR days and case volumes designated for teaching by staff sex and supervised teaching volumes by staff and resident sex.

**Results**: Forty-nine staff surgeons (30.6% female) and 35 residents (54.3% female) operated during the study period. Median number of OR days by staff was similar between the sexes (difference 1.5-4 days/year). At the earliest training level, female staff oversaw a greater proportion of complete cataract cases compared to male staff for all residents (9.0% vs 5.3%), female residents (4.8% vs 4.3%), and male residents (10.2% vs 5.9%). Early in training, female staff allowed male residents to complete more cases compared to female residents (10.2% vs 9.0%, respectively). At the most senior level of surgical training, male staff allowed male residents to complete more cataract cases compared to female residents (64.1% vs 58.3%, respectively). However, at the most senior level of training, female staff allowed a similar proportion of complete cases to be performed by both sexes (49.8% male vs 48.9% female).

**Conclusions**: Overall, female staff allowed a greater proportion of cataract cases to be completed early in training by all residents compared to male staff. This suggests female staff are more burdened with teaching the earliest, and arguably, the most difficult stage of cataract surgery.

**Paper** | Article 4308

**Authors**: Francesca Lee, Sohel Somani MD, FRCSC *Uptown Eye Specialists*, Steve Arshinoff MD, FRCSC *North York Eye Associates*, Hannah Chiu MD, FRCSC *Uptown Eye Specialists*, Lili Tong MD, FRCSC *Uptown Eye Specialists*, Eric Tam MD, FRCSC *Uptown Eye Specialists*, Zaynab Somani BA *Uptown Eye Specialists*.

**Author disclosure block**: F. Lee: None., S. Somani: None., S. Arshinoff: None., H. Chiu: None., L. Tong: None., E. Tam: None., Z. Somani: None.

**Title**: Cost Analysis of Immediately versus Delayed Sequential Bilateral Cataract Surgery at a Community Based Ambulatory Surgical Center.

**Abstract body**:

**Purpose/Study Design**: A prospective chart review was conducted to assess the cost-effectiveness of immediately sequential bilateral cataract surgery (ISBCS) versus delayed sequential cataract surgery (DSBCS) among Canadian adults over the age of 65 who undergo different sequencing of cataract extraction surgery at a community ambulatory surgical-based center (C-ASC) in the Greater Toronto Area following the COVID-19 pandemic.

**Methods**: Cost metrics were collected from 202 patients who underwent either DSBCS or ISBCS at one of two CACs between January 2022 and January 2023. Data consisted of direct and indirect costs. Direct cost measures included pre-, intra-, and post-operative surgical expenses. Pre-operative measures included diagnostic and consultation fees. Intra-operative metrics consisted of medical and non-medical labor, anesthesia fees, and consumables (including amortized cost of equipment and sterilization). Post-operative surgical costs included post-operative follow-up visits at post-operative day 0 (POD0) and post-operative week 1 (POW1). Indirect costs were measured by time lost due to travel and additional post-operative visits (any visits other than required POD0 and POW1).

**Results**: The average surgical costs were reduced by 20.23% when performing ISBCS ($p < 0.001$); the average total cost of DSBCS was $1617.18 compared to $1352.03 for ISBCS. Average direct surgical costs were found to be $1491.09 and $1249.41 for DSBCS and ISBCS respectively ($p<0.001$), whereas average indirect costs were calculated to be $126.09 and $103.62 ($p = 0.059$). Additional post-operative visits accounted for a significant proportion of the difference in indirect costs between study groups ($p = 0.010$). No other variables, including current comorbidity, pre-and intra-operative ocular metrics, and perioperative systemic vitals had a significant effect on cost-effectiveness between ISBCS and DSBCS.

**Conclusions**: Average costs of cataract extraction in a community ambulatory surgical center were significantly reduced when performing ISBCS compared to DSBCS.

**Cornea, External Disease and Refractive Surgery | Cornée, maladies externes et chirurgie réfractive**

**Paper** | Article 4616

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**Author disclosure block**: T. Felfeli: None., A. Sriranganathan: None., C. Wedge: None., C. Humphreys: None., D. Naimark: None., C. Chan: None.

**Title**: Cost-Utility Analysis of Cultured Human Corneal Endothelial Cells for Corneal Edema Secondary to Endothelial Dysfunction

**Abstract body**:

**Purpose**:The use of novel cell injection therapy using cultured human corneal endothelial cells (hCEC) for endothelial dysfunction has shown promise as an alternative therapy. This study aimed to evaluate the cost-effectiveness of hCEC compared to current standard of Descemet stripping (automated) endothelial keratoplasty (DSAEK) and Descemet membrane endothelial keratoplasty (DMEK) for endothelial dysfunction.

**Study Design**: Decision-analytic microsimulation model.

**Methods**: In this cost-utility analysis, injectable hCEC therapy versus DSAEK/DMEK costs and effects were projected over a life-time horizon for a simulated cohort of adult patients (≥ 18 years old) requiring endothelial keratoplasty in theoretical surgical centres in Ontario, Canada. Procedural wait-times, effectiveness (quality-adjusted life year, QALY) and cost (2023 Canadian dollars) values were obtained from the literature and discounted at 3% per year. A cost-effectiveness threshold of ICER ≤ $50,000 per Quality-Adjusted Life Year (QALY) gained was applied as a criterion for determining the economic viability of the interventions.

**Results**: The patient population consisted of 13,077 adults (prevalence of endothelial dysfunction in Ontario). The pre-operative wait time (days) was 425.84 (40.23) and 567.79 (31.28) for hCEC and DSAEK/DMEK, respectively. The post-operative follow-up duration was longer for DMEK/DSAEK compared to hCEC (254.92 [SD 18.60] vs. 838.41 [SD 30.63] days). Excellent vision outcomes (>=20/25 Snellen visual acuity) was achieved in 97.39% (SD 0.53) and 81.89% (SD 0.17) of the hCEC and DMEK/DSAEK groups, respectively. The life-time costs for hCEC and DSAEK/DMEK were $26,1148.17 (SD 983.43) and $4,216.23 (SD 158.37), respectively. The expected lifetime QALYs were higher for those receiving hCEC (10.76; SD 1.69) relative to DSAEK/DMEK (7.96; SD 1.44). The incremental cost-effectiveness ratio for hCEC therapy against DSAEK/DMEK was $7,829.18 per QALY. The threshold analyses indicated that hCEC would be the dominant cost-effective option

with a cost less than $4,000. At costs greater than $2,000 up to $40,000, hCEC had an ICER ranging from $12.13/QALY to $14,393.88/QALY.

**Conclusions**: Injectable hCEC therapy is a cost-effective option when compared to DSAEK/DMEK for endothelial dysfunction. The implementation of injectable hCEC therapy has the potential to improve clinical outcomes and increase accessibility for patients with endothelial dysfunction globally. Further large-scale studies are warranted to capture long-term outcomes and adverse events of hCEC injection therapy as more countries adopt this new treatment

**Paper |** Article 4537

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**Author disclosure block**: C. Chan: Member on advisory board, speaker bureau or consultant: AbbVie, Aurion Biotech, Aequus Pharmaceuticals, Johnson & Johnson, Bausch + Lomb, Novartis, Kala Ophthalmics, Thea Pharma, Santen Pharmaceutical, Sun Pharmaceutical, Grant/Research support: CorNeat and Claris Bio., A. Fahmy: Advisory boards, speakers bureaus, or as a consultant for Allergan, BioTissue, Dompé, Lumenis, NovaBay, Oyster Point Pharma, and Sight Sciences.., D. Evans: None., J. Harthan: Serving on advisory boards or as an investigator for Bausch + Lomb, Novartis, Johnson & Johnson, Kala Pharmaceuticals, and Ocular Therapeutix., J. Gourgouvelis: Employee of Bausch + Lomb., K. Kelley: None., J. Vittitow: Employee of Bausch + Lomb., J. Greiner: Investigator for Allergan, Bausch + Lomb, Calm Water Therapeutics, LENZ Therapeutics, Mimetogen Pharmaceuticals, and Sylentis.

**Title**: Perfluorohexyloctane Ophthalmic Solution for Dry Eye Disease: Pooled Analysis of Two Phase 3 Clinical Trials

**Abstract body**:

**Purpose**: Perfluorohexyloctane ophthalmic solution (PFHO) is approved in the United States for treatment of the signs and symptoms of dry eye disease (DED). This analysis evaluated the integrated safety and efficacy of PFHO across two clinical trials.

**Study design**: Pooled analysis of data from two phase 3, randomized, double-masked, hypotonic saline-controlled trials.

**Methods**: Patients with DED and clinical signs of Meibomian gland dysfunction were randomly assigned to instill PFHO or hypotonic (0.6%) saline solution QID into both eyes for 8 weeks. The primary sign endpoint was change in total corneal fluorescein staining (tCFS; National Eye Institute [NEI] scale, 0-15) at Week 8 in the designated study eye. The primary symptom endpoint was change in patient-reported eye dryness measured on a visual analog scale (VAS; 0-100) at Week 8. Responder analyses were conducted for the primary endpoints, with response defined as reduction in tCFS of ≥3 points on the NEI scale and reduction in eye dryness of ≥30% on the VAS scale. Key secondary endpoints were tCFS at Week 2, VAS dryness score at Week 2, central CFS at Week 8, and VAS burning/stinging score at Week 8.

**Results**: A total of 614 patients received PFHO; 603 patients received saline. The majority of patients were female (75.7%); mean age was 57.2 years. Mean (SD) decrease in tCFS at Week 8 was -2.2 (2.7) with PFHO and -1.1 (2.8) with saline (P<0.0001). Mean (SD) decrease in VAS dryness score at Week 8 was -28.5 (28.2) with PFHO and -19.3 (27.0) with saline (P<0.0001). The proportion of tCFS responders at Week 8 was 45.7% in the PFHO group and 29.0% in the saline control group (odds ratio, 2.1; 95% CI, 1.66-2.73; P<0.0001). The proportion of eye dryness responders at Week 8

was 61.6% and 45.9%, respectively (odds ratio, 1.9; 95% CI, 1.50-2.39; P<0.0001). PFHO was superior to saline on all key secondary endpoints (all P<0.0001). Incidence of ocular adverse events in the study eye was 11.2% with PFHO and 10.0% with hypotonic saline. Blurred vision, which was mostly mild and transient, was the most common ocular adverse event with PFHO (2.1% of patients vs 0.3% for saline). Other safety assessments (eg, visual acuity, biomicroscopy, fundoscopy, intraocular pressure) were unremarkable.

**Conclusions**: The combined safety and efficacy data from this pooled analysis demonstrated that PFHO was well tolerated and efficacious for improving both the signs and symptoms of DED.

**Paper |** Article 4100

**Authors**: Milad Modabber, Sheldon Herzig MD *Herzig Eye Institute*.

**Author disclosure block**: M. Modabber: Financial or material interest: Johnson & Johnson., S. Herzig: None.

**Title**: THE ROLE OF MONOVISION IN POSTERIOR-CHAMBER PHAKIC IMPLANTABLE COLLAMER LENSES FOR MYOPIA CORRECTION IN EARLY PRESBYOPIA: A LARGE COHORT STUDY

**Abstract body**:

**Purpose**: This study aimed to investigate the safety and visual performance at far to near distances of Implantable Collamer posterior chamber phakic refractive lenses (EVO and EVO+ ICLs) in myopic patients with early presbyopia.

**Study Design**:Retrospective, single-center study

**Methods**:This study comprised 164 eyes of 82 early presbyopic patients (mean age: 44.2 ± 3.2 years, range: 40-52 years) who underwent bilateral EVO/EVO+ ICLs (spherical or TORIC) implantation between years 2016-2023 for myopic correction. Refractive target was set at emmetropia for the dominant eye (D-eye), and at slight myopia (mean - 1.67 ± 0.58; range 0.75-1.75) diopters (D)) for the non-dominant eye (nD-eye). Outcome measures included uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), spherical equivalent (SE), intraocular pressure (IOP), endothelial cell density (ECC), ICL vault, as well as presbyopic add power, visual acuity (logMAR) of D-eyes, nD-eyes, and both eyes (Bi) at 0.4 m, 0.8 m, and 5 m were recorded at the last follow-up.

**Results**:At last follow-up of 6.8 ±8.5 months, CDVA significantly improved, from 0.08 ± 0.12 preoperatively to 0.01 ± 0.03 logMAR at last follow-up ($P<0.05$). In D-eye, mean post-operative UDVA was 0.08 ± 0.20, with MRSE of -0.15 ± 0.61 D; whereas in nD-eye, the UDVA was 0.31 ± 0.27, with a mean MRSE of -0.90 ± 0.78 D. The aggregate safety index was favorable at 1.08 ± 0.18. The mean efficacy index was 0.96 ± 0.2 in D-eye only. The mean binocular VA was 0.17 logMAR at all distances (5.0, 0.8, 0.4 m). Most (96.4%) eyes were within ± 0.5 D of the targeted correction. No adverse events were observed. Subjects were satisfied with far and near VA compared to pre-operatively.

**Conclusion**: This study demonstrates the safety and efficacy of monovision ICL surgery for the correction of myopes with presbyopia, with long-term efficacy at near and far distances and high patient satisfaction.

**Paper |** Article 4507

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**Author disclosure block**: L. Vaudoisey: None., J.Choremis: None., S. Al-Zanki: None., S. Jabbour: None., J. Talajic: None.

**Title**: The Efficacy of Modified Monofocal and Trifocal-EDoF Intraocular Lenses in staged and combined Descemet Membrane Endothelial Keratoplasty procedures

**Abstract body**:

**Purpose**: To assess outcomes of modified monofocal and trifocal-EDoF intraocular lens (IOL) implantation in Descemet Membrane Endothelial Keratoplasty (DMEK) procedures in patients with Fuchs endothelial corneal dystrophy (FECD).

**Study design and Methods**: This two-center retrospective study evaluated a consecutive series of patients to quantify post operative best corrected visual acuity (BCVA), uncorrected distance (UDVA), intermediate (UIVA), near visual acuity (UNVA) and the spherical equivalent refraction in all patients with FECD operated for DMEK and cataract surgery. We also compared the results between combined and staged DMEK.

**Results**: 25 modified monofocal IOLs (Tecnis Eyhance, Johnson and Johnson) and 1 trifocal-EDoF (Tecnis Synergy, Johnson and Johnson) IOL were implanted in 26 eyes of 20 patients (11 women and 9 men; age 56-78). 8 were spherical and 18 were toric. Postoperatively, the median BCVA was 0 logMAR (range 0 to 0.3), the median UDVA was 0.1 logMAR (range to 0-0.3), the median UIVA was 0.1 logMAR (range 0.1 to 0.18), the median UNVA was 0.4 logMAR (range 0.1 to 0.4) and the median spherical equivalent refraction was 0.0625 (range -1.625D to +1.25D). The median BCVA in combined was 0.05 logMAR (range 0 to 0.3) and the median BCVA in staged procedures was 0.1 logMAR (range 0 to 0.18).

**Conclusion**: Favourable visual and refractive outcomes were obtained with modified monofocal IOLs and trifocal-EDoF in patients with FECD and cataract post DMEK, phacoemulsification and IOL implantation surgery. In our study there are no significant differences in visual outcomes between staged and combined DMEK procedures. Modified monofocal and trifocal-EDoF IOLs may offer DMEK patients an alternative option to standard monofocal IOLs, with an improvement in near and intermediate vision.

**Paper |** Article 4182

**Authors**: Manokamna Agarwal, Sara Williams *The Hospital for Sick Children*, Larissa Gouvea *The Hospital for Sick Children*, Asim Ali *The Hospital for Sick Children*, Kamiar *Mireskandari The Hospital for Sick Children*.

**Author disclosure block**: M. Agarwal: None., S. Williams: None., L. Gouvea: None., A. Ali: None., K. Mireskandari: None.

**Title**: Validation of a Novel Technique to Measure Tarsal Conjunctival Thickness Using Anterior Segment Optical Coherence Tomography

**Abstract body**:

**Purpose**: This study aimed to validate a novel technique for measuring tarsal conjunctival thickness (TCT) using anterior segment optical coherence tomography (AS-OCT). By providing an objective measurement, we aim to improve the current subjective grading system for tarsal conjunctival disorders, such as allergic conjunctivitis and vernal keratoconjunctivitis.

**Study Design**: This was a prospective study.

**Methods**: AS-OCT (Heidelberg Engineering) was performed on 10 eyes of 10 healthy adult volunteers to image the superior tarsal conjunctiva after lid eversion. Consistent alignment and centration were achieved using marking of the lower eyelid margin with TCT measurements in micrometers (μm) taken at nine marked points centrally. Validation of measurements were carried out for inter-observer, intra-observer, intra-session, and inter-session variability using intra-class correlation and Bland-Altman analysis. The study received ethical approval, and all volunteers provided consent.

**Results**: The study demonstrated excellent inter-observer reliability (ICC = 0.91), with individual points exhibiting varying reliability. Bland-Altman analysis indicated a mean bias of -1.91 μm, with differences primarily falling within -26.97 to +23.15 μm. Intra-observer measurements showed excellent reliability (ICC = 0.92), a mean bias of 2.30 μm, and differences mainly within -21.31 to +25.91μm. Intra-session reliability was excellent (ICC = 0.91) with a mean bias of -2.01 μm and differences between -16.67 to +12.65μm. Inter-session reliability was good (ICC = 0.89) with a mean bias of -1.97 μm and differences between -18.79 to +14.85 μm.

**Conclusion**: This study successfully validated a standardized AS-OCT technique for measuring TCT, demonstrating excellent reliability and inter-observer consistency. This method has the potential to enhance grading and clinical management of tarsal conjunctival disorders by providing an objective and accurate measurement of TCT for clinical and research purposes.

**Paper |** Article 4138

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**Title**: Designing anti-scarring and anti-inflammatory biomaterials for corneal implants: A potential alternative to human donors.

**Abstract body**:

**Purpose**: Currently, corneal blindness is mainly treated by cornea transplantation. However, there is a constant shortage of cornea donors for surgeries in many provinces and countries. Even if donors were easily accessible, patients suffering from severe pathologies causing inflammation may not benefit as they are at high risk for graft rejection. The Griffith laboratory is the first to use acellular recombinant human collagen implants to regenerate high-risk corneas in a small group of patients. For broader clinical applications, scalable collagen-like peptide (CLP)-based synthetic hydrogels are being developed. It is important to identify significant design patterns to ensure the implants do not cause inflammation.

**Study Design**: Basic science.

**Methods**: The growth of stromal fibroblasts cultured on CLP hydrogels with and without RGD groups are compared, with collagen gels and tissue culture plastic as controls. Cellular growth and viability on the different substrates were compared using the AmarBlue assay. Next, TGF-beta was added to the media to stimulate fibroblast differentiation into myofibroblasts. The latter has been linked to corneal scarring. The proportion of resulting myofibroblasts was determined by immunostaining using anti-smooth muscle actin (SMA) antibody. Stromal cells seeded onto the hydrogels were also stained against fibronectin to study its implication due to RGD. Furthermore, the CLP-based hydrogel was tested in vivo on alkali burnt BALB/c mice to investigate their practical biocompatibility and efficacy.

**Results**: a-SMA expression was observed in cells grown on CLP-RGD containing hydrogels but not on tissue culture plastic or CLP only control. There was a positive fibronectin expression by cells cultured on CLP-RGD hydrogels, on 5% collagen hydrogels and on tissue culture control. The CLP-RGD hydrogel is a very smooth and soft gel with a desirable water content and an average storage

modulus of 3651.14 Pa. The in vivo test showed that there was no sign of inflammation or angiogenesis in the cornea after three months, which can prove the great biocompatibility of the prepared CLP-based hydrogel.

**Conclusion**: This project allowed for the testing and study of cell growth on RGD-containing CLP hydrogels, which has not been done before. Early results suggest that RGD groups within CLPs induced myofibroblast differentiation and potential pro-inflammatory responses.

**Paper |** Article 4516

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**Title**: The Effect of Mitomycin C on Corneal Crosslinking in Keratoconus Patients

**Abstract body**:

**Purpose**: Corneal crosslinking (CXL) is the principal treatment offered for the stabilization of corneal ectatic disorders. Corneal haze commonly develops after CXL and may impact visual acuity outcomes. Mitomycin C (MMC) has been shown to reduce corneal haze following refractive surface ablative procedures. However, the role of MMC in CXL for ectatic disorders needs further evaluation. This study examines the outcomes of MMC application in keratoconus patients undergoing CXL.

**Study design**: This is a retrospective single-centre study for patients with keratoconus undergoing CXL with or without MMC between January 2021 and June 2022.

**Methods**: Corneal haze was quantified using Pentacam densitometry values obtained from Scheimpflug images and expressed as grayscale units (GSU). The central zones were analyzed and compartmentalized into the anterior 120-micron depth and total corneal depth. Clinical assessment and topography values were analyzed pre- and post-operatively at 3, 6 and 12 months. Independent and paired samples t tests were performed as appropriate.

**Results**: Twenty-one eyes of 18 patients were analyzed in each study group. Mean follow-up was 12 months in both groups. Anterior 0-2 mm central densitometry values were similar at baseline between the two groups (mean of 31 in the CXL with MMC group vs 30 in the CXL without MMC group; p=0.8) while they were significantly higher in the CXL with MMC group at 3 months post-operatively (42 vs 36;p=0.03), with no significant change in best-corrected visual acuity. However, there was no significant difference at 6 and 12 months post-operatively (41 vs 39 at 12 months;p=0.8). Baseline pre-operative Kmax and Kmean values were higher in the CXL with MMC group compared to the CXL without MMC group (65D vs 60D for Kmax and 54D vs 49D for Kmean). Kmax values significantly decreased by 2D (p=0.03) in the CXL with MMC group at 1 year post-operatively compared to baseline pre-operatively while Kmax values decreased by 0.4D in the CXL without MMC group. At 1 year, Kmean values decreased by an average of 1D in both groups. Pachymetry measurements remained stable in both groups.

**Conclusions**: MMC use with CXL for keratoconus patients may result in a transient increase in early post-operative haze with no impact on visual acuity. The increased corneal flattening effect observed with MMC may be partially due to the steeper corneal measurements at baseline in the MMC group and should be explored further in future studies.

**Paper |** Article 4303

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**Author disclosure block**: L. Gouvea: None., M. Agarawal: None., K. Mireskandari: None., A. Ali: None.

**Title**: Long term visual outcomes of optical iridectomy for congenital corneal opacities

**Abstract body**:

**Purpose**: To report the long-term outcomes of optical iridectomy in children with congenital corneal opacities (CCO).

**Methods**: Retrospective chart review of all patients with CCO who underwent optical iridectomy from 2007 to 2022. Data collection included diagnosis, location of opacity, laterality of disease and of surgery, need for concomitant surgery and best corrected visual acuity (BCVA) at final follow-up.

**Results**: Fifty-two eyes of 43 patients were included in the study. Of those, 34 eyes (65.38%) had moderate and 18 (34.6%) had severe disease. Thirty-nine eyes (73.1%) had a diagnosis of Peters Anomaly. Median age at time of surgery was 3.74 months (range 0.9 - 93.1). Corneal diameter at time of surgery was 10.41 ± 1.27mm. No intraoperative complications occurred. Twenty-two patients (51.16%) had bilateral disease, but only 9 (20.9%) underwent bilateral optical iridectomies. Mean overall BCVA at final follow-up was quantifiable in 33 eyes (63.5%) and was 0.81 ± 0.29 logMar. Final BCVA was not significantly different in those with unilateral (0.80 ± 0.28logMAR) versus those with bilateral iridectomy (0.82 ± 0.30 logMAR. Twenty-six (50%) eyes achieved BCVA of 20/200 or better, and 5 (19.2%) achieved 20/50 or better. Mean follow-up time was 4.92 ±4.14 years. No patients developed glaucoma during the follow-up period.

**Conclusion**: Optical iridectomy is a safe procedure in patients with congenital corneal opacities with an acceptable visual acuity in patient with unilateral and bilateral diseases. It can be an alternative to corneal transplantation in patients with moderate to severe unilateral and bilateral disease without the risk of long term glaucoma.

**Paper |** Article 4601

**Authors:** Manokamna Agarwal, Mor Bareket *University of Toronto*, Alonso Gutierrez Guerinoni *University of Toronto*, Erica Darian-Smith *University of Toronto*, Mariana Collazos *University of Toronto*, David Rootman *University of Toronto*, Clara Chan *University of Toronto*.

**Author disclosure block**: M. Agarwal: None., M. Bareket: None., A. Gutierrez Guerinoni: None., E. Darian-Smith: None., M. Collazos: None., D. Rootman: None., C. Chan: None.

**Title**: Clinical outcomes of novel double layered 9mm dehydrated amniotic membrane disc

**Abstract body**:

**Purpose**: To evaluate the clinical outcomes of a novel double layered 9mm dehydrated amniotic membrane disc in patients with ocular surface disorders.

**Study design**: Retrospective case series

**Methods**: A retrospective analysis of 9 eyes of 9 patients treated with double layered dehydrated amniotic membrane was performed. Included patients had limbal stem deficiency (n=6), neurotrophic cornea (n=2), and conjunctival lesion (n=1). Clinical outcomes included changes in slit lamp findings and visual acuity.

**Results**: Of 9 patients, 6 were males and the rest females with a mean age of 56.2±21.9 years (range 33-98). Post-procedure, patients were evaluated from any time between 1 to 18 weeks (median 2.4 weeks). The total mean follow-up was 7.72±5.3 months (range 0.33-14.7, median 9.33). At first follow-up, all patients showed improvement in clinical signs, and the dehydrated amniotic membrane was integrated in all except one (shifted nasally). Visual acuity pre-procedure was 1.57±0.92 logMAR units (range 0.1-3, median 1.3), which improved to 1.04±0.75 logMAR units (range 0.1-2.5, median 1) at first follow-up (p-value 0.00819), and 0.86±0.49 (range 0.1-1.7, median 1) at the last follow-up (p-value 0.00551).

**Conclusion**: The novel double layered 9mm dehydrated amniotic membrane shows significant improvement in clinical signs and visual acuity in patients with ocular surface disorders.

**Paper |** Article 4168

**Authors**: Mohamed Gemae, Davin Johnson MD, FRCSC *Kingston Health Sciences Center*.

**Author disclosure block**: M. Gemae: None., D. Johnson: None.

**Title**: Prevalence of Epithelial Ingrowth and Other Complications Following Refractive Enhancement Surgery

**Abstract body**:

**Purpose**: The purpose of the study was to evaluate visual outcomes and complications amongst varying techniques of excimer laser enhancement procedures.

**Study Design**: Retrospective Chart Review

**Methods**: This retrospective chart review included 101 eyes who underwent refractive enhancement surgery in 2022. We excluded patients for which details of the original refractive surgery were not available, or for enhancement procedures in patients with a history of cataract or refractive lens exchange surgery. Procedures were grouped into 4 groups: femtosecond laser LASIK  relifts (Group 1, n=71); PRK retreatments (Group 2, n=13); femtosecond laser LASIK post PRK (Group 3, n=15) and PRK post femtosecond LASIK (Group 4, n=2). The study compared complication rates and visual outcomes at 1-week, 1-month, 3-months, and 6-12-months following the between the different types of enhancement procedures.

**Results**: Within Group 1, epithelial ingrowth was reported in 41% (29/71) of patients by 1-month. Epithelial ingrowth was more common if the enhancement was performed more than 1 year after the original refractive surgery (46 vs. 29%). However, all cases were self-limiting, with none requiring treatment. Corneal haze was reported in 2/71 eyes in Group 1 vs. 2/23 in Group 2 with all cases resolving over 12 months. Other complications included grade 1 DLK (2/71 eyes in Group 1), microstriae (8/71 eyes in Group 1), and a flap tear (1 patient in Group 3). At 6-12 months follow-up, the spherical equivalent was within 0.5D of target in 75% of patients in group 1 vs. 63% of patients within Group 2.

**Conclusions**: Excimer laser retreatments are generally safe procedures.  When the original surgery is made by femtosecond LASIK, relift enhancement is a safe procedure that provides a faster patient recovery; while epithelial ingrowth is common we found no cases for which treatment was required. The small sample size of other enhancement procedures prevented a robust intergroup comparison of visual outcomes and complications.

**Paper |** Article 4422

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**Author disclosure block**: W. Alsarhani: None., A. Basilious: None., M. Popovic: None., S. AlShaker: None., C. Chan: None.

**Title**: Povidone-iodine in the treatment of infectious keratitis: A systematic review

**Abstract body**:

Purpose: To evaluate if povidone-iodine is effective and safe in the treatment of infectious keratitis

**Study Design**: Systematic review

**Methods**: A review of MEDLINE, EMBASE, and Cochrane Library was conducted to find relevant published articles. Outcomes including best corrected visual acuity, infiltrate, ulcer size and colony forming units were collected. All clinical trials and observational studies published in English were included. Descriptive statistics were used to summarize findings.

**Results**: Following database review, 343 articles were identified. Four studies met the inclusion criteria. The studies included 590 cases, with a culture positivity rate of 87.61%. Of the 590 cases, 288 received povidone-iodine treatment, and the rest underwent either standard of care treatment or placebo. When comparing povidone-iodine to standard antibiotic treatment, there was no significant difference in achieving presumed recovery. However, in two other studies, povidone-iodine did not significantly reduce CFU and did not improve visual outcomes when added to standard antibiotic treatment. None of the studies reported any safety concerns with topical povidone-iodine.

**Conclusion**: While some studies showed benefit for the use of povidone-iodine in infectious keratitis, others found no significant differences relative to standard of care antibiotic therapy or placebo. In conclusion, further randomized controlled studies with a larger sample size and longer follow up duration are recommended to evaluate the efficacy of povidone-iodine in the treatment of infectious keratitis.

**Paper |** Article 4264

**Authors**: Raheem Remtulla, Robert Koenekoop *McGill University*.

**Author disclosure block**: R. Remtulla: Grant research support: National Eye Institute, Canadian Institute of Health Research, Vision Health Network, Montreal Childrens Foundation., R. Koenekoop: None.

**Title**: Development of a Neural Network Model for Predicting Keratoconus in Leber Congenital Amaurosis and AIPL1 Mutations

**Abstract body**:

**Purpose**: Leber Congenital Amaurosis (LCA) is a rare genetic retinal disorder resulting in severe visual impairment from birth. AIPL1 gene mutations are among the causes of LCA and exhibit a highly variable clinical phenotype, often accompanied by symptoms like nystagmus, photophobia, and keratoconus. The exact cause of keratoconus in LCA remains uncertain but is suspected to be related to the oculo-digital phenomenon. Timely diagnosis of keratoconus is crucial for optimizing treatment outcomes. To address this knowledge gap, we have developed a neural network to predict the presence of keratoconus in LCA patients with AIPL1 mutations, utilizing clinical features and allele mutations as input data.

**Study Design**: Machine learning applications of prospectively collected data

**Methods**: Data collected globally in 2004 included nineteen patients diagnosed with Leber Congenital Amaurosis (LCA) possessing AIPL1 mutations and undergoing ocular examinations to assess keratoconus. A neural network model was developed using MATLAB, utilizing various clinical factors such as age, geographic origin, the presence of oculo-digital phenomenon, night blindness, photoaversion, photoattraction, pigmentary retinopathy, optic nerve pallor, maculopathy, and the presence or absence of the stop mutation W278Stop in one or both AIPL1 alleles as input parameters. The model's output data represented the presence or absence of keratoconus. The dataset was randomly divided into training, validation, and testing sets in a 60%, 20%, and 20% ratio, respectively. The neural network model's performance was assessed using accuracy, sensitivity, and specificity measures.

**Results**: The average accuracy across all neural networks was 92.7±20.0% in the training set, 92.5±12.1% in the validation set and 82.5±26.5% in the test set. The average total sensitivity across all 10 neural networks was 88.3±11.3%, the average total specificity was 91.5±24.2%;and the average total accuracy across all neural networks was 90.5±17.5%. Furthermore, 4 out of the 10 neural networks made no errors across the training, validation, or test sets, indicating a high level of consistency in their predictions. Additionally, 8 of the 10 neural networks had a 100% specificity in the test sets.

**Conclusion**: We developed a neural network model specifically for keratoconus in blindness due to retinal degeneration, which shows promising results in predicting the presence of keratoconus in LCA patients with AIPL1 mutations. We were able to predict based on the clinical features and the AIPL1 mutations as input data. The trained networks consistently demonstrated high specificity.

The results demonstrate proof of concept for the use of neural network models to predict the presence of keratoconus in LCA patients with AIPL1 mutations.

**Paper |** Article 4651

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**Author disclosure block**: S. Nath: None., J. Talajic: None., A. Bernstein: None., J. Mouhanna: None., D. Mitsos: None., JY. You: None., C. Courey: None., G. Courey: None., N. Khrushch: None., J. Choremis: None.

**Title**: Efficacy and safety of nanomicellar cyclosporin 0.09% in patients with dry eye disease refractory to emulsion cyclosporin 0.05%: a prospective crossover study

**Abstract body**:

**Purpose**: Emulsion 0.05% cyclosporin (commercially, and, herein, Restasis), remains central to the management of dry eye disease (DED). Within the ocular surface microenvironment, cyclosporin inhibits transcription factors governing pro-inflammatory cytokines and prevents T cell activation, thereby reducing inflammation and restoring tear film homeostasis. Despite considerable evidence supporting the efficacy of Restasis, some patients continue to be symptomatic while receiving treatment. In such cases, inadequate delivery of cyclosporin to the ocular surface is posited to be the underlying mechanism for treatment failure. As cyclosporin is a hydrophobic molecule, and in Restasis and generics, packaged in a hydrophobic emulsion vehicle, delivery to the hydrophilic aqueous environment of the ocular surface is inherently limited. Recently, Health Canada approved a novel formulation of cyclosporin for treatment of DED. This preparation (commercially, and, herein, Cequa) contains 0.09% cyclosporin, packaged in a nanomicellar vehicle with hydrophilic properties. It is posited that this hydrophilic vehicle coupled with the increased concentration of cyclosporin may better address ocular surface inflammation. The purpose of this study is to evaluate the efficacy and safety of Cequa for treatment of DED in patients with partial or no response to Restasis.

**Study Design**: Prospective crossover study

**Methods**: Our study was conducted in adherence with the principles of the Declaration of Helsinki, and we received institutional research ethics board approval. We enrolled adult patients with a diagnosis of moderate-to-severe DED (ocular surface disease index; OSDI ≥22) with partial or no amelioration of symptoms following at least six-months of treatment with Restasis. Our primary outcome was the corneal inter-palpebral conjunctival staining score as defined in the Oxford Scheme 6-point scale. Secondary outcomes were: tear break-up time (TBUT, in seconds), Schirmer strip test (in millimeters), OSDI score, and adverse events as reported by patients. All outcomes

were assessed at baseline as well as at day 42 and day 84 after commencing treatment with Cequa. Our analyses were summarized using repeated measures analysis of variance.

**Results**: We enrolled 7 patients (14 eyes). The mean Oxford staining score decreased significantly from 1.50 at baseline to 0.30 by the end of the study ($p<0.05$) and the TBUT increased significantly from 3.8s to 4.8s ($p<0.05$). Schirmer tear testing trended towards an increase from 12.0mm at baseline to 15.3mm at day 84 ($p=0.10$) and the OSDI decreased from 44.2 at baseline to 38.3 at the end of the study period ($p=0.91$). No significant adverse events were reported by patients.

**Conclusions**: Nanomicellar 0.09% cyclosporin has utility in the management of DED recalcitrant to treatment with emulsion 0.05% cyclosporin.

**Paper |** Article 4592

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**Author disclosure block**: D. Geoffrion: None., Y. Agoumi: None., G. Durr: None., MC. Robert: None., R. Koenekoop: None., A. Di Polo: None., M. Harissi-Dagher: None.

**Title**: Inflammatory tear cytokine levels in patients with Boston keratoprosthesis type 1 versus primary angle closure glaucoma

**Abstract body**:

**Purpose**: In Boston keratoprosthesis (KPro) patients, recent data has shown that inflammation and post-surgical angle closure contribute to the pathogenesis of glaucoma. The lack of biointegration of the KPro allows for communication between the ocular surface and intraocular media, warranting lifelong antibiotic prophylaxis. The purpose of this study was to characterize the difference in ocular surface inflammation between KPro patients and glaucoma patients to identify therapeutic biomarkers.

**Study Design**: Prospective cross-sectional study.

**Methods**: A total of 68 eyes (from 68 patients) were included in this study: 10 healthy controls, 18 primary angle closure glaucoma without KPro (PACG), 41 KPro with glaucoma (KPro G), 7 KPro without glaucoma (KPro NoG). The levels of 27 cytokines in the tear fluid were measured using a multiplex bead immunoassay. Angle closure was assessed by anterior segment optical coherence tomography. Patients with underlying autoimmune, inflammatory, or cardiovascular conditions or diabetes were excluded from this study. Statistical analysis included Brown-Forsythe ANOVA with post hoc multiple comparisons with Dunnett's T3 test to compare groups, as well as a generalized linear model using multiple linear regression to account for the effect of factors and covariates.

**Results**: All groups had similar age and gender distribution. Mean time from KPro surgery to tear collection was 7.9±3.5 years. Compared to PACG patients, KPro G patients had higher tear cytokine levels of IL-1RA (P= 0.015), IL-8 (P=0.029), IP-10 (P=0.002), VEGF (P=0.42), and RANTES (P=0.007), but lower levels of IL-1b (P=0.022). In multivariate analysis, KPro status and angle closure status remained, respectively, associated with IL-1RA (b=5795, P<0.0001; b=-1580, P=0.020), IL-8 (b=689.6, P=0.0004; b= -379.8, P=0.048), and RANTES levels (b=10.90, P=0.0002; b=-7.813, P=0.008) after adjusting for age, gender, and glaucoma status. KPro status remained positively

associated with VEGF levels (b=82.91, P=0.034) after adjusting for age, gender, KPro and glaucoma status. Glaucoma status remained positively associated with IL-1b (b=12.42, P=0.033) after adjusting for age, gender, KPro status, and angle closure status. The other inflammatory cytokines were not significantly different in the study groups.

**Conclusions**: Cytokines IL-1RA, IL-8, VEGF, and RANTES are elevated in tear fluid of KPro G patients compared to PACG patients, while IL-1b is decreased. These results show, for the first time in humans, a different inflammatory profile between KPro eyes with angle closure glaucoma versus primary angle closure glaucoma. These cytokines may serve as biomarkers for angle-closure glaucoma in KPro eyes. We recommend that KPro patients with glaucoma should be treated earlier and more aggressively.

## Equity, Diversity and Inclusion | Diversité, d'équité et d'inclusion

**Paper** | Article 4590

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**Author disclosure block**: J. Kaur: None., T. Gholamian: None., D. Taghaddos: None., S. Moosa: None., M. Popovic: None., G. Mercer: None., RH. Muni: None., PJ. Kertes: None.

**Title**: The impact of demographic factors on clinical outcomes and loss to follow-up in diabetic macular edema and diabetic retinopathy following anti-vascular endothelial growth factor therapy or panretinal photocoagulation: A systematic review

**Abstract body**:

**Purpose**: The association between demographic factors and the efficacy of anti-vascular endothelial growth factor (VEGF) therapy or panretinal photocoagulation (PRP) in the treatment of diabetic retinopathy (DR) or diabetic macular edema (DME) is not well understood. The objective of this study was to review the existing evidence on the impact of demographic factors on clinical outcomes and loss to follow-up in DR and DME following anti-VEGF and PRP therapy.

**Study Design and Methods**: Ovid MEDLINE, Embase, Cochrane Library, and the US National Institutes of Health clinical trials registry were searched from January 1, 2000, to July 15, 2022 for randomized controlled trials (RCTs) investigating the efficacy of anti-VEGF therapy and PRP for patients with DR and/or DME. Peer-reviewed studies stratifying outcome data by demographic factors, including age, race, sex/gender, income, and education level, were included. Outcomes of interest included loss to follow-up, visual acuity (VA), central macular thickness (CMT), and complications. Data were extracted by two independent reviewers. Risk of bias was assessed with the Cochrane Risk of Bias tool 2 and certainty of evidence was assessed with the GRADE evaluation.

**Results**: Of 295 full texts screened, eight RCTs comprising 2441 eyes were included. One study found a strong negative association between increased age and VA gains (112 eyes) following treatment, while two others found no correlation between age and VA (144 eyes). Two articles found no differences in loss to follow-up and VA at 24 months based on groups, stratified by age, sex, and race/ethnicity. In two studies, sex was not associated with completion of follow-up at 2 years. Race was found to play a role, with White patients completing study visits more often than their Hispanic and Black counterparts, suggesting a higher trial attrition rate in non-White patients.

**Conclusions**: Few prospective, randomized studies have explored the relationship between demographic characteristics and the effectiveness of treatment for DME and DR. Notwithstanding the fact that the demographic characteristics of study participants may not be representative of the general DME and DR patient population, we found that there are conflicting conclusions among studies. Existing studies were not designed to evaluate clinical outcomes by demographic parameters as a primary objective. Future trials on the treatment of diabetic eye disease should

investigate clinical outcomes as a function of demographic features to enable more targeted care for marginalized demographic patient groups that experience poorer clinical outcomes.

**Paper |** Article 4128

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**Author disclosure block**: M. Gemae: None., P. Kim: None., S. Sturrock: None., C. Law: None.

**Title**: Diversity Service Gaps Amongst Practicing Ophthalmologists in Canada: A Landscape Study

**Abstract body**:

**Purpose**: Language- and gender-concordant care enhances the physician-patient relationship and reduces disparities by increasing trust and advancing equity. The purpose of our study is to outline EDI-related disparities in Canada in the current ophthalmology workforce relative to the demographic make-up of the geographic area they serve.

**Study Design**: Cross-sectional study

**Methods:**

*Data Sources*

Provincial medical practice regulatory bodies

Statistics Canada - 2021 Census Profile

*Inclusion and Exclusion Criteria*

All ophthalmologists registered with their regulatory body were eligible for inclusion. Provincial registries who do not disclose ophthalmologist's gender or language spoken, or without complete records were excluded from the analysis.

*Data Analysis*

Ophthalmologist gender and location were collected from the provincial registries and geo-coded in Quantum Geographic Information System (QGIS) software. Summary statistics for gender data were calculated. Access for each language group was summarized at the province-level by calculating the 25th, 50th and 75th percentile of distance between the geographic center of the dissemination area and the closest ophthalmologist offering language-appropriate care. Only languages spoken by >20 physicians were included to ensure an adequate sample size for meaningful comparisons.

**Results:** *Gender*

The final sample consisted of 1382 practicing ophthalmologists (24.3% female; 75.1% male; 0.5% other) across Canada. Nova Scotia had the highest proportion of female ophthalmologists (31.1%), while Saskatchewan had the lowest (16.3%).

*Language*

There was also a marked disparity in access to ophthalmologists by language across provinces. Nationally, the median distance to an English-speaking ophthalmologist was 5.6km, and 12.9km for French. In contrast, access to language-appropriate services ranged from 27.3km for Arabic, up to 209.6km in Punjabi. Indeed, 10% of the Arabic and Punjabi speaking population would have to travel 351.2 and 921.0km respectively to access appropriate care. nterprovincial differences were also noted. For example, access to Mandarin, one of the most popular non-official languages in Canada, was significantly better in British Columbia (median: 10.1km) compared to Manitoba (median: 1205.2km).

**Conclusion**: Females are underrepresented in ophthalmology, suggesting Canadian women have fewer options for gender-congruent doctors. The disparities in access to language-appropriate services, with higher distances traveled for speakers of non-official languages, highlighting the need for equitable distribution of ophthalmologists across Canada. This disparity is even more pronounced in provinces such as Manitoba. The results of our study will help inform evidence-based EDI initiatives to address specific disparities in the community. Future analyses will take into account the differences in the distribution of language groups across the country.

**Paper |** Article 4378

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**Author disclosure block**: E. Chaudry: None., AXL. Nguyen: None., N. Ahuja: Board of directors (St. Joseph's Healthcare Foundation) - Docs in Leadership Inc. (Founder).

**Title**: Pathways to Leadership and Mentorship in Canadian Ophthalmology: A Cross-Sectional Study

**Abstract body**:

**Purpose**: Attaining leadership roles within the Canadian ophthalmology community is a complex and multifaceted process with limited prior research. This study explores pathways to reach influential academic leadership positions in ophthalmology to provide insights for aspiring ophthalmologists and enhance opportunities and support in the field.

**Study Design**: A cross-sectional online survey.

**Methods**:An online survey designed on Google Forms was distributed in English and French to Canadian ophthalmology faculty, facilitated by the Association of Canadian University Professors of Ophthalmology (ACUPO). Participants received three reminders to complete the survey, which was accessible for a duration of five months (October 17, 2022, to March 17, 2023).

**Results and Conclusions**: Thirty-seven ophthalmologists completed the survey (31 in English, 6 in French), with near-equal representation of men (51.4%) and women (48.6%). They represented 10 (66.7%) of the Canadian ophthalmology programs, exclusively practiced in urban settings, predominantly within academic hospital-based practice (56.8%), Ophthalmic specialties represented included: comprehensive (40.5%), glaucoma (16.2%), pediatrics (16.2%), oculoplastics (10.8%), retina (10.8%), cornea (8.1%), neuro-ophthalmology (5.4%), and genetics (2.7%), with 4 participants (10.8%) with dual specialties. Participants held a variety of roles including Committee Member (32.4%), Department Chair (18.9%), Committee Chair (16.2%), Program Director (16.2%), Division Head (10.8%), Subspecialty Coordinator (5.4%), and various role combinations. Notably, a significant proportion of participants (73%) attained their initial and most senior leadership roles within the first five years of their careers, emphasizing the importance of early leadership education and mentorship. Many reported having benefited from informal mentorship throughout their academic journey (48.6%). Prior to assuming their most senior leadership roles, 67.6% identified their predecessor as male, 21.6% as female, and 8.1% stepped into newly created positions. This data reinforces the need for increased female representation in leadership roles to provide mentorship and serve as role models. Support was mainly received during practice (32.4%) and residency (21.6%), with faculty development programs playing a smaller role (10.8%). This raises the question of awareness and accessibility of the resources at academic institutions. In summary, this research advocates for a comprehensive approach to leadership development in Canadian ophthalmology, emphasizing the importance of mentorship,

raising awareness of faculty development programs, and championing diversity in leadership positions.

**Paper |** Article 4496

**Authors**: Brendan Tao, Jeffery Ding *University of British Columbia*, Edsel Ing *University of Alberta and University of Toronto*, Radha Kohly *University of Toronto*, Robert Langan *University of Geneva*, Nawaaz Nathoo *University of British Columbia*, Guillermo Rocha *McGill University*, Enitan Sogbesan *McMaster University*, Salina Teja *University of British Columbia*, Javed Siddiqi *California University of Science and Medicine*, Faisal Khosa *University of British Columbia*.

**Author disclosure block**: B. Tao: None., J. Ding: None., E. Ing: None., R. Kohly: None., R. Langan: None., N. Nathoo: None., G. Rocha: None., E. Sogbesan: None., J. Siddiqi: None., F. Khosa: None.

**Title**: Gender, Race and Ethnicity Among US Academic Ophthalmologists and Department Chairs: A Half-Century Analysis Between 1966-2021

**Abstract body**:

**Purpose**: To analyze gender, race, and ethnicity trends in rank and leadership amongst American academic ophthalmologists.

**Study Design**: Retrospective study of ophthalmologists with full-time faculty appointments and department chairs between 1966-2021 in the United States (US).

**Methods**: Gender, race, and ethnicity data were acquired from the Association of American Medical Colleges. Where appropriate, multivariable linear regression and multiple comparison tests (pairwise t-test, analysis of variation, and Tukey honestly significant difference test) were conducted, with corresponding 95% confidence intervals (CI). The primary outcome was the annual rate of change in both the proportion of women, racialized, and ethnic academic faculty between 1966-2021 and in academic rank. Secondary outcomes were annual rate of change by these same variables in chair status.

**Results**: There were 221 academic physicians in 1966 (12.2% women; 18.3% racialized; 3.2% Hispanic/Latino/Spanish) and 3158 individuals by 2021 (41.8% women; 39.67% racialized; 2.3% Hispanic/Latino/Spanish ethnicity). The proportion change per year for women, racialized, and sole Hispanic/Latino/Spanish ethnicity was +0.63%/year [95%CI: 0.53,0.72], +0.54%/year [95%CI 0.72,0.36], and -0.011% [95%CI -0.03,0.004], respectively. Over this period, men significantly outnumbered women (period-averaged mean difference (PA-MD) 56.2% [95%CI 21.9,78.1]. Women were significantly underrepresented across academic ranks, and increasingly so at higher echelons, ranging from non-professor/instructor roles (PA-MD 19.8% [95CI 40.1%,59.9]) to professor (PA-MD 81.3% [95%CI 78.8,83.6]). Racialized participants were significantly less likely to hold a given academic rank than non-racialized individuals. The corpus of department chairs grew from 77 in 1977 (0% women; 9.1% racialized; 2.6% Hispanic/Latino/Spanish ethnicity) to 104 by 2021 (16.3% women; 21.2% racialized; 3.8% Hispanic/Latino/Spanish ethnicity). For department chairs, the annual rate of change in the proportion of women, racialized, and Hispanic/Latino/Spanish ethnicity were +0.32%/year [95%CI: 0.20,0.44], +0.34%/year [95%CI 0.19,0.49], and +0.05% [95%CI 0.02,0.08], respectively. For full-time academic faculty and department chairs, White men predominated representation while women and underrepresented

in medicine groups (Black, Hispanic, American Indian/Alaska Native, and Native Hawaiian/Pacific Islander) grew the least among marginalized groups.

**Conclusions**: Since 1966, diversity among US ophthalmologists has progressed slowly and is limited to lower academic ranks and leadership positions. Further targeted advocacy is recommended.

**Paper |** Article 4495

**Authors**: Brendan Tao, Manvis Xia *University of British Columbia*, Jim Xie *McMaster University*, Sahand Marzban *University of Western Ontario*, Amir Vosoughi *University of Manitoba*, Nina Ahuja *McMaster University*, Guillermo Rocha *McGill University*.

**Author disclosure block**: B. Tao: None., M. Xia: None., J. Xie: None., S. Marzban: None., A. Vosoughi: None., N. Ahuja: None., G. Rocha: None.

**Title**: Diversity in Enrollment to Clinical Trials for Cataract Medicine and Surgery: A Meta-Analysis

**Abstract body**:

**Purpose**: To investigate sex, racial, and ethnic disparities in patient enrollment across cataract trials registered in the United States (US).

**Study Design**: Cross-sectional study of participants enrolled in high-quality (reduced risk of bias), US-registered (on clinicaltrials.gov), cataract-related randomized controlled trials (RCTs). RCTs must have been completed, employed double or greater masking, and have published results through the registry or a scholarly journal.

**Methods**: Trial (study sponsor country, study site location, trial initiation year, study phase, and study masking) and demographic data (sex, race, and ethnicity according to US reporting guidelines) were collected from clinicaltrials.gov study records, and where available, their correspdoning journal publication. The Global Burden of Disease (GBD) database provided sex-based cataract disease burdens, calibrated to each study's initation year and countries of study. For each study, we calculated a participation-to-prevalence ratios (PPRs), given by the enrollment of females in a given study divided by its expected female enrollment according to their disease burden reported from the GBD database. Pooled PPR with 95% confidence intervals (CI) were then calculated for female sex, with a value between 0.8 and 1.2 constituting sufficient study enrollment. Kruskal-Wallis tests (alpha = 0.05) with subsequent post-hoc comparisons were used to evaluate demographic representations stratified by trial characteristics.

**Results**: From 864 records, we identified 100 clinical trials (N=67 874), of which 97 (N=67 697) reported sex demographics with a pooled female PPR of 0.89, 95%CI [0.85,0.94]. The PPR for females was significantly more favorable for studies published between 2011-2020 than before 2001, and in studies investigating devices or procedures over drug therapies. Of the 67 697 total participants, the absolute female enrollment was 19 062 (28.16%) and their absolute enrollment was significantly higher in lesser masked studies, lesser phase studies, studies with US sites and sponsors, and drug trials. Ethnicity and race were reported in 9 (N= 1 792) and 26 trials (N= 23 181), respectively. Among trials that reported race, most were Caucasian (N=19 574; 84.44%). For both race and ethnicity, there were predominately no significant differences between sub-levels of various trial characteristics. However, Black or African American and American Indian/Alaskan Native participants were enrolled significantly more often in drug over device and procedure trials.

**Conclusions**: High-quality, US-registered, cataract trials enrolled acceptable proportions of females. However, the absolute number of female and racialized participants was low. Race and

ethnicity were underreported. Disparity trends predominately held across secondary variables. To promote generalizability, future trials should pursue equitable demographic enrollment.

# Glaucoma | Glaucome

**Paper** | Article 4401

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**Author disclosure block**: A. Mihalache: None., R. Huang: None., Popovic: Financial support (to institution) – PSI Foundation, Fighting Blindness Canada., N. Patil: None., B. Pandya: Involved in website design for OCTCases., R. Shor: None., A. Pereira: Cofounder of OCTCases., J. Kwok: Cofounder of OCTCases., D. Wong: Consultant – AbbVie, Alcon, Apellis, Bayer, Bausch Health, Biogen, Boehringer Ingelheim, Novartis, Ripple Therapeutics, Roche, Topcon, Zeiss. Research grants from Novartis, Roche., R. Muni: Consultant- Alcon, Apellis, AbbVie, Bayer, Bausch Health, Roche; Financial Support (to institution) - Alcon, AbbVie, Bayer, Novartis, Roche.

**Title**: Accuracy of an Artificial Intelligence Chatbot to Interpret Clinical Ophthalmic Images

**Abstract body**:

**Purpose**: To evaluate the performance of the multimodal release of ChatGPT-4 in providing valuable insight on ophthalmic cases accompanied by various forms of imaging.

**Study Design**: Observational study.

**Methods**: We used a publicly available dataset of ophthalmic cases with multiple-choice questions from OCTCases, a medical education training platform based out of the Department of Ophthalmology and Vision Sciences at the University of Toronto. Our primary outcome was the performance of ChatGPT-4 in answering multiple-choice questions pertaining to ophthalmic cases across various categories, measured as the proportion of correct responses. We conducted chi-squared ($\chi 2$) tests to compare the proportion of correct responses across different categories.

**Results**: 429 multiple-choice questions from 136 ophthalmic cases and 448 images were included in our analysis. ChatGPT-4 answered 299 (70%) of multiple-choice questions correctly across all cases. ChatGPT-4 performed best on questions in the category retina (77% correct) and poorest in the category neuro-ophthalmology (58% correct). ChatGPT-4 demonstrated intermediate performance on questions from the ocular oncology (72% correct), pediatric ophthalmology (68% correct), uveitis (67% correct), and glaucoma (61% correct) categories. The performance of ChatGPT was significantly better on retina questions than neuro-ophthalmology questions (77% vs. 58%; difference=18%, 95%CI=[7.5% to 29.4%], $\chi 2=11.4$, df=1, $p<0.001$). Nonetheless, ChatGPT-4 achieved a significantly better performance on non-image-based questions compared to image-based questions (82% vs. 65%; difference=17%, 95%CI=[7.8% to 25.1%],  $\chi 2=12.2$, df=1, $p<0.001$).

**Conclusions**: ChatGPT accurately responded to most multiple-choice questions pertaining to ophthalmic cases, albeit performing better on questions that did not rely on the interpretation of

imaging modalities. As the use of multimodal chatbots becomes increasingly widespread, it is imperative to continuously stress their appropriate integration within medical contexts.

**Paper |** Article 4329

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**Author disclosure block**: RB. Shi: None., V. Ramalingam: None., Y. Li: None., S. Arshinoff: Employment, honoraria and/or consulting fees - Alcon, BVI, Bohus Biotech, Rayner, Zeiss, Cima, Arctic Dx., W. Wong: None.

**Title**: Trial-Oriented Reconstruction ON Tree Optimization (TORONTO): a new data-driven visual field testing algorithm

**Abstract body**:

**Purpose**: There is a constant effort to search for faster and more accurate visual field test algorithms given that patients have a limited attention span. Long test durations not only cause patient fatigue but also slow down patient care. We developed a new, more efficient data-driven algorithm, named Trial-Oriented Reconstruction ON Tree Optimization (TORONTO).

**Study Design**: Computer simulation and pilot cohort.

**Methods**: The development of faster and more accurate algorithms depends on better utilizing common field defect patterns. Current algorithms only utilize basic patterns, e.g., quadrant seeding estimates general heights of quadrants by fully determining thresholds at quadrant centers. In contrast, TORONTO generalizes existing Bayesian algorithms (ZEST) to simultaneously estimate multiple thresholds. After each trial, without waiting for fully determined thresholds, TORONTO updates the estimates at all locations. This is achieved by learning field patterns as point-wise threshold relationships in a training dataset. Conceptually, TORONTO directly tests for defect "patterns," rather than "thresholds." The TORONTO algorithm was trained and tested with cross-validation on 278 eyes in the Rotterdam glaucomatous 24-2 visual fields. The algorithm's performance was compared against standard algorithms (i.e., ZEST, comparable to SITA-Standard) in terms of point-wise error (for accuracy of threshold estimation) and number of trials (for test duration). In a preliminary study at York Finch Eye Associates, Toronto, Canada, 16 eyes of 11 patients (age: 35–80 years, VFI: 89%–100%) with mild glaucoma or suspected of glaucoma were tested using TORONTO-Faster (a variant of TORONTO) 24-2 on the Toronto Portable Perimeter (TPP) against Humphrey Field Analyzer's (HFA) SITA-Fast algorithm.

**Results**: In the simulated Rotterdam glaucomatous eyes, in the reliable condition (FP=FN=3%), the median termination and point-wise root-mean-square error (RMSE) of TORONTO was 153 trials and 2.0 dB, twice as fast and just as accurate as ZEST. In particular, among mild eyes (MD>−6 dB), TORONTO took only 99 trials while ZEST took 303 trials. In the unreliable FP=FN=30% condition, TORONTO terminated in 148 trials and was 2.4x faster than ZEST with much better RMSE (4.2 vs 7.9 dB). Among the 16 eyes tested, the Bland-Altman 95% limits of agreement of VFI between TPP TORONTO-Faster and HFA SITA-Fast was −4.5% to +8.6%, which is similar to SITA-Fast test-retest's limits of agreement (−5.6% to 8.0%), though TPP's VFI was higher than HFA's by 2% (p=0.03). TPP

TORONTO-Faster took on average 1 min 47 sec, 45% shorter than HFA SITA-Fast's 3 min 16 sec ($p<0.001$).

**Conclusions**: In simulation, we found TORONTO is fast and accurate in estimating visual fields in a variety of reliability conditions. We aim to further study the characteristics and benefits of TORONTO in practical use in a larger patient sample with more severe glaucomatous eyes.

**Paper |** Article 4197

**Authors**: Devin Betsch, Kevin Hodgson *Dalhousie University*, Rodolfo Bonatti *Dalhousie University*, Lesya Shuba *Dalhousie University*, Brennan Eadie *Dalhousie University*, Paul Rafuse *Dalhousie University*, Mathew Palakkamanil *University of Alberta*, Marcelo Nicolela *Dalhousie University*.

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**Title**: Initial results on safety and efficacy of sub-tenon triamcinolone injection versus a conventional steroid drops post-operative regimen following glaucoma surgery

**Abstract body**:

**Purpose**: Our study aims to: (i) compare surgical results between use of either sub-tenon triamcinolone acetonide (TAC) injection or prednisolone acetate drops following trabeculectomy and PreserFlo MicroShunt® surgery, and (ii) determine the safety of sub-tenon TAC after these procedures. This novel approach could reduce the burden of drops required after surgery, while achieving non-inferior intraocular pressure (IOP) reduction compared to the traditional post-operative drop regime.

**Study design**: Patients undergoing trabeculectomy or PreserFlo MicroShunt® surgery were randomized to two distinct steroid regimens: (i) a one-time TAC injection (16 mg) at the conclusion of their surgical case or (ii) a 10 week course of topical steroid drops. Data collected at each post-operative visit included IOP, number of glaucoma medications, need for additional rescue steroid, need for additional surgical procedures and complications.

**Methods**: Data analysis consisted of a two-sided t-test, with a p-value $< 0.05$ considered statistically significant.

**Results**: Thirteen patients undergoing trabeculectomy and nine patients undergoing PreserFlo MicroShunt® surgery were included in the current analysis, for a total of 22 participants. Twelve out of 22 patients (54.5%) were randomized to TAC injection. Mean IOP at the last post-operative visit thus far, ranging from 2 weeks to 3 months postoperatively, was not found to be significantly different between patients randomized to TAC injection versus steroid drops ($10.8 \pm 3.2$ vs $14.6 \pm 7.4$, $p= 0.12$). At their most recent follow up visit, patients who received TAC injection across both surgical groups required an average of 0.1 classes of glaucoma medications, compared to 1.2 in those randomized to drops. One patient initially given TAC injection required rescue topical steroid to control anterior chamber inflammation at post-operative week two. Regarding complication rate, one patient who underwent trabeculectomy and TAC injection required reformation of the anterior chamber with viscoelastic for early hypotony, while another who was randomized to conventional drops following their trabeculectomy surgery required bleb needling. Two patients who were randomized to steroid drops following their PreserFlo MicroShunt® surgeries required revision of the shunt due to elevated IOP.

**Conclusions**: Patients randomized to TAC injection demonstrated similar IOP post-operatively compared to the conventional drops groups, while requiring fewer topical glaucoma medications.

These early results suggests that TAC injection may be a safe and effective alternative to conventional post operative steroid drops following bleb forming glaucoma surgery.

**Paper |** Article 4647

**Authors**: Mina Mina, Janelle Olughor *University of Calgary*, Antoine Sylvestre-Bouchard MD, MSc *University of Calgary*, Abdullah Al-Ani MD, PhD *University of Calgary*, Emi Sanders BSc *Alberta Health Services*, Andrew Crichton MD, FRCS *University of Calgary*.

**Author disclosure block**: M. Mina: None., J. Olughor: None., A. Sylvestre-Bouchard: None., A. Al-Ani: None., E. Sanders: None., A. Crichton: Advisor and shareholder of RetinaLogik Inc.; Advisor for Aequus Pharmaceuticals; Consultant for Bausch and Lomb.

**Title**: Inter-test Comparability of a Novel VR Perimetry Device with the Humphrey Visual Field Analyzer

**Abstract body**:

**Purpose**: Mapping of visual fields is fundamental to ophthalmologic examination; it aids clinicians in assessing the progression of eye diseases, localizing lesions of the visual pathway, and verifying fitness to drive. At present, the Humphrey Visual Field Analyzer (HFA; Carl Zeiss Meditec Inc., California) is the accepted benchmark amongst visual field testing equipment. However, while validated as a reliable tool, the HFA is large, expensive, and necessitates a fixed testing environment. In response to the challenges, virtual reality (VR) headsets have emerged as an alternative to perimetry testing. This study investigates the inter-test comparability of a novel VR perimetry device (RetinaLogik Inc., Calgary, AB) relative to the HFA.

**Study Design and Methods**: This prospective, single-center study was conducted on 20 eyes of 12 patients with 70% glaucoma-suspect and 30% glaucomatous eyes. Exclusion criteria included a high false positive rate (>15%) for either device, ensuring that the results of the comparison were solely attributable to device performance rather than being strongly influenced by patient-related factors. Each participant completed visual field testing using both devices. The same grid pattern (either 24-2 or 30-2) was used for each patient on both devices, and the grid was selected based on the patient's clinical care needs. The data extracted included global mean deviation [MD], pattern standard deviation [PSD], global mean sensitivity [MS], and pointwise sensitivity. Linear regression analysis was used to evaluate the MD and PSD data. A Bland-Altman plot was used to assess the mean difference and level of agreement between the two devices. Lastly, pointwise analyses were conducted including a heatmap presentation of the results.

**Results**: Linear regression analysis demonstrated a strong Pearson correlation coefficient of r = 0.8327 for MD and r = 0.9083 for PSD (both P<0.0001). Similarly, Bland-Altman analysis of the global MS also demonstrated a strong Pearson correlation coefficient of 0.8252 (P<0.001). Additionally, the Bland-Altman plot revealed a bias of 0.80 dB with 95% limits of agreement between -2.1 and 3.7, when comparing global MS of the HFA and VR device. Pointwise analysis showed a statistically significant Pearson correlation coefficient of 0.8027 (P<0.0001). Differences in light sensitivity between both devices, averaged individually at each stimuli location, were plotted on a heatmap, and demonstrated a variation between -2.21 and 4.11 with a mean difference of 1.02 dB.

**Conclusions**: This study demonstrates a strong correlation between the RetinaLogik VR headset and the HFA, in a population of glaucoma-suspect and glaucomatous eyes. These promising results indicate a potential for broader and more routine use of this accessible device.

**Paper |** Article 4639

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**Author disclosure block**: L. Renaud: None., G. Docherty: None., M. Bhalla: None., A. Banwell: None., T. Dave: None.

**Title**: Corneal and Scleral Patch Graft Utilization in PreserFlo Microshunt with Ripcord versus PreserFlo Microshunt alone; Retrospective Review with 6 month Follow Up in a Canadian Centre

**Abstract body**:

**Purpose**: The study compares the efficacy and safety of PreserFlo with donor sclera/corneal patch graft and ripcord versus PreserFlo alone.

**Study Design**: Retrospective chart review of cases with 6months follow up data available.

**Methods**: 97 eyes were treated with either PreserFlo. Primary PreserFlo without a patch graft or ripcord was placed in 70 eyes. In 27 eyes a scleral or corneal patch graft was placed with a ripcord. The efficacy was evaluated by reduction of intraocular pressure (IOP) and glaucoma medication usage at 12 months post-surgery.

**Results**: In the PreserFlo group 12% of cases were classified as failure (Requiring reoperation with trabeculectomy, PreserFlo, revision or Ahmed valve). An additional 13% still required glaucoma medications to achieve target IOP. In the PreserFlo group IOP was reduced from 25.2 mmHg to 12.12 mmHg. Medications were reduced from 3.6 to 0.8. Diamox use was reduced from 22 patients requiring it to 4 patients. Surgical revision was required for 8 patients. Persistent hypotony was present for 2 patients. In the patch graft/ripcord group IOP was reduced from 25.6 mmHg to 9.5 mmHg. Number of glaucoma drops was reduced from 3.2 to 0.3 in the patch graft/ripcord group. Diamox was reduced from 9 patients to one patient. Two patients had transient hypotony. No patients had revision surgery or secondary interventions.

**Conclusion**: Both surgeries significantly reduced intraocular pressure and medication use for patients with moderate to advanced glaucoma. The reoperation and failure rate was higher in the PreserFlo alone group. Both groups had hypotony, but it was transient in the ripcord/patchgraft group. IOP and medication reduction was slightly lower in the patch graft group. Limitations include the reduced sample size in the patch graft/ripcord group. Further long term data is needed to validate the use of patch graft and ripcord with the PreserFlo microshunt.

**Paper |** Article 4109

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**Author disclosure block**: L. Yang: None., A. Al-Ani: None., M. Bondok: None., P. Gooi: None.

**Title**: The impact of extended reality simulators on ophthalmic surgical training and performance: A systematic review and meta-analysis

**Abstract body**:

**Purpose**: Extended reality (XR) simulators, which encompasses virtual reality and augmented reality, has shown promise in enhancing surgical training. By replicating realistic surgical scenarios, XR provides trainees with a controlled learning and practice environment, enabling them to safely bolster their surgical skills and confidence. Despite significant advancements in XR technology, its specific role in ophthalmic surgical training remains unclear. This is the first comprehensive study delving into the use of XR for ophthalmic surgical training. Prior to this, no study had systematically summarized the efficacy and potential of XR in simulating ophthalmic surgery.

**Study design**: Systematic review and meta-analysis.

**Methods**: Eight electronic databases were searched, and resulting studies were assessed against predefined inclusion and exclusion criteria. Data extracted from selected studies underwent a random effects meta-analysis that examined the odds ratio (OR) for the common surgical complication, posterior capsular rupture (PCR). Risk of bias analyses were performed for each study using the Risk of Bias 2 and Risk of Bias in Non-randomized Studies of Interventions I.

**Results**: Of 1354 identified studies, 25 were included: nine (36%) retrospective, nine (36%) prospective, one (4%) cross-sectional, and six (24%) randomized controlled trials. Eight (32%) were included in the meta-analysis. Twenty-two (88%) studies used EyeSi, two (8%) HelpMeSee, and one (4%) MicroVis. Of these, two (8%) trained general microsurgery, one (4%) trained vitrectomy, two (8%) trained manual small incision cataract surgeries, 11 (44%) covered all phacoemulsification steps, eight (32%) capsulorhexis, and two (8%) cracking and chopping. The studies involved resident (19/25, 76%), attending (4/25, 16%), medical student (4/25, 16%), and fellow (1/25, 4%) trainees. The meta-analysis demonstrated a significant reduction in PCR after Eyesi practice, with no significant heterogeneity observed across studies (OR=0.71, 95% confidence interval=0.60-0.85, $I^2$=9%). Sixteen studies (64%) had potential risks of bias, with two (8%) having critical, one (4%) having serious, and the rest (36%) having moderate risks.

**Conclusions**: This study establishes a correlation between XR training and enhanced surgical outcomes, particularly in reducing surgical complications. Future studies may consider exploring the effect of using XR and wet-lab training in conjunction, the application of XR for training the non-dominant hand, and its utility as a warm-up to surgical procedures. The results of this study have profound implications as they challenge the conventional ways of training and sets a precedent for

change. Current training methods can be significantly enhanced by XR-based training. As a result, residency curricula may undergo revolutionary changes to incorporate XR as a mainstream tool.

**Paper |** Article 4501

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**Title**: Revolutionizing Glaucoma Screening: An Innovative Low-Cost Protocol Empowered by Automated Machine Learning

**Abstract body**:

**Purpose**: There is an undeniable need for a low-cost glaucoma screening strategy. Artificial intelligence (AI) is revolutionizing large-scale screening by standardizing the process, enhancing its accuracy, and reducing costs. However, employing AI models on cloud systems can be expensive. Automated Machine Learning (AutoML) enables clinicians to construct their own deep learning (DL) models. AutoML Vertex Edge offers offline AI models, enabling screening without incurring model costs and the necessity of an internet connection, which is particularly advantageous for resource-limited regions. This study assesses the performance of low-cost AutoML models (Cloud and Edge) in glaucoma screening using fundus images and compares it to expert-designed DL models.

**Study Design**: Artificial intelligence diagnostic algorithm design and validation.

**Methods**: Ophthalmology trainees with no programming experience constructed AutoML model design using a dataset comprised of 101,442 labeled fundus images. We designed two binary models, a Cloud model and an Edge model, to distinguish between normal and glaucomatous eyes. Subsequently, we conducted external validation on two separate datasets.

**Results**: The AutoML models demonstrated high diagnostic capabilities, comparable or superior to bespoke models. The binary Cloud model had an area under the precision-recall curve (AuPRC) of 0.97, sensitivity of 88%, specificity of 92% and accuracy of 91% (compared to a sensitivity of 85% and specificity of 95% for the best expert models). The binary Edge model had an AuPRC of 0.97, sensitivity of 85%, specificity of 94% and accuracy of 91%. For external validation, our Cloud model showed a sensitivity, specificity, positive predictive value, and accuracy ranging from 75 to 83%, 97 to 99%, 73 to 94%, and 95 to 98% with the REFUGE database, and 92 to 100%, 94 to 96%, 94 to 96%, and 94 to 97% with the GAMMA database.

**Conclusions**: AutoML models created by ophthalmologists without programming experience were comparable or better than expert models. This innovative approach demonstrates how AutoML has

the potential to revolutionize global glaucoma screening, facilitating accessible, precise, and low-cost screening protocols.

**Paper |** Article 4499

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**Author disclosure block**: N. Costanzo: None., S. Kowal: None., MS. Wasim: None., M. Hou: None., AXL. Nguyen: None., S. Tanya: None.

**Title**: Design and Development of Virtual Modules Based on Introductory Ophthalmology Lectures for Medical Trainees

**Abstract body**:

**Purpose**: Medical students in Canada often lack formalised ophthalmology teaching, leading to knowledge gaps and limited career exploration. To address this, the Canadian Ophthalmology Student Interest Group (COSIG) created the Virtual Introductory Summer Course in Ophthalmology (VISCO), a free six-week course consisting of lectures by Canadian ophthalmologists/residents and pre-reading materials. Despite the success of this course in 2021 and 2022, its lasting advantages are limited. Live *Zoom* sessions were not accessible for some students, the archived recordings posted on *YouTube* are lengthy and less engaging than the live sessions, and there is minimal flexibility for self-directed learning. Here we describe the creation of virtual modules to facilitate a comprehensive understanding of ophthalmology concepts while simultaneously enhancing the accessibility and interactivity of introductory ophthalmology education for medical trainees.

**Study Design**: Technical report

**Methods**:VISCO lectures were reviewed for extraction of key themes, pertinent examples, and learning objectives. This information was integrated into the *ScholarRx Bricks* online platform using text, images, videos, and quizzes. Each module was edited by a panel of three reviewers composed of medical students and ophthalmology residents to maintain the accuracy and educational integrity of the original lectures. The COSIG executive team piloted the virtual modules, providing feedback on the clarity, engagement, and effectiveness of the content that was incorporated. The finalised modules were made accessible to the public on the COSIG's website (www.cosig-geico.com).

**Results**: Five ScholarRx Bricks modules were created. The lecture titled *Anatomy, Physiology, and Approach to the Patient with an Eye Complaint* was converted from a 2.2-hour video to a 9-minute module (93% reduction). The *Cataract & Glaucoma* lecture was converted from a 1.5-hour video to a 15-minute module (84% reduction). The *Retina* lecture was converted from a 1.9-hour video to a 15-minute module (87% reduction). The *Uveitis* lecture was converted from a 44-minute video to a 14-minute module (68% reduction). The *Pediatric Ophthalmology and Optics* lecture was converted from a 44-minute video to an 11-minute module (75% reduction).

**Conclusions**: This work demonstrates the successful development and integration of virtual learning modules for medical students using ScholarRx Bricks based on the lectures from the COSIG's Virtual Introductory Summer Course in Ophthalmology. These modules aim to enhance the educational experience of medical students by providing accessible, engaging, and flexible learning tools. Continued assessment of these virtual modules and their impact on student learning outcomes is essential for future work and has the potential to enhance ophthalmology education by complimenting traditional teaching methods.

**Paper |** Article 4396

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**Author disclosure block**: A. Salimi: None., H. Watt: None., H. Saheb: None., P. Harasymowycz: None.

**Title**: A Decade-Long Outcomes of Two First-Generation Trabecular Micro-Bypass Stents with Cataract Surgery in Primary Open-Angle Glaucoma

**Abstract body**:

**Purpose**: A substantial body of research has explored the outcomes of the first-generation trabecular micro-bypass stents (iStent) since its FDA approval in 2012. However, most studies have primarily focused on short- to medium-term outcomes. In this study, we present the 10-year outcomes of two first-generation trabecular micro-bypass stents combined with cataract surgery, representing the longest-term study on iStent outcomes available to date.

**Study Design**: Longitudinal consecutive case series.

**Methods**: The study cohort comprised eyes with mild to severe primary open-angle glaucoma (POAG) that underwent the implantation of two first-generation iStents with concomitant cataract surgery at two academic ophthalmology centers and had follow-up data available for up to 10 years postoperatively. The primary outcome measure was surgical success, defined as the need for secondary glaucoma surgery due to uncontrolled intraocular pressure (IOP) or evidence of disease progression. Secondary outcome measures included postoperative changes in IOP, use of antiglaucoma medications (AGM), and safety measures.

**Results**: A total of 51 POAG eyes were included. The surgical success rate was 83%, with 9 eyes requiring secondary glaucoma surgery during the 10-year follow-up period. IOP decreased by 27.4%, from 19.0 ± 3.9 mmHg preoperatively to 13.8 ± 2.1 mmHg at the 10-year follow-up ($p<0.001$). At the 10-year mark, 88.2% of eyes achieved an IOP of ≤18 mmHg (vs. 55.6% preoperatively). Medication use significantly decreased during the first 4 years ($p<0.001$). However, it gradually increased thereafter, showing no statistically significant difference in subsequent years compared to preoperative levels. Safety outcomes were favorable. Retinal nerve fiber layer (RNFL) thickness remained stable throughout the follow-up. Only one eye lost >2 lines of visual acuity attributable to progression of glaucoma. In one instance, an iStent was inadvertently placed in the suprachoroidal space with no significant sequelae.

**Conclusions**: The implantation of two first-generation trabecular micro-bypass stents in conjunction with cataract surgery is an effective and safe treatment option for surgery-naïve POAG eyes, evidenced by significant reductions in IOP and medication usage sustained over a medium-to long-term follow-up, a reasonable surgical success rate, and favorable safety outcomes.

**Paper |** Article 4269

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* Qingqing Kinna Zhao and Dr. Ziad Butty contributed equally to this work and should be considered as joint first authors.

**Title**: Prevalence of Glaucoma in Canada: Results from the Canadian Health Measures Survey between 2016 and 2019

**Abstract body**:

**Purpose**: To estimate the prevalence of glaucoma in Canada between 2016 and 2019 based on data derived from the Canadian Health Measures Survey utilizing Frequency Doubling Technology Perimetry (FDT), vertical cup-to-disc ratio (CDR), and intraocular pressure (IOP).

**Study Design**: Cross-sectional survey.

**Methods**: Data was examined from 2,612 randomly selected Canadians aged 40-79 taking part in the Canadian Health Measures Survey between 2016 and 2019. Following questions regarding a history of glaucoma, participants were invited to a mobile clinic for an ocular examination, including FDT, fundus photographs, and IOP. Participants who failed FDT and had a CDR≥0.7, with or without raised IOP, were considered to have examination-determined definite glaucoma. Those with FDT failed only, CDR≥0.7 only or IOP>21 mmHg only, or those with 'normal' values of FDT, CDR, and IOP but used glaucoma medications, were considered glaucoma suspects. Participants who passed FDT, had CDR<0.7, IOP≤21 mmHg, and did not use glaucoma medications were deemed as not having glaucoma.

Results: Based on self-reports, an estimate of 421,800 Canadians aged 40-79 had glaucoma, representing a prevalence of 2.5% (95% confidence interval [CI] 1.7%-3.3%). The prevalence was higher in Canadians aged 65-79 (5.0%) than those aged 40-64 (1.6%), in people with less than secondary school graduation (5.0%) than those with secondary school graduation (2.0%) or higher (2.3%), and in individuals who had visited an ophthalmologist/optometrist in the past 12 months (10.0%) versus those that did not (1.4%). Less than half (44.0%) of the self-reported glaucoma individuals used glaucoma medications. Based on ocular examination, there were 71,000 Canadians with definite glaucoma and an additional 1.7 million Canadians labelled as glaucoma suspects. Corresponding prevalence was 0.7% (95% CI 0.3%-1.1%) and 16.3% (95% CI 13.2%-19.4%), respectively. Of the glaucoma suspects, 44.3% had ocular hypertension (OHT, mean IOP

22.8 mmHg). Only 3% of OHT individuals used glaucoma medications. IOP≥28 mmHg was found in 2.4% of OHT individuals, with a mean of 31.0 mmHg. None of the individuals with IOP≥28 mmHg was on glaucoma medications. Nearly 2/5 (37.5%, or 26,625) of Canadians with examination-determined definite glaucoma were unaware they had glaucoma.

**Conclusions**: Amongst Canadians aged 40-79, the prevalence of glaucoma was 2.5% based on self-reports and 0.7% based on clinical examination. Examination identified 1/6 Canadians as glaucoma suspects requiring further examination to clarify a glaucoma diagnosis. Few Canadians with OHT used glaucoma medications, including those with IOP≥28 mmHg. Nearly 2/5 Canadians with examination-determined definite glaucoma were unaware of their disease status.

**Paper |** Article 4609

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**Author disclosure block**: A. Sylvestre-Bouchard: None., M. Mina: None., E. Sanders: None., A. Crichton: None.

**Title**: A Novel, Canada-Made, Virtual Reality Perimeter: Usability Compared to the Gold Standard

**Abstract body**:

**Purpose**: Patients with reduced mobility, short attention span and children are often unable to use table-mounted perimeters, such as the gold standard Humphrey Field Analyzer (HFA). In many ophthalmologic practices, this can impede care for a significant portion of patients. The purpose of this study was to evaluate user experience when using a Virtual Reality Perimeter (VRP) compared to the HFA in a clinical setting.

**Study Design**: Prospective, single-centre cohort study

**Methods**: The study was conducted on glaucoma suspect cases referred to our office for evaluation. 30 otherwise healthy patients were tested on each eye, on both a validated VRP (Retinalogik – Pico Neo3 Pro Eye) and the HFA. Patients then graded their experience comparing the VRP to the HFA, using a 5-point Likert scale (1=strongly favour HFA, 3=neutral, 5=strongly favour VRP), on 5 different usability measures: learning curve, comfort, ability to focus on the task, engagement, and general preference. Descriptive statistics using mean and standard deviation (SD) were used to summarize the data. Pearson's correlation coefficient was used to assess the relationship between age and each individual measure. Their prior experience (yes or no) with virtual reality (VR) and perimetry, and their usage of prescription eyewear (yes or no) were noted and a subgroup analysis with Mann-Whitney U test was conducted to evaluate for nonparametric differences. An alpha of 0.05 was used for statistical significance.

**Results**: Mean age was 64.43 (*SD*=12.30). Participants reported better user experience using the VRP compared to the HFA on all individual measures: learning curve (*M*=3.97, *SD*=0.81), comfort (*M*=4.30, *SD*=0.75), ability to focus on the task (*M*=4.10, *SD*=0.71), engagement (*M*=4.37, *SD*=0.67), and general preference (*M*=4.37, *SD*=0.72). Not one single patient favoured the HFA (range of all measures: [3-5]). There was no correlation between age and any individual measure ($R^2(30)<.05$). Subgroup analysis with the Mann-Whitney U test showed that new VR users were significantly more positive about their VRP experience compared to more experienced users on learning curve ($p<0.001$), ability to focus ($p=0.001$), engagement ($p=0.006$), but showed no difference on comfort ($p=0.51$) and general preference ($p=0.27$). The U test showed no statistically significant difference when looking at prior VF experience and glasses usage.

**Conclusions**: VRPs are starting to establish themselves as a serious, validated, and cheaper alternative to table-mounted perimeters, like the HFA. This study is the first to demonstrate that, even for patients able to use both devices, the VRP is what they do prefer, independent of age. It

also showed that prior VF experience or glasses did not affect this preference, while new VR users showed an even stronger bias towards VRPs' learning curve, ability to focus, level of engagement.

**Paper |** Article 4448

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**Author disclosure block**: K. Bachour: None., D. Geoffrion: None., G. Mullie: None., Y. Agoumi: AbbVie/Allergan Inc, Consultant, Lecture Fees., G. Durr: Alcon Laboratories Inc, C, R, L; AbbVie/Allergan Inc, C, R, L; Avisi Technologies Inc, C, O; Bausch and Lomb, C; Glaukos Corporation, C, R, L; Ivantis Inc, C, L; Johnson and Johnson, C; Labtician Ophthalmics Inc, C, L; MicroSurgical Technology, C, L; Nova.

**Title**: Comparison of Keratometric Change after Xen Gel Stent Implantation, Glaucoma Drainage Devices and Trabeculectomy

**Abstract body**:

**Purpose**: To compare the severity of postoperative keratometric changes and surgically induced astigmatism (SIA) after Xen Gel stent implantation, glaucoma drainage device (GDD) and trabeculectomy.

**Study Design**:Prospective, interventional, longitudinal study.

**Methods**: A total of 51 eyes diagnosed with glaucoma were stratified into 3 distinct groups, based on the type of glaucoma surgery administered between November 2020 to May 2023 : Xen Gel Stent, GDD, or trabeculectomy. GDDs included Ahmed glaucoma valve (AGV) and Baerveldt glaucoma implant (BGI). Primary outcomes included quantification of SIA at 12 months postoperatively, using Scheimpflug imaging (Pentacam) and topography (OPD-scan). Secondary outcomes included changes in best-corrected visual acuity (BCVA), intraocular pressure (IOP), number of topical medications, and complications. Differences in outcomes were compared using parametric and nonparametric tests.

**Results**: Groups included 19 Xen implants (37%), 21 GDDs (41%) (2 AGV, 19 BGI), and 11 trabeculectomies (22%). Average follow-up time was 49 ± 12 weeks. At final follow up, using Pentacam imaging, SIA was reduced (P>0.05) with Xen implants (0.37 ± 0.29) when compared to GDDs (0.58 ± 0.48) and trabeculectomies (0.51 ± 0.38). On topography imaging, SIA was comparable (P>0.05) in all groups at 12 months (0.51 ± 0.51 for Xen implants; 0.49 ± 0.58 for GDDs; 0.49 ± 0.29 for trabeculectomies). At 12 months, IOP was 13 ± 23 mmHg on 1.4 ± 1.4 glaucoma drops for Xen implants, 12 ± 4 mmHg on 2.4 ± 1.2 glaucoma drops for GDDs, and 11 ± 2 mmHg on 0.2 ± 0.7 glaucoma drops for trabeculectomies (P> 0.05 for IOP comparison between groups; P<0.001 for number of glaucoma drops comparison between groups). Mean change in BCVA was 0.07 ± 0.13 LogMAR for Xen implants, 0.01 ± 0.25 LogMAR for GDDs, and -0.11 ± 0.16 LogMAR for trabeculectomies (P>0.05) at final follow up. Number of complications were comparable between groups (P>0.05).

**Conclusions**: Xen implantation shows a trend towards less SIA compared to GDD implantation and trabeculectomy on Pentacam imaging. However, SIA appears comparable when assessed using topography.

**Paper |** Article 4343

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**Author disclosure block**: R. Zhang: None., M. Schlenker: Abbvie: consulting, honorarium; Alcon: honorarium, unrestricted grant; Bausch Health: honorarium, unrestricted grant; J&J: honorarium, unrestricted grant; Thea-Labtician: honorarium; Santen: consulting, honorarium; Zeiss: consulting, honorarium., I. Ahmed: Consultant for: Aequus, Ace Vision, Aerie Pharmaceuticals, Akorn, Alcon, Allergan, Aqua Health Inc, ArcScan, Avellino Lab USA Inc, Avisi, Bausch Health, Beaver Visitec, Belkin Vision, Beyeonics, Carl Zaiss Meditec, Centricity Vision Inc, CorNeat Vision, Custom Surgical, Elios Vision, ElutiMed, Equinox, EyeFlow Inc, EyedMed, EyeQ Technologies, Exhaura Limited, Genentech, Glaukos, Gore, Heine, Heru, Hexiris Pharma, Iantrek, InjectSense, Iridex, iStar, Ivantis, Johnson & Johnson Vision, Labtician Thea, Layer Bio, Leica Microsystems, Life Long Vision, Long Bridge Medical Inc, MicroOptx, Myra Vision/Shifamed LLC, New World Medical, Nova Eye, Ocular Instruments, Ocular Therapeutix, Oculo, Oculus Surgical, Omega Ophthalmics, PolyActiva, Pulse Medica, Radiance Therapeutics Inc, Radius XR, Rheon Medical SA, Ripple Therapeutics, Samsara Vision, Sanoculis, Santen, Sight Sciences, Smartlens Inc, Stroma, Thea Pharma, TFS Health Science, ViaLase, Visus Therapeutics, Vizzario, VSY Biotechnology, Zilia Inc. Speaker honoraria: Alcon, Allergan, Carl Zeiss Meditec, Heine, Johnson & Johnson Vision, MST Surgical. Research Grant/Support: Aerie Pharmaceuticals, Alcon, Allergan, Bionode, Glaukos, iCare, Ivantis, Johnson & Johnson Vision, New World Medical, Santen

**Title**: Combined phacoemulsification with gelatin stent vs SIBS microshunt

**Abstract body**:

**Purpose**: Compare the effectiveness and safety of combined phacoemulsification with gelatin stent or SIBS microshunt.

**Study design**: Single-center, retrospective, interventional cohort study

**Methods**: Consecutive patients who had phacoemulsification with 45µm gelatin stent (phaco-gel, n=132) or phacoemulsification with SIBS microshunt (phaco-SIBS, n=72) implantation between Jul 2015 and Dec 2018 were included. Eyes with previous subconjunctival filtration surgery were excluded. Primary outcome was the hazard ratio of treatment failure, defined as any revisions, reoperations, no light perception, or consecutive visits with IOP > 17mmHg, IOP < 6 mmHg and >2 lines of vision lost, or less than 20% reduction from baseline IOP after 3 months. “Complete” success required no medications while “qualified” success did not. Secondary outcomes included using 14 and 21 mmHg thresholds, risk factors, IOP and # classes at month 12, interventions, complications, and reoperations.

**Results**: At baseline, the phaco-gel eyes had a significantly ($p<0.05$) lower median IOP (20.0 vs 22.0 mmHg), and median #classes (3.0 vs 4.0). Phaco-gel had a significant ($p<0.05$) association with increased failure compared to phaco-SIBS at all thresholds for both complete and qualified success. Using a threshold of 17mmHg, crude HR of complete failure (95% CI) for phaco-gel was

2.29 (1.55-3.39); and 12-month complete success was 71.6% in phaco-SIBS and 42.1% in phaco-gel. At month 12, there were no significant differences in median IOP but there was a significant difference in #classes. Median IOP (IQR) was 14.0 (11.0, 18.5) in phaco-SIBS and 14.0 (12.0, 16.8) in phaco-gel ($p>0.05$); and median #classes were 0 (0, 0) in phaco-SIBS and 0 (0, 2) in phaco-gel ($p<0.05$). In phaco-SIBS, 31.9% underwent needling compared to 33.3% in phaco-gel (OR 1.1, 95%CI 0.6-2.0); 9.7% were revised compared to 6.1% (OR 1.7, 95%CI 0.6-5.0); and 1.4% had a reoperation compared to 6.8% (OR 0.2, 95%CI 0.0-1.2). The phaco-SIBS group had significantly ($p<0.05$) higher rates of choroidals (15.3% vs 0.8%), leak/dehiscence (6.9% vs 0.8%), and macular edema (5.6% vs 0%).

**Conclusion**: Phaco-gel was associated with higher rates of failure than phaco-SIBS, but phaco-SIBS was associated with higher rates of complications. Risk for failure and complications are both key considerations when choosing a surgery for patients needing combined cataract and glaucoma surgery

**Paper |** Article 4360

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**Title**: Glaucoma home monitoring with the Toronto Portable Perimeter (TPP): two-year compliance and repeatability results

**Abstract body**:

**Purpose**: Visual field tests are indispensable in monitoring patients with glaucoma. Theoretical simulations suggest that frequent (monthly or fortnightly compared to standard six-monthly) testing allows for earlier progression detection. (Anderson et al. 2017) Virtual reality perimeters can make this a reality by allowing frequent testing at home in a relaxed, convenient environment. This study aims to evaluate the compliance and repeatability of home visual field monitoring using the Toronto Portable Perimeter (TPP) by glaucoma patients.

**Study Design**: Prospective longitudinal cohort study. Methods Patients with visual field defects on the Humphrey Field Analyzer (HFA) were recruited from the Glaucoma Clinic at Toronto Western Hospital, Toronto, Canada. Each participant was instructed during a 20-minute session on how to use the TPP before taking the device home to perform TPP-Standard 24-2 visual field tests. Participants' preferences between TPP and HFA were evaluated through a questionnaire administered at the first follow-up (typically at six months). The repeatability of TPP and HFA (SITA) tests was assessed by examining the differences between consecutive test-retests with both modalities. Results Among the 25 participants (mean age: 67.4 years, range: 48–80 years, female: 48%, mean MD: −5.2 dB, range: −14.8–+1.7 dB), 72% (18/25) successfully conducted unsupervised tests at home. The mean test frequency over 2 years was 1.5 tests per month. 61% (11/18) completed ≥1 tests per month ; 33% (6/18) participants completed ≥2 tests per month. Unfamiliarity with technology and time constraints were the most cited reasons for non-compliance in retired and working participants, respectively. Participants reported that the TPP test produced less anxiety ($p=0.02$) and preferred testing with the TPP at home if frequent visual field tests were to be performed ($p<0.01$). The TPP's MD and VFI were strongly correlated with the SITA-Standard 24-2 (Pearson $r=0.86$, 0.91 for MD and VFI; $p<0.01$) and SITA-Faster 24-2C ($r=0.80$, 0.91; $p<0.01$). The test-retest repeatability for MD was similar among TPP, SITA-Standard and SITA-Faster tests (SD of test-retest differences: 1.4, 1.5, 1.5 dB, respectively; lower value indicates more consistent results). TPP's VFI test results were more consistent than those obtained by SITA-Standard and SITA-Faster (SD: 3.7%, 4.3%, 4.2%, respectively). The test duration for TPP-Standard

was on average 16 seconds shorter than SITA-Standard (5 min 24 sec vs 5 min 40 sec; p=0.004), but longer than SITA-Faster (3 min; <0.01).

**Conclusions**: Participants who used TPP at home achieved similar MD repeatability and better VFI repeatability compared to clinical HFA tests. While half of all recruited participants performed the test at least once a month, others cited complexity of technology and finding time to conduct home visual field tests as impediments to taking up frequent home testing.

**Paper |** Article 4646

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**Author disclosure block**: R. Tolba: None., A. Xu: None., L. Bussières: None., M. Hébert: Bayer Fighting Blindness Canada and Vision Health Research Network., C. Lajoie: None.

**Title**: Impact of age, corneal thickness, intraocular pressure, and preoperative use of topical carbonic anhydrase inhibitors on rates of corneal decompensation requiring corneal graft in patients with Ahmed or Baerveldt implants.

**Abstract body**:

**Purpose**: To study the impact of age at first valve implantation, corneal thickness, intraocular pressure, and preoperative use of topical carbonic anhydrase inhibitors on rates of corneal decompensation requiring corneal graft in patients with Ahmed or Baerveldt glaucoma drainage devices in a tertiary-care center.

**Study design**: Retrospective cohort study.

**Methods**: All patients operated with a glaucoma drainage device at the CHU de Québec – Université Laval between 2000 and 2021 were considered for inclusion. Patients lost to follow-up before 6 months were excluded. The primary outcomes included the impact of age at first valve implantation, corneal thickness, intraocular pressure, and use of topical carbonic anhydrase inhibitors preoperatively on the incidence of corneal decompensation requiring corneal graft.

**Results**: Of the total initial 914 eyes, 865 were included in the analysis. Median [Q1, Q3] age at first implantation was 68 [58, 76] years and median [Q1, Q3] maximum IOP was 31 [25, 38]mm Hg. Median [Q1, Q3] BCVA was 0.34 [0.14, 0.67]. Median [Q1, Q3] pachymetry was 538 [510, 571] um. In the period leading to implantation, 81% of the eyes had prostaglandin analogs, 80% had carbonic anhydrase inhibitors, 77% had beta-blockers, 57% had alpha-receptor agonists, and 8% had pilocarpine. Median [Q1, Q3] follow-up duration was 52 [21, 97] months (4 years). At follow-up, a total of 95 (11%) patients required a corneal graft. There were no significant differences in relation to age ($p=0.15$) and preoperative pachymetry ($p=0.36$) in the need for corneal graft, nor were there significant differences in the type of topical glaucoma drops used preoperatively ($p>0.05$). There were significant differences in relation to preoperative IOP between the grafted group 24 mm Hg [17, 30] and the non-grafted group 20 mm Hg [15, 28] ($p=0.006$).

**Conclusion**: Patients with a higher preoperative IOP had higher rates of corneal decompensation requiring corneal grafts.

**Paper |** Article 4566

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**Title**: Comparison of surgical outcomes of gonioscopy-assisted transluminal trabeculotomy, Ahmed glaucoma valve implantation and Baerveldt glaucoma implant in uveitic glaucoma

**Abstract body**:

**Purpose** : The purpose of this study is to compare the outcomes of three surgical interventions, namely Ahmed glaucoma valve implant, nonvalved Baerveldt glaucoma implant, and Gonioscopy-Assisted Transluminal Trabeculotomy, in patients diagnosed with uveitic glaucoma (UG).

**Study Design**: IRB-approved retrospective interventional case series.

**Methods**: We reviewed the medical charts of patients with UG who underwent different initial surgical interventions: Ahmed glaucoma valve (AGV), nonvalved Baerveldt glaucoma implant (BGI), or gonioscopy-assisted transluminal trabeculotomy (GAAT) from September 2012 to December 2022, as a standalone procedure or concomitant with cataract extraction and intraocular lens implantation. Demographics, baseline and postoperative clinical data, were extracted from medical records before surgery, at day 1, week 1, and months 3, 6, and 12 postoperatively. The main outcome was surgical success which is defined as intraocular pressure (IOP) between 6 and 21 mmHg or IOP reduction ≥20% from baseline following the third postoperative month, no secondary glaucoma surgery, and no loss of light perception. Not achieving the aforementioned IOP criteria at 2 or more consecutive visits constituted a failure. Baseline group differences were assessed using the Analysis of Variance (ANOVA) and post-hoc tests with Bonferroni correction. Success rates as a function of time was assessed by survival analyzes using Kaplan–Meier curves. To our knowledge, this study is the first to compare the outcomes of these three surgical interventions for UG.

**Results**: A final sample of 77 eyes (15 GATT, 23 AGV, 39 BGI), with a median length of follow-up of 12 months were included. The mean age was 48±15.3 years. Baseline demographics and clinical characteristics were compatible between groups. The BGI group on average experienced an IOP decrease from 32.0 ± 5.8mmHG to 15 ± 1.0 mmHG over the 12 months, with a 53% reduction ($p<0.001$) and a 78% success rate. The AGV on average experienced an IOP decrease from 34.0 ± 1.6 mmHG to 14.8 ± 2.3 mmHG over the 12 months, with a 56 % reduction ($p<0.001$) and a 82% success rate. The GATT group on average experienced an IOP decrease from 40.2 ± 5.5 mmHG to 14.2 ± 3.3 mmHG over the 12 months, with a reduction of 65% ($p<0.001$) and a 86% success rate. The BGI, AGV and GATT complication rate was 24%, 19% and 12% ,respectively ($p<0.731$).

**Conclusion**: As GDDs are currently the preferred first-line surgical intervention for UG, GATT offers a similar success rate and better safety profile. Considering the substantial risk these patients face of requiring multiple surgical interventions throughout their lifetime, GATT offers a hopeful prospect for improved long-term outcomes.

**Paper |** Article 4523

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**Title**: Glaucoma Medication Persistence Rates in Ontario – A Population Study

**Abstract body**:

**Purpose**: Effective medical treatment is a vital aspect in glaucoma management. However, despite the success of intraocular pressure lowering therapy, glaucoma medication persistence - defined as the act of continuing the treatment for the prescribed duration - remain suboptimal. Numerous factors can contribute to medication non-persistence. To date, there has been no comprehensive population-based study examining glaucoma medication persistence in Ontario, Canada. This is the first study that employs a big-data approach to elucidate treatment persistence patterns for glaucoma eye drops in this province.

**Study Design**: In this proof-of-concept study, we collaborated with the Institute for Clinical Evaluative Sciences (ICES) and conducted a retrospective population-based study utilizing data from Ontario's publicly funded healthcare system.

**Methods**: All individuals diagnosed with glaucoma who initiated medication between January 1, 2011, and December 31, 2016, were included in the study. Glaucoma was defined as patients using one or more glaucoma medications, accompanied by at least one visual field test within four months before or up to two years after medication initiation. Medication persistence was defined as maintaining a continuous supply of medications for up to two years. Partial persistence was for patients who intermittently maintained medications within the two-year period; and transient users had less than 3 refills. We further analyzed potential factors, such as age, sex and socioeconomic status (SES), that can influence medication persistence.

**Results**: From the ICES database, we identified 75,055 glaucoma patients (Figure 1). Among them, 13,150 were transient medication users (Group 1). In contrast, 61,905 patients belonged to the consecutive group. Of these, 17,462 (28.2%) achieved full persistence (Group 2); 31,125 (50.3%) patients (Group 3) experienced more than 90 days of medication interruption but later resumed their medications. The no-persistent group (Group 4, 21.5%) discontinued medications after 3 consecutive refills. The average age, average number of comorbidities, SES and sex distribution in each group are outlined in Figure 1. Among these factors, there is both an association between persistence group and SES ($p<0.01$), and with gender ($p<0.001$). Specifically, the no-persistence group have higher proportion of patients with low SES than the full-persistence group (19% vs 17%).

**Conclusions**: Our study underscores the prevalence of low persistence (28.2%) for glaucoma medications in Ontario over a 2-year period. As the next step, we will further examine other potential factors related to suboptimal medication persistence. This knowledge will facilitate the refinement of both medical practice and social policies, with the overarching aim of providing enhanced support to individuals who are grappling with these challenges.

**Paper |** Article 4588

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**Author disclosure block**: W. Herspiegel: None., R. Zhang: None., V. Patil: None., A. Vinokurtseva: None., W. Reisman: None., C. Hutnik: Consultant for: Thea, AbbVie, Viatris, Valeo, Bausch & Lomb.

**Title**: Prevalence of glaucoma risk in sleep study participants

**Abstract body**:

**Purpose**: This study seeks to investigate the association between the severity and symptom length of obstructive sleep apnea (OSA) and the risk of glaucoma.

**Study Design**: This was a prospective cohort study.

**Methods**: Patients who recently underwent a sleep study were offered participation if they met the following criteria: >40 years old, no previous glaucoma diagnosis, and no previous eye surgeries. Participants' OSA severity was stratified using the apnea-hypopnea index (AHI). The length of their OSA symptoms was determined in months. Patients received a comprehensive eye exam in which several parameters were assessed to determine glaucoma risk including intraocular pressure (IOP), cup-to-disk ratio, visual field (VF) deviation, and retinal nerve fibre layer (RNFL) thickness. A one-way ANOVA with Tukey's multiple comparisons test and linear regression was performed.

**Results**: The interim analysis (n=13) revealed a strong positive association between AHI and the cup-to-disc ratio ($r^2$=0.4331) and temporal RNFL thickness ($r^2$=0.4360). A weak positive association was found between length of OSA symptoms and mean inferior quadrant RNFL thickness ($r^2$=0.3418) as well as between AHI and mean VF deviation ($r^2$=0.3607). One-way ANOVA p-values revealed statistical significance (p-value<0.05) between the length of OSA symptoms and the following parameters: mean cup-to-disk ratio, mean average RNFL thickness, and mean superior quadrant RNFL thickness.

**Conclusions**: Preliminary data suggest a potential link between the severity of sleep apnea and glaucoma risk. These data support and warrant the need for further patient testing to better understand the association between these two diseases.

**Paper |** Article 4648

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Author disclosure block: A. Xu: None., R. Tolba: None., L. Bussières: Bayer Fighting Blindness Canada and Vision Health Research Network., M. Hébert: Bayer Fighting Blindness Canada and Vision Health Research Network., C. Lajoie: Bayer Fighting Blindness Canada and Vision Health Research Network.

**Title**: A Retrospective Study: Effect of Glaucoma type, Pre-Implant Incisional Surgery and Lens Status on the Corneal Decompensation Rates Following a Baerveldt and Ahmed Implantation in a Tertiary-Care Center

**Abstract body**:

**Purpose**: To examine the impact of glaucoma type, pre-implant incisional surgery, and lens status on the rate of corneal decompensation requiring corneal graft following the implantation of a Baerveldt or Ahmed glaucoma valve in a tertiary-care center.

**Study design**: Retrospective cohort study

**Methods**: All patients with a glaucoma drainage device at the CHU de Québec – Université Laval between 2000 and 2021 were considered for inclusion. Patients lost to follow-up before 6-months were excluded from the study. Primary outcomes were rates of corneal decompensation requiring corneal graft in relation to preoperative glaucoma type, incisional surgery, and lens status.

**Results**: This study included 865 eyes of the initial 914 eyes that underwent surgery for a glaucoma drainage implant. The median age of patients who received a glaucoma implant was 68 years. In the study cohort, the distribution of glaucoma types included primary open angle glaucomas (55%), neovascular glaucomas (11%), uveitic glaucomas (10%), primary closed angle glaucomas 7%), traumatic glaucomas (4%) and juvenile glaucomas (3%). There was a statistically significant difference between the types of glaucoma and the rates of corneal decompensation requiring corneal grafts ranging from 2.1% of patients with GNV to 23% of patients with traumatic glaucoma ($p = 0.008$). Patients with a previous incisional surgery (e.g., trabeculectomy, bleb-forming implants) had higher rates of corneal decompensation requiring corneal graft (with incisional surgery: 14% vs. without incisional surgery: 7%; $p<0.001$).

**Conclusion**: Traumatic glaucomas displayed the highest rate of decompensation requiring corneal graft. Patients with a history of incisional surgery equally had higher rates of corneal decompensation at follow-up. Our findings suggest that patients with traumatic glaucoma or patients with a history of incisional surgery may need more frequent follow-ups after valve implantation.

**Paper |** Article 4475

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**Author disclosure block**: M. Bondok: None., R. Selvakumar: None., NK. Bakshi: None., T. Felfeli: None.

**Title**: Evaluating the performance of ChatGPT in responding to patient eye health queries

**Abstract body**:

**Purpose**: We evaluated the ability of ChatGPT, an AI Chatbot, to respond to patient eye health queries.

**Study Design**: Cross-sectional study.

**Methods**: We conducted an analysis of eye health questions and physician responses posted on the American Academy of Ophthalmology (AAO) 'Ask an Ophthalmologist' forum from January 2015 to December 2022. We compared board-certified ophthalmologists' responses to ChatGPT (version GPT-3.5, OpenAI) responses. Primary outcomes included automated AI-rated similarity and accuracy of ChatGPT responses, relative to ophthalmologist responses. Secondary outcomes included readability, empathy, and length of ChatGPT responses compared to ophthalmologist responses.

**Results**: A total of 1,079 questions and responses from 41 board-certified ophthalmologists were assessed. The mean similarity score for ChatGPT responses compared to the AAO responses was 68% (SD=22%). The mean accuracy of ChatGPT responses, when AAO responses were considered the 'gold standard', was 90% (SD=8%). Ophthalmologist's responses had a lower mean Flesch-Kincaid Grade Level (Grade 11.0 [SD=2.7] v Grade 13.6 [SD=2.0], t=27.7, p<0.001) than chatbot responses, making them easier to understand. Ophthalmologist responses were significantly shorter than ChatGPT responses (80.6 [SD=56.4] words v (130.1 [SD=48.2] words, t=21.9, p<0.001). Empathy scores of ChatGPT responses were rated as not being significantly different from ophthalmologist responses (2.46 [SD=0.50] v 2.43 [SD=0.48], t = 0.359, P =0.72).

**Conclusions**: Our findings suggest that ChatGPT has acceptable similarity and good accuracy compared to ophthalmologists' responses for answering patient eye health queries. AI chatbots may be useful in drafting initial responses to patient ocular concerns, potentially increasing efficiency and reducing workload.

**Paper |** Article 4608

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**Title**: PreserFlo MicroShunt Versus Trabeculectomy in Patients with Moderate to Advanced Glaucoma: 12 Month Follow up in a Canadian Centre.

**Abstract body**:

**Purpose**: The study compares the efficacy and safety of PreserFlo microshunt and trabeculectomy in eyes with moderate to advanced glaucoma.

**Study Design**: Retrospective chart review of cases with 12 months follow up data available.

**Methods**: 132 eyes were treated with either PreserFlo or Trabeculectomy. In the PreserFlo group there were 70 eyes. In the Trabeculectomy group there were 62 eyes. The efficacy was evaluated by reduction of intraocular pressure (IOP) and glaucoma medication usage at 12 months post surgery.

**Results**: In the Trabeculectomy group 11% were classified as failures with 3 requiring reoperation with an Ahmed Glaucoma Valve or PreserFlo. Three more required revision surgery. One patient had persistent hypotony with vision loss. In the PreserFlo group 12% of cases were classified as failure (Requiring reoperation with trabeculectomy, PreserFlo, revision or Ahmed valve). An additional 13% still required glaucoma medications to achieve target IOP. In the PreserFlo group IOP was reduced from 25.2 mmHg to 12.12 mmHg. Medications were reduced from 3.6 to 0.8. Diamox use was reduced from 22 patients requiring it to 4 patients. Surgical revision was required for 8 patients. In the trabeculectomy group mean IOP was reduced from 29.7 mmHg to 8 mmHg. Medications were also reduced from 3.2 drops to 0.5. Diamox was reduced from 22 patients requiring Diamox to 4 patients remaining on it at one year post surgery.

**Conclusion**: Both surgeries significantly reduced intraocular pressure and medication use for patients with moderate to advanced glaucoma. The reoperation, failure rate, and complication rates were similar. Trabeculectomy was more reliable to achieve lower IOP with less dependence on glaucoma medications.

**Paper |** Article 4603

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**Author disclosure block**: R. Michael: None., V. Kheir: None., C. Baril: None., B. Desmarchais: None., C. Lajoie: None., A. Goyette: None., J. Wang: None., A. Toren: None.

**Title**: Ahmed Valve vs Baerveldt Tube implantation in Uveitic Glaucoma

**Abstract body**:

**Purpose**: To compare the safety and efficacy of Ahmed (AI) and Baerveldt (BVT) drainage device implantion in uveitic glaucoma treatment.

**Study design**: Retrospective comparative study

**Methods**: Patients with uveitic glaucoma that underwent Ahmed or Baerveldt valve implantation between 2007 and 2020 in a single tertiary academic referral center were included. Patients were followed for over a year and intraocular pressure (IOP) had to be over 21mmHg on maximal medical treatment. Treatment success was defined as post-operative IOP < 21mmHg with or without drops and IOP reduction of ≥ 20 mmHg. Failure was defined as post-operative IOP > 21mmHg or IOP < 5 mmHg, need of another surgery and decreased vision to no light perception.

**Results**: In total, 161 patients with uveitic glaucoma were reviewed. 101 patients received an AI and 61 patients received a BVT. Mean age was 56.08 (SD 19) years old in the AI group, and 63.81 (SD 13.66) years old in the BVT group (P-value = 0.0339). Other baseline characteristics were similar in both groups. Chronic anterior uveitis was the most frequent diagnosis. Mean change in best corrected visual acuity (BCVA) was similar in both groups (P-value = 0.8171). Mean post-operative IOP was of 13.5 mmHg AI, and 11 mmHg BVT (P-value = 0.0341) at one year of follow-up (FU); and 13.11mmHg AI and 9.89mmHg BVT (P-value = 0.0117) at two-year FU. IOP reduction was similar in both groups (P-value = 0.4933), as well as the mean number of drops (P-value = 0.5970). Success rates were higher in the BVT group (81.1% BVT vs 74.6% AI), but the difference was not statistically significant. Hypotonia rates were 15.4% and 28.5% in AI and BVT groups, respectively (P-value = 0.2166). More complications were observed in the BVT group, the difference was not significant (P-value = 0.0744).

**Conclusion**: Both implants seem to offer similar results in uveitic glaucoma. BVT implant tends towards better success rates, but also more complications, specifically hypotony, requiring reintervention. This study presents further clarity on the risks and benefits of surgical management in patients with uveitic glaucoma, which can guide therapeutic treatment options.

**Paper |** Article 4139

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**Author disclosure block**: TE. Zhou: Grant/research support: Glaucoma Research Society of Canada, Fighting Blindness Canada, PSI Foundation of Canada. D. Mathew: None., K. Wigg: None., C. Balian: None., I. Kherani: None., M. Schlenker: None., J. Sivak: None.

**Title**: Molecular profiles in different stages of primary open angle glaucoma – a prospective study

**Abstract body**:

**Purpose**: Glaucoma is a sight-threatening condition affecting over 400,000 Canadians and 67 million individuals worldwide. Primary open-angle glaucoma (POAG) constitutes 85-90% of glaucoma cases in developed countries. The prevailing theory suggests that POAG stems from trabecular meshwork (TM) dysfunction, resulting in increased intraocular pressure (IOP). However, some POAG patients continue to deteriorate despite normal IOP, and there has been no study correlating the molecular profile in aqueous humor (AH) with glaucoma progression. This knowledge gap is concerning given glaucoma's natural history of progression. This project aims to analyze cytokines in AH from POAG patients to establish a correlation with disease severity.

**Study Design**: Prospective comparative study.

**Methods**: Research ethics approvals were obtained from Toronto Western Hospital and Kensington Eye Institute, University of Toronto. Three patient groups (control, mild glaucoma, advanced glaucoma; n = 10 per group) were identified and consented. Glaucoma staging was based on visual field mean deviation values within 6 months of enrollment. AH samples (100 µL per eye) were collected prior to any intraocular surgery. The samples were thawed and subjected to quantitative multiplex cytokine analysis using RayBio® C-Series Human Cytokine Antibody Array C1000.

**Results**: Each AH sample underwent analysis of 8000 molecules. Remarkably, when compared to the control and mild glaucoma groups, the advanced glaucoma group exhibited significant changes of proinflammatory cytokines (e.g., interleukin [IL]-1, IL-17, IL-6), immune modulators (CD74, CD40 and CD40 ligand), structural proteins (e.g., matrix metalloproteinases), and mostly intriguingly, angiogenic factors (e.g., angiopoietin-1/2 which played an important role in POAG and primary congenital glaucoma based on animal models and human genetic studies). Gene ontology (GO) analysis highlighted multiple pathways related to immune activation and regulation in the advanced glaucoma group when compared to the mild group.

**Conclusions**: This pilot study seeks to correlate disease stages with potential aggravating factors via large-scale molecular analysis. The plethora of identified pathways in advanced POAG patients may collectively contribute to disease progression. Our forthcoming endeavors entail the validation of these pathways within an experimental POAG model, along with a correlation of expression levels with clinical parameters from the same patient cohort. Ultimately, we anticipate that a

deeper understanding of the molecular signature of POAG will provide valuable insights for the management and treatment of these patients.

**Paper |** Article 4231

**Authors**: Ahmed Abdelaal, Jeb Ong *Hôpital Saint-Sacrement*, Matthew Schlenker *Prism Eye Institute*, Ike Ahmed *Prism Eye Institute*.

**Author disclosure block**: A. Abdelaal: Employment/honoraria/consulting fees: Abbvie, Thea-Labtician, Zeiss, Aequus, Ace Vision, Aerie Pharmaceuticals, Akorn, Alcon, Allergan, Aquea Health, ArcScan, Avellino Lab USA, Avisi, Bausch Health, Beaver Visitec, Belkin Vision, Grant/research support: Aerie Pharmaceuticals, Alcon, Allergan, J. Ong: None., M. Schlenker: •Abbvie: consulting, honorarium •Alcon: honorarium, unrestricted grant •Bausch Health: honorarium, unrestricted grant •J&J: honorarium, unrestricted grant •Thea-Labtician: honorarium •Santen: consulting, honorarium •Zeiss: consulting, honorarium., I. Ahmed: None.

**Title**: Outcomes of Full 360-Degree Versus 180-Degree Trabeculotomy Without Phacoemulsification: An International Multicentre Study

**Abstract body**:

**Purpose**: To evaluate the effectiveness and safety of 360° trabeculotomy versus 180° trabeculotomy. 360° opens the entire trabecular meshwork,[1] which may be unnecessary or of little benefit over opening 180°.[2]

**Study Design**: Multicentre, consecutive, retrospective cohort study.

**Methods**: Consecutive patients >40 years old undergoing either 360° or 180° trabeculotomy without phacoemulsification, at one of 9 participating centres (Canada, Turkey, Japan) between June 2015 and November 2021 were compared. Primary outcome was surgical success (primary success) at 1 year follow-up, defined as IOP <18mmHg, and 1) ≥20% IOP reduction from baseline on same number of medications, or 2) IOP ≤ baseline on fewer medications. Secondary outcomes included complete success (no medications allowed) and qualified success (medications allowed) at IOP threshold of 17 mmHg, post-operative IOP, medication use, complications, interventions, and reoperations.

**Results**: A total of 263 eyes were included (360° group: n=154; 180° group: n=109). Eyes in the 360° group had a significantly higher baseline median IOP of 24mmHg (IQR 19.50-32.00) on 3 medication classes compared to 21mmHg (IQR 17.00-27.75) on 3 classes in the 180° group ($P < 0.01$). Other baseline characteristics showed no difference between groups. After 1 year follow-up, the 360° group demonstrated a significantly higher primary success rate than 180° (49.4% vs. 29.1%; $P = 0.002$). The crude hazard ratio of failure for 180° relative to 360° trabeculotomy was 1.72 (95% CI 1.20-2.45). Complete success showed no significant difference between groups ($P = 0.28$), although qualified success favored the 360° group (42.5% vs. 27.8%; $P = 0.008$). At 12 months, mean post-operative IOP in the 360° group was 14.86mmHg (±5.76) on 1.56 (±1.45) classes compared to 14.3mmHg (±6.21) on 1.55 (±1.438) classes for the 180° group. Post-operative complications were generally higher in the 360° group, with hyphema ≥2mm (22.7% vs 3.7%; $P < 0.001$), severe corneal edema (5.2% vs 0%; $P = 0.023$), and macular edema (3.9% vs. 0%; $P = 0.043$)

occurring at a significantly higher rate compared to the 180° trabeculotomy group. Reoperation rates were similar between groups (360°: 25.97%; 180°: 25.69%; $P > 0.05$).

**Conclusions**: This international multicentre study provides evidence for the efficacy of full 360° trabeculotomy without phacoemulsification, demonstrating higher surgical success and IOP-lowering effect at one year post-operatively than the 180° trabeculotomy group. However, this benefit should be carefully weighed against the significantly higher risk of post-operative hyphema, corneal edema, and macular edema.

**Paper |** Article 4183

**Authors**: Nicole Costanzo, Nicholas Bel MSc, PhD Student *Lakehead University*, Neelam Khaper PhD *Northern Ontario School of Medicine University*, Sanjoy Gupta MD, PhD, FRCSC *Northern Ontario School of Medicine University*.

**Author disclosure block**: N. Costanzo: None., N. Bel: None., N. Khaper: None., S. Gupta: None.

**Title**: How Prostaglandin Analogues and the PTGFR do the (PRESTO-) Tango

**Abstract body**:

**Purpose**: The current first-line treatment for glaucoma are prostaglandin analogues (PGAs). These mimic the interaction between the Prostaglandin F2alpha molecule (PGF2α) and the Prostaglandin F receptor (PTGFR). The PTGFR is located on trabecular meshwork cells and when activated, increases the outflow of aqueous humour from the eye to lower intraocular pressure.There is currently a gap in the literature regarding the exact molecular interaction between PGAs and the PTGFR. Directly treating trabecular meshwork cells with PGAs for example, does not account for pleiotropic downstream cellular effects such as proliferation and differentiation, making data difficult to interpret. Moreover, there remains a need for improved efficacy and adjuvant therapies to enhance our therapeutic index of glaucoma treatments. Our study aimed to observe the interaction between various PGAs and the PTGFR in an isolated cell culture model using a modified PRESTO-Tango reporter assay developed by Kroeze and colleagues (2015). This provides a measurable luminescence response equal to receptor-ligand interaction, allowing a better definition of their interactions and determination of which PGA concentrations caused the greatest receptor activation.

**Study Design**: Basic science study

**Methods**: HTLA cells were transfected with the PTGFR-Tango plasmid and treated with increasing doses (0.1μM, 1μM, and 10μM) of Latanoprost, Monoprost, Travoprost, and Bimatoprost. HTLA cells were treated with PGF2α as a positive control, and the synthetic antagonist AL-8810 as a negative control. Luminescence readings were obtained via Bright-Glo Luciferase Assay.

**Results**: The 0.1μM Latanoprost and Monoprost treatments were found to have the greatest receptor activation from the concentrations tested, with 14.50% and 9.99% ($p<0.05$) receptor activation, respectively. The 1μM Travoprost treatment was found to have the greatest PTGFR activation from the concentrations tested with 76.53% ($p<0.05$) receptor activation. As expected, the Bimatoprost treatments did not yield a significant response, likely due to its prostamide activity reported in the literature.

**Conclusions**: We have established a working model to compare and standardize the receptor activation response of existing PGAs with the PTGFR. This holds the potential for future work to screen possible adjuvant therapies, as well as discover new drugs to further improve glaucoma management.

**Global and Public Health Ophthamology | Ophtalmologie mondiale et la santé publique**

**Paper |** Article 4571

**Authors**: Kourosh Sabri, Yasmin Jindani *McMaster University*.

**Author disclosure block**: K. Sabri: None., Y. Jindani: None.

**Title**: Visual Status of Metis Children in Northern Saskatchewan

**Abstract body**:

**Purpose**: Indigenous children often exhibit higher rates of avoidable vision impairment (VI) which can be partly attributed to limited access to eye care services. This study aims to report on the prevalence of VI in Metis children living in remote, underserved regions of northern Saskatchewan, Canada, as well as the feasibility of the expansion of the Indigenous Children eye Examination (ICEE) project as an eye care delivery model to improve access to eye care for Indigenous (First Nation, Metis and Innuit) communities across Canada.

**Study Design**: Retrospective chart review

**Methods**: This study comprised of 50 Metis children, aged 1 year to 18 years of age. At least one comprehensive eye examination, including a cycloplegic refraction, was provided in Île-à-la-Crosse, SK in May 2023.

**Results**: In Saskatchewan, 50 children (range 1-18 years, mean 8.1 years, median 8.0 years) received eye examinations. Of the 50 children examined, 38 (76%) received their first eye examination and 31 (62%) required prescription eyeglasses to improve their vision. Of the 100 eyes examined, 4 (8%) experienced mild VI, 2 (4%) experienced moderate VI, and 0 experienced severe VI. The prevalence of astigmatism was 47% (-0.50DC up to -5.00DC), myopia was 11% (-0.50DS up to -1.75DS), and hyperopia was 36% (+0.50DS up to +3.50DS).

**Conclusions**: These findings suggest high rates of uncorrected refractive error, particularly astigmatism and highlights the urgent need to implement and expand eye care delivery models to improve vision care access for Indigenous children in remote communities across Canada.

**Paper |** Article 4437

**Authors**: Jacqueline Coblentz, Bryan Arthurs *McGill University*, Christian El-Hadad *McGill University*.

**Author disclosure block**: J. Coblentz: None., B. Arthurs: None., C. El-Hadad: None.

**Title**: Challenges in Establishing a Diabetic Retinopathy Screening Program in Northern Quebec

**Abstract body**:

**Purpose**: Indigenous populations, such as those in Canada, face a significantly higher prevalence of type-2 diabetes, with rates 3 to 5 times higher than the general population. Various factors, including genetic predisposition, environmental factors, poverty, limited resources, and multiple barriers, such as geographical isolation, education disparities, employment challenges, and cultural and linguistic differences, contribute to the disproportionate impact of diabetes on Indigenous communities. Notably, Indigenous individuals are diagnosed at a younger age, exhibit more severe diagnoses, experience higher rates of complications, and achieve poorer treatment outcomes. Over the last two decades, advances in digital fundus photography have improved both image quality and device portability, enhancing DR screening in remote areas where diabetic patients reside. Despite the presence of trained professionals from Montreal willing to travel to Northern Quebec, several challenges impede the implementation of an effective DR screening program. Our goals are to identify and elucidate the barriers hindering the successful implementation of a diabetic retinopathy screening program; and to quantify the number of patients scheduled for screening versus those who actually attend their appointments.

**Study design**: descriptive study.

**Methods**: This project involves diabetic patients of all age groups residing in the 14 villages of Northern Quebec. The screening program for diabetic retinopathy entails dispatching ophthalmologists or nurses from the McGill Academic Eye Centre in Montreal to Northern Quebec. Fundus images are obtained using a mobile retina camera (Visuscout® 100 from Zeiss) and analyzed for the presence or absence of diabetic retinopathy. Essential components include access to office space within a hospital or clinic, an appointment scheduling assistant, a local nurse to assist with patient flow, and a translator.

**Results**: Visits to Northern Quebec faced cancellations due to various reasons, including a lack of available office space due to concurrent specialist presence, insufficient personnel to contact and schedule patient appointments, a shortage of local nurses to assist during appointments, and an absence of translators. Between March and August 2023, three visits occurred, with 119 patients scheduled for screening, of which 45 (37.81%) were absent.

**Conclusion**: Barriers for patient attendance at scheduled appointments are multifactorial. These include a large geographic distance, limited examining room space, limited nursing and administrative personnel and limited translators.

**Paper |** Article 4184

**Authors**: Fannie Nadeau, Mazen Choulakian *Department of Ophthalmology, University of Sherbrooke*, Alexandre Suey *Department of Psychiatry, University of Sherbrooke*, Mathieu Fradet *Department of Psychiatry, University of Sherbrooke*, Sylvain Grignon *Department of Psychiatry, University of Sherbrooke*.

**Author disclosure block**: F. Nadeau: None., M. Choulakian: None., A. Suey: None., M. Fradet: None., S. Grignon: None.

**Title**: Presenting visual impairment among inpatients with psychotic disorders

**Abstract body**:

**Purpose**: The objective of this study was to characterize the presenting ophthalmologic condition of patients hospitalized for psychotic illness, to assess to which extent the presenting visual deficits could be corrected and to evaluate the impacts of visual impairment on the concomittant psychotic disease.

**Study design**: This cross-section observational study used a simple random sample of 101 psychiatric inpatients diagnosed with psychotic illness in a tertiary care center in a North American setting.

**Methods**: A complete ophthalmologic examination was conducted, including presenting visual acuity and best-corrected visual acuity after optical refraction. Sociodemographic data and measures of psychopathology and functioning (CGI-S score, duration of current hospitalization, total duration of hospitalizations in the past two years) were obtained through medical records, interviews, and the patient's psychiatric team.

**Results**: 23.8% (95%CI [15.9-33.3]) of inpatients diagnosed with psychotic illness had significant binocular presenting visual acuity deficit (defined as 20/40 or worse), 91.7% (95% CI: [73.0-99.0] of which were corrected to a normal range (20/25 or better) with adequate optical correction.16.8 % (95% CI [10.1-25.6]) had a 20/50 or worse visual acuity. A median of 3 years had elapsed since the patients' last vision examination. When patients with VA deficits were compared to patients without VA deficits, the former were found to have longer total durations of hospitalization in the last two years (p= 0.013), and a mild correlation was found between the total length of hospitalization in the last two years and the severity of visual deficits.

**Conclusions**: This study, using a complete ophthalmologic examination, demonstrates that presenting visual deficits in psychotic inpatients are both prevalent and easily rectifiable. Considering the possible impacts of visual impairment on daily functioning and psychotic symptoms, clinicians should consider screening for visual deficits in this population.

**Paper |** Article 4242

**Authors**: Sidratul Rahman, Jacquelin Coblentz *McGill University*, Abed Baiad, Bryan Arthurs *MUHC*, Christian El-Hadad *MUHC*.

**Author disclosure block**: S. Rahman: None., J. Coblentz: None., A. Baiad: None., B. Arthurs: None., C. El-Hadad: None.

**Title**: Evaluating Quality of care and post-operative outcomes for Inuit patients in Nunavik

**Abstract body**:

**Purpose**: Indigenous patients in Nunavik face numerous challenges in accessing healthcare services, including limited access to cataract surgery, which requires extended leaves from their communities. With the substantial need for more research and quality improvement measures for Indigenous populations, we aim to examine current practices in place for Nunavik.

**Study design**: Retrospective chart review

**Methods**: Records of all Inuit patients undergoing cataract surgery at the McGill University Health Centre, the primary service centre for Inuit health, were reviewed from 2018 until 2023. The number of patients and timing of pre- and post-op visits were recorded. Baseline parameters, such as pre- and post-op best corrected visual acuity (BCVA), intraocular pressure (IOP), ocular or systemic comorbidities, and intra-op or post-op complications were collected.

**Results**: 150 patients (252 eyes) were included. 97% of patients had a post-op day 1 (POD1) visit, while 95% and 8% of patients had post-op week 1 (POW1) and post-op month 1 (POM1) visits, respectively. 27 patients had bilateral cataracts, while 198 patients had unilateral cataract surgery. The mean time for the first post-op visit was 1 ± 0.0 days, the second post-op visit was 7.12 ± 2.43 days and the third post-op 36 ± 14.44 days. Patient compliance with scheduled appointments was 100% for POD1, 97% for POW1 and 85% for those scheduled for POM1. Patients saw a mean improvement of BCVA from 0.35 ± 0.29 (LogMAR) at PO visit 1 to 0.14 ± 0.19 (LogMAR) to the latest post-op visit (n=168 eyes). No post-op complications were observed for any of the patients. No difference in safety or efficacy outcomes was observed between POD1 and POW1 visits. Furthermore, there was no difference in BCVA or complication rates between patients who underwent unilateral vs. bilateral cataract surgery. Patients travelled at least 1572.5 KM from their homes to stay in Montreal for surgery and PO visits.

**Conclusions**: Our data shows no significant difference in outcomes between POD1, POW1 and POM1 visits, with a nearly 100% compliance rate for Inuit patients. This may suggest that it may be useful to reduce the timing of POW1 visit, (e.g., to 3 days) and promote follow-up through telemedicine or local optometrists located in Nunavik to minimize the time patients spend away from home. Ultimately, shorter postoperative stays in urban centres may significantly improve patient well-being and potentially save costs that can be reinvested in addressing healthcare disparities for patients from Nunavik communities.</p>

**Paper |** Article 4481

**Authors**: Hong-An Nguyen, Pushpinder Kanda University of Ottawa, Department of Ophthalmology, David Maberley University of Ottawa, Department of Ophthalmology.

**Author disclosure block**: HA. Nguyen: None., P. Kanda: None., D. Maberley: None.

**Title**: Prevalence and etiologies of visual impairment in the Ottawa inner-city population

**Abstract body**:

**Purpose**: The inner-city homeless population in Canada is four times more likely to developing visual impairment compared to the general Canadian population. Low vision can fuel the disparity in health equality as it is makes more difficult to seek medical care for example, traveling to clinic is more challenging and difficulty obtaining employment makes it harder to afford healthcare. The Homeless population in Ottawa has increased by 25% since 2014 to 2019 and continues to grow. Currently there is no epidemiological data on the prevalence of visual impairment in the Ottawa inner-city population. In this study, we aim to collect data and identify the burden of visual impairment and the type of eye disease for the inner-city population in Ottawa, Canada.

**Study design**: Retrospective chart review

**Methods**: Retrospective data will be collected from charts of patients seen at the Ottawa Inner City Health (OICH) for ocular eye exam. At least 100 charts will be reviewed. Outcomes will report the percentage of different ocular diseases (e.g., refractive error, diabetic retinopathy, etc.) and patient demographics (e.g., age, gender, ethnicities, medical co-morbidities).

**Results**: Ninety-five patients have received eye care at the OICH over 18.5 months. Pathology includes refractive error (63% of patients), retina (25.4%, e.g. diabetic retinopathy), cataract (13.6%), glaucoma (13.7%), cornea (6.3%, e.g. scarring), ocular surface disease (3.2% e.g. blepharitis), neuro-ophthalmology (5.2% e.g. strabismus), and others (7.4% e.g. posterior capsule opacification, episcleritis). Thirty-two percent of the patients required referral for cataract surgery or assessment by an ophthalmology subspecialist.

**Conclusions**: This will be the first study to provide epidemiological data on the prevalence of visual impairment in the Ottawa inner-city population. In the long run, this study will provide benefits for the inner-city population as it will help determine causes of ocular disease and if they can be preventable or easily reversed (e.g. providing refractive correction). Data form this study can be used to tailor specific outreach programs to help minimize ocular healthcare inequalities.

**Paper |** Article 4171

**Authors**: Keean Nanji, Felicia Tai MD *McMaster University*, Michele Zaman MSc *Queen's University*, Jane Jomy MSc *Univeristy of Toronto*, David Mikhail BAS *University of Toronto*, Mark Phillips PhD *McMaster University, Department of Health Research Methods*, Dena Zeraatkar PhD *McMaster University, Department of Health Research Methods*, Tien Wong MBBS, MMED (Ophth*) Singapore Eye Research Institute, Singapore National Eye Centre*, Sobha Sivaprasad FRCOphth NIHR *Moorfields Biomedical Research Centre, Moorfields Eye Hospital*, Charles Wykoff MD, PhD *Retina Consultants of Texas*, *Blanton Eye Institute, Houston Methodist Hospital*, Varun Chaudhary MD, MSc *McMaster University, Department of Health Research Methods*.

**Author disclosure block**: K. Nanji: None., F. Tai: None., M. Zaman: None., J. Jomy: None., D. Mikhail: None., M. Phillips: None., D. Zeraatkar: None., T. Wong: None., Wykoff: Consulting for Acuela, Adverum Biotechnologies, Inc, Aerpio, Alimera Sciences, Allegro Ophthalmics, LLC, Allergan, Apellis Pharmaceuticals, Bayer AG, Chengdu Kanghong Pharmaceuticals Group Co, Ltd, Clearside Biomedical, DORC Dutch Oph., V. Chaudhary: Advisory board member, grants and other from Novartis; acting as an advisory board member, grants and other from Bayer; grants from Allergan; acting as an advisory board member and grants from Roche; acting as an advisor.

**Title**: The Prevalence of Diabetic Retinopathy in Indigenous Versus Non-Indigenous Populations in Canada: A Systematic Review and Meta-Analysis

**Abstract body**:

**Purpose**: Indigenous Canadians disproportionately suffer from higher rates of diabetes and diabetes-related complications compared to non-Indigenous Canadians. Previous studies evaluating the rates of diabetic retinopathy in Indigenous and non-Indigenous Canadians have demonstrated conflicting results. The purpose of this investigation is to compare the prevalence of diabetic retinopathy (DR) in adult Indigenous Canadians compared to non-Indigenous Canadian patients with diabetes.

**Study Design**: Systematic review and meta-analysis.

**Methods**: This systematic review was registered, and all analyses were pre-specified on PROSPERO (CRD42023464825). Ovid MEDLINE, EMBASE, and Web of Science Databases were searched from inception until July 30$^{th}$, 2023, for studies evaluating the prevalence of DR in Indigenous or non-Indigenous Canadian diabetics. Two independent reviewers in duplicate reviewed all titles, abstracts, and full texts, performed data extraction, and conducted risk of bias assessments according to the Joanna Briggs Institute Appraisal Checklist for Prevalence Studies. The prevalence between groups for the following outcomes were compared: a) any stage of DR, b) diabetic macular edema (DME), c) proliferative diabetic retinopathy (PDR), d) vision-threatening diabetic retinopathy (VTDR), e) PDR complications. Meta-analyses and multivariable meta-regressions were performed using Freeman Tukey double arcsine transformation and random-effects modelling. Analyses were performed in R (version 4.3.1).

**Results**: Sixteen studies comprising 17,989 individuals were included. The studies reporting prevalence rates in Indigenous individuals included younger patients (50.9 years vs. 57.7 years; p=0.009), had a higher proportion of females (0.63 vs. 0.53; p=0.007), and had lower appraisal scores (79% vs 93%; p=0.025). There was no difference between groups in the prevalence of DR (0.33 vs. 0.30; p=0.788), prevalence of DME (0.04 vs. 0.04; p = 0.591), or prevalence of PDR (0.02 vs 0.03; p=0.314). The rate of VTDR was higher in the Indigenous group (0.14 vs 0.06; p=0.021). No study reported rates of PDR complications. Post-hoc analyses evaluating the prevalence of DR between groups remained non-significant after adjusting for age (p=0.272), and appraisal score (p=0.087).

**Conclusion**: There was no difference in the prevalence of DR, PDR, or DME in Indigenous and non-Indigenous groups. The rate of VTDR was higher in the Indigenous group suggesting that Indigenous patients have more severe disease. Studies of indigenous individuals included younger patients and had lower methodologic quality scores thus potentially underestimating the disease burden in the indigenous population. Building on current efforts to deliver high-quality, culturally appropriate care targeted at reducing risk factors and removing barriers to care in Indigenous communities must remain a public health priority.

**Paper |** Article 4572

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**Author disclosure block**: KZY. Huang: Grant/research support: Institute of Medical Science, University of Toronto, Glaucoma Research Society of Canada., M. Popovic: None., P. Yan: None., Y. Buys: Grant/research support: Glaucoma Research Society of Canada., G. Trope: None., Y. Jin: Grant/research support: Glaucoma Research Society of Canada.

**Title**: Eye care utilization trends in Ontario's public healthcare system: A 20-year population-based study

**Abstract body**:

**Purpose**: To investigate ocular care utilization trends in Ontario's universal health care system from 1997-2019.

**Study Design**: Retrospective, population-based study.

**Methods**: Using physician billing data from the Ontario Health Insurance Plan (OHIP), we calculated annual eye-visits per 100 population from 1997-2019, stratified by age-group, urban/rural residency, emergency/non-emergency visit, and physician specialty.

**Results**: In Ontario, non-emergency eye-visits (including revisits) increased by 4.6 million (67%) from 1997 (6.9 million) to 2019 (11.5 million). Per 100 population, the number of non-emergency visits increased by 32% from 58.4 to 76.9. Emergency eye-visits only slightly increased (2.9%, from 135,147 in 1997 to 139,023 in 2019). Between 1997 and 2019, among individuals with an eye-care visit, the average annual number of visits per patient increased by 63% from 1.9 to 3.1 for non-emergency cases, and emergency cases exhibited little change (1.2-1.4). Excluding revisits, distinct eye patients per 100 population decreased from 32.7 to 26.6 (19%) for non-emergency visits and from 1.8 to 1.4 for emergency visits, from 1997-2019. Per 100 population, urban residents exhibited a higher rate of non-emergency visits between 1997-2019 compared to rural residents (94.9 urban vs 90.6 rural). In emergency cases, per 100 population, the visit rate among rural patients (2.3) was more than double that of urban patients (1.0) in all study years, except 1997. Both urban and rural residents in the 20-39 and 40-64 age groups exhibited a substantial decrease in non-emergency OHIP visits to optometrists after 2004 (e.g., 60.5% in 2004 to 25.09% in 2019). Comparatively, visits to ophthalmologists increased over this timeframe (e.g., 17.5% in 2004 to 44.9% in 2019). Trends in ophthalmology and optometry visits for other age groups remained stable, except for Ontarians under 20, where an increase in optometry visits for both rural and urban populations was seen. Between 1997 and 2019, primary non-emergency diagnoses remained consistent, with myopia and conjunctivitis for age groups under 40, myopia and glaucoma in the 40-64 age group, and cataract

and glaucoma in the 65-79 and 80+ age groups. Corneal foreign body and conjunctivitis were the primary emergency diagnoses in all age-groups throughout the study period.

**Conclusions**: From 1997 and 2019, Ontario saw a 19% reduction rate in non-emergency eye patients, but a 67% increase in the total number of non-emergency eye-visits, likely due to a 63% increase in revisits per patient. Over the 22 years, urban patients had more frequent visits for non-emergency cases compared to rural patients. The visit rate for emergency cases was twice as common in rural patients than urban patients. The most common eye diagnoses in Ontarians showed little change over the study period.

**Paper |** Article 4406

**Authors**: Zayd Khan, Khalid Hasanee *McMaster University Glaucoma Programme*, Hasan Khan *St. George's University School of Medicine*.

**Author disclosure block**: Z. Khan: None., K. Hasanee: None., H. Khan: None.

**Title**: Wildfire associated ocular diseases and its prevalence in Canada: a systematic review

**Abstract body**:

**Purpose**: In recent years, the frequency and intensity of wildfires in Canada have significantly increased due to climate change, presenting a pressing concern for public health, as seen with the 2023 wildfires. Smoke and fine particulate matter released during these wildfires contain a complex mixture of irritants and toxic substances that can directly affect ocular health. Our study aims to comprehensively analyze the relationship between exposure to wildfire-related air pollutants and the development of ocular pathologies, including conjunctivitis, dry eye syndrome, retinopathy, blepharitis, and glaucoma. The objective of this study is to investigate the growing impact of Canadian wildfires and its effects on a plethora of ocular pathologies, shedding light on the potential risks posed to human eye health.

**Study Design**: This study is a systematic literature review in accordance with PRIMSA guidelines.

**Methods**: This study systematically searched and evaluated relevant research papers, scholarly articles, reports, and studies published between 2013 and 2023. Covidence was in part used to aid the search. Databases PubMed, Google Scholar, and MEDLINE were used to retrieve eligible studies. The search terms used to retrieve literature were, ‘ocular health’, ‘wildfire’, ‘ophthalmology’.

**Results**: Our search strategy yielded 84 relevant articles, specifically in relation to wildfires on multiple ocular pathologies and subsequently ocular health. Of these, 39 met our inclusion criteria. Wildfires have been shown to impact and/or play a role in causing conjunctivitis in 10 studies, dry eye syndrome in 16 studies, retinopathy in 7 studies, blepharitis in 2 studies, and glaucoma in 4 studies. Based on our systematic review it is evident that there is an association between wildfires, specifically the toxins they produce, and an increase in the prevalence of ocular pathologies.

**Conclusions**: The results of this study reinforce the fact that the recent 2023 Canadian wildfires have had a significant and multifaceted impact on ocular health. The exposure to wildfire-related air pollutants, including fine particulate matter and irritants, lead to eye related pathologies as well as the exacerbation of pre-existing conditions. This research underscores the importance of recognizing the implications of wildfires on public health, emphasizing the need for proactive measures, public awareness, and healthcare strategies to mitigate ocular health risks. The findings also highlight the broader importance of addressing climate change and wildfire prevention as a means to safeguard not only ocular health but overall well-being in wildfire-prone regions.

**Paper** | Article 4372

**Authors**: Cody Lo, Sloane Kowal *Queen's School of Medicine*, Deion D'Souza *Faculty of Medicine, University of Ottawa*, Andrew Samuel MD *Max Rady College of Medicine, University of Manitoba*, Michael Nguyen MD, FRCSC *Boston Children's Hospital/Mass Eye and Ear/Harvard Medical School*, Misty Stuti Tanya MD *Department of Ophthalmology & Visual Sciences, McGill University*, Anne Xuan-Lan Nguyen MD *Department of Ophthalmology and Vision Science, University of Toronto*.

**Author disclosure block**: C. Lo: None., S. Kowal: None., D. D'Souza: None., A. Samuel: n/a., M. Nguyen: None., MS. Tanya: None., AXL. Nguyen: None.

**Title**: Evaluation of the Virtual Introductory Summer Course in Ophthalmology (VISCO): An accessible and interactive national review course for medical trainees in Ophthalmology

**Abstract body**:

**Purpose**: To evaluate the perspectives of participants in an accessible, free, and interactive national virtual review course to support early ophthalmology trainees in grasping fundamental concepts in ophthalmology.

**Study Design**: Survey-based quality improvement study.

**Methods**: In the summer of 2022, a six-week virtual course on Zoom was run by medical students, residents, and ophthalmologists based in Canada. The curriculum was based on learning objectives in ophthalmology set by the Canadian Medical Undergraduate Leads. Surveys were facilitated *Google Forms* and contained Likert scale and open-answer questions, assessing confidence and participants' assessment of the lecturer's teaching ability, presentation style, and interactivity of the session. Pre- and post-course survey results were analyzed using a two-tailed t-test where a p-value of $<0.05$ was considered statistically significant.

**Results**: From the 445 participants registered in the 2022 VISCO, the largest group included fourth-year medical students (22.5%) and incoming first-year residents (13.7%). Attendees from all years of medical school and residency training were represented, including family and emergency physicians. A majority (67.9%) of attendees joined from institutions outside of Canada. 236 participants completed the post-session survey. VISCO was highly rated, with scores for each session ranging, out of 5 (with 5 being the highest score), between 4.56-4.77 for presentation, 4.57-4.88 for teaching ability, and 4.33-4.8 for engagement. The total mean score of all sessions was 4.72. With respect to self-perceived confidence (scores out of 10, with 10 being the highest), the pre-course scores were lowest in approaches to optical coherence tomography (OCT) (3.6/10) and diagnosis and management of basic ocular emergencies (4.92/10). The highest pre-course comfort was reported for concepts of ocular orbital anatomy (7.0/10), basic optics principles (6.36/10) and understanding the role of ophthalmologists (7.3/10). Across all topics, comfort rose significantly following VISCO attendance ($p<0.05$). Participants reported largely positive perceptions of the course and increases in confidence in their ophthalmology knowledge.

**Conclusions**: VISCO was a well-received virtual interactive course that increased access to ophthalmology education. Particiants' confidence was significantly increased in many fields of ophthalmic knowledge. Virtual interactive courses can be useful in medical education for reducing barriers to knowledge and improving trainee confidence.

**Paper |** Article 4332

**Authors**: Jeffrey Mah, Meghan McConnell Ph.D *Department of Innovation in Medical Education, University of Ottawa*, Kaisra Esmail MD *Alberta Health Services*, Irfan Kherani MD *Department of Ophthalmology & Vision Sciences, University of Toronto*, Stephanie Baxter MD, MBA *Department of Ophthalmology, Queen's University*, Bernard Hurley MD Department of *Ophthalmology, University of Ottawa, Ottawa Hospital Research Institute*, Michael O'Connor MD *Department of Ophthalmology, University of Ottawa, Ottawa Hospital Research Institute*, Chloe Gottlieb MD *Department of Ophthalmology, University of Ottawa, Ottawa Hospital Research Institute*.

**Author disclosure block**: J. Mah: None., M. McConnell: None., K. Esmail: None., I. Kherani: None., S. Baxter: None., B. Hurley: None., M. O'Connor: None., C. Gottlieb: None.

**Title**: The Canadian Ophthalmology Assessment Tool for Surgery: Development and Validation of a Surgical Assessment Tool for Ophthalmology Training Programs

**Abstract body**:

**Purpose**: Competency-based medical education emphasizes frequent work-place based assessment and requires valid and reliable assessment tools for this purpose. In ophthalmology, one area that requires assessment is surgical competence. Although multiple assessment tools have been proposed to assess surgical competence, the majority are not validated. Furthermore, all the previously proposed tools are specific to only surgical procedure or skill. The primary objectives of this study were to develop a surgical assessment tool to evaluate the breadth of surgical procedures in which ophthalmology residents are required to gain competence during their postgraduate training and to validate this tool for cataract surgery.

**Study Design**: Prospective Cohort Validation Study

**Methods**: The Canadian Ophthalmology Assessment Tool for Surgery (COATS) was developed by a group of experts by modifying the O-SCORE, a previously validated tool, to make it more specific to ophthalmology. Ophthalmology residents and faculty in the University of Ottawa Department of Ophthalmology were invited to participate in the study. Data collection was performed over a two-year period from July 1, 2021 to June 30, 2023. To examine validity, the effect of stage of training, number of cataract surgeries performed, and overall procedural independence on total COATS score was evaluated. To examine reliability, a generalizability analysis was performed.

**Results**: There were 160 COATS assessments collected across 5 residents. Mean total COATS scores were higher for the last three blocks of cataract surgery training compared to the first two blocks (4.81±0.03 vs. 4.33±0.25, p=0.012) and for procedures where the resident was rated "independent" compared to procedures where the resident was rated as "not independent" (4.74±0.06 vs. 4.26±0.13, p=0.006). There was a significant correlation between the number of cataract surgeries performed and mean total COATS score (Pearson r = 0.20, p=0.02). The overall reliability of the COATS measured using the G-coefficient was 0.39. A subsequent D-study revealed that 45 COATS assessments per resident would be required to obtain a G-coefficient of 0.70, the accepted threshold for intermediate stakes assessments.

**Conclusions**: The results of this study suggest that the COATS is a valid tool for the assessment of surgical competence in cataract surgery. There is also evidence that the COATS is a reliable tool when completed multiple times per resident over the course of training. Future research to further determine the sources of variability in COATS assessments and to model learning curves for cataract surgery is warranted.

**Paper** | Article 4219

**Authors**: Etienne Benard-Seguin, Andrew M. Pendley MD *Emory University*, David W Wright MD *Emory University*, Fadi Nahab MD *Emory University*, Nancy Newman MD *Emory University*, Valerie Biousse MD *Emory University*

**Author disclosure block**: E. Benard-Seguin: None., AM. Pendley: None., DW. Wright: None., F. Nahab: None., N. Newman: None., V. Biousse: None.

**Title**: Diagnosis of acute retinal artery occlusion in the Emergency Department (ED): Time for change!

**Abstract body**:

**Purpose**: Acute central and branch retinal artery occlusions (CRAO/BRAO) are similar to cerebral ischemic strokes and are associated with a risk of recurrent vascular events best prevented by immediate specialized Stroke Center care.Visual outcome is poor and acute treatment options are limited by often-delayed diagnosis. In the hyper-acute setting (<4.5hrs), the fundus may appear "normal", making the diagnosis challenging. Macular OCT demonstrates early inner retinal hyper-reflectivity, aiding the diagnosis of acute CRAO. However, OCT is seldom available in the ED, and ophthalmology is rarely on-site to immediately confirm the diagnosis. We evaluated the use of a nonmydriatic ocular fundus camera (NMFP) combined with OCT to facilitate ultra-rapid remote diagnosis and stroke alert for patients with acute visual loss presenting to the ED.

**Study Design**: Prospective evaluation of all CRAO/BRAO between 06/06/2023 to 10/01/2023 who had NMFP-OCT in our general ED affiliated with a comprehensive stroke center.

**Methods**: Descriptive statistics were used to summarize demographic data, time between CRAO and presentation, time between CRAO and NMFP-OCT acquisition, time between NMFP-OCT acquisition and interpretation, number of patients undergoing thrombolysis treatment and OCT changes.

**Results**: Over 17 weeks, 11 patients were diagnosed with CRAO and 3 with BRAO. Two presented within 4.5hrs, 4 within 4.5-12hrs, 8 >12 hrs. On average, NMFP-OCT was performed within 2 hrs 34 min of presentation (30 min to 7 hrs 22 min) and remote interpretation occurred on average within 39 min (0 min to 2 hrs and 33 min). Diagnosis of acute RAO was made remotely with NMFP-OCT within 4.5 hrs in 2 patients (2 hrs 30 min and 3 hrs 55 min from symptom onset to imaging). One patient received intravenous thrombolysis with their visual acuity improving from Count Fingers to 20/200. Of the 6 patients with NMFP-OCT imaging within 12 hours of symptom onset, 4 patients had subtle retinal whitening on color fundus photograph, but all had OCT inner retinal hyper-reflectivity/edema.

**Conclusion**: Implementation of NMFP-OCT in the ED enables remote diagnosis of CRAO/BRAO and facilitates initiation of an Eye Stroke protocol in acute patients. OCT complements fundus photography and provides greater diagnostic accuracy in hyperacute cases which may have a near-

normal appearing fundus. These positive preliminary results suggest that implementation of NMFP-OCT in the ED changes the approach to acute CRAO and accelerates the diagnosis of acute vision loss, potentially improving patient outcomes. Results of an additional 6 months will be presented at the conference.

**Paper |** Article 4564

**Authors**: Matthew Quinn, Danah Albreiki *University of Ottawa*, Tara Gholamian *University of Ottawa*.

**Author disclosure block**: M. Quinn: None., D. Albreiki: None., T. Gholamian: None.

**Title**: The clinical course and prognosis of incidental idiopathic intracranial hypertension (IIH) patients: the Ottawa experience

**Abstract body**:

**Purpose**: A subset of patients with IIH are diagnosed after incidental detection of optic nerve edema, and do not present because of symptoms of increased intracranial pressure (ICP). The objectives of this study were to compare the patients with incidental presentation of IIH ('incidental IIH') to those who present with symptoms of high ICP ('symptomatic IIH').

**Study Design & Methods**: This was a retrospective cross-sectional study of all patients who were referred to the Eye Institute in Ottawa, Canada between the dates of 31-Aug-2000 and 31-08-2022 for a possible diagnosis of IIH and who were later diagnosed with IIH/presumed IIH. Demographics, referring health professional, visual symptoms, systematic symptoms, visual signs, visual fields data, OCT data, (RNFL and ganglion cell complex), and neuroimaging findings were collected. Descriptive statistics were performed.

**Results**: One-hundred twenty-four patients were included: 24 had a diagnosis of incidental IIH while 100 were diagnosed with symptomatic IIH. The mean age in the incidental IIH group was 35.9 (standard deviation [SD], 4.5) and 30.3 in the symptomatic IIH group (SD, 2.3); this was a statistically significant difference (P<0.001). In the incidental IIH group, 0 (0%) were female, and in the symptomatic IIH group, 5 (5%) were female (P=0.263). In the incidental IIH group, 81.3% had no/mild grade of edema (between 0-2) in the worst eye, while in the symptomatic IIH group 61.6% had no/mild grade of edema (P=0.136). Out of all incidental patients, 25% became symptomatic and the mean time to symptom onset was 15.1 months (SD, 10.4 months). Medical treatment was required in 50%, and no surgical treatment was required in any incidental IIH patient. In the symptomatic group, 80% of the patients required medical treatment (P=0.006 vs asymptomatic patients) and 9% of them required surgical intervention (P=0.13 versus asymptomatic patients). Among incidental IIH patients, 50% received a lumbar puncture (LP) while 67.0% of the symptomatic patients received an LP (P=0.12). Among incidental IIH patients, the opening pressure of the LP was 28.95mm$H_2O$ (SD, 6.36), while for symptomatic patients it was 29.745mm$H_2O$ (SD, 10.38) (P=0.817). In terms of neuroimaging findings, 83.3% of patients with incidental IIH had features of high ICP on MRI, versus 82.0% of symptomatic IIH patients (P=0.880).

**Conclusions**: Patients with incidentally detected IIH are older than those who present because of symptoms of high ICP, however they have similar rates of optic disc edema, neuroimaging findings of high ICP, and high opening pressure on LP. Incidentally detected IIH patients are less likely to require medical treatment. Future work will compare visual outcomes between the groups.

**Paper |** Article 4122

**Authors**: Samir Touma, Tracy Aoun *University of Montreal*, Fares Antaki *University of Montreal*, Daniel Milad *University of Montreal*, Renaud Duval *University of Montreal*.

**Author disclosure block**: S. Touma: None., T. Aoun: None., F. Antaki: None., D. Milad: None., R. Duval: None.

**Title**: Papilledema and Pseudopapilledema Recognition using Artificial Intelligence: A Code-Free Automated Machine Learning Model

**Abstract body**:

**Purpose**: Papilledema is characterized by bilateral optic nerve swelling due to increased intracranial pressure. It can sometimes be challenging to distinguish papilledema from pseudopapilledema, which is defined as an abnormal elevation of the optic nerve without swelling. Automated Machine Learning (AutoML) enables the creation of artificial intelligence algorithms without requiring programming knowledge. The goal of this project is to develop a deep learning algorithm using AutoML to differentiate between papilledema and pseudopapilledema.

**Study design**: Diagnostic accuarcy study

**Methods**: An ophthalmology trainee with no previous coding experience designed a deep learning (DL) model in Google Vertex AutoML Image Classification. We used a public dataset with 1368 optic head photos produced by the Department of Ophthalmology of Kim's Eye Hospital in South Korea. Model training, validation and testing were done using this database. External validation was performed on 30 images collected from different websites.

**Results**: The AutoML model demonstrated excellent discriminating performance. The area under the precision-recall curve was 0.981. At the 0.5 confidence threshold cut-off, the overall performance metrics were as follows: precision (97.8%), sensitivity (97.8%), specificity (98.9%), and accuracy (99.0%). Looking at each subgroup specifically, precision varied from 93.5–100.0%, sensitivity varied from 96.6–100.0%, specificity varied from 98.3–100.0% and accuracy varied from 97.8–100.0%. Pseudopapilledema was the most accurately predicted subgroup (with an accuracy of 100.0%). Our model had similar performance metrics to published DL models handcrafter by AI experts, despite being the first study to look at pseudopapilledema.

**Conclusion**: A machine learning model developed without a single line of code by an ophthalmology trainee could accurately identify and classify papilledema from pseudopapilledema and normal optic nerve images with an accuracy comparable or better than models developed by experts.

**Paper |** Article 4500

**Authors**: Milena Cioana, Mariam Issa MD *Department of Ophthalmology and Vision Sciences, University of Toronto*, Marko Popovic MD MPH *Department of Ophthalmology and Vision Sciences, University of Toronto*, Laura Donaldson MD *Department of Ophthalmology, McMaster University*, Jonathan Micieli MD *Department of Ophthalmology and Vision Sciences, University of Toronto*, Edward Margolin MD *Department of Ophthalmology and Vision Sciences, University of Toronto*.

**Author disclosure block**: M. Cioana: None., M. Issa: none., M. Popovic: none., L. Donaldson: none., J. Micieli: none., E. Margolin: none.

**Title**: Analysis of diplopia referrals in a tertiary neuro-ophthalmology center

**Abstract body**:

**Purpose**: Little is known about the prevalence of morbidity and mortality in patients with diplopia who receive neuro-ophthalmology consultations. The purpose of our study was to describe the referral patterns, morbidity and mortality associated with diplopia for patients referred for a neuro-ophthalmology consultation.

**Study Design**: Retrospective chart review.

**Methods**: A retrospective chart review of all patients seen by two neuro-ophthalmologists in a tertiary practice between December 2, 2021and May 21, 2022 was performed. All patients who were referred for diplopia were included. Our primary outcome was loss of vision, while progression of symptoms or systemic morbidity or mortality without neuro-ophthalmic consult were secondary endpoints.

**Results**: Overall, 196 patients were referred for diplopia. The mean age at presentation was 61.3± 17.0 years and 48.5% were women. The most common final diagnoses reached following neuro-ophthalmology consultation were cranial nerve palsies (38.3%), convergence insufficiency and decompensated phoria (22.4%), non-neuro-ophthalmic causes (19.9%), thyroid eye disease (4.5%), myasthenia gravis (3.5%), and multiple sclerosis (3.1%). In total,15.3% of patients referred to neuro-ophthalmology for diplopia had potential of morbidity or mortality. Specifically, 1.0% had potential of vision loss due to severe papilledema in context of untreated idiopathic intracranial hypertension, and 3.0% had potential for systemic morbidity or mortality due to brain aneurysms (1.0%), pituitary apoplexy (0.5%), anaplastic glioma (0.5%) and other malignancy (1.0%). In addition,11.2% had potential for progression of symptoms due to thyroid eye disease (4.6%), myasthenia gravis (3.5%), and multiple sclerosis (3.1%). Of the patients who had a pre-referral neuroimaging study, 30.1% required additional neuroimaging after neuro-ophthalmology consultation.

**Conclusions**: Overall, 15.3% of patients with diplopia had potential for morbidity without neuro-ophthalmology consult. This study emphasizes the importance of urgent neuro-ophthalmologic referral for patients with diplopia to allow for appropriate evaluation and investigation to reduce morbidity and mortality.

**Paper |** Article 4452

**Authors**: Saffire Krance, Walter Swardfager PhD *Department of Pharmacology and Toxicology, University of Toronto*, Hugo Cogo-Moreira PhD *Department of Psychiatry, Universidade Federal de São Paulo*, Wendy Hatch OD, MSc *Department of Ophthalmology and Vision Sciences, University of Toronto*, Christopher Hudson OD *University of Waterloo, School of Optometry and Vision Science*, Peter Kertes MD, CM, FRCSC *Department of Ophthalmology and Vision Sciences, University of Toronto*, Sandra Black OC, O.Ont., MD, FRCPC, FRSC *Division of Neurology, Department of Medicine, Sunnybrook Health Sciences Centre, University of Toronto*.

**Author disclosure block**: S. Krance: None., W. Swardfager: None., H. Cogo-Moreira: None., W. Hatch: None., C. Hudson: None., P. Kertes: None., S. Black: None.

**Title**: The reciprocal predictive relationships between retinal thickness and brain volume over time in Alzheimer's disease: A random-intercept cross-lagged panel model

**Abstract body**:

**Purpose**: To understand the directionality of the predictive relationships between retinal thickness and brain atrophy over time in Alzheimer's disease.

**Study Design**: Retrospective longitudinal cohort study.

**Methods**: ADMCI subjects were recruited in the Ontario Neurodegenerative Research Initiative. They underwent spectral domain ocular coherence tomography (SD-OCT) and magnetic resonance imaging (MRI) of the brain annually. Subjects with SD-OCTs and MRIs available for at least one timepoint were included in the current study. Peripapillary retinal nerve fiber layer (pRNFL) and posterior pole OCT scans were obtained, and poor quality images and confounding retinal diseases (maculopathies and optic neuropathies) were excluded. Global pRNFL and mean macular total retinal thickness (mRT), were each summed across both eyes for analysis. Brain volumes were quantified with semi-automatic brain region extraction. The brain-parenchymal volume (BPV), an indicator of brain atrophy, was quantified by summing the brain tissue volume and dividing by the total intracranial volume. The random-intercept cross-lagged panel model (RI-CLPM) is a statistical model used to determine the direction in which selected longitudinal variables predict each other over time. Unlike other regression models, it does not assume the direction in which the variables influence each other. The model rigorously assesses the predictive relationship of each longitudinal variable on the other while controlling for all reciprocal predictions, cross-sectional relationships, and the variable's own change over time. pRNFL, mRT, and BPV were assessed in a RI-CLPM over three timepoints spanning two years, controlling for baseline age, sex, and number of apolipoprotein e4 (APOE4) alleles.

**Results**: 85 ADMCI subjects met inclusion criteria. Mean age at baseline was 71.2 (SD=8.5), and subjects were 52% male. BPV, mRT, and pRNFL showed stable progression over time, strongly predicting their subsequent timepoints. pRNFL and mRT significantly correlated with each other at cross-sectional timepoints, but neither correlated with BPV. Longitudinally, pRNFL at baseline significantly predicted BPV at year one (B=-0.05, p=0.046), but BPV never reciprocally predicted

retinal thicknesses. pRNFL and mRT did not significantly predict each other. Regarding covariates, having more APOE4 alleles predicted thicker pRNFL (B=0.220, p=0.032), but a smaller BPV (B=-0.306, p<0.001). Being older significantly predicted a thinner mRT (B=-0.185, p=0.049) and smaller BPV (B=-0.580, p<0.001). Females were likelier to have a thinner mRT (B=-0.220, p=0.029) and larger BPV (B=0.245, p<0.001).

**Conclusions**: In ADMCI subjects, retinal thickness predicted brain volume longitudinal changes, but the reciprocal did not occur, suggesting that there may by a directional relationship during ADMCI disease progression. This may be important for methods of early detection of ADMCI.

**Paper |** Article 4508

**Authors**: Saffire Krance, Wendy Hatch OD, MSc *Department of Ophthalmology and Vision Sciences, University of Toronto*, Alex Kiss PhD *Institute of Clinical Evaluative Sciences, Sunnybrook Health Sciences Centre*, Wendy Lou PhD *Dalla Lana School of Public Health, University of Toronto*, Christopher Hudson OD *University of Waterloo, School of Optometry and Vision Science*, Peter Kertes MD, CM, FRCSC *Department of Ophthalmology and Vision Sciences, University of Toronto*, Sandra Black OC, O.Ont., MD, FRCPC, FRSC *Division of Neurology, Department of Medicine, Sunnybrook Health Sciences Centre, University of Toronto*.

**Author disclosure block**: S. Krance: None., W. Hatch: None., A. Kiss: None., W. Lou: None., C. Hudson: None., P. Kertes: None., S. Black: None.

**Title**: Comparing the longitudinal rate of change in retinal thickness between different dementia types

**Abstract body**:

**Purpose**: To determine whether the rate of change in retinal thickness differs between dementia subtypes.

**Study Design**: Retrospective longitudinal cohort study.

**Methods**: Subjects were recruited within the Ontario Neurodegenerative Research Initiative (ONDRI), a multi-site cohort study. They had thorough cognitive testing, and were grouped by dementia type. They underwent spectral domain ocular coherence tomography (SD-OCT) annually. Subjects with SD-OCTs available at two consecutive timepoints were included in the current study. Subjects with vascular cognitive impairment (VCI), Alzheimer's (ADMCI), Parkinson's (PD), and frontotemporal (FTD) dementia were included. Amyotrophic lateral sclerosis subjects were excluded as too few subjects had follow-up imaging. Peripapillary retinal nerve fibre layer (pRNFL) and posterior pole scans were obtained, and were included if image quality was at least 17 and 19, respectively. OCTs included in ONDRI were rigorously screened by ophthalmologists to exclude confounding maculopathies, optic neuropathies, and prior retinal surgeries. Two linear mixed models were performed to assess the effects of dementia type on the percentage change over one year in (a) global pRNFL thickness and (b) mean macular total retinal thickness (mRT). Subject identification numbers were included as a random effect, controlling for within-subject bias. Percentage change was calculated as (thickness at year 1 – thickness at baseline) / thickness at baseline.

**Results**: 507 eyes from 259 subjects met inclusion criteria for the pRNFL model (eyes = 135 ADMCI, 41 FTD, 177 PD, 154 VCI), and 499 eyes from 257 subjects met inclusion for the mRT model (eyes = 134 ADMCI, 39 FTD, 174 PD, 152 VCI). Dementia cohorts' mean ages ranged from 66.8–71.3, and percentage male from 57-81%. Dementia type did not significantly affect the percentage change in retinal thickness over one year in both pRNFL and mRT (p=0.375 and 0.592 for type III test, respectively).

**Conclusions**: The longitudinal rate of change in pRNFL and mRT was not different between dementia groups over one year. Future studies measuring thickness changes over longer periods of time would be warranted to see if any differences emerge, or if the dementias still progress at the same rate.

**Paper |** Article 4583

**Authors**: Irina Sverdlichenko, Heather McDonald MD *University of Toronto*, Edward Margolin MD *University of Toronto*.

**Author disclosure block**: I. Sverdlichenko: None., H. McDonald: None., E. Margolin: None.

**Title**: Macular optical coherence tomography findings in patients with syphilitic optic neuropathy – A case series and systematic review

**Abstract body**:

**Purpose**: Syphilis is a sexually or congenitally acquired infectious disease that can affect multiple organs systems, including the eye. When left undiagnosed and untreated, it can lead to significant morbidity and mortality. Syphilitic optic neuropathy can be difficult to diagnose as it can mimic many other non-syphilitic causes of optic-nerve involvement, leading to delay in treatment. Diagnosing ocular syphilitic may be facilitated by assessing for specific outer retina abnormalities on macular optical coherence tomography (OCT).

**Study Design**: Case series and case-based systematic review

**Methods**: A retrospective chart review was conducted for four patients who presented to a neuro-ophthalmology practice over 6 months with undifferentiated optic neuropathy and were eventually diagnosed with syphilitic optic neuropathy. For the systematic review, databases were searched to identify all cases of syphilitic optic neuropathy with macular OCT. The primary research outcome was the prevalence of cases with outer retinal abnormalities on OCT. Research ethics board approval was obtained, and the study aligned with the Tenets of the Declaration of Helsinki.

**Results**: Four cases were identified that were eligible for inclusion. The ages ranged from 27 to 62 years old, and two of the patients were female. On examination, vision ranged from hand motion to Snellen 20/50; all patients had optic neuropathy and macular OCT revealed chorioretinitis characterized by retinal pigment epithelium excrescences. The patients subsequently underwent uveitis work-up and were diagnosed with syphilis. They were treated with intravenous penicillin and showed improvement in outer retina appearance on follow-up. The systematic review consisted of 24 cases and 35 eyes with syphilitic optic neuropathy and reported macular OCT findings. Eighty-three percent (20/24) were males, and the mean age was 47.7 (SD: 49.2). The mean visual acuity at presentation was Snellen 20/57. On fundoscopy, 25.7% (9/35) of eyes had vitritis, while 22.8% (8/35) had placoid chorioretinal lesions. On OCT, 45.7% (16/35) of eyes had abnormal outer retina findings, most commonly disruption of the ellipsoid zone and/or retinal pigment epithelium excrescences. All patients were treated with penicillin or ceftriaxone, and final mean visual acuity was Snellen 20/29.

**Conclusion**: Four patients in our case series and nearly half with syphilitic optic neuropathy described in the literature had concurrent disruption of ellipsoid zone and/or placoid chorioretinitis in the form of retinal pigment epithelium excrescences seen on macular OCT. We recommend clinicians obtain macular OCT for all patients presenting with undifferentiated optic neuropathy.

**Paper |** Article 4348

**Authors**: Abdullah Al-Ani, Saerom Youn *McMaster University*, Fiona Costello *University of Calgary*, Jodie Burton *University of Calgary*.

**Author disclosure block**: A. Al-Ani: None., S. Youn: None., F. Costello: None., J. Burton: None.

**Title**: Insights from Alberta's Cases: Investigating Myelin Oligodendrocyte Glycoprotein Antibody-Associated Optic Neuritis

**Abstract body**:

**Purpose**: Myelin Oligodendrocyte Glycoprotein (MOG)-associated Optic Neuritis (ON) is an antibody-mediated demyelinating disease of the central nervous system (CNS). This relatively recent addition to the spectrum of CNS demyelinating disorders distinguishes itself from other CNS demyelinating diseases, such as Multiple Sclerosis and neuromyelitis optica spectrum disorder, in terms of its clinical presentation, treatment approach, and prognosis. This study aims to thoroughly investigate the demographics, clinical presentation, and treatment of patients with MOG-ON in Alberta by comprehensively examining patients who tested positive for the MOG autoantibody at Alberta’s centralized testing facility.

**Study Design**: This retrospective study investigates patients who underwent fixed, cell-based MOG-IgG assays in the province of Alberta, conducted by MitogenDx through Alberta Precision Labs, from July 2017 to September 2022.

**Methods**: In Alberta, MitogenDx through Alberta Precision Labs performs all MOG-IgG cell-based assays. A comprehensive review of the medical records of each patient who underwent this cell-based assay provided various data points for patients with a positive MOG-IgG titer. These included demographic information, initial symptoms, diagnostic investigations, principal diagnosis, treatment protocols, Neuroimaging findings, available Optical Coherence Tomography (OCT) data, and final visual acuity. Final diagnoses were carefully verified, and patients without confirmed final diagnoses were excluded.

**Results**: Data analysis revealed that among 3,135 tested patients over approximately 5 years, 162 patients tested positive for MOG-IgG, resulting in a positivity rate of 5.2%. Of these, 79 (48.8%) presented with ON, with 43 (54.4%) females and 36 (45.6%) males. Of the 79 patients testing positive for MOG-IgG, 24 (30.4%) were highly positive, 17 (21.5%) were moderately positive, 32 (40.5%) were weakly positive, and 6 (7.6%) initially tested negative before seroconverting. Initial presentations ranged from 5.5 to 85.2 years, with an average age of 33.8 years. Ocular pain was reported in 74.5% of cases, with 35.5% presenting with bilateral optic neuritis. Additionally, 78.8% of patients displayed a relative afferent pupillary defect. Ocular examination and ancillary tests indicated a baseline best-corrected visual acuity ranging from light perception to 20/20, and OCT measured retinal nerve fiber layer values ranging from 59 to 422 µm.

**Conclusions**: This study represents the first comprehensive investigation of the demographic and clinical presentation of all confirmed MOG-ON cases within a defined time in a Canadian province. The data provides statistical evidence to guide clinical practice and prioritize investigations in the

workup of ON. Continued analysis of follow-up data will delineate treatment efficacy and identify prognostic factors influencing visual outcomes

**Paper |** Article 4305

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**Author disclosure block**: M. Quinn: Other financial or material interest: Bayer, D. Albreiki: None., D. Lelli: None.

**Title**: Central retinal artery occlusion: Presentation and management at a Canadian academic health sciences centre

**Abstract body**:

**Purpose**: Guidelines for the management of central retinal artery occlusion (CRAO) are evolving. Data from American and European centres have outlined practice patterns for CRAO in those regions. Canadian data are lacking but are needed to inform discussions about a national strategy for this condition. Our objective was to describe CRAO presentation and management at one of Canada's largest academic health sciences centres.

**Study design**: Institutional case series

**Methods**: We performed a retrospective analysis of consecutive patients with CRAO presenting to The Ottawa Hospital between 1-June-2019 and 31-May-2023. Patients with remotely diagnosed CRAO were excluded. Study outcomes included demographics, presentation pathways, workup, interventions, and referrals. The institutional review board approved the study protocol.

**Results**: Seventy-six patients were included. The median (interquartile range [IQR]) age was 68.1 (61.4-81.8) years and 46 (60.5%) were male. The most common site of presentation was an emergency department for 47 (61.8%). The median (IQR) time from vision loss to presentation was 15.0 (3.5-48.0) hours. Twenty-two (28.9%) presented within 4.5 hours. The median (IQR) door-to-ophthalmology time was 12.0 (4.6-22.6) hours. Neurovascular imaging was obtained for 73 (96.1%) patients. Among patients presenting within 48 hours, median (IQR) door-to-imaging time was 6.1 (3.6-9.1) hours. A targeted history/physical for giant cell arteritis (GCA) was documented for 66 (86.8%) and GCA serology was obtained for 58 (76.3%). Temporal artery biopsy was performed for 19 (25.0%) and GCA was ultimately diagnosed in 6 (7.9%). No patient received thrombolysis. Four (5.3%) received putative conservative therapy for CRAO (ocular massage and/or intra-ocular pressure lowering therapy). Empiric glucocorticoid therapy for GCA was initiated for 17 (22.5%). Sixty-four patients were eligible for anti-platelet therapy (APT) escalation. Of those, escalation to single APT occurred for 16 (25.0%) and to dual APT for 29 (45.3%). Anti-platelet loading dose was administered to 19 (42.2%) of those 45 patients. Sixty-four (91.4%) of 70 patients with non-arteritic CRAO were referred for secondary stroke prevention. Referral for ocular follow up was made for 60 (78.9%) patients in the entire cohort.

**Conclusion**: We found that patients seek care urgently following CRAO, and generally receive appropriate stroke care. Work is called for to reduce delays to ophthalmological consultation, to optimize screening for GCA, to clarify best practice for APT, and to promote secondary prevention

referrals. Despite growing evidence for efficacy of thrombolysis in CRAO, our hospital system, one of the largest in Canada, has not yet adopted this within its institutional scope.

**Paper |** Article 4254

**Authors**: Christopher Nielsen, Fiona Costello *University of Calgary*, Matthias Wilms *University of Calgary*, Nils Forkert *University of Calgary*.

**Author disclosure block**: C. Nielsen: None., F. Costello: Received speaker fees or advisory board honoraria from Alexion, Horizon, Vindico, Healio live, Sanofi and Novartis., M. Wilms: None., N. Forkert: None.

**Title**: Improving Multiple Sclerosis Classification: A Novel Machine Learning Approach Using Multimodal Retinal Imaging Data

**Abstract body**:

**Purpose**: Multiple sclerosis (MS) is a progressive neurodegenerative disorder affecting approximately 2.8 million individuals globally. The optic nerve has been proposed as a fifth anatomic compartment to determine dissemination in space for MS diagnosis. To this end, machine learning analysis of imaging data from color fundus photography (CFP) and optical coherence tomography (OCT) may be a promising source of diagnostic biomarkers. Although there is tremendous potential to develop machine learning models for MS classification, the high dimensionality of multimodal CFP and OCT image data poses significant challenges for model training, especially for smaller datasets. As a result, most existing MS classification approaches predominantly utilize low-dimension preprocessed OCT tabular features for training. However, this reduction in data dimensionality may lead to important diagnostic information being lost during preprocessing, ultimately decreasing the clinical performance of MS classification models. The purpose of this study was to develop a novel machine learning architecture for MS classification using multimodal CFP and OCT image data that could be effectively trained on small datasets. Furthermore, we compared the performance of the proposed model to a MS classifier trained solely on preprocessed OCT tabular features.

**Study Design**: Retrospective cross-sectional study

**Methods**: We developed a deep learning architecture based on RETFound, a foundation model pretrained on 1.6 million retinal images, to perform MS classification using multimodal CFP and OCT image data. The performance was compared against an XGBoost model trained for MS classification on 24 preprocessed OCT tabular features. Training and validation were performed using a balanced dataset constructed from 124 UK Biobank participants (62 with MS and 62 healthy control). Five-fold cross validation was used to evaluate the performance of the models.

**Results**: The model trained using multimodal CFP and OCT image data achieved an AUC (area under the receiver operating curve) of 0.83±0.04, which was significantly larger ($p<0.05$) than the AUC of the model trained using OCT tabular features, which was 0.77±0.02.

**Conclusions**: The improved performance of the proposed model suggests that multimodal CFP and OCT imaging data likely contain pertinent diagnostic information for MS classification which is not captured by preprocessed OCT tabular features. Consequently, training machine learning models using multimodal CFP and OCT image data may be advisable to achieve optimal MS

classification performance. Incorporating the developed methodologies into clinical practice has potential to elevate diagnostic precision for patients with MS and other neuro-ophthalmologic conditions where diagnostic biomarkers are discernible from retinal imaging data.

**Paper |** Article 4388

**Authors**: Bhadra Pandya, Aaditeya Jhaveri *Temerty Faculty of Medicine, University of Toronto*, Farooq Shamshad *University of Alberta Faculty of Medicine*, Edward Margolin *Department of Ophthalmology and Vision Sciences, University of Toronto*, Jonathan Micieli *Department of Ophthalmology and Vision Sciences, University of Toronto*.

**Author disclosure block**: B. Pandya: None., A. Jhaveri: None., F. Shamshad: None., E. Margolin: None., J. Micieli: None.

**Title**: Etiologies of Optic Disc Edema in Patients with Significant Visual Compromise

**Abstract body**:

**Background**: To evaluate the most common conditions causing optic disc edema (ODE) in patients with significant visual compromise (i.e., best-corrected visual acuity (BCVA) ≤ 20/400).

**Methods**: This was a retrospective review of consecutive patients presenting to tertiary neuro-ophthalmology clinics at the University of Toronto over a 5-year period. Inclusion criteria were (1) presence of ODE, (2) documented fundus imaging, and (3) BCVA of 20/400 or worse.

**Results**: In total, 656 patients with ODE were included in this study. 49 patients (7.5%) had an initial BCVA of ≤ 20/400. There were 54 eyes at baseline and 49 eyes at final follow-up. A total of 20 male and 29 female patients were included. The mean patient age was 55.9 years. Female patients were significantly older than male patients ($p < 0.05$). The two most common causes of ODE were non-arteritic anterior ischemic optic neuropathy (NAION) (n = 22; 40.7%) and optic neuritis (ON) (n = 22; 40.7%). Additional causes included arteritic anterior ischemic optic neuropathy (AAION) (n = 5; 9.26%), uveitis-related (n = 3; 5.56%), papilledema from idiopathic intracranial hypertension (IIH) (n = 1; 1.85%), and Vogt–Koyanagi–Harada disease (n = 1; 1.85%). No significant difference was observed in initial BCVA between ON and NAION groups ($p = 0.52$). Final BCVA was significantly better in the ON group ($p < 0.0001$). Initial BCVA was worst in the AAION group (2.62 ± 0.54 logMAR). When stratified by age, the most common cause of ODE in patients <40 was ON (83%). In patients >80, NAION (60%) and AAION (40%) were the most common etiologies. Moreover, between 60-80, NAION was the sole cause (100%).

**Conclusions**: Only a small proportion of patients with ODE and significant visual compromise are seen in neuro-ophthalmology (10%). The two most common causes were ON and NAION. Although a smaller proportion of patients were diagnosed with AAION, VKH, uveitis, and IIH, it is crucial to recognize these diagnoses as prompt treatment can preserve vision and be lifesaving.

**Paper |** Article 4624

**Authors**: Wendy Hatch, Saffire Krance MD *Sunnybrook Health Sciences Centre*, Christopher Hudson PhD *University of Waterloo*, Faryan Tayyari PhD *Kensington Eye Institute*, Edward Margolin MD *University of Toronto*, Efrem Mandelcorn MD *University of Toronto*, Jonathan Micieli MD *University of Toronto*, M. Amin Banihashemi MD University *of Toronto*, Carmen Balian PhD *Kensington Eye Institute*, Richard Cheng OD MSc *Kensington Health*, Ilse Belgraver MPH *Baycrest Health Sciences*

**Author disclosure block**: Hatch: None., S. Krance: None., C. Hudson: None., F. Tayyari: None., E. Margolin: None., E. Mandelcorn: None., J. Micieli: None., A. Banihashemi: None., R. Cheng: None., I. Belgraver: None.

**Title**: The Ontario Neurodegenerative Research Initiative retinal imaging dataset

**Abstract body**:

**Purpose**: To compare peripapillary retinal nerve fibre layer (pRNFL) and macular retinal (mRT) thicknesses between disease groups in the Ontario Neurodegenerative Disease Initiative (ONDRI). ONDRI is a longitudinal, multi-site, observational cohort study which includes participants with five diseases: (1) Alzheimer's Disease/Mild Cognitive Impairment (AD/MCI) (2) Amyotrophic lateral sclerosis (ALS); (3) Frontotemporal dementia spectrum disorders (FTD) (4) Parkinson's Disease (PD), (5) cerebrovascular disease (CVD) with a history of stroke. Amyloid negative cognitively normal controls (CNC) were included from the Brain Eye Amyloid Memory study. Participants underwent clinical, neuropsychology, speech, eye tracking, gait/balance, MRI, genomics and SD OCT assessments.

**Study Design**: observational cohort

**Methods**: Participants enrolled in ONDRI with SDOCT retinal images were included. Exclusion criteria were history of glaucoma, wet AMD, retinal surgery and uncontrolled diabetes (high A1C).   Fundus photographs, 3 SDOCT images of the posterior pole and 3 images of the optic nerve head were acquired in both eyes using the Heidelberg Spectralis (software version 6.0.13.0, Heidelberg Engineering GmbH, Heidelberg, Germany). Expert observers inspected fundus photographs to exclude glaucoma or suspect glaucoma, other optic neuropathies and maculopathies. SDOCT images were then inspected by trained and expert observers to exclude poor quality scans (Q score <17), maculopathies that could affect retinal thickness and suspect/confirmed optic neuropathies. One posterior pole image and one pRNFL image underwent automated retinal segmentation (Heidelberg HEYEX version 6.3.4.0 software). Trained observers inspected the boundary lines of the cross-sectional B scans from the posterior pole image for segmentation errors in the ILM and BM for mRT, and the ILM and RNFL boundary lines for the pRNFL thickness, and manually corrected segmentation errors. Thickness values were batch exported. Mean/SD thickness of all 9 sectors within the ETDRS grid for mRT, and the global and 6 sectors for pRNFL were calculated. A linear mixed model tested for disease group as a predictor of pRNFL and mRT.

**Results**: There were 390 subjects (769 eyes) in the pRNFL dataset and 387 (755 eyes) in the mRT dataset (n= AD/MCI 86/86, PD 116/115, CVD 91/92, FTD38/36 ALS n=16/16, CNCs n=43/42 respectively). Mean age ranged from 61.3 years (ALS) to 71.3 years (AD/MCI). The FTD and PD groups were predictive of thicker pRNFL ($p < 0.001$ and $p=0.047$ respectively), and FTD was predictive of thicker mRT ($p=0.039$).

**Conclusion**: This dataset provides significant potential to explore associations with brain imaging, cognition, and other test platforms within disease and between disease groups. Longitudinal and sublayer analyses can be explored to determine the utility for SDOCT to be used to identify potential biomarkers for neurodegenerative disease.

**Paper |** Article 4311

**Authors**: Dan DeAngelis, Michael Webb BCO *Webb Ocular Prosthetics*, Christopher Forrest MD FRCSC *The Hospital for Sick Children*.

**Author disclosure block**: D. DeAngelis: None., M. Webb: None., C. Forrest: None.

**Title**: Long term results after neonatal exenteration for congenital orbital teratoma - 20 years of craniofacial management.

**Abstract body**: Congenital orbital teratoma is a extremely rare embryonic tumor, with only few cases being described in the literature. Although some lesions have been managed with local resection, this has not possible with other larger lesions. Only a few cases of neonatal exenteration have been described in these patients. The concerns with socket and soft tissue development are well known issues with such procedures in the neonatal period. We discuss our results in our combined multi-disciplinary orbito-craniofacial clinic at The Hosital for SIck Children and the results of twenty years of active management in a patient with a massive congenital orbital teratoma.

**Paper |** Article 4512

**Authors**: Farnaz Javadian, Mariam Tabatadze MD *Tbilisi State Medical University*, Vladimir Kratky MD FRCSC *Queen's University*.

**Author disclosure block**: F. Javadian: None., M. Tabatadze: None., V. Kratky: None.

**Title**: A novel technique for removal of 'hard-to-find' metallic foreign bodies in the posterior orbit

**Abstract body**:

**Purpose**: Intra-orbital foreign bodies from penetrating injuries can be challenging to detect and remove in the operative setting. We report a case of a 59-year-old female who had presented with a double penetrating ocular injury from an electric weed trimmer and a retained 8 mm metallic foreign body in the posterior orbit. To expedite localization and removal, we employed the SentiMag Magnetic Localization System®, developed for breast cancer operations in general surgery. To our knowledge, this is the first case of an ophthalmology application using this technology to localize and remove a metallic intra-orbital foreign body.

**Study Design**: Single case report and review of literature

**Methods**: This is a single case study of a patient presenting to our academic centre.

**Results**: A 59-year-old female presented to our emergency department with a left globe rupture, secondary to a broken metal blade from an electric weed trimmer. Imaging confirmed a double perforation of the globe, by an 8 mm metallic missile foreign body which came to rest in the posterior retrobulbar space. The globe was urgently repaired, but the vision remained poor at light perception and the patient continued experiencing pain in the eye. Both the cornea and retina service deemed the status of the globe beyond further surgical help with zero prognosis for improvement in vision. The patient preferred to go straight to enucleation and was referred to our oculoplastics service. In the operating room, the eye was successfully enucleated, and careful palpation of the orbital cavity was done to locate the foreign body. Unfortunately, this turned out to be difficult, as multiple small nodular lesions were removed but turned out to be scar tissue. The SentiMag®probe was then employed, and it immediately picked up a magnetic signal in the posterior superior orbit, leading to successful removal of the metal fragment. A standard orbital implant was then inserted, and the enucleation was completed in the usual fashion.

**Conclusion**: To our knowledge, this is the first case describing successful removal of an intra-orbital metallic foreign body, using the SentiMag® magnetic probe. It appears that this device, used primarily in breast cancer surgery, can also be helpful in orbital surgery for retained metallic objects and represents another useful tool available for the orbital surgeon.

**Paper |** Article 4312

**Authors**: Yen Minh Cung, Lorne Bellan MD, FRCSC *University of Manitoba*, Matthew Lee-Wing MD, FRCSC *University of Manitoba*, William Turk MD, FRCSC *University of Manitoba*.

**Author disclosure block**: YM. Cung: None., L.Bellan: None., M. Lee-Wing: None., W. Turk: None.

**Title**: Distraction techniques in periocular local anesthesia: Tapping vs Vibration

**Abstract body**:

**Purpose**: To compare the efficacy of different distraction techniques, tapping vs vibration, in lowering pain scores for periocular anesthesia injections.

**Study design**: Prospective, interventional, cross-over, randomized controlled clinical trial.

**Methods**: Our intent was to show non-inferiority of tapping, which is free (and currently the standard of care at our facility), compared to the use of a vibration assist device (sourced from Amazon.ca: Beauty Bar 24k Golden Pulse Facial Massager, manufactured by Maymil, China), which costs approximately $15 and would require sterilization between patients. This is built on top of a study by Fayers, Morris, and Dolman showing vibration was superior to placebo. We recruited 80 patients undergoing bilateral lid or brow procedures, and randomized them into either group A or B. Group A would receive tapping first during the first eye getting local anesthetic, then vibration for the second eye. Group B would receive vibration first and then tapping. Patients were asked after the second eye to grade their pain for each eye on a scale of 0 to 10. Those who reported a difference in numbers between the two sides were asked if the subjective difference was by a little, quite a bit, or a lot.

**Results**: The mean pain scores were 4.5 for the tapping side and 4.1 for the vibration side. This difference was not statistically significant (P=0.0005); 50% of participants found the tapping side better than vibration; with 47% finding no to little difference between the two sides.

**Conclusions**: Tapping is not inferior to vibration in lowering perceived pain scores during the administration of periorbital local anesthesia. This is a cheap and effective distraction technique and should continue to be the standard of care in our facility.

**Paper |** Article 4440

**Authors**: Sonia Anchouche, Kenneth Chang MD, MSc *Department of Ophthalmology & Vision Sciences, University of Toronto*, Carlo Hojilla MD, PhD *Department of Laboratory Medicine and Pathobiology, University of Toronto*, Georges Nassrallah MD *Department of Ophthalmology & Vision Sciences, University of Toronto*, Navdeep Nijhawan MD *Department of Ophthalmology & Vision Sciences, University of Toronto*.

**Author disclosure block**: S. Anchouche: None., K. Chang: None., C. Hojilla: None., G. Nassrallah: None., N. Nijhawan: Viridian Therapeutics (PI).

**Title**: Concurrence of orbital immunoglobulin G4-related disease and lymphoproliferative neoplasms: case series and review of literature

**Abstract body**:

**Purpose**: Lymphoproliferative disorders span a wide spectrum of diseases ranging from benign infiltrative conditions to malignant lymphomas. Immunoglobulin G4-related disease (IgG4-RD) is an emerging immune-mediated systemic condition consisting of lymphoplasmacytic infiltrates and lesions with IgG4-positive plasma cells. Lymphoproliferative neoplasms, including lymphoma, may mimic IgG4-RD. There exists a growing interest in the relationship between IgG4-RD and lymphoproliferative neoplasms.

**Study design**: Retrospective observational case series and associated literature review

**Methods**: Patient charts were reviewed. The National Library of Medicine (PubMed) database was employed to identify cases of concurrent orbital lymphoproliferative neoplasm and IgG4-RD and associated mechanistic studies.

**Results**: Case 1 describes a 78-year-old man with a 3-month history of binocular diplopia and decreased vision in the left eye. Serum IgG4 levels were elevated. CT imaging of the orbits demonstrated diffuse enlargement and heterogenous enhancement of the left lacrimal gland and enlargement of both infraorbital nerves. The left lacrimal gland was biopsied, with histopathology showing extranodal marginal zone lymphoma of mucosa associated lymphoid tissue (MALT lymphoma) and concurrent IgG4+ plasma cell elevation. Case 2 involves a 38-year-old man with a 6-year history of progressive eyelid swelling and past medical history notable for cutaneous low grade B cell lymphoma. Bloodwork was notable for elevated serum IgG4 and immunohistochemistry of the biopsy tissue revealed sheets of IgG4+ monoclonal plasma cells and marked deposition of amyloid. Although IgG4-RD and lymphoma have distinct histopathological features and diagnostic criteria, they are both lymphoproliferative disorders and several reports have proposed a possible link between these two entities. T-helper-2 (Th2) and regulatory T-cell cytokines have been shown to be upregulated in IgG4-RD lesions. Moreover, Th2 and Treg cytokines were shown to be upregulated in ocular IgG4-associated marginal zone lymphoma when compared to non-IgG4-RD marginal zone lymphomas.

**Conclusions**: Herein, we present two cases of concurrent orbital IgG4-RD and lymphoproliferative neoplasm. These cases emphasize the importance of accurate histopathological tissue analysis

and highlight the potential interplay between these two lymphoproliferative disorders. While the mechanistic link between IgG4-RD and lymphoma, if any, remains unknown, it is postulated that upregulation of regulatory T cells in IgG4-RD, which can promote tumor development through inhibition of anti-tumor immunity, may contribute to development of lymphoma.

**Paper |** Article 4274

**Authors**: Edsel Ing, *Georges Nassrallah* University of Toronto.

**Author disclosure block**: E. Ing: None., G. Nassrallah: None.

**Title**: Superotemporal Skin Transposition to Augment the Repair of Tarsal Ectropion

**Abstract body**:

**Purpose**: Patients with involutional/paralytic tarsal ectropion of the lower lid (TEc) may have residual lid margin eversion or increased recurrence after conventional lateral tarsal strip (LTS) and medical conjunctival spindle procedures. Chang et al suggested that for paralytic ectropion, the LTS should be attached using a 10-15 mm long tarsal strip to the outer temporal orbital rim, at a point higher than a conventional LTS. In our augmentation we place the posterior lamella in the conventional position to preserve lid globe apposition, but transpose an inferolateral skin flap into a superotemporal wound bed to improve the results of TEc repair.

**Study design**: retrospective

**Methods**: The retrospective review was approved by our Research Ethics Board. Adults with involutional TEc tarsal ectropion between 2021 and 2023, and that underwent LTS surgery with anterior lamellar skin transposition between Nov 2021 and Sept 2023 were included in the study. In our LTS augmentation procedure the excess lateral lower lid skin is not discarded, but fashioned into a flap that is transposed into a 1 cm superotemporal triangular wound bed in a tongue-in-groove fashion with anchoring to the periosteum. As initial results showed that this skin augmentation markedly improved the lid margin position markedly in patients with TEc compared to senior author's convetional LTS, it was not felt a control group would be ethical.

**Results**: 12 cases of TEc in 8 patients who underwent LTS with skin augmentation and medial conjunctival spindle were reviewed. At 2-4 week follow-up, all of the patients had good lid globe apposition with less than 2 mm of residual lid eversion or lid margin erythema. None of the patients required repeat surgery at 6 month follow-up. Disadvantages of our flap augmentation compared to conventional LTS included approximately 5 more minutes of operating room time, more ecchymosis in the immediate post-operative period, and more prominent lateral canthal skin scarring at the 2 week mark, which faded over 6 month follow-up.

**Conclusions**: Patients with TEc and superotemporal skin flap augmentation have less lid margin erythema and post-op ectropion than patients undergoing conventional LTS.The technique is straighforward, but further long-term follow-up is required.

**Paper |** Article 4489

**Authors**: Ryan Mason, Kenneth Chang *University of Toronto*, David Yan *University of Toronto-Resident Program*, Georges Nassrallah *University of Toronto*, Dan DeAngelis *University of Toronto*.

**Author disclosure block**: R. Mason: None., K. Chang: None., D. Yan: None., G. Nassrallah: None., D. DeAngelis: None.

**Title**: Inadvertent Orbital Mitomycin C Injection as a Cause of Ophthalmoplegia and Orbital Necrosis

**Abstract body**:

**Purpose**: Mitomycin C (MMC) is an alkylating agent with the ability to suppress fibroblast proliferation and activity, making it a powerful antifibrotic. MMC is popular in glaucoma filtering surgeries, both intraoperatively during bleb formation and post-operatively as an adjunct to needling procedures to address episcleral fibrosis and bleb encapsulation. Here we present a rare but serious risk of bleb needling with MMC; inadvertent orbital injection that resulted in inflammation, ptosis, ophthalmoplegia, and orbital necrosis.

**Study Design**: Case report and literature review.

**Methods**: We present an illustrative case of orbital necrosis causing ptosis and ophthalmoplegia following inadvertent orbital injection of MMC during a bleb needling. We highlight the investigations and clinical course to inform both glaucoma and oculoplastic specialists about this potential complication. A literature review for orbital sequelae following MMC injection was also performed.

**Results**: A 66-year-old woman had elevated intraocular pressure despite previous Xen stent and maximum medical therapy. In an attempt improve the performance of her Xen, she underwent a bleb needling at the slit lamp with injection of MMC. During the procedure the patient moved, causing the needle to enter the superonasal orbit with local injection of MMC (40 ng). The following day she awoke with periorbital edema, erythema, and difficulty opening the eye. There was no improvement on Cephalexin for presumed preseptal cellulitis. In oculoplastic consultation three weeks later there was complete ptosis, reduced levator function, marked limitation in ocular ductions, and a palpable mass in the superonasal orbit. A CT scan of the orbits found no abscess or involvement of the orbital apex. During an excisional biopsy of the orbital mass numerous adhesions and fibrotic tissues extended from the mass to the levator muscle. Pathology identified acute and chronic inflammation composed of lymphocytes, plasma cells, and eosinophils with extensive fat necrosis. Special stains were negative for fungal microorganisms and mycobacteria. Pathology, immunostaining, and flow cytometry did not identify any malignancy. When followed over the next year her ptosis slowly but fully resolved and there was improvement in levator function. She has a deep upper eyelid sulcus secondary to the fat atrophy, and scarring of the levator to the superior rectus has caused a persistent supraduction deficit without diplopia in primary gaze.

**Conclusions**: While there are reports of accidental intraocular injection of MMC, to our knowledge this is the first reported case of inadvertent orbital injection of MMC during a bleb revision. Potential sequelae of MMC to orbital tissues includes inflammation, fat necrosis, ptosis, and ophthalmoplegia. After ruling out infectious, infiltrative, and malignant causes, these orbital sequelae may be safely observed and can improve over time.

**Paper |** Article 4151

**Authors**: David Jordan.

**Author disclosure block**: Jordan: None.

**Title**: Soft Tissue Fillers and Biofilms: A Hazard to Watch For

**Abstract body**:

**Purpose**: To describe the presentation and management of soft tissue filler infection because of biofilm formation in 4 patients.

**Study Design**: case series

**Methods**: Single center, retrospective review of 4 patients who developed infection within their soft tissue filler because of biofilm formation. Their presentation and management are described. This retrospective chart review was performed in compliance with the Declaration of Helsinki.

**Results**: Injectable soft-tissue fillers for facial rejuvenation and reshaping have been increasing in popularity and the rise of biofilm-related complications associated with these fillers will concurrently increase. Although most accept their existence, the potential impact of biofilms on the medical field with respect to soft tissue fillers has yet to be fully appreciated. Biofilm infection is the leading cause of device-associated infection in a variety of medical devices and implants. Fillers should be considered medical devices as they are foreign materials inserted into the patient and thus it should be no surprise that they are also at risk of bacterial biofilm contamination and its subsequent consequences.

**Conclusion**: All soft tissue fillers are capable of supporting growth of bacterial biofilms. Patients may not display any problems for months or years following their soft tissue filler injection. The clinical presentation of biofilm infection within a soft tissue filler is not always straightforward and may not be recognized by the unsuspecting injector. Treatment can be difficult and may require prolonged antibiotics as well as dissolving the filler, or removing the filler if it is not dissolvable. Recommendations and tips are provided to help one recognize this problem.

**Paper |** Article 4418

**Authors**: Jenny Ma, Kenneth Chang MD *Department of Ophthalmology and Vision Sciences, University of Toronto*, Georges Nassrallah MD FRCSC *Department of Ophthalmology and Vision Sciences, University of Toronto.*

Author disclosure block: J. Ma: None., K. Chang: None., G. Nassrallah: None.

Title: Surgical planning for orbitotomy using artificial intelligence (ChatGPT)

**Abstract body**:

**Purpose**: There has been an increasing use of artificial intelligence (AI) to aid radiologic imaging interpretation and to complement clinical decision making. ChatGPT is a recently developed large language model, and its ability to suggest appropriate radiologic imaging modalities for certain clinical presentations and to answer common patient questions has been investigated. However, its role in ophthalmologic surgical decision making has not been assessed. This study aims to assess the ability of ChatGPT to interpret diagnostic imaging reports and to recommend appropriate surgical approaches for patients undergoing orbitotomy.

**Study design**: We conducted a consecutive, retrospective case series of all adult orbitotomy cases from July 2021 to September 2023 of three oculoplastic surgeons at University of Toronto, Ontario, Canada.

**Methods**: Thirty-four patients underwent an orbitotomy. For each patient, the computed tomography (CT) or magnetic resonance imaging (MRI) report was input into ChatGPT 3.5. A standardized script was used each time to ask ChatGPT four questions: 1) Top 3 differential diagnosis; 2) Single most likely diagnosis; 3) Most appropriate type of biopsy (incisional vs. excisional) for the most likely diagnosis; and 4) Recommended surgical approach to access the lesion during an orbitotomy. For the recommended surgical approach, ChatGPT was given several multiple choice options based on the quadrant of the lesion. Our outcomes included the proportion of cases where ChatGPT's differential diagnosis included the final pathology diagnosis and how often its recommended biopsy type and surgical approach matched the surgeon's operative choice.

**Results**: The analysis included 30 eyes. The top 3 differential diagnoses proposed by ChatGPT based on the CT or MRI imaging report findings included the final pathology diagnosis in 50% of cases. When asked to single out the one most likely diagnosis, it matched the pathology diagnosis in 38% of cases. The suggested type of biopsy (incisional vs. excisional) matched the surgeon's choice in 72% of cases. However, when asked regarding the most appropriate surgical approach to access the lesion in an orbitotomy, ChatGPT's recommendation agreed with the surgeon's choice in 39% of cases. For 5 patients, ChatGPT indicated neither type of biopsy as appropriate as the suspected diagnosis was inflammatory in nature. In two patients, it indicated neither biopsy was appropriate and suggested different biopsy techniques such as a stereotactic biopsy or fine-needle aspiration biopsy instead.

**Conclusions**: AI and ChatGPT demonstrate potential in diagnostic imaging interpretation and in aiding preoperative surgical planning. However there remains limitations in its ability to accurately

interpret radiologic imaging findings without clinical context and to select an appropriate surgical approach, illustrating the complexity and nuance of this decision.</p>

**Paper |** Article 4562

**Authors**: Khaldon Abbas, Husayn Gulamhusein MD *Division of Ophthalmology, Faculty of Medicine, McMaster University*, John Harvey MD *Division of Ophthalmology, Faculty of Medicine, McMaster University*.

**Author disclosure block**: K. Abbas: None., H. Gulamhusein: None., J. Harvey: None.

**Title**: Investigating the impact of unilateral lateral tarsal strip on palpebral fissure sizes

**Abstract body**:

**Purpose**: The lateral tarsal strip (LTS) is a common oculoplastic procedure performed to tighten the lower eyelids. While the tightening effect of the LTS is evident, it is unclear as to whether it results in the shortening of the horizontal palpebral fissure (HPF). The purpose of this study is to investigate the effect of the LTS on the HPF, using the fellow (unoperated eye) as a reference point.

**Study Design**: Single-center prospective study.

**Methods**: Patients 18 years or older with a unilateral LTS procedure performed between April 2019 - April 2020 at a tertiary Canadian center and with at least 12 months follow-up were recruited. Patients with current or previous history of facial or eyelid disease, facial trauma, facial nerve palsy, and previous lacrimal or orbital surgery were excluded. Primary outcome measure was the difference in HPF width between the unoperated eye and the operated eye at least one year after surgery as measured during the study visit, both physically with a millimeter ruler as well as in a computerized fashion. Secondary outcome measures included vertical palpebral fissure (VPF) widths, correlation between physical and computerized measurements, and patient's perceived difference in palpebral fissure measurements.

**Results**: The eyes of 14 patients who had unilateral LTS were evaluated (69.2% male, 30.7% female). Mean patient age was 82.1 years (range 72-99). Mean follow-up duration was 23.4 months (range 12-33 months). The indication for LTS was entropion in 11 patients and ectropion in 3 patients. The average width of the HPF of the operated eye was 25.3 mm, and the unoperated eye 25.7 mm, with a mean difference of 0.4 mm ($p = 0.11$). The average width of the VPF of the operated eye was 8.0 mm, and the unoperated eye 8.2 mm, with a mean difference of 0.2 mm ($p=0.34$). Only 1 patient perceived a difference in the HPF between their operated and unoperated eyes.

**Conclusions**: There was no significant difference in HPF and VPF measurements between the operated and unoperated eyes post LTS surgery after a minimum of one year of follow-up. Patients are less likely to perceive a difference in palpebral fissure sizes following LTS procedure.

**Paper |** Article 4322

**Authors**: Selya Amrani.

**Author disclosure block**: Amrani: None.

**Title**: Botulinum Toxin Injection as an Alternative Treatment for Structural Lacrimal Outflow Obstructions, Functional NLDO and Gustatory Reflex Lacrimation

**Abstract body**:

**Purpose**: To investigate the use of transconjunctival botulinum toxin for the treatment of symptomatic epiphora due to hyperlacrimation of various etiologies.

**Study Design**: Randomized, double-blind, double-armed, interventional study (RCT).

**Methods**: In this prospective double-arm interventional study, two groups of patients presenting with epiphora were randomized into a group receiving a transconjunctival injection of 0.1mL of Botox®(10U) and a control group receiving the same volume of placebo saline (0.9% NaCl) into the lacrimal gland. Thirty patients were recruited for this study (38 eyes; 19 Botox® arm, 19 placebo arm, mean age 70.3, 16 males and 14 females). Patients were evaluated at four different time intervals: before injection (V0), one-week post-injection (V1), after 4 weeks (V2), and 13 weeks post-injection (V3). A Schirmer I test score was measured to assess the tear production (in mm). Validated questionnaires including MUNK and Lac-Q (Lacrimal Symptom Questionnaire) were used to quantify the efficacy of the transconjunctival treatment. Three-way ANOVA, independent t-tests, and Mann-Whitney U-test were performed for each outcome on SPSS 20.

**Results**: The Schirmer's score (mean 15.05 mm, SD 7.670) in the treatment group at V2 (4 weeks post-injection) was found to be significantly different (P<0.001 three-way ANOVA) compared to the placebo group (mean 21.70, SD 6.111). The mean MUNK score at V2 in the Botox® arm (1.95, stdev 1.026) also improved in individual cases, but as a group, it was not found to be statistically significant after treatment compared to the placebo arm (mean 2.30, SD 1.337, P=0.062). Finally, the mean social component of Lac-Q scores at V2 in the Botox® arm (5.32, SD 2.405) was found to be statistically significant after treatment compared to the placebo arm (mean 5.70, SD 2.459 P=0.031).

**Conclusions**: Our results provide evidence for the efficacy of transconjunctival Botox® for the temporary relief of symptomatic epiphora, as shown by the reduction in their quantitative Schirmer I score after four weeks post-injection. Overall, patient satisfaction was greater in the Botox®arm with all patients which is also reflected in post-treatment social Lac-Q scores.

**Paper |** Article 4409

**Authors**: Carson Schell, Ryan Nugent MD *University of Calgary*, Karim Punja MD *University of Calgary*, Martin Hyrcza MD/PhD *University of Calgary*, Andrzej Kulaga MD *University of Calgary*.

**Author disclosure block**: C. Schell: None., R. Nugent: None., K. Punja: Consultant/Advisor for Alcon Canada Inc., Allergan Inc., Clarion Medical Technologies., M. Hyrcza: None., A. Kulaga: None.

**Title**: What's Hiding in the Clamp? A Histopathologic Review of Müller's Muscle-Conjunctival Resection

**Abstract body**:

**Purpose**: The purpose of this study is to identify the composition of tissue resected during internal ptosis surgery using a Müller's muscle-conjunctival resection technique.

**Study Design**: This is a single center, case series performed at a single center with three surgeons using the same surgical technique. Histopathology review was performed under supervision of two ophthalmic pathologists.

**Methods**: Tissue resected within a Putterman ptosis clamp, while performing Müller's muscle-conjunctival resection was evaluated and categorized as containing smooth versus striated muscle. Smooth muscle representing Müller's muscle while striated muscle can be assumed to represent levator muscle.

**Results**: 103 procedures were performed, 102 of the samples contained smooth muscle and 1 sample contained both smooth and striated muscle. Additionally, 11 samples contained neither smooth nor striated muscle.

**Conclusions**: The internal approach to ptosis surgery as described by Drs. Putterman and Ulrist in 1975 has been solidified as a common and effective technique. [1]Histopathologic analysis of the resected tissue has been studied in small samples, including Dr. Putterman himself who found only conjunctiva and Müller's muscle, with no evidence of levator muscle in 8 samples. [1]In contrast, Morris (n=8 cadaver, n=8 clinical) found striated muscle in all samples while Maheshwari (n=13) found a samples with both smooth and striated muscle. [2,3]Our study provides a significantly larger sample size than otherwise shown in the literature and may offer further insight into the mechanism of Müller's muscle-conjunctival resection. Further analysis of this data set is being performed to investigate whether resection length and intraoperative use and quantity of conjunctival anesthetic may affect the type and amount of tissue resected.

**Paper |** Article 4244

**Authors**: Kenneth Chang, Steven Bonneau MD MSc *Université de Sherbrooke*, Patrick Daigle MD FRCSC DABO *Université de Sherbrooke*, Dan DeAngelis MD FRCSC *University of Toronto*.

**Author disclosure block**: K. Chang: None., S. Bonneau: None., P. Daigle: None., D. DeAngelis: None.

**Title**: A case series of Taser injuries to the eye and orbit

**Abstract body**:

**Purpose**: Taser is a conducted energy device that launches two metal probes at a subject, transmitting electrical pulses that cause incapacitation through skeletal muscle contractions. While marketed as less-than-lethal, there have been infrequent reports of serious injuries and death from these weapons. Ocular injuries are rare with few cases in the literature. We present the largest Canadian case series of ocular injuries from Taser.

**Study Design**: Retrospective case series.

**Methods**: We present three cases of patients who sustained a Taser injury to the eye or orbit who were evaluated at two Canadian institutions in the past 20 years.

**Results**: Case 1: an actively suicidal 25M was shot by a police Taser, with one of the probes striking the right eye (OD). Visual acuity (VA) was count fingers and IOP was 11 OD, with limited upgaze. On exam, the probe protruded through the right upper lid, significant vitreous hemorrhage was present, and CT found that the tip of the barb was embedded through the superior sclera into the vitreous. In the operating room, the barb was removed, the scleral and eyelid lacerations were repaired, and the retina was lasered. Postoperatively, VA improved to 20/25 and IOP was 16 OD. Case 2: a 54F was shot by a police Taser. On exam, a wire was found protruding from the medial canthus of the left eye (OS). VA was 20/25, IOP was normal, with no RAPD. Fundus exam found commotio retinae nasally, otherwise within normal limits. CT showed the probe had migrated along the medial orbital wall and embedded in the maxillary sinus by the orbital apex. The probe was surgically removed, and on postop exam the vision remained intact with full motility. Case 3: a 48F with a history of psychiatric disorder and alcohol abuse was struck in the right eye by a police Taser. On exam, VA was light perception (LP), IOP was 2, and RAPD was present OD. A Taser wire protruded through a corneal laceration, with a flat anterior chamber, a large hyphema, and significant disorganization of intraocular structures. EOM's were normal. CT showed the probe perforating through the posterior sclera and embedding in the posterior orbit. The patient was brought to surgery, where the probe was removed and the corneal laceration was repaired. The patient's vision was NLP postop, however the eye remained comfortable.

**Conclusions**: While the Taser was introduced as a less-than-lethal method of subduing a target, devastating injuries and death have been reported in the literature. We present three cases of patients who sustained Taser injures to the eye and orbit, discuss their clinical course, and their visual outcome. To our knowledge, this is the largest Canadian case series of Taser eye injuries published to date

# Paediatric ophthalmology and strabismus | L'ophtalmologie pédiatrique et strabisme

**Paper** | Article 4301

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**Title**: Evaluation of Visual Outcomes in Retinoblastoma Survivors and Determining Factors Predicting Failure of Vision Salvage

**Abstract body**:

**Purpose**: Improving survival rates of retinoblastoma (RB) has shifted the focus toward eye and vision salvage. We aim to identify factors responsible for suboptimal visual outcome and evaluate final vision and impairment in RB survivors.

**Study Design**: Retrospective, Observational.

**Methods**: Clinical data of all RB patients treated from January 2000 to August 2021 at The Hospital for Sick Children was reviewed. Ocular characteristics, treatment, and final vision were documented. Salvaged eyes were required to have at least one year of quiescence to be included. In children with bilateral RB, visual impairment (VI) was categorized using ICD11. The visual acuity (VA) in logMAR for each salvaged eye was separately analyzed. Unsuccessful vision salvage was defined as eyes with vision potential that were primarily enucleated, that underwent secondary enucleation or were salvaged, but had visual outcomes worse than their potential.

**Results**: 312 affected eyes of 222 children were included. 90 children (41%) had bilateral RB of which 11 (12%) had severe VI (5% of all children with RB). Diagnosis age of <6months was associated with lesser VI. None of them had severe VI or blindness when both eyes were salvaged. Overall, 187 eyes were enucleated of which 38 were secondary enucleations. Diagnosis age of <12 months was associated with higher chances of salvaged eye status. Of 125 eyes salvaged, one was excluded from analysis of visual outcome as there was no vision documented after treatment initiation. Mean VA was: 0.53 (n=124; SD: 0.69), and in each AJCC stage was: cT1: 0.28 (n= 80; SD:

0.45); cT2: 0.97 (n= 42; SD: 0.76); cT3: 1.45 (n= 2; SD: 1.91), with a mean follow-up of 9.51 years (SD: 5.43). A final VA of 6/60 or worse was found in 28 eyes (23%). As anticipated, a higher stage ($p < .05$) and involvement of the fovea ($p < .05$) were associated with poorer vision outcomes in the eyes that were salvaged. Eyes treated with external beam radiation (n=3) had an average VA of 1.59, as compared to 0.51 of eyes without. Of the 52 eyes with unsuccessful vision salvage, 4 eyes (all unilateral) with good vision potential underwent primary enucleation, 38 eyes underwent secondary enucleation, and 10 salvaged eyes were found to have worse vision compared to expected visual outcome.

**Conclusion**: This study represents a large cohort and is the only one to report visual outcomes compared to different AJCC stages of disease. Most salvaged eyes had good vision after treatment and were associated with a lower stage at diagnosis and absence of foveal involvement. Of the eyes with vision unsuccessfully salvaged, most necessitated secondary enucleation due to disease progression. None of those with bilateral RB and both eyes salvaged had blindness or severe VI. The limitations include use of outdated treatment modalities over the long study period and not considering factors like amblyopia treatment contributing to suboptimal VA.

**Paper |** Article 4464

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**Author disclosure block**: Strube: Employment/honoraria/consulting fees: Santen Canada, Oxford University Press, Oher financial or material interest: Oxford University Press, American Academy of Pediatrics, Springer Publishing. B. Germano: None., R. Zein: None., W. Hopman: None., K. Wright: None.

**Title**: Over-correction Rate between Wright Hang-Back Glue Recession versus Standard Fixed Suture Recession for Esotropia

**Abstract body**:

**Purpose**: To compare the risk of over-correction after medial rectus (MR) recession with the Wright hang-back glue versus standard fixed suture techniques. Guyton and Chung have reported standard hang-back recession has an over correction rate of 20% to 30% potentially due to poor muscle-sclera adherence. Hang-back recession reduces the complication of retinal tear, but the muscle may not adhere at the desired position increasing the risk of late posterior slippage and over-correction.

**Study Design**: Retrospective chart review of patients with MR recession by two techniques (Wright hang-back rectus recession with fibrin glue (WHBG) versus standard fixed suture rectus recession (SFR)) to treat esotropia. Historical comparison to results of standard hang-back recession of medial rectus muscle by literature review.

**Methods**: Medical records of 166 patients who underwent strabismus surgery by one surgeon between ---2017-2022 were reviewed. Inclusion criteria were patients who underwent MR recession by WHBG or SFR to correct esotropia. Exclusion criteria were patients undergoing concurrent strabismus surgery for vertical deviation, and patients without long-term follow-up. Primary outcome measure was incidence of over correction post-operatively defined as > 10 PD with minimum 3 months follow-up. Secondary outcome measure was post-operative alignment: good surgical outcome defined as post-operative deviation < or equal to 10 PD with minimum 3 months follow-up. Tertiary outcome was post-operative complications and rate of resolved diplopia. Data was analyzed using t-tests for continuous data, Fisher's exact test for non-continuous data (SPSS). Study was approved by our institutional Health Sciences Research Ethics Board.

**Results**: 27 eyes (14 patients) underwent WHBG and 58 eyes (32 patients) underwent SFR of the MR. Demographics were similar/non-significantly different between groups. Patients ranged from 6 months - 71 years. Pre-operative mean esotropia was 31.2+/- 10 PD (WHBG) and 32.3+/- 16PD (SFR); average MR recession 5.5+/- 1 mm (SFR) and 5.3+/- 0.7 mm (WHBG). Post-operative over-correction at 3-12 months was similar between groups: 0/13 (0%) (WHBG) and 1/29 (3.5%) (SFR) (p=1.00). Good surgical outcomes at 3-12 months post-operatively were similar between groups, 13/13 (100%) (WHBG) and 27/29 (93.1%) (SFR) (p=1.00), average post-operative deviation was

2.5+/- 2.6PD (WHBG) and 2.2+/- 7.7PD (SFR) (p=0.85). No complications occurred in either group. Diplopia resolved in 5/7 (62.5%) (WHBG) and 5/8 (71.4%) (SFR) patients (p=1.0).

**Conclusions**: WHBG recession of the medial rectus muscle was effective, with post-operative results not significantly different than SFR. WHBG has the important advantage of eliminating the complication of retinal perforation that can occur with SFR whilst avoiding over-correction that can occur with traditional hang-back recession.

**Paper |** Article 4628

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**Author disclosure block**: S. Dotchin: Employment/honoraria/consulting fees: Santen, Sun Pharma, Bayer. G. Assadzadeh: None., E. Sanders: None.

**Title**: Pediatric Vision Screening in Alberta

**Abstract body**:

**Purpose**: Pediatric eye health is a critical component of a child's overall ability to learn. School aged children may be unaware of visual disturbances that impede their vision. Alberta Health Care covers an initial comprehensive eye exam for all young Albertans. This is coupled with the The Eye See... Eye Learn® program which provides free glasses to kindergarten children. The aim of these resources is for early detection, diagnosis and treatment of pediatric eye conditions including refractive error, strabismus and amblyopia as children enter the school system. However, it is not clear how effective this program has been and who is accessing these resources. The purpose of this study is to determine the usage of provincial vision screening resources for children 10 years of age and younger, with specific interest in ages entering the school system (4, 5 and 6 years) and to look at the factors that may potentially affect utilization of the program.

**Methods/Studay Design**: A retrospective data review process was undertaken. Data was collected from Alberta Health (AH) from 2013-2020, and from Statistics Canada (SC) data product, 2016 census. AH data included billing information for all children ages 0-10 years who visited an optometrist or ophthalmologist in Alberta between 2013-2020. AH local geographic areas were mapped with SC postal code areas to utilize census 2016 data. SC household data including urban vs rural, income, language, education and current work status were obtained.

**Results**: Approximately 575674 (15%) children between the ages of 0 and 10 had their first vision screening by an optometrist in Alberta during 2013-2020. Within these years, 16.8% of children aged 4-6 in Alberta saw an optometrist for the first time. Those who lived in rural remote areas (14.2% access) were less likely than those who lived in rural (17%), urban (16.4%) or metro areas (17.5%) to see an optometrist. By pearson correlation, lower education levels percent with no high school certificate (-0.44) was found to be an important factor in access to optometry services. Lower household income was also found to be related to decreased utilization of care.

**Conclusion**: Pediatric vision screening is a crucial component of preventative healthcare. Early diagnosis and treatment of vision conditions in young children is essential. Currently, many of Alberta's children enter the school system without vision screening despite a comprehensive eye exam being covered by Alberta Health Care. This study is an important step in understanding patterns of access to pediatric vision screening services and to inform increasingly effective delivery of these resources hereafter.

**Paper |** Article 4486

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**Title**: Epidemiology of paediatric ocuLar pAthologies aND aSsoCiated referrAl pattErns (LANDSCAPE): A prospective study

**Abstract body**:

**Purpose**: Ocular conditions in childhood can cause permanent reductions in visual acuity (amblyopia), impacting multiple facets in life including, career opportunities, safety in locomotion, mental health, and athletic abilities. Identifying and understanding the epidemiology of various pediatric ocular pathologies can be crucial in allocating resources and proper recognition and management strategies. At the current time, there is limited comprehensive epidemiologic literature for the presentation of ocular diseases in the Canadian pediatric population. The objective of this study is to determine the spectrum of pediatric ocular pathologies presenting to a tertiary eye care centre.

**Design**: This is a prospective, single centered, observational study.

**Methods**: All new patients presenting to the pediatric ophthalmology clinic between April 2018-April 2019 were recruited on a rolling basis. Data collected included referral source, reason for consult, time to consult, patient age, gender, documentation of vision, and diagnosis. Data was extracted, coded, and analyzed by descriptive statistics using SPSS. Association between referral source or age of patient and follow up timing was analyzed using bivariate analysis.

**Results**: There were 214 patients recruited. The majority of referrals were received from optometrists (34.1%), family physicians (26%) and pediatricians (23.6%). Most common reasons for referrals included strabismus (27.6%), general assessment (16.7%), and external disease (11.4%). Most notably vision was not documented in 75.2% of the referrals and this appeared to be dependent on the age of the patient ($p<0.001$). Average number of days for consults to be seen was 68.49±44.1 days. Older children (7.27, 2.0-12.50, P=0.007) and referrals from optometrists (3.83, 0.073-7.58, p=0.046) were more likely to be seen at a later time.

**Conclusions**: This is first Canadian study to highlight the spectrum of ocular pathologies of children presenting to a tertiary eye care center. Common ocular pathologies included strabismus, refractive error, and external diseases. Moreover, this study highlights the need to educate primary eyecare providers regarding vision assessment in a preverbal child. Using epidemiologic data to

understand trends and areas for improvement may help to create initiatives to detect and treat ocular pathologies or causes of vision loss in a timely manner.

**Author's Note**: Dr. Gloria Isaza, a cherished pediatric ophthalmologist at McMaster University, played a significant role in the development and completion of this project. Regrettably, she passed away in 2020. The authors of this abstract wish to honor her contribution and acknowledge the vital role she played in this project/abstract.

**Paper |** Article 4201

**Authors**: Edward Tran, Vivian Phu BmSC *Western University*, Monali Malvankar PhD *Ivey Eye Institute*, Sapna Sharan MD *Ivey Eye Institute*.

**Author disclosure block**: E. Tran: None., V. Phu: None., M. Malvankar: None., S. Sharan: None.

**Title**: Strabismus surgery outcomes in pediatric patients with developmental delay: a meta analysis

**Abstract body**:

**Purpose**: The prevalence of strabismus is markedly increased in children with developmental delays, such as cerebral palsy, hydrocephalus, down syndrome, chromosomal anomalies, and many other syndromic children. In children with developmental delays, the prevalence of strabismus is approximately 44%, in contrast to the significantly lower prevalence of about 2% in the general population. Intervention of strabismus in these children is a contentious issue due to the unpredictable outcomes influenced by factors such as cortical visual impairment, limited neuroplasticity, and poor patient cooperation. Surgeons are often faced with parental pressures to align the eyes surgically. This meta-analysis aims to understand the strabismus surgical outcomes in children with developmental delay.

**Study Design**: Meta-Analysis

**Methods**: Eligible studies published before May 28th, 2023, were extracted from MEDLINE, EMBASE, CINAHL, Cochrane, and PsychINFO, as well as grey literature. Using Covidence, duplicate records were removed, and two independent reviewers assessed each record for relevance. Afterwards, a risk of bias assessment was conducted. Data were extracted and a meta-analysis was performed using STATA 14.0. Fixed-effect and random-effect models were computed based on heterogeneity.

**Results**: Our meta-analysis of 31 articles involved 3,687 subjects. We found that 37% of children with developmental delays undergo strabismus surgery. There was no significant difference in surgical dose (SMD -0.06, 95% CI: [-0.36,0.23]) between developmentally delayed and normal children. Though children with developmental delays had larger preoperative angles of deviation (SMD 0.34, 95% CI: [0.07,0.61]), post-operative angles of deviation were similar between the two groups (SMD -0.20, 95% CI: [-0.51,0.11]). In developmentally delayed children, the angle of deviation significantly improved (SMD 2.79, 95% CI: [2.50,3.08]) after surgery. The success rate of achieving orthotropia was lower in developmentally delayed (59.5%) compared to normal children (75.79%). The success rate of achieving binocular vision in developmentally delayed children was 17.5% compared to 42% seen in normal children. Among developmentally delayed children undergoing surgery, 71.45% had one operation, 23.9% had two, and 7.15% had three. Undercorrection rates were similar between the groups (20.4% vs 20.2%), but overcorrection rates were higher in children with delays (12%) compared to normal ones (4.35%).

**Conclusion**: Strabismus surgery in developmentally delayed children is a viable treatment option to improve misalignment of the eyes, however, it is associated with higher rates of re-operation, overcorrection, and worse rates of achieving binocular vision compared to normal children. These

findings will help in objective discussions with the family to allow them to make educated decisions on whether to operate.

**Paper |** Article 4551

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**Author disclosure block**: K. Nanji: None., J. Xie: None., A. Hatamnejad: None., D. Pur: None., M. Phillips: None., D. Zeraatkar: None., S. Sivaprasad: Research grants from Novartis, Bayer, Allergan, Roche, Boehringer, Ingelheim and Optos Plc, Travel grants from Novartis, Bayer, speaker fees from Novartis, Bayer and Optos Plc, and attending advisory board meetings. M. Bhandari: None., D. Steel: None., C. Wykoff: Consulting for Acuela, Adverum Biotechnologies, Inc, Aerpio, Alimera Sciences, Allegro Ophthalmics, LLC, Allergan, Apellis Pharmaceuticals, Bayer AG, Chengdu Kanghong Pharmaceuticals Group Co, Ltd, Clearside Biomedical, DORC Dutch Oph., V. Chaudhary: Advisory board member, grants and other from Novartis, acting as an advisory board member, grants and other from Bayer, grants from Allergan, and acting as an advisory board member for Roche, outside the submitted work.

**Title**: Exploring the Fragility of Meta-Analyses in Ophthalmology: A Systematic Review

**Abstract body**:

**NOTE**: This abstract will be presented via video recording.

**Purpose**: The quality of a meta-analysis can vary widely; not all meta-analyses can provide the same level of evidence. The fragility index (FI) of a meta-analysis evaluates the extent to which the statistical significance of a meta-analysis can be changed by modifying the event status of individuals from the included trials. An event status modification is defined as changing non-events to events or events to non-events for the outcome examined in the meta-analysis. Understanding the fragility of meta-analyses aids with the interpretation of the results and can help to inform changes to clinical practice. The purpose of this review was to determine the fragility of published meta-analyses in ophthalmology.

**Study Design**: Systematic review and meta-analysis.

**Methods**: This systematic review was registered in PROSPERO (CRD42022377589). Meta-analyses of randomized controlled trials with a binary outcome published prior to September 1st, 2022, in a journal classified as 'Ophthalmology' according to the 2022 Journal Citation Report or an Ophthalmology-related review published in the Cochrane Database of Systematic Reviews were

included. An iterative process was utilized to determine the minimal number of event-status modifications from individual trials that would change the statistical significance of the pooled treatment effect of the meta-analysis. A linear regression model evaluated the associations between the FI and the following characteristics: a) whether the outcome was the primary outcome, b) whether the study had a significant result, c) the sample size, d) the number of events, e) the impact factor of the journal that the study was published in, f) the subspecialty most relevant to the published report and g) whether the included outcome was related to safety or efficacy.

**Results**: 175 meta-analyses were included. The median FI was 6 (Q1-Q3: 3-12). This meant that modifying the event status of 6 individuals from one of the included studies would reverse the findings of the meta-analysis. The FI was 1 for 18 (10.2%) of the included meta-analyses and was <5 for 75 (42.4%) of the included meta-analyses. Only the number of outcome events was associated with the FI (p=0.037).

**Conclusions**: The statistical significance of meta-analyses in ophthalmology often hinges on the outcome of a few patients. The number of outcome events in a review is the single most important factor in determining the fragility of the evidence. Clinicians are encouraged to interpret the results of meta-analyses in ways beyond the p-value. The FI can supplement the reader's understanding of the strength of the evidence being presented.

**Paper |** Article 4618

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**Author disclosure block**: Youn: None., V. Parra: None., TE. Zhou: Recipient of Fighting Blindness Canada award., AL. Dorfman: None., A. Polosa: None., P. Hamel: None., TM. Luu: None., AM. Nuyt: None., S. Chemtob: None., A. Cloutier: None., CXY. Qian: Consultant/Contractor: Abbvie, Bausch & Lomb, Bayer, Boehringer Ingelheim, Novaris, Roche; Recipient of Choroidemia Research Foundation, Paul A. Fournier Foundation.

**Title**: The Structural and Functional Impact of Retinopathy of Prematurity in a Group of School-Aged Children

**Abstract body**:

**Purpose**: Increased survival of extremely premature infants has raised concerns for this population's long-term outcomes. The objective of this study was to evaluate the functional and structural effects of retinopathy of prematurity in a group of school-aged children.

**Study design**: Clinical cross-sectional study.

**Methodology**: Participants were recruited into three groups: "ex-ROP" (individuals born prematurely with a prior ROP diagnosis), "Preterm" (individuals born prematurely without a prior ROP diagnosis) and "Term" (full-term) individuals. Ex-ROP and Preterm participants were derived from the Health of Adults born Preterm Investigation (HAPI) cohort. Both eyes were included in the study. Participants received a comprehensive ophthalmological assessment including OCT imaging and flash and multifocal ERG. Statistical analysis was conducted on SPSS version 28.0.1.0.

**Results**: 18 participants, aged 7.9 to 13.7 years, were enrolled in the study, including 9 ex-ROP, 6 Preterm, and 3 Term. The ex-ROP group exhibited slightly worse best corrected visual acuity (BCVA) (logMAR 0.08) and a significantly higher prevalence of astigmatism (56%), compared to the Preterm (logMAR -0.01 [p=0.027]; 8% [p=0.008]) and Term (logMAR 0.01 [p=0.013]; 0% [p=0.01]) groups. Cylindrical errors were increased in the ex-ROP group (0.99 ± 0.70 D vs Preterm 0.25 ± 0.32 D [p<0.001] vs Term 0.17 ± 0.26 D [p=0.012]). In the macular OCT scans, ex-ROP participants displayed increased retinal thickness in the fovea (303 ± 34 µm vs Preterm 259 ± 27 µm [p=<0.01]) vs Term 239 ± 13 µm [p=0.019]) and parafovea (313 ± 24 µm vs Preterm 261 ± 27 µm [p=0.002] vs Term 281 µm ± 9 µm [p=0.002]). In flash ERG testing, attenuation in retinal function was observed in

several parameters for the ex-ROP group, notably in the a-wave and b-wave amplitudes under both photopic and scotopic conditions. Ex-ROP and Preterm participants showed decreased Multifocal ERG responses, especially in the parafovea, but this was not significant.

**Conclusions**: Our study indicates that a history of ROP is associated with worse BCVA, increased astigmatism, foveolar thickening, and diminished panretinal function on electrophysiological testing in a group of school-aged children. Consequently, ROP should not be regarded solely as a disease of infancy but rather as a lifelong condition capable of longstanding effects.

**Paper |** Article 4149

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**Author disclosure block**: M. Zaman: None., S. Donnelly: None., A. Bradshaw: None., N. Robitaille: None., C. Law: None.

**Title**: Effect of Bookmarks and E-Newsletter Inserts in Promoting Comprehensive Eye Exams in Young Children

**Abstract body**:

**Purpose**: Comprehensive pediatric eye exams are an opportunity to assess the structure and function of a child's eye. When the crucial visual developmental period for children has passed undetected conditions may be irreversible and lead to long-term negative visual and psychosocial outcomes. The objective of our study is to raise awareness of the vision related-health resources available to parents of young children.

**Study Design**: A single field experiment including every school (n = 64) with junior and senior kindergarten classes in the Kingston, Frontenac, Lennox, and Addington (KFL&A) catchment area

**Methods**: Bookmarks and e-newsletter inserts with URLs and QR codes directing parents to a landing page with information on comprehensive eye exam scheduling were distributed to all kindergarten students. Landing page visits from both modalities were tracked in order to understand which messaging, method, and school-factors impacted health-seeking behavior. Descriptive statistics were used to describe our study population. Independent and paired t-tests were used to understand how school related factors responded to the messaging modalities.

**Results**: The schools were divided into 3 groups (low n = 21, medium n = 20, or high index groups n = 21) based on their Educational Opportunity Index (EOI) scores. The Ontario Ministry of Education calculates the EOI scores based on census data on parental education, family income and lone-parent family status. The high index group is correlated with more external challenges affecting student outcomes. Our study population included a total of 3690 children: 16% lived in low-income households, 7% did not speak English as their first language, 3% were new to Canada from a non-English speaking country and 4% of parents did not hold a degree or diploma. Majority of the parents used the QR code to visit the landing page and group 2 had the highest engagement rate.

**Conclusion**: Utilizing targeted messaging about comprehensive eye exams has the potential to improve health-seeking behaviors of parents. There may be an association between demographic factors such as parental education, family income and immigration status as our results found a difference in engagement between EOI groups. The findings from our study can be used to inform future public health initiatives and strategies to promote the importance of pediatric eye exams.

**Paper |** Article 4262

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**Author disclosure block**: Isaac: None., K. Mireskandari: Advisory board member - Santen Inc, Bayer and Novartis., Tehrani: None.

**Title**: Do Infants Need Further Treatment after Receiving a Single Injection of Bevacizumab for Severe Retinopathy of Prematurity?

**Abstract body**:

**Purpose**: To assess the rate of re-treatment after a single injection of intravitreal bevacizumab (IVB), indications and characteristics of infants requiring further treatment.

**Study design**: Retrospective cohort chart review.

**Methods**: A review was performed of all consecutive infants treated between 2010-2021. Included infants had a single injection of IVB and a minimum follow-up of 6 months. Primary outcome was indications and frequency of re-treatment. Secondary outcomes included structural, visual, and refractive outcomes at last follow up.

**Results**: 127 infants (238 eyes) were included; 35 (28%) infants (67 eyes) received further treatment. The mean gestational age was 24.1±1.1 (range 22.9-26.6 weeks), birth weight was 589±123 (range 400-900 grams) and post-menstrual age (PMA) at re-treatment was 85.3±93.8 (median 63.9, IQR=50.9-75.8, range 36.6-545.1 weeks). 49 eyes (73%) of re-treatments originally had ROP in zone I and 27 eyes (40%) had AROP. Reactivation (7.1%) and progression or inadequate signs of regression (1.7%) were indications for re-treatment, all before 60 weeks PMA. Prophylactic laser treatment was performed for persistent avascular retina (15.5%), and other reasons (3.8%). Fifty-eight eyes were re-treated with laser photocoagulation, seven eyes received another injection of IVB, and two eyes of one patient received laser and buckle. All re-treated eyes had favorable structural outcomes at a mean age of 4.5±2.4 (range 0.8-10.0 years). Favorable visual outcomes were achieved in 83% (44/53) of eyes with measurable visual acuity. Mean monocular visual acuity was 0.5 ± 0.36 (median 0.4, IQR= 0.2-0.7, range 0.1-1.4 logMAR, n=53/67 eyes). Mean refractive error was -5.1± 5.4 (median -3.75, IQR -0.25 to -10.0, range +1.38 to -16.5 D, n=65/67 eyes). Prevalence of emmetropia (>-1.0 to ≤1 D) was (29%), overall myopia was (65%); low myopia (≥1.0 to <5 D) was (19%), high myopia (≥5 to <8 D) was (14 %), and very high myopia (≥ 8.0 D) was (32%).

**Conclusion**: In this cohort, the likelihood of re-treatment was higher in eyes with ROP in zone I or with AROP. Re-treatment for progression, failure of regression, or reactivation of acute disease was encountered in under 9% of all patients. Prophylactic laser treatment was performed in under 20% of infants. Routine laser treatment of all infants before NICU discharge may not be indicated when adequate follow up is possible. With up to 10 years of follow-up, no re-treated eye developed unfavorable structural outcome, and most eyes had favorable visual outcomes. The prevalence of myopia was high in these eyes.

**Paper |** Article 4213

**Authors**: Mariana Akemi Matsura Misawa, Mohab Eldeeb MD *Department of Ophthalmology and Vision Sciences, University of Toronto*, Michelle Markowitz OD *Toronto Western Hospital*, Samuel N Markowitz MD *Low Vision Service, Department of Ophthalmology and Vision Sciences, University of Toronto*, Monica Daibert-Nido MD *Low Vision Service, Department of Ophthalmology and Vision Sciences, University of Toronto*.

**Author disclosure block**: MA. Matsura Misawa: None., M. Eldeeb: None., M. Markowitz: None., SN. Markowitz: None., M. Daibert-Nido: None., : ., : ., : ., : ., : .

**Title**: Biofeedback Training for improving visual functions in children with nystagmus: a short-and-long term analysis

**Abstract body**:

**Purpose**: To increase visual functions and quality of life (QoL) in pediatric nystagmus cases with biofeedback training (BT).

**Study design**: We propose an interventional and non-randomized study to assess the effectiveness of Biofeedback training in the pediatric population of patients with infantile nystagmus.

**Methods**: Children treated with audio-visual BT on the MAIA microperimeter were analyzed pre- and 1-week post-BT (short term). Outcomes were binocular best corrected visual acuity (BBCVA) for distance and near, fixation stability (FS), reading speed (RS), contrast sensitivity (CS), stereopsis, and Children's Visual Function Questionnaire. BBCVA and FS were measured in the long term (> 3 months). One-way repeated ANOVA and paired t-tests were used for statistics.

**Results**: 23 cases (9.2 ± 2.3 years old) were followed for 1 week post-BT with a long term follow up of 14.8 ± 11.7 months. At the 1-week follow-up visit, there was a significant improvements in contrast sensitivity (from 0.16 ± 0.17 to 0.05 ± 0.08; p<0.001), reading speed (from 84.8 ± 42.7 to 108.9 ± 43.9; p<0.001), and QoL questionnaire scores (from 25.8 ± 2.8 to 27.4 ± 2.7; p=0.007). BBCVA logMAR VA improved from 0.38 ± 0.18 to 0.29 ± 0.19 and 0.27 ± 0.18 in the 1-week (p<0.001) and final follow-up (p<0.001) visits. Similarly, there was a significant improvement in near BCVA from baseline (0.13 ± 0.16) to the 1-week (0.05 ± 0.08; p=0.020) and final follow-up (0.02 ± 0.06; p=0.006) visits. Fixation stability improved from 14.3 ± 14.7 at baseline to 7.5 ± 8.9 (p=0.047) at 1-week and 5.4 ± 7.9 (p=0.006) at the final visit.

**Conclusion**: Biofeedback training delivered significant improvement in BBCVA for distance and near, fixation stability, contrast sensitivity, reading speed, and subjective visual functioning in patients with nystagmus. In this series, BT improved fixation stability and visual acuity for at least  14.8 ± 11.7 months. As a safe and cost-efficient rehabilitation technique, this study brings evidence that BT could provide a novel and relevant visual rehabilitation for patients with nystagmus.

**Paper |** Article 4195

**Authors**: Abed Baiad, Grace Yin *Queen's University*, Marko Popovic *University of Toronto*, Catherine Sun *McMaster University*, Rajeev Muni *University of Toronto*, Kamiar Mireskandari *University of Toronto*, Peter Kertes *University of Toronto*.

**Author disclosure block**: Baiad: None., G. Yin: None., M. Popovic: Financial support (to institution) – PSI Foundation, Fighting Blindness Canada., C. Sun: None., R. Muni: Advisory board- Bayer, Novartis, Allergan, Roche; Financial Support (to institution)- Bayer, Novartis., K. Mireskandari: Advisory board – Santen Inc, Bayer, Novartis; Financial Support (to institution) – Bayer., P. Kertes: Honoraria: Novartis, Bayer, Roche, Boehringer Ingelheim, RegenxBio, Apellis. Advisory board – Novartis, Bayer, Roche, Apellis, Novelty Nobility, Janssen, Viatris, Biogen. Financial support (to institution) – Roche, Novartis, Bayer, RegenxBio, Janssen, Ora.

**Title**: Which anti-VEGF to use for retinopathy of prematurity? A meta-analysis of bevacizumab, ranibizumab and aflibercept

**Abstract body**:

**Purpose**: Intravitreal anti-VEGF injections are being increasingly used for the treatment of retinopathy of prematurity (ROP). The purpose of this study was to compare the efficacy and safety of intravitreal bevacizumab (IVB), ranibizumab (IVR) and aflibercept (IVA) in the treatment of ROP.

**Methods**: MEDLINE, EMBASE and Cochrane CENTRAL were used to identify studies comparing IVB to IVR, IVB to IVA, or IVR to IVA. The primary outcome was ROP regression. Secondary outcomes included the likelihood of additional treatment, complete peripheral revascularization, refractive outcomes, and complications such as retinal detachment, cataract, endophthalmitis, macular ectopia, retinal folds, vitreous or retinal hemorrhages. A random effects model was designed.

**Results**: Overall, 2361 articles were identified. 3966 eyes from 15 comparative studies were included. There was no significant difference in initial regression of ROP between IVB vs. IVR or IVA ($p$>0.05). However, regression was greater with IVA compared to IVR (risk ratio RR= 1.66, 95% confidence interval CI= [1.14, 2.42], $p$= 0.008). The likelihood of retreatment was significantly higher with IVR compared to IVB and IVA (RR= 2.11, CI= [1.89, 2.37], $p$< 0.00001 and RR= 2.76, CI= [1.54, 4.97], $p$= 0.0007; respectively). However, there was no significant difference in retreatment between IVB and IVA ($p$= 0.36). Postprocedural complications were rare with no differences between IVB, IVR and IVA. IVB was more likely to be associated with subsequent myopia compared to IVR with a weighted mean difference of 1.11 D (CI= [0.32, 1.89], $p$= 0.006). Quality of evidence was rated moderate-low.

**Conclusion**: IVR was associated with a higher risk of retreatment compared to IVB and IVA. Initial regression was similar between IVB vs. IVR or IVA, but IVA was associated with better disease regression compared to IVR. Infants who received IVR had decreased myopia compared to infants who received IVB. With the increasing use of IVB, IVR and IVA for ROP, a randomized, prospective head-to-head comparison of these anti-VEGF agents' efficacy and safety is needed.

**Paper |** Article 4424

**Authors**: Sajedeh Uzbak, Michael Wan MD *Hospital for Sick Children*, David Smith MD *Hospital for Sick Children*, Leah Walsh MSc OC(C) *IWK Health Centre*.

**Author disclosure block**: S. Uzbak: None., M. Wan: None., D. Smith: None., L. Walsh: None.

**Title**: Is 15 minutes of monocular occlusion test as effective as 45 minutes of monocular occlusion test when evaluating divergence excess intermittent exotropes?

**Abstract body**:

**Purpose**: This investigation was carried out to determine if 15-minutes of prolonged monocular occlusion (PMO) test would be clinically and statistically equivalent to 45-minutes of prolonged monocular occlusion test when evaluating patients with divergence Excess intermittent Exotropia.

**Study Design**: Randomized, prospective, non-interventional study

**Methods**: A total of 22 patients diagnosed with divergence excess intermittent exotropia (DE-IXT) were prospectively reviewed. After a routine orthoptic examination, participants were randomly assigned to start with either a 15-min or 45-min PMO test, with each occlusion test separated by 10-min of recovery time to re-establish the baseline fusional status. The mean near and distance exodeviations obtained following each occlusion test were compared. The mean near-distance disparity obtained following each occlusion test was also compared. The data were statistically analyzed by the non-parametric Wilcoxon Signed Rank test.

**Results**: The mean initial exodeviation before occlusion was 9.64 ± 4.35, and 25.84 ± 5.22 at near and distance fixation points respectively. The mean near-distance disparity before occlusion was also measured to be 16.20 ± 3.94 prism diopters. The mean exodeviation at near was found to be 21.07 ± 7.45 and 22.32± 8.24 following 15-min and 45-min PMO respectively, with no clinical or statistically significant difference (P-value >0.05) in the size of the near deviation following each occlusion tests. The mean exodeviation at distance was 25.80 ± 5.61, and 26.68 ± 5.95 following the 15-min and 45-min PMO respectively, with no clinical or statistically significant difference notable between the two occlusion tests (P-value > 0.05). The initial near-distance disparity before occlusion was 16.20 ± 3.94 prism diopters. The near-distance disparity decreased to 4.95 ± 4.53 after 15-min PMO, and 5.73 ± 4.01 after 45-min PMO with no clinical or statistically significant difference between the two occlusion groups (P-value> 0.05).

**Conclusions**: The change in near and distance exodeviation noted following a 15-min of PMO and 45-min PMO are clinically equivalent and within 5 prism diopters of each other. The near-distance disparity noted in divergence excess exotropia patients can effectively be reduced to basic type with a 15-min of PMO. Therefore, reducing the costs and the time required in evaluating divergence excess intermittent exotropia patients in ophthalmology clinics.

## Retina | Rétine

**Paper |** Article 4145

**Authors**: Deven Deonarain, Amit Mishra MD *University of Alberta, Alberta Retina Consultants*, Graeme Loh MD *University of Alberta, Alberta Retina Consultants*, Matthew Tennant MD *University of Alberta, Alberta Retina Consultants*.

**Author disclosure block**: D. Deonarain: None., A. Mishra: None., G. Loh: None., M. Tennant: None.

**Title**: Outcomes of treatment of central serous chorioretinopathy with half-fluence half-dose photodynamic therapy

**Abstract body**:

**Purpose**: Photodynamic therapy (PDT) with verteporfin is an effective and relatively safe treatment for central serous chorioretinopathy (CSCR). Modifications to PDT protocols such as using half-dose verteporfin or half-fluence laser have shown comparable efficacy to standard PDT with better safety outcomes. It is hypothesized that the safety profile of PDT could be further ameliorated while maintaining efficacy via a half-dose, half-fluence approach. The purpose of this investigation is to determine outcomes in eyes with CSCR treated with a combination of half-dose and half-fluence PDT (half-half PDT).

**Study Design**: Retrospective cohort review.

**Methods**: This study included patients with CSCR treated with half-half PDT at Alberta Retina Consultants between September 2014 and July 2023. Exclusion criteria included any concomitant ocular disease or any history of ocular surgery, intraocular injection, or non-PDT laser therapy in the treated eye. Outcomes included visual acuity (VA), central subfield thickness (CST) and fluid resolution assessed at 3 months along with need for retreatment and reports of adverse events.

**Results**: There were 352 patients who met eligibility criteria and 378 eyes included in the study. The mean age was 50.4 years old and there were 262 males (74%). A total of 31 patients (8.8%) were on steroids before treatment. The mean baseline visual acuity was 59.2 ETDRS letters and the mean baseline CST was 364.3 microns. Post treatment there was a mean gain of 14.0 ETDRS letters ($p<0.05$). The mean CST decreased by 83.1 microns ($p<0.05$). There was complete resolution of subretinal fluid by 3 months post treatment in 212 eyes (50.8%). A second treatment was required in 135 eyes (35.7%). There were 13 eyes (3.4%) which developed choroidal neovascularization at some point during follow up post-PDT treatment.

**Conclusions**: PDT is a mainstay of treatment for CSCR. We describe a cohort of patients who received half-dose and half-fluence PDT for CSCR with improvement in both BCVA and CST. We highlight that half and half PDT is an alternative treatment for CSCR but may not be as effective as half-dose PDT.

**Paper |** Article 4525

**Authors**: David Wong.

**Author disclosure block**: D. Wong: Grant research support - Novartis, Roche, Employment/honoraria/consulting fees – Abbvie, Alcon, Apellis, Bayer, Bausch Health, Biogen, Ripple Therapeutics, Zeiss, Membership on an advisory panel, standing committee or board of directors – Ripple Therapeutics, Alcon

**Title**: Aflibercept 8 mg for DME: 96-Week Results from the Phase 2/3 PHOTON Trial

**Abstract body**:

**Purpose**: Evaluate aflibercept 8 mg vs 2 mg efficacy and safety in diabetic macular edema.

**Study design**: PHOTON (NCT04429503) was a multicenter randomized double-masked, 96-week (wk), Phase 2/3, non-inferiority trial.

**Methods**: Patients were randomized to receive aflibercept 8 mg every 12 or 16 wks after three initial monthly injections (8q12 [n=328] or 8q16 [n=163]) or aflibercept 2 mg every 8 wks after five initial monthly doses (2q8; n=167). Dosing intervals in the 8q12 and 8q16 arms could be shortened from Week (Wk) 16 and extended from Wk 52 based on protocol criteria.

**Results**: Least squares (LS) mean best-corrected visual acuity (BCVA) change from baseline at Wk 96 was +7.7 (2q8), +8.2 (8q12), and +6.6 (8q16) letters (LS mean difference: non-inferiority at 4-letter margin 8q12 vs 2q8: [nominal p<0.0001]; 8q16 vs 2q8: [nominal p=0.0044]). Through Wk 96, 88% (8q12) and 84% (8q16) of patients maintained ≥12- and ≥16-wk dosing intervals, respectively. In 8q16, 47% of patients had an assigned dosing interval of ≥20 wks at Wk 96. Aflibercept 8 mg and 2 mg safety outcomes were similar through Wk 96.

**Conclusions**: Aflibercept 8 mg maintained comparable BCVA gains vs 2 mg, with no new safety signals through 96 wks.

**Paper |** Article 4256

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**Author disclosure block**: R. Gizicki: Grant/research support – Roche, Bayer, Employment/honoraria/consulting fees – Bayer, Abbvie, Alcon, Bausch + Lomb., A. Ambresin: Speaker: Allergan/AbbVie, Bayer, Novartis, Optovue, Roche; Advisory board: AbbVie, Apellis, Novartis, Roche., A. Hock Chaun Koh: Consultant: Alcon, Allergan/AbbVie, Apellis, Bayer, Boehringer Ingelheim, Heidelberg Engineering, Novartis, Santen, Topcon, Zeiss., M. Singer: Consultant: Aerie, Allegro, Allergan, EyePoint, Genentech, Inc., Kodiak, Novartis, Regeneron, Santen; Speaker: Allergan, Genentech, Inc., Mallinckrodt, Novartis, Regeneron, Spark; (F): Aerie, Allegro, Allergan, DRCR.net, Genentech, Inc., Icon, Ionis, Kalv., R. Tadayoni: Consulting, personal fees, advisory boards: AbbVie, Alcon, Allergan, Apellis, Bayer, Chengdu Kanghong, Genentech, Inc., Iveric Bio, Novartis, Oculis, Roche, Thea, ZEISS., L. Hill: Genentech, Inc., A. Souverain: F. Hoffmann-La Roche Ltd.

**Title**: Potential for Q20W Dosing With Faricimab and Extended Treatment Outcomes in Neovascular Age-Related Macular Degeneration (nAMD): a Post Hoc Analysis of the Pivotal TENAYA/LUCERNE Trials

**Abstract body**:

**Purpose**: In the 112-week randomized, double-masked, active comparator–controlled, 2-year phase 3 TENAYA/LUCERNE (NCT03823287/NCT03823300) trials, dual inhibition of angiopoietin-2 and vascular endothelial growth factor-A (VEGF-A) with faricimab up to every 16 weeks (Q16W) resulted in durable vision gains, non-inferior to aflibercept Q8W in nAMD patients. This post hoc analysis evaluated how many patients could have been extended to Q20W dosing had the trials allowed and assessed the impact of maintaining extended faricimab treatment intervals (≥ Q12W) on vison and anatomy.

**Methods**: Treatment-naïve patients (pooled N = 1329) were randomised 1:1 to receive faricimab 6.0 mg up to Q16W (n = 665) after 4 initial Q4W doses or aflibercept 2.0 mg Q8W (n = 664) after 3 initial Q4W doses. Following protocol-defined disease activity assessments at weeks 20 and 24, faricimab-treated patients received fixed dosing up to Q16W until week 60 and then entered a protocol-driven treat-and-extend–based (T&E) dosing regimen. In this post hoc analysis, we evaluated the change in BCVA and CST at year 1 and year 2 of faricimab-treated patients who were always on ≥ Q12W and always on Q16W for the duration of the trials. We applied the T&E criteria to patients on Q16W dosing who had received ≥ 1 dose during the T&E phase to see whether they met the criteria for extension to Q20W.

**Results**: At year 1, faricimab-treated patients always on ≥ Q12W (n = 372) and always on Q16W (n = 204) treatment intervals demonstrated robust BCVA gains in line with the overall faricimab arm

(mean [SD]; always on ≥ Q12W, +7.0 [10.8] letters; always on Q16W, +7.9 [10.7] letters; overall faricimab arm, +6.2 [12.1] letters) that were maintained through year 2 (always on ≥ Q12W, +6.6 [12.9] letters; always on Q16W, +7.5 [11.8] letters; overall faricimab arm, +4.7 [14.9] letters). Patients on extended faricimab treatment intervals had meaningful reductions in CST from baseline and maintained through year 2 (always on ≥ Q12W,–142.8 [112.7] μm; always on Q16W, –145.3 [110.8] μm; overall faricimab arm, –147.1 [125.7] μm). 56% of faricimab-treated patients who received ≥1 dose during the T&E phase potentially could have extended to Q20W dosing.

**Conclusion**: Stable outcomes achieved by faricimab-treated patients always on extended treatment intervals could allow for potential interval extension to Q20W.

**Paper |** Article 4359

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**Author disclosure block**: K. Koushan: Grant/research support – Bayer, Membership on advisory panel, standing committee or board of directors: Novartis, Roche, Alcon, Allergan, Apellis., C. Bailey: Advisory board work/honoraria/travel support from: Roche, Bayer, Novartis, Janssen, Apellis, Alimera Sciences, Boehringer-Ingelheim., D. Tabano: Employee: Genentech, Inc., D. Borkar: Consultant: Allergan/AbbVie, Glaukos, Iveric Bio., V. Garmo: Employee: Genentech, Inc., A. Ahmed: Employee: Genentech, Inc.., R. Myers: Nothing to disclose., A. LaPrise: Nothing to disclose., T. Leng: Grants: Astellas; Consultant: Alcon, Astellas, Roche/Genentech, Apellis, Graybug, Nanoscope, Regeneron, Verana Health, Protagonist Therapeutics., R. Sing: Research Grant: Aerie, Apellis, Graybug; Consultant: Alcon, Bausch + Lomb, Genentech, Inc., Gyroscope, Novartis, Regeneron.

**Title**: FARETINA-DME- Six-Month Treatment Patterns and Outcomes in Patients with Diabetic Macular Edema Treated with Faricimab: an IRIS RegistryTM Analysis

**Abstract body**:

Purpose: Anti-Vascular Endothelial Growth Factor (VEGF) intravitreal agents for diabetic macular edema (DME) require frequent injections to mitigate vision loss. Faricimab is the only bispecific antibody for intraocular use that independently binds and neutralizes both angiopoietin-2 and VEGF-A. Real-world data on treatment patterns and outcomes of faricimab continues to grow. This analysis describes the largest real-world evaluation of injection frequency and clinical response of DME patients initiating faricimab.

**Methods**: FARETINA-DME is a retrospective real world study using data from the IRIS registry. Data analyzed February-September 2022 identified faricimab starts among patients diagnosed with DME. Rules-based text search using regular expression keywords was used to identify faricimab use. Patients with ≥ 12 months of electronic health record data prior to initiation and known laterality were included. Patients with ≥ 6 months of follow-up data were included in injection intervals and best documented visual acuity (BDVA) analyses. Injection intervals were categorized as “extended” if any interval was >6 weeks apart.

**Results**: 3,229 eyes (2,543 patients) were treated with faricimab for DME, with a mean (SD) of 2.9 (1.7) faricimab injections over a mean (SD) of 123.9 (65.5) days of follow-up. 515 (19.1%) of eyes were anti-VEGF treatment naïve; 2,176 (80.9%) were previously treated. Nearly half of eyes (48.2% treatment naïve; 44.3% previously treated) had 20/40 or better BDVA at faricimab initiation. Mean (SD) injection frequency of anti-VEGFs in the prior 12 months was 5.4 (2.9) injections with a mean

(SD) interval length of 52.9 (38.9) days. Most (64.3%) previously treated eyes were treated with aflibercept.128 (17.5%) treatment naïve and 605 (82.5%) previously treated eyes had ≥ 6 months of follow-up, with a mean (SD) 4.2 (2.2) injections. Mean (SD) change in BDVA after 4 injections was 0.8 (10.6) letter for previously treated eyes and 0.1 (9.5) letters in treatment naïve eyes. 92 (71.9%) of treatment naïve eyes (436 (72.1%) of previously treated eyes) “extended” their injection interval within their first 2 injections.

**Conclusions**: Over 3,000 eyes were treated with faricimab for DME in the US through September 2022. Among eyes with ≥ 6 months of follow-up, vision stability was observed while a majority of eyes began extending treatment intervals during four initial doses. Early treatment extensions may indicate a positive anatomical response to faricimab in DME patients.

**Paper |** Article 4319

**Authors**: Kirk Stephenson, Andrew Merkur MD FRCSC *University of British Columbia*, Andrew Kirker MD FRCSC *University of British Columbia*, David Albiani MD FRCSC *University of British Columbia*, Kaivon Pakzad-Vaezi MD FRCSC *University of British Columbia*.

**Author disclosure block**: K. Stephenson: None., Merkur: none., Kirker: Apellis Canada (consultant)., Albiani: Alcon Canada (consultant)., Pakzad-Vaezi: None.

Title: Rates of endophthalmitis before and after transition from povidone-iodine to aqueous chlorhexidine asepsis for intravitreal injection.

**Abstract body**:

**Purpose**: To assess the rate of post-intravitreal injection endophthalmitis between two asepsis groups: aqueous chlorhexidine 0.1% and povidone-iodine 5%.

**Study Design**: retrospective, observational cohort study

**Methods**: Retrospective chart review was performed investigating all patients receiving intravitreal injections at a single centre over 14 years. Patients from July 2009 to February 2017 received povidone-iodine, and patients from March 2017 to July 2022 received aqueous chlorhexidine. Assessed characteristics of endophthalmitis cases included demographics, time to presentation, visual function, intervention type (i.e., tap and inject vs vitrectomy) and microbiological results.

**Results**: Fifty-eight cases of post intravitreal injection endophthalmitis occurred during the study period (July 2009 to July 2022). The rate of endophthalmitis was comparable for povidone-iodine (0.03%) and aqueous chlorhexidine (0.04%) (p=0.17). Vitreous cultures were negative for 55% of patients. Visual acuity (VA) outcomes did not differ between asepsis groups nor between culture positive/negative groups with overall mean VA of LogMAR 1.17 ±0.82 at 1 year follow up.

**Conclusions**: Aqueous chlorhexidine is a viable and safe alternative to povidone-iodine for post intravitreal injection endophthalmitis prophylaxis and may reduce ocular surface adverse events and discomfort with chronic use.

**Paper |** Article 4253

**Authors**: Graeme Loh - *University of Alberta, Alberta Retina Consultant*, Simon Chen *University of Alberta - Faculty of Medicine and Dentistry*, Amit Mishra *University of Alberta, Alberta Retina Consultant*, Carl Shen *University of Alberta, Alberta Retina Consultant*, Mark Greve *University of Alberta, Alberta Retina Consultant*, Mark Seamone *University of Alberta, Alberta Retina Consultant*.

**Author disclosure block**: G. Loh: None., S. Chen: None., A. Mishra: None., C. Shen: None., M. Greve: None., M. Seamone: None.

**Title**: Comparison of RPE tear rate between anti-VEGF agents in the treatment of macular neovascularization.

Abstract body:

**Purpose**: Anti vascular endothelial growth factor (VEGF) injections are the gold standard for treatment of macular neovascularization. One known complication is the formation of retinal pigment epithelium (RPE) tears. This study aims to compare rates of RPE tears with different anti-VEGF agents (bevacizumab, ranibizumab, and aflibercept) and identify factors associated with this complication.

**Study Design**: Retrospective cohort study.

**Methods**: Eyes at a single site received anti-VEGF treatment for macular neovascularization. Cases of RPE tear were identified and incidences per anti-VEGF agent were calculated. Further data including size of pigment epithelial detachment (PED) pre tear, number of injections, BCVA post tear, and smoking were collected and analyzed.

**Results**: A total of 169659 anti-VEGF injections were performed during the study. There were a total of 58 cases of RPE tears following treatment (0.034%). The rate of RPE tears per medication was as follows: bevacizumab 0.057% (n=45), aflibercept 0.010% (n=9) and ranibizumab 0.33% (n=4) ($p<0.05$). The most common indication for treatment in the patients who developed RPE tear was AMD (92%) followed by polypoidal choroidal vasculopathy (3%), myopia (3%), and pachychoroid neovasculopathy (2%). There was an average loss of 5 ETDRS letters in patients who developed RPE tears in our study ($p=0.35$). The RPE tears following bevaciumab and ranibizumab resulted in a mean decrease of 5.36 and 8.75 ETDRS letters respectively while the aflibercept group had a mean gain of 0.56 ETDRS letters this was not significant. The mean number of injections before RPE tear across all agents was 6.15 (range 1-47). The mean PED size in all eyes that developed RPE tears was 523 microns.

**Conclusions**: RPE tears are a rare event following anti-VEGF injection for macular neovascularization. In our cohort the higest rate of tear was seen with ranibizumab treatment followed by bevacizumab and aflibercept. While it is often thought that this complication leads to vision decline there was a slight trend towards improvement in the aflibercept group; however, this was not statistically significant. The results of this study help guide anti-VEGF selection in patients who are at risk of RPE tear development.

**Paper |** Article 4365

**Authors**: Marko Popovic, Rajeev Muni, Katrijn Bogman PhD F. Hoffmann-La Roche Ltd, Ivaylo Stoilov MD Genentech, Inc., Cheikh Diack PhD F. Hoffmann-La Roche Ltd,

**Author disclosure block**: M. Popovic: None., R. Muni: Company: Alcon, Allergan, Bausch + Lomb, Bayer, Novartis, Roche, Type of affiliation: Employment/honoraria/consulting fees / Company: Bayer, Novartis, Roche, Type of affiliation: Grant/research support., K. Bogman: Employee: F. Hoffmann-La Roche Ltd., I. Stoilov: Employee: Genentech, Inc.., C. Diack: Employee: F. Hoffmann-La Roche Ltd.

**Title**: Faricimab Causes Rapid and Sustained Intraocular Suppression of Ang-2 and VEGF-A for Up to 16 Weeks in nAMD and DME

**Abstract body**:

**Objective**: To characterize the extent and duration of suppression of angiopoietin-2 (Ang-2) and vascular endothelial growth factor A (VEGF-A) in the aqueous humor of patients with neovascular age-related macular edema (nAMD) or diabetic macular edema (DME) treated with faricimab.

**Purpose**: Faricimab is a bispecific antibody designed to inhibit Ang-2 and VEGF-A, promote vascular stability, and improve outcomes in nAMD and DME. The purpose of this analysis was to evaluate the intraocular pharmacodynamics of faricimab.

**Methods**: Optional aqueous humor (AH) samples were collected from patients in randomized, double-masked, active comparator–controlled, phase 2/3 trials in nAMD (AVENUE [NCT02484690], STAIRWAY [NCT03038880], TENAYA [NCT03823287], LUCERNE [NCT03823300]) and DME (BOULEVARD [NCT02699450], YOSEMITE [NCT03622580], RHINE [NCT03622593]). Free Ang-2 and VEGF-A levels were measured using validated assays. A population pharmacokinetic/pharmacodynamic model (popPKPD) was developed using phase 2/3 pooled data, including AH data from ~300 patients, corresponding to 1025 free Ang-2 concentrations, 1345 free VEGF-A concentrations, and 1095 faricimab concentrations. Only patients with ≥ 1 non–below the limit of quantification (BLQ) sample were included in the popPKPD analysis.

**Results**: Mean baseline VEGF-A levels were 135 and 58 pg/mL in patients with DME and nAMD, respectively. Mean baseline Ang-2 levels were 13.4 and 8.1 pg/mL in patients with DME and nAMD, respectively. Approximately 75% of post-dose Ang-2 observations were BLQ. The popPKPD model described the observed data well. The model derived Ang-2 and VEGF-A concentration-time profiles showed that following intravitreal injection of faricimab, AH concentrations of Ang-2 and VEGF-A were rapidly suppressed to nearly unquantifiable levels. At 8 weeks post dose, median Ang-2 concentrations remained suppressed by ~80%. At 16 weeks post dose, median VEGF-A concentrations returned to baseline, but median Ang-2 levels remained below baseline.

**Conclusions**: PopPKPD analyses showed that faricimab treatment leads to rapid and sustained suppression of AH Ang-2 and VEGF-A levels, with Ang-2 suppression through 16 weeks post dose, supporting the extended durability demonstrated in phase 3 trials.

**Paper |** Article 4431

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**Author disclosure block**: V. Chaudhary: Grant/research support – Allergan Inc, Bayer, Novartis, Roche, Membership on advisory panel, standing committee or board of directors – Alcon, Bayer, Novartis, Roche Korobelnik: Receives consultant fees for AbbVie, Apellis, Bayer, Janssen, Nano Retina, Roche, Théa Pharmaceuticals, and Carl Zeiss Meditec AG; is a member of a data safety monitoring board or advisory board for Alexion, Novo Nordisk, and Oxular., : ., : ., : ., : ., : ., : ., : ., : .

**Title**: Aflibercept 8 mg in Patients with nAMD: Phase 3 PULSAR Trial 96-Week Results

**Abstract body**:

**Purpose**: Evaluate aflibercept 8 mg vs 2 mg in patients with treatment-naïve neovascular age-related macular degeneration.

**Study design**: PULSAR (NCT04423718) was a multicenter randomized double-masked, 96-week (wk), Phase 3 trial.

**Methods**: Patients were randomized 1:1:1 to receive aflibercept 8 mg every 12 or 16 wks (8q12 [n=335] or 8q16 [n=338]) or 2 mg every 8 wks (2q8 [n=336]) after three initial monthly injections. Dosing intervals in the aflibercept 8q12 and 8q16 groups could be shortened from Week (Wk) 16 and extended from Wk 52 based on protocol criteria.

**Results**: Least squares mean (SE) best-corrected visual acuity (BCVA) change from baseline at Wk 96 was +6.6 (0.7), +5.6 (0.8), and +5.5 (0.8) letters with aflibercept 2q8, 8q12, and 8q16, respectively (non-inferiority at 4-letter margin 8q12 vs 2q8: p=0.0006; 8q16 vs 2q8: p=0.0007 [p-values are nominal]). Through Wk 96, 76% (8q12) and 72% (8q16) of patients maintained ≥12- and ≥16-wk dosing intervals, respectively. In 8q16, 48% of patients had a planned dosing interval of ≥20 wks at Wk 96. No new safety signals were identified.

**Conclusions**: Aflibercept 8 mg maintained comparable BCVA gains vs aflibercept 2 mg, with similar safety through Wk 96.

**Paper |** Article 4374

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**Author disclosure block**: D. Rabinovitch: None., T. Felfeli: None., F. Murtaza: None., R. Goud: None., M. Veitch: None., L. Giavedoni: None., A. Berger: None., D. Chow: None., F. Altomare: None., E. Mandelcorn: None., D. Wong: None.

**Title**: Clinical and Demographic Risk Factors Associated with Recurrent and Fellow Eye Rhegmatogenous Retinal Detachments

**Abstract body**:

**Purpose**: To identify clinical and surgical risk factors associated with recurrent rhegmatogenous retinal detachment (RRD) in the same eye and RRD in the fellow eye.

**Study Design**: Retrospective chart review.

**Methods**: A retrospective analysis of clinical data over four years was conducted on adult patients undergoing RRD repair at two tertiary care centers. A total of 1,000 consecutive RRDs repaired between January 2018 to January 2022 were identified. Preoperative clinical characteristics, method of repair, and post-operative outcomes were evaluated using bivariate and multivariable analyses to identify variables associated with RRD recurrence in the same eye and RRD in the fellow eye. Primary outcomes measured were RRD recurrence and RRD in fellow eyes.

**Results**: Amongst the 1,000 patients, the mean age was 60.0 years and 40% were female. At baseline, 41% of the eyes were pseudophakic. RRD history was noted in 20% of the eyes with RRD and 10% of the fellow eyes at presentation. RRD recurred in 22% of eyes, primarily up to 80 days post-surgery. In the fellow eye, incident RRD occurred in 5% of the patients, typically beyond one year after the initial detachment in the presenting eye. Postoperative visual acuity significantly improved at one year for all eyes with RRD ($p<0.0001$). Bivariate analysis identified significant differences in recurrent RRD cases compared to those with no recurrence, including female sex, baseline visual acuity, detachment extent, and tamponade agents. After adjusting for confounders, only the extent of detachment in clock hours at presentation ($p=0.0048$) and pneumatic retinopexy ($p=0.0317$) significantly predicted RRD recurrence. For the fellow eyes, age ($p=0.0135$) and male sex ($p=0.0010$) were significant predictors of RRD.

**Conclusion**: Our study highlights the association of detachment extent and pneumatic retinopexy as predictors of recurrent RRD, which was most commonly noted up to 80 days post-operatively. Age and male sex are also risk factors for RRD in the fellow eye, which is commonly noted beyond one year after the initial detachment in the presenting eye. These findings emphasize risk stratification of patients and the necessity for follow-up care, particularly during the one-year post-operative follow-up period.

**Paper |** Article 4203

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**Author disclosure block**: Balas: None., T. Felfeli: None., A. Banahashemi: None., B. Tan: None., C. Hudson: None., W. Hatch: None.

**Title**: Longitudinal Analysis of Macular Thickness, Brain Volume, and Cognition in Alzheimer's Disease and Mild Cognitive Impairment

**Abstract body**:

**Purpose**: To investigate the utility of macular retinal thickness (mRT), measured by Spectral Domain Optical Coherence Tomography (SDOCT), as a potential biomarker for Alzheimer's disease (AD) and mild cognitive impairment (MCI) by exploring temporal relationships between mRT, brain volumes, and cognition.

**Study Design**: Longitudinal observational cohort study.

**Methods**: 47 participants enrolled in the Ontario Neurodegenerative Research Initiative (ONDRI) with two annual study visits and diagnosed with either MCI or AD were included in the analysis. They underwent assessments at each visit including Montreal Cognitive Assessment (MoCA) testing, mRT measurements, and neuroimaging using established neurodegenerative markers including total cerebrospinal fluid (CSF) and normal-appearing grey matter (NAGM) volumes. Overall mRT was calculated by averaging all Early Treatment Diabetic Retinopathy Study (ETDRS) grids composing the inner (1-3mm diameter) and outer (3-6mm diameter) macular rings (superior, temporal, inferior, nasal), followed by taking the mean of both eyes. Time-adjusted changes in each of these measures (mRT, MoCA, CSF, and NAGM) were calculated by dividing the difference in values between visits (first minus last) by the time in days. Spearman's correlation (ρ), Wilcoxon tests, and multivariable linear regression models were used to investigate relationships between time-adjusted changes in mRT, CSF, NAGM, and MoCA scores, along with various demographic covariates.

**Results**: Our analysis revealed significant correlations between time-adjusted changes in mRT and CSF (ρ=-0.32, 95% CI -0.56 to -0.04, $p<0.05$) as well as NAGM (ρ=0.36, 95% CI 0.08 to 0.59, $p<0.05$). No significant correlation was identified with changes in MoCA scores (ρ=0.02, 95% CI -0.27 to 0.31, p=0.89). Time-adjusted change in overall mRT was a significant predictor for the time-adjusted changes in CSF (parameter estimate: -928.87 $mm^3$, 95% CI: -1836.09 to -21.66, $p<0.05$), NAGM (parameter estimate: 934.16 $mm^3$, 95% CI: 292.99 to 1575.34, $p<0.01$), and MoCA scores (parameter estimate: 0.37 points, 95% CI: 0.07 to 0.71, $p<0.05$). There was no statistically significant difference in time-adjusted mRT change between the MCI and AD groups.

**Conclusion**: Our study identified time-adjusted mRT change as a significant predictor of CSF volume alterations as well as cognitive decline in patients with AD and MCI. Specifically, an increase in time-adjusted mRT (macular thinning) was significantly linked to CSF volume expansion, NAGM reduction, and decreasing MoCA scores (ie worsening cognition). These findings underscore the potential utility of SDOCT as a non-invasive, cost-effective biomarker for cognitive decline. However, further validation is required with larger studies and longer follow-up time, as well as sublayer analyses to fully explore the role of SDOCT in diagnosing, monitoring, and prognosticating neurodegenerative disorders.

**Paper |** Article 4553

**Authors**: Raman Tuli, Jeffrey Heier, Chao Li, Felix Yemanyi, Daniel Pereira, Daniel Jones, Charles Wykoff

**Author disclosure block**: Tuli: Membership on an advisory panel, standing committee or board of directors – Appelis, Roche, Bayer, Grant/research support – Opthea, Iveric Bio, Regenxbio, Jansen, Novartix., J. Heier: None., C. Li: None., F. Yemanyi: None., D. Pereira: None., D. Jones: None., C. Wykoff: None.

**Title**: Long-Term Efficacy and Safety of Pegcetacoplan from the GALE Open-Label Extension of the Phase 3 OAKS and DERBY Trials

**Abstract body**:

**Purpose**:
To report the efficacy and safety of continuous intravitreal (IVT) pegcetacoplan treatment in patients with geographic atrophy (GA)

**Study Design**: GALE is a 3-year open-label extension study of two Phase 3, randomized, double-masked, sham-controlled trials, OAKS and DERBY. The change in total area of GA lesions from baseline to Month 12 and Month 24 has previously been reported. GALE is assessing the long-term safety and efficacy of IVT pegcetacoplan in patients with GAsecondary to age-related macular degeneration (AMD).

**Methods**: In OAKS and DERBY, patients with GA secondary to AMD (best-corrected visual acuity ≥24 ETDRS letters and GAarea of 2.5–17.5 mm2) were randomized to pegcetacoplan monthly (PM) or every other month (PEOM), or sham monthly or every other month. Both subfoveal and nonsubfoveal GA lesions were included and choroidal neovascularization in the fellow eye was not exclusionary. In the GALE open-label extension study, patients in the pegcetacoplan arms in OAKS and DERBY continued the same treatment frequency, as did those on sham who switched to pegcetacoplan.

**Results**:
In OAKS and DERBY (N=1258) at Month 24, pegcetacoplan reduced GA lesion growth vs sham by 21 % PM and 17% PEOM (both $p<0.0001$; nominal), by 26% with PM and 22% with PEOM (both $p<0.0001$; nominal) in nonsubfoveal lesions (n=446), and by 19% with PM ($p<0.0001$; nominal) and 16% with PEOM ($p<0.0003$; nominal) in subfoveal lesions (n=765). Pegcetacoplan was well tolerated at 24 months; most study eye ocular adverse events were classified as mild or moderate. Overall, 83% (n=782) of patients who completed OAKS and DERBY entered GALE. Between Months 24 and 30, PM and PEOM reduced lesion growth vs a hypothetical sham arm by 39% and 32% (both $p<0.0001$; nominal), respectively. Between Months 24 and 30, PM and PEOM reduced lesion growth vs projected sham by 45% and 33%, respectively, in nonsubfoveal lesions, and 33% and 33%, respectively, in subfoveal lesions. Patients receiving sham who crossed over to pegcetacoplan (pooled) in the first 6 months of GALE had a reduction in GA lesion growth vs projected sham by 14%. There were no new or unexpected safety signals. Twelve-month GALE data will be presented.

**Conclusion:** Long -
term efficacy and safety of IVT pegcetacoplan were demonstrated in patients with GA.

**Paper |** Article 4175

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**Author disclosure block**: WY. Lam: None., Q. Li: None., N. Fung: None., WC. Lam: None.

**Title**: A common surgery to an uncommon problem: Surgical management of Myopic Traction Maculopathy

**Abstract body**:

**Purpose**: To review outcome of vitrectomy with membrane peeling in patients with Myopic Traction Maculopathy(MTM)

**Study design and Methods**: Patients who met the inclusion criteria of MTM with vitrectomy and membrane peeling done between 2018-2022(5-years) in a tertiary centre were included. Baseline demographics, visual acuity(VA), lens status, axial length and OCT features were extracted. The primary outcome was to analyze factors associated with anatomical success. The secondary outcome was to analyze factors associated with VA improvement.

**Results**: 80 eyes(from 71 patients) were included. 34 eyes had myopic foveoschisis-only, 31 had macular hole and 34 had macular detachment. 70.6% of myopic foveoschisis-only eyes showed post-op improvement in central retinal thickness(CRT). The median %CRT improvement was 25%. 52.9% had VA improvement(median 7.5-letter gain). Outer-schisis group had a median 61% CRT improvement, compared to no improvement in inner-schisis-only group(p=0.0047). Eyes without lamellar-hole had greater %CRT improvement, median 45% versus no improvement in lamellar-hole group (p=0.046) and VA improvement, median 15-letter gain versus no gain in lamellar-hole-group (p=0.0067) 42% of macular holes and 53% of macular detachments achieved primary anatomical success. For the latter, the presence of macula hole was associated with reduced chance of anatomical success(p=0.0006, odds-ratio=18.2). The final anatomical success rate was 51.7% for macula holes and 55.9% for macular detachment cases. A better baseline VA was associated with VA improvement(median: pre-VA=1.0 logMAR, 7.5-letter-gain).

**Conclusion**: Vitrectomy with membrane peeling is effective in the management of MTM, especially those with myopic foveoschisis-only. Although macular detachment and macula hole are both poor prognostic factors, the final anatomic success is >50%.

**Paper |** Article 4330

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**Title**: Impact of Faricimab vs Aflibercept on Epiretinal Membrane Formation Over 2 Years in Eyes with DME in the YOSEMITE/RHINE Phase 3 Trials

**Abstract body**:

**Purpose**: We conducted a novel post-hoc analysis to compare incidence of ERM formation in eyes with diabetic macular edema (DME) treated with faricimab vs aflibercept over 2 years. We describe the impact of ERMs on BCVA, anatomy and treatment intervals.

Methods: YOSEMITE/RHINE (NCT03622580/03622593) were randomized, double-masked, active comparator–controlled, phase 3 trials designed to assess efficacy, durability, and safety of faricimab in patients with DME. Patients were randomized 1:1:1 to faricimab 6.0 mg every 8 weeks (Q8W) after 6 initial Q4W doses, faricimab 6.0 mg treat-and-extend (T&E) after 4 initial Q4W doses, or aflibercept 2.0 mg Q8W after 5 initial Q4W doses. The protocol-driven T&E algorithm allowed dosing intervals to be extended to Q16W, maintained, or reduced to Q4W based on visual acuity and anatomic criteria. Presence of ERMs was an exclusion criterion for both trials. Masked, independent ERM grading (defined prior to study start as significant distortion of macular architecture in the central 1 mm of OCT images) was conducted at the Central Reading Centers (Duke and Vienna) at baseline and weeks 16, 48, 52, 56, 92, 96, and 100. The intent-to treat population included eyes with no baseline ERM.

**Results**: Over 2 years, ERMs developed in 23/619 (3.7%), 31/618 (5.0%) and 45/604 (7.5%) of faricimab Q8W, T&E, and aflibercept Q8W eyes, respectively. Risk of ERM formation was lower for faricimab Q8W vs aflibercept (HR 0.48; 95% CI 0.29, 0.80; nominal P=0.0039). The corresponding data for T&E patients vs aflibercept were HR 0.65 (95% CI 0.41, 1.03; nominal P=0.0644). Using a treatment agnostic approach, at year 2, eyes that developed ERMs during the study tended to have worse BCVA and CST outcomes than those that did not develop ERMs. Similarly, eyes that developed ERMs also tended to have higher rates of intra- (63/83; 75.9% vs 649/1336; 48.6%) and sub-retinal fluid (9/85; 10.6% vs 47/1372; 3.4%) at 2 years than those without ERM. Among faricimab-treated eyes in the T&E arm, dosing was extended to Q16W in a larger proportion of eyes without ERMs (332/516; 64.3%) than those with ERMs (7/28; 25%).

**Conclusions**: For the first time, we have demonstrated a potential anti-fibrotic effect of faricimab vs aflibercept in an analysis of pooled YOSEMITE/RHINE trial data from eyes with DME. ERMs were associated with numerically worse visual acuity, worse anatomic outcomes, and a lower rate of dose extension to Q16W.

**Paper |** Article 4199

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**Author disclosure block**: J. Wiens: None., M. Larocque: None., A. Murtha: None., G. Menon: None., E. Weis: None.

**Title**: Plaque Brachytherapy for Circumpapillary, Juxtapapillary and Peripapillary Choroidal Melanoma

**Abstract body**:

**Purpose**: To evaluate the treatment of circumpapillary, juxtapapillary and peripapillary choroidal melanomas using plaque brachytherapy, including visual outcomes, treatment failure and mortality data.

**Study Design**: Retrospective single-center study of 202 patients treated with iodine-125 plaque brachytherapy for circumpapillary (n=80), juxtapapillary (n=59), peripapillary (n=63) choroidal melanoma from January 2012 to September 2023.

**Methods**: Ethics approval was obtained from the Health Research Ethics Board for Alberta-Cancer Committee. Tumor distance from the optic nerve was measured with indirect ophthalmoscopy or from calibrated plaque brachytherapy photos. All patients were treated through the provincial ocular brachytherapy program by one surgeon (EW). Baseline examinations included ETDRS visual acuity, fundus photography, ultrasound (A- and B-scan), 24-2 visual field (SITA-standard), slit-lamp and fundus examinations. Studies from baseline examinations were completed annually. A significant reduction in visual acuity was defined as a best corrected visual acuity < or = 20/200. Significant central vision loss on visual field was defined as a cluster of >3 abnormal points (p<5%) on pattern-deviation plot with at least 1 point with p<1%, looking at the central 12 points (24 degrees). Patients were followed up to 5 years for visual endpoints, and to present day for metastatic disease and mortality data.

**Results**: The median follow up duration was 4.00 years for all patients, with 101 patients (50%) followed for at least 5 years. 95.5% of patients were treated with a notched episcleral plaque. 56 patients (27.7%) received prophylactic adjuvant treatment with transpupillary thermotherapy. At present, 1 patient (0.495%) has had local treatment failure requiring enucleation. 23 patients (11.4%) were diagnosed with metastatic disease post-brachytherapy. All cause mortality was 13.7% (28 patients) and melanoma-specific mortality was 7.92% (16 patients). At present, 73 patients have been followed for 5 years with reliable fields. 53.4% had central field loss at baseline, with a cumulative 91.8% of patients at 3 years and 97.3% at 5 years. At present, 79 patients have a complete 5 years of visual acuity data available. 45.6% had a visual acuity < or = 20/200 at 1 year, with a cumulative 70.9% of patients at 3 years and 83.5% at 5 years.

**Conclusions**: Plaque brachytherapy provides excellent local control with high rates of globe conservation for choroidal melanomas in close proximity to the optic nerve. The majority, but not all, patients will experience significant visual impairment.

**Paper |** Article 4362

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**Title**: Port Delivery System with Ranibizumab in Diabetic Macular Edema: Primary Analysis of the Phase 3 Pagoda Trial

**Abstract body**:

**Purpose**: The Port Delivery System with ranibizumab (PDS) is an innovative drug delivery system with a refillable ocular implant for continuous delivery of a customised formulation of ranibizumab into the vitreous. The phase 3 Pagoda trial is assessing the efficacy, safety and pharmacokinetics of the PDS with fixed 100 mg/mL refill-exchange procedures every 24 weeks (PDS) compared with intravitreal ranibizumab 0.5 mg injections every 4 weeks (RBZ) in patients with centre-involved diabetic macular edema (CI-DME).

**Methods**: Pagoda enrolled patients ≥18 years with CI-DME who were treatment-naïve or who had not received treatment for diabetic retinopathy or DME in the past 6 months. Inclusion criteria included best-corrected visual acuity (BCVA) of 25–78 Early Treatment Diabetic Retinopathy Study (ETDRS) letters (20/32 to 20/320 approximate Snellen equivalent), and central subfield thickness (CST) ≥325 µm. Eligible patients were randomised 3:2 to treatment with PDS or RBZ. Patients receiving PDS were assessed for the need for supplemental treatment with RBZ 0.5 mg at 2 visits before each refill-exchange. The prespecified primary endpoint was change in BCVA score (ETDRS letters) from baseline averaged over weeks (W) 60 and 64 using a non-inferiority margin of 4.5 letters. Additional efficacy endpoints included change from baseline CST and proportion of patients with ≥2-step improvement on the ETDRS Diabetic Retinopathy Severity Scale (ETDRS-DRSS).

**Results**: 634 eyes were randomised (PDS, n=381; RBZ, n=253). Baseline demographics were balanced between arms. Primary endpoint of noninferiority met for mean change in BCVA from baseline averaged over W60 and W64 (in ETDRS letters [95% CI]: PDS, 9.6 [8.7, 1.5]; RBZ, 9.4 [8.3, 10.5]; difference [95% CI] 0.2 [–1.2, 1.6]). PDS resulted in CST reductions comparable to RBZ through W64 with change of –203.5 µm with PDS and –199.7 µm with RBZ. A clinically meaningful improvement in DRSS at W64 was also observed with 39% of PDS patients achieving ≥2-step improvement from baseline on ETDRS-DRSS compared with 41.9% in the RBZ arm, although noninferiority was not met (difference (95% CI): –2.9 (–10.7%, 4.9%); Noninferiority margin: –10.0%). Through 2 refill-exchange intervals, 95.9% and 97.4% of PDS patients assessed did not receive supplemental treatment, respectively. Additional secondary efficacy results will be presented. The

PDS was well tolerated with no endophthalmitis cases and comparable systemic safety findings reported in the PDS arm through W64.

**Conclusion**: The PDS phase 3 Pagoda trial met its primary endpoint and demonstrated PDS Q24W resulted in vision outcomes at W60/64 that were noninferior to RBZ Q4W. PDS resulted in vision, anatomic and DRSS outcomes that were comparable to RBZ. The PDS was well tolerated, with no new safety signals.

**Paper |** Article 4276

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**Title**: Insights into the Effects of Subretinal Voretigene Neparvovec-rzyl in RPE65-Associated Leber Congenital Amaurosis: A One-Year Report

**Abstract body**:

**Purpose**: Leber Congenital Amaurosis (LCA) is a heterogeneous group of blinding retinal disorders commonly inherited in an autosomal recessive manner. Biallelic mutations in the *RPE65* gene cause ~8% of LCA, and patients demonstrate significant vision impairment from infancy. *RPE65* encodes an isomerase key to Vitamin A recycling. The first gene augmentation therapy (Voretigene Neparvovec, Luxturna) developed for *RPE65*-related LCA was approved by Health Canada in 2020. Provincial reimbursement was obtained in 2023. We were privileged to treat the first 3 Canadian patients whose treatment was reimbursed through private insurance. This study evaluates the safety and effectiveness of Voretigene Neparvovec until one year after treatment.

**Study Design**: Retrospective study of the three patients (6 eyes) with *RPE65*-related LCA who underwent subretinal administration of Voretigene Neparvovec.

**Methods**: Following ethics committee approval at The Hospital for Sick Children, data were collected from electronic medical records. This included pre- and post-operative best corrected visual acuity (BCVA), optical coherence tomography [elliposoid zone area (Eza) and width (Ezw), nuclear layer area (ONLa), and central macular thickness (CMT)], full-field stimulus threshold (FST), Goldman visual field (GVF) and a list of postoperative complications. We conducted a simple patient satisfaction index following surgery (0: unsatisfactory, 1: satisfactory, 2: very satisfactory).

**Results**: Caucasian males aged 25 years (case 1) and 13 years (cases 2 and 3, twins) participated in the study. Case 1 was compound heterozygous for two splice-site variants: c.11+5G>A and c.495+1dupG, while the twins had biallelic pathogenic missense variants [(p.Leu341Ser)/(p.Gly187Glu)]. There were no surgical complications. The BCVA did not change after surgery except for the left eye of case 2, which showed an improvement of 15 letters [baseline:

50 ETDRS letters (20/100), one year: 65 ETDRS (20/50)]. Manual OCT segmentation could be done only in the twins. At one year, all eyes had smaller EZa (mean reduction: - 4.38 $mm^2$), EZw (mean reduction: - 1167.5 um) and ONLa (mean reduction:- 2.66 $mm^2$). Except for the left eye of case 1, all eyes showed a decrease in CMT (mean reduction -29.6 um). All patients had significantly improved FST following therapy (Mean Baseline for white stimulus: -21.33 db; 1-year: -34.50 db). Patients had mild GVF loss to V4e (case 1) or III4e (the twins); however, the left eye of case 2 showed improved paracentral visual field (III4e). All patients were very satisfied to have undergone gene therapy.

**Conclusion**: Voretigene Neparvovec was found to be safe and significantly improved FST and night vision in all three patients despite a structural loss on macular OCT.

**Paper |** Article 4159

**Authors**: Jason Noble, Christina Weng MD, MBA *Baylor College of Medicine, Cullen Eye Institute*, Audrey Souverain PharmD, MSc F. *Hoffmann-La Roche*, Ivaylo Stoilov MD Genentech, Inc., Philippe Margaron PhD Hoffmann-La Roche.

**Author disclosure block**: J. Noble: Membership on an advisory panel, standing committee or board of directors – Apellis, Bayer, Employment/honoraria/consulting fees – Hoffmann-La Roche, Biogen, C. Weng: None., A. Souverain: None., I. Stoilov: None., P. Margaron: None.

**Title**: An Assessment of the Impact of Disease Activity Criteria on Dosing Interval Assignment in Clinical Trial Patients With nAMD

**Abstract body**:

**Purpose**: Clinical treatment decisions for patients with neovascular age-related macular degeneration are based on disease activity. Likewise, in clinical trials, disease activity criteria guide dosing regimen allocation and dosing interval adjustment. Criteria may differ between trials, complicating comparison of durability outcomes. Faricimab (Vabysmo) (FAR), a dual angiopoietin-2/vascular endothelial growth factor-A inhibitor, maintained vision with extended treatment durability and fewer injections vs aflibercept through 2 years in the TENAYA/LUCERNE (NCT03823287/NCT03823300) nAMD trials. This analysis evaluated how applying different disease activity criteria may have impacted FAR dosing interval assignment in TENAYA/LUCERNE.

**Methods**: In TENAYA/LUCERNE, patients (N=1329) were randomized 1:1 to FAR 6.0 mg or aflibercept every 8 weeks (Q8W). In the FAR arm, patients were assigned to treatment intervals up to Q16W (n=665) based on protocol-defined disease activity designed to reflect clinical practice, defined as: best-corrected visual acuity (BCVA) loss of ≥5 (vs mean over 2 previous visits) or ≥10 letters (vs highest BCVA over 2 previous visits); or central subfield thickness (CST) >50 µm (vs mean over 2 previous visits) or ≥75 µm (vs lowest CST over 2 previous visits); or new macular hemorrhage. Application of these criteria at week 20 was compared with application of vision and anatomic disease criteria (adapted from dose regimen modification criteria used in PULSAR; NCT04423718) at week 20, defined as: BCVA loss >5 letters (vs week 16 BCVA) and CST increase >25 µm (vs week 16 CST) or new macular hemorrhage.

Results: When disease activity was based on vision or anatomic criteria (TENAYA/LUCERNE), 78% of FAR patients were assigned to ≥Q12W dosing at week 20 (**Fig 1**). In contrast, in a hypothetical scenario where disease activity was based on vision and anatomic criteria, 96% of FAR patients would have been assigned to ≥Q12W dosing at week 20 (**Fig 1**).

**Conclusions**: Application of disease activity criteria in clinical trials can have a significant impact on dosing interval adjustment/determination. Attention should be paid to which criteria best reflect real-world practice to understand the likelihood of trial results translating to treatment burden reductions.

**Paper |** Article 4397

**Authors**: Andrew Mihalache, Ryan Huang MSc MD(C) *University of Toronto*, Marko Popovic MD MPH *University of Toronto*, Michael Balas MD(C) *University of Toronto*, Mariam Issa MD *University of Toronto*, Isabela Melo MD *University of Toronto*, Aurora Pecaku MD *University of Toronto*, Sue Demian MD *University of Toronto*, Rajeev Muni MD MSc FRCSC *University of Toronto*.

**Author disclosure block**: A. Mihalache: None., R. Huang: None., M. Popovic: Financial support (to institution) – PSI Foundation, Fighting Blindness Canada., M. Balas: None., M. Issa: None., I. Melo: None., A. Pecaku: None., S. Demian: None., R. Muni: None.

**Title**: Adaptive Optics Imaging in Retinal Detachment: A Retrospective Analysis

**Abstract body**:

**Purpose**: To investigate the associations between adaptive optics (AO) photoreceptor parameters and clinical outcomes in retinal detachment (RD) patients post-RD surgery.

**Study Design**: Retrospective, observational cohort study.

**Methods**: Patients with RD over the age of 18 years old that underwent AO imaging following RD repair were included. AO imaging was performed using the RTX1 camera (Imagine Eyes, Orsay, France) and data pertaining to the following photoreceptor parameters were collected: cone regularity, density, spacing, and dispersion. Associations between photoreceptor parameters and logMAR BCVA, metamorphopsia, and aniseikonia were examined using multivariable regression models on Stata v.17.0 (StataCorp LLC, College Station, Texas), adjusting for age, sex, and the number of days between AO imaging and each outcome.

**Results**: Across 49 patients imaged with AO, 41 RD eyes and 28 control eyes were included in our analysis. BCVA was associated with cone spacing at 2° (p=0.033) and 4° eccentricities (p=0.016). Moreover, BCVA was inversely associated with cone density at 2° (p=0.045) and 4° eccentricities (p=0.009). Vertical and horizontal metamorphopsia were both inversely associated with cone density at 2° (p=0.029 and p=0.034, respectively) and 4° (p=0.012 and p=0.013, respectively) eccentricities. Vertical metamorphopsia was also associated with cone spacing at 4 degrees of eccentricity (p=0.020). The difference in cone dispersion between eyes was associated with vertical (p=0.033 and p=0.016, respectively) and horizontal aniseikonia (p=0.025 and p=0.022, respectively) at 2° and 4° eccentricities, respectively.

**Conclusions**: Several changes in AO photoreceptor architecture were significantly associated with clinical outcomes in RD patients post-RD surgery. Future prospective trials should explore associations between clinical characteristics and AO parameters in diverse RD patient populations.

**Paper |** Article 4445

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**Author disclosure block**: P. Arjmand: Membership on an advisory panel, standing committee or board of directors – Roche, Bayer, Employment/honoraria/consulting fees – Sentrex., M. Kamei: Ad board/ honoraria: Alcon Japan, Bayer, Chugai, Daicel, HOYA, Kowa, Menicon, Novartis, Otsuka, Santen, Senju, Sony, Wakamoto., LP. Paris: Employment/ Consultancy: Genentech, Inc.., F. Abreu: Employment/ consultancy: Genentech, Inc.., P. Arrisi: Employment/ Consultancy: Roche Products Ltd., K. Basu: Employment/ Consultancy: Roche Products (Ireland)., Z. Haskova: Employment/ Consultancy: Genentech, Inc.., Y. Liu: Employment/ Consultancy: Genentech, Inc.., AC. Retiere: Employment/Consultancy: Roche Products., J. Willis: Employment/ Consultancy: Genentech, Inc.., A. Korecha: Employment/ Consultancy: Roche Products Ltd.

**Title**: Faricimab in Retinal Vein Occlusion: 24-week results from the BALATON and COMINO Trials

**Abstract body**:

**Purpose**: To assess the 24-week efficacy and safety of faricimab in patients with macular edema due to retinal vein occlusion (RVO).

**Study Design**: Phase 3, multicenter, randomized, double- masked, active comparator–controlled trials, BALATON (NCT04740905) and COMINO (NCT04740931).

**Methods**: Anti-VEGF treatment-naïve patients with center-involving macular edema secondary to BRVO or CRVO/HRVO were enrolled in this faricimab study. From day 1 through week 20, patients received 6 monthly intravitreal injections of faricimab 6.0 mg or aflibercept 2.0 mg. After the primary endpoint at week 24, all patients crossed over to faricimab 6.0 mg in up to 16 weekly intervals based on personalized treat-and-extend based regimen. The primary endpoint was change from baseline in best-corrected visual acuity (BCVA) at week 24. Noninferiority of faricimab versus aflibercept was evaluated. Secondary endpoints through week 24 include mean change from baseline in BCVA and central subfield thickness (CST).

**Results**: 553 and 729 patients were enrolled in BALATON and COMINO, respectively. BCVA gains from baseline at week 24 with faricimab were noninferior to aflibercept in BALATON (adjusted mean [95.03% confidence interval] change: +16.9 letters [15.7, 18.1] vs +17.5 letters [16.3, 18.6]) and COMINO (+16.9 letters [15.4, 18.3] vs +17.3 letters [15.9, 18.8]). CST reductions from baseline were comparable across treatment arms. Faricimab was well tolerated through week 24, with a safety profile comparable to aflibercept.

**Conclusions**: Findings from BALATON/COMINO demonstrate the efficacy and safety of faricimab, a dual angiopoietin-2 and VEGF-A inhibitor, in patients with macular edema secondary to RVO.

**Paper |** Article 4280

**Authors**: Sheetal Pundir, Gael Cagnone *CHU St Justine Hospital, University de Montreal*, Jean S. Joyal CHU St-Justine, Univerity de *Montreal*.

**Author disclosure block**: S. Pundir: None., G. Cagnone: None., JS. Joyal: None.

**Title**: New therapeutic target for optimizing retina ischemic tissue revascularization

**Abstract body**:

**Purpose**: To define distinct metabolic and transcriptional signatures for physiological and pathological vessels in retina.

**Study design**: Basic (experimental)

**Methods**: We used a multiomics approach to study the metabolic hallmarks of physiological and pathological angiogenesis in proliferative retinopathies and to identify transcriptional signature for pathological neovessels.

**Results**: Physiological angiogenesis revascularizes the ischemic retina, while misguided pathological neovessels grow towards the vitreous. We analysed the metabolite profile in vitreous humor samples from patients with proliferative diabetic retinopathy. We observed an accumulation of fatty acyl carnitines, by-products of mitochondrial fatty-acid-oxidation (FAO) in diabetic retinopathy samples compared to controls. In mouse PR, using unbiased large-scale approaches combining metabolomics and single-cell transcriptomics, we observed distinct metabolic pathways define glycolytic migratory tip endothelial cells (ECs), essential to the regenerative process, and misguided yet actively proliferating neovascular endothelial cells (nvECs) that rely instead on fatty acid oxidation. Direct comparison showed 449 differentially expressed genes (DEGs) between healthy tip EC and nvEC (P value < 0.05, log2(FC) > 0.5. nvECs up-regulated genes were significantly enriched in FAO pathways whereas tip ECs were enriched for glycolysis pathways. Inhibition of FAO in ischemic retina shifted the metabolism to glycolysis, accelerated physiological revascularization and, improved visual function as measured by electroretinography (ERG) in murine model.

**Conclusions**: Providing metabolic supply to ischemic neurons preserves function. In proliferative retinopathies, a prevalent cause of blindness globally, misdirected pathological neovascular tufts often emerge in lieu of needed physiological revascularization of the ischemic neuroretina. We show that metabolic shifts in the neurovascular niche define this angiogenic dichotomy. Fatty acid oxidation (FAO) metabolites accumulated in human and murine PR samples. Neovascular tufts with a distinct single-cell transcriptional signature highly expressed FAO enzymes. The deletion of Sirt3, an FAO regulator, shifted the neurovascular niche metabolism from FAO to glycolysis and mitigated tuft formation. This metabolic transition increased Vegf expression in astrocytes and reprogrammed pathological ECs to a physiological phenotype, hastening vascular regeneration of the ischemic retina. Our findings identify SIRT3 as a metabolic switch in the neurovascular niche, offering a new therapeutic target for optimizing ischemic tissue

revascularization. Our findings have implications for other neuro-ischemic conditions like stroke, where enhancing regenerative angiogenesis could preserve neuronal function.

**Paper |** Article 4119

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**Author disclosure block**: I. Martins Melo: None., A. Elsehemy: None., A. Pekacu: None., C. Zajner: None., R. Naidu: None., R. Muni: None.

**Title**: Impact of Baseline Morphologic Stage of Rhegmatogenous Retinal Detachment on Post-operative Anatomical Outcomes

**Abstract body**:

**Purpose**: The previously described morphologic stages of rhegmatogenous retinal detachment on OCT allow for more objective treatment decision-making and may be valuable for accurate prognostication of treatment outcomes (1). In this study, we sought to assess whether the baseline morphologic stages of rhegmatogenous retinal detachment (RRD) are associated with postoperative optical coherence tomography (OCT) anatomic outcomes.

**Study design**: This is a retrospective cohort study including consecutive patients with fovea involving RRDs who were referred to St. Michael's Hospital, Unity Health Toronto, Toronto, Canada, from January 2012 to September 2022. Patients were treated at the discretion of the same surgeon (R.H.M.) with either pneumatic retinopexy, pars plana vitrectomy (PPV), scleral buckle (SB) or combined PPV and SB, as per standard of care. Exclusion criteria included any prior macular pathology, vitrectomy, or recurrent RRD in the first 12 months post-treatment. Best corrected visual acuity (BCVA) was obtained at 3, 6 and 12 months post-operatively.

**Methods**: Patients with primary RRD were assessed for the morphologic stage of RRD according to baseline OCT as per Melo et al 2022 (1). Briefly, RRDs were divided into 5 stages: 1) Stage 1 was marked by dissociation of neurosensory retina layers, 2) Stage 2, the bacillar layer thickesn, leading to a hyperreflective homogenous line, 3) Stage 3 is marked by the appearance and abundance of retinal corrugations (ORCs) that are low frequency in the early phase (Stage 3a) and high frequency on the low phase (Stage 3b), 4) Stage 4, the continuous thickening of the bacillary layer leading to hyperreflective dots (HRDs) and loss of ORCs definition, 5) Stage 5, where the loss of both outer segment and inner segment layer of the photoreceptors occurs. Postoperative OCTs were graded at 3, 6 and 12 months for internal limiting membrane (ILM), ellipsoid zone (EZ) and interdigitation zone (IDZ) integrity, epiretinal membrane (ERM) presence and severity of residual subfoveal fluid.

Results: 351 RRD patients were included in the study. Advanced baseline morphologic stages of RRD were significantly associated with a discontinuous ELM, EZ and IDZ at all time points

postoperatively ($p<0.001$). On the contrary, early stages were more associated with subfoveal blebs of residual fluid ($p<0.001$). There was no association between presenting stage of RRD and ERM severity. However, late stages were associated with earlier development of ERM at 3 months ($p=0.012$). Finally, we found that ELM, EZ, or IDZ discontinuity on post-operative OCT was associated with BCVA outcomes post-operatively ($p<0.001$).

**Conclusion**: Increasing baseline morphologic stages of RRD are associated with worse recovery of outer retinal bands and faster development of ERM at 3 months postoperatively. The stages of RRD are novel prognostic biomarkers of postoperative photoreceptor integrity.

# Uveitis | Uvéite

**Paper** | Article 4342

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**Author disclosure block**: DR. Chow: None., M. Hébert: None., MJ. Aubin: None.

**Title**: Choroidal metastasis masquerading as anterior and posterior scleritis

**Abstract body**:

**Purpose**: Choroidal metastasis can present with visual symptoms like blurry vision, flashes and floaters, but rarely redness and pain. We describe here an unusual presentation of choroidal melanoma metastasis from a cutaneous primary, initially manifesting as anterior and posterior scleritis.

**Study Design**: Case report.

**Methods**: Retrospective analysis of BSCR patients' initial symptoms from medical records, data analyzed statistically.

**Results**: A 70-year-old man with no neoplastic history but a familial history of colon cancer presented with redness and pain, without photophobia. On initial examination, visual acuity was 20/50+2 in the right eye (OD) and 20/20-1 in the left eye (OS), with intraocular pressures of 18 mmHg OD and 12 mmHg OS. Physical examination revealed scleral vessel dilation nasally and supero-nasally with pain on palpation consistent with anterior scleritis OD. On MRI, a choroidal nodular non-pigmented mass located nasal to the optic nerve OD, measuring 7 x 3 mm, was observed. This mass measured 5DD x 2DD on fundus exam and 13.6 x 5.9 mm on B-scan a few weeks later. Additionally, fundus examination OD revealed peripheral choroidal detachments. Examination of the contralateral eye was unremarkable except for a small retinal tear that was treated with laser. Prednisolone, atropine drops and oral corticotherapy were provided after excluding infections. Routine colonoscopy biopsied polyps with a diagnosis of melanoma. A suspicious scalp lesion was biopsied, testing positive for MelanA and SOX10 but negative for AE1/3 in immunohistochemistry. There was absence of BRAF mutation but NRAS was positive. A PET scan revealed numerous hypermetabolic hypodense hepatic lesions and multicentric metastatic involvement in infra-diaphragmatic, hepatic, splenic, muscular, and osseous lymph nodes. These findings suggested melanoma metastasis. Subsequently, cerebral MRI revealed multiple intracranial metastatic lesions with potential hemorrhagic components. Following two immunotherapy cycles, metastatic progression persisted along with headache, scotoma and a 3 day blurred vision episode OD. Eye examination revealed vitreous hemorrhage OD and MRI showed slight growth in the right ocular mass and new or progressing hemorrhagic components of the ocular and intracranial lesions. On final follow-up, visual acuity was 20/50-2 OD and 20/20 OS, with slight progression of the OD choroidal mass and no signs of scleritis or intraocular inflammation. In addition to immunotherapy, the patient was offered local ocular and cerebral palliative radiotherapy, aiming to reduce lesion size, preserve vision and minimize discomfort.

**Conclusion**: Recognizing that neoplasia can mimic inflammatory disorders such as scleritis is crucial. Moreover, primary choroidal melanoma can be difficult to distinguish from melanoma metastasis. Raising awareness of such atypical presentations is essential for early diagnosis and management.

**Paper |** Article 4351

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**Author disclosure block**: A. Hocini: None., M. Hébert: None., E. Celo: None., S. Trottier: None., L. Jaworski: None., MJ. Aubin: None.

**Title**: Ocular syphilis: case series (2016-2023) from 2 tertiary care centres in Montreal, Canada

**Abstract body**:

**Purpose**: To describe the demographic characteristics, clinical presentation, prevalence of co-infection with the Human Immunodeficiency Virus (HIV), and treatment of patients with ocular syphilis who were treated at the ophthalmology department of two university hospitals in Montreal, Canada, and to examine the use of oral prednisone in the treatment of patients with ocular syphilis.

**Design**: Retrospective case series

**Methods**: Review of records of 95 patients from 2016 to 2023, with a positive syphilis treponemal serology and a likely ophthalmological diagnosis associated with syphilis.

**Results**: Mean age of onset was 57 years, with a predominance of 82% of male subjects. The average visual acuity was 0.22 [0.04, 0.70] logMAR (approx. 20/40) at the initial examination and 0.10 [0.00, 0.40] logMAR (approx. 20/25) at the final examination ($p<0.01$). HIV serological status was known for 74% of the subjects, with an HIV infection rate of 20%. Among the ocular diagnoses, 45% of patients had anterior uveitis, 18% had intermediate uveitis, 8% had posterior uveitis, 24% had panuveitis, 14% had optic nerve involvement, and 5% had episcleritis/scleritis. Both eyes were affected in 57% of patients. A lumbar puncture was performed in 54% of subjects, among whom 18% had a positive result in cerebrospinal fluid examination. Regarding treatment, 78% of patients were treated with the neurosyphilis antibiotic regimen, while 20% received oral prednisone.

**Conclusions**: Syphilis continues to be prevalent in Montreal, and it should always be considered in the differential diagnosis of ocular inflammation. In our cohort of patients treated at a tertiary care ophthalmology clinic, there was a statistically significant improvement in logMAR acuity between the first and last ophthalmology visits. It remains important to diagnose syphilis and co-infection with HIV, and to initiate treatment promptly.

**Paper |** Article 4469

**Authors**: Valérie Gagné, Department of Medicine, Université Laval, Anna (Huixin) Zhang *Prism Eye Institute and Department of Medicine, Université Laval*, Kevin Yang Wu DMD, MD *Université de Sherbrooke*, Lysa Houadj *Université de Sherbrooke*.

**Author disclosure block**: V. Gagné: None., A. Zhang: None., KY. Wu: None., L. Houadj: None.

**Title**: Diagnosing and Managing Uveitis Associated with Immune Checkpoint Inhibitors: A Comprehensive Review

**Abstract body**:

**Purpose**: As immune checkpoint inhibitors (ICI) are increasingly employed in cancer therapy, a staggering number of ICI-induced uveitis cases are reported. Diagnosis and management are often delayed due to barriers to recognizing it as a rare immune-related adverse event (IRAE). The present study aims to provide a comprehensive review of the mechanism, risk factors, clinical manifestations, diagnostic, and therapeutic approaches for uveitis induced by ICIs.

**Study Design**: This article is a literature review.

**Methods**: A comprehensive literature search of MEDLINE and EMBASE using keywords “uveitis”, “immune checkpoint inhibitors”, and generic drug names yielded 343 articles, of which 168 case reports, randomized clinical trials, and cohort studies were included. No date and language limitations were set.

**Results**: Uveitis is the most common ocular IRAE outside of dry eyes and has a prevalence of 0.3% to 6% among ICI users across clinical trials. A combination of factors – including HLA predisposition, cross-reactivity with cancer antigens, and the microbiome - play a role in the pathogenesis of ICI-induced uveitis. Melanoma, CTLA-4 inhibitors, and past ocular inflammation are key risk factors. Anterior uveitis is the most common clinical manifestation (around one case in three), but diagnostic imaging remains necessary to exclude posterior segment involvements, including Vogt-Koyanagi-Harada-like and birdshot-like posterior uveitis. Treatment modalities and prognosis are defined according to disease severity, as per the Common Terminology Criteria for Adverse Events. In low-grade uveitis, topical treatments suffice whereas most cases of higher-severity disease require systemic corticosteroids, immunosuppressive agents, or discontinuation of therapy.

**Conclusions**: Care must be taken when starting ICIs because of their side effects. Collaboration between ophthalmologists and oncologists is crucial to adequately manage ocular immune-related adverse events while reducing the risk of tumor progression.

**Paper |** Article 4658

**Authors**: Daniel Chow, Mélanie Hébert MD MSc *Ophthalmology Resident - (Université Laval)*, William Sebag *Université de Montréal*, Keith Perry *Université de Montréal*, Anna Polosa *Visual Electrophysiology Specialist (Hôpital Maisonneuve-Rosemont)*, Marie-Josée Aubin MD, MPH, MSc (PHO) *Université de Montreal*.

**Author disclosure block**: D. Chow: None., M. Hébert: None., W. Sebag: None., K. Perry: None., A. Polosa: None., MJ. Aubin: None.

**Title**: Evolution of retinal nerve fiber layer and ganglion cell layer thickness in Birdshot chorioretinopathy by initial presentation

**Abstract body**:

**Purpose**: To characterize the evolution of retinal nerve fiber layer (RNFL) and ganglion cell layer (GCL) thickness in Birdshot chorioretinopathy (BSCR) based on initial presentation.

**Study design**: Retrospective cohort study.

**Methods**: Patients with BSCR followed by the uveitis service of the Centre universitaire d'ophtalmologie – Hôpital Maisonneuve-Rosemont were considered for inclusion (n=172 eyes). They were categorized based on initial presentation: inflammatory presentation with hot disc, vasculitis, and cystoid macular edema (CME); CME only; and no inflammatory component. Differences between initial and final RNFL and GCL measurements were compared using Wilcoxon signed-rank test and subsequently compared between presentation groups.

**Results**: Median [Q1, Q3] age at presentation was 53 [46, 59] years and 57% were female. Follow-up time was 4.2 [2.1, 5.6] years for RNFL and 6.8 [3.0, 9.4] years for GCL. Initial and final RNFL thickness were 100 [90, 127] and 94 [84, 105] ($p<0.001$), while initial and final GCL thickness were 65 [48, 76] and 60 [48, 71] ($p=0.001$). When comparing differences in initial and final RNFL and GCL measurements by presentation, there were no significant differences between presentations ($p=0.39$ for RNFL and $p=0.85$ for GCL).

**Conclusions**: RNFL and GCL measurements decrease over time in BSCR patients, but these do not seem to be further affected by extent of inflammation at initial presentation.

**Paper |** Article 4679

**Authors**: Larissa Derzko-Dzulynsky, Sumit Sharma MD *Cole Eye Institute, Cleveland Clinic*, Eric Suhler MD, MPH *Casey Eye Institute, Oregon Health & Science University*, Phoebe Lin MD, PhD *Cole Eye Institute, Cleveland Clinic*, Meike Pauly-Evers, PhD; F. *Hoffmann-La Roche*, Daniela Willen PhD F. *Hoffmann-La Roche AG*, Robbie Peck PhD F. *Hoffmann-La Roche AG*, Federica Storti F. *Hoffmann-La Roche AG*, Simone Rauhut MSc F. *Hoffmann-La Roche AG*, Tatiana Gott BSc F. *Hoffmann-La Roche AG*, Benedicte Passemard Pharm D F. *Hoffmann-La Roche AG*.

**Author disclosure block**: L. Derzko-Dzulynsky: Grant/research support: Abbvie, Gilead, Hoffmann-La Roche Ltd., Employment/honoraria/consulting fees: Allergan, Pfizer, Novartis., S. Sharma: Roche, Genentech, Alimera, Abbvie, Eyepoint, Clearside, Regeneron, Bausch and Lomb, RegenxBio (Consultant); Roche, Genentech, Eyepoint, IONIS, Gliead, Santen (Research support)., E. Suhler: Roche, Abbvie, Clearside, EyePoint, Gilead, Kriya (Consultant); Roche, Abbvie, Clearside, EyePoint, Gilead (Research support)., P. Lin: Roche/Genentech, Bausch & Lomb (Consultant)., M. Pauly-Evers: F. Hoffmann-La Roche AG, Roche (Employee)., D. Willen: Roche (Employee)., R. Peck: Roche (Employee)., F. Storti: Roche (Employee)., S. Rauhut: Roche (Employee)., T. Gott: Roche (Employee)., B. Passemard: Roche (Employee).

**Title**: A novel intravitreal anti-IL-6 monoclonal antibody for UME: preliminary results from the phase 1 DOVETAIL study

**Abstract body**:

**Purpose**: The DOVETAIL phase 1 clinical trial assessed the safety, tolerability and efficacy of a novel anti–IL-6 monoclonal antibody (RG6179) specifically designed for IVT use in patients with DME and UME.

**Study Design**: DOVETAIL is a phase 1, multicenter, non-randomized, open-label, multiple ascending dose study that investigates the safety, tolerability, efficacy, and PK/PD profile of RG6179 in both DME and UME patients.

**Methods**: Inflammation is a key pathway in retinal disease pathophysiology. However, standard-of-care anti-inflammatory corticosteroid use carries significant risk of side effects. RG6179 is a recombinant monoclonal antibody that potently inhibits all forms of IL-6 signalling. This abstract reports the preliminary data with RG6179 in patients with UME. Patients ≥18 years with non-infectious uveitis and concurrent ME (CST ≥325 µm) were included (N=33). Patients were enrolled into 3 dose groups: 0.25 mg (n=10), 1 mg (n=10), and 2.5 mg (n=13), and received IVT RG6179 at Week 0, 4 and 8, followed by post-treatment observation until Week 36.

**Results**: Mean age was 62 years, 42% of patients were male, mean (range) baseline BCVA and CST were 64 (43-80) letters and 509 (271-893) µm, respectively. Mean (SE) BCVA change from baseline was +10.3 (2.6), +9.5 (2.1) and +8.4 (3.1) letters for the 0.25, 1 and 2.5 mg doses, respectively, with a combined mean of +9.3 (1.6) letters at 12 weeks. Mean CST change from baseline was -124 (44), -177 (59) and -184 (48) µm, respectively, with a combined mean of -161 (28) µm at 12 weeks. Of note, the BCVA and CST benefits were maintained during the post-treatment observation period. All

doses of RG6179 were well tolerated across all 33 patients. Ocular AEs (n=27) were reported in the study eye of 16 of 33 patients. Of those AEs; 21 were mild, 5 were moderate, 1 was severe (worsening of uveitis; unrelated). Only 1 AE in 1 patient was reported as related to RG6179 (transient visual acuity loss). Two patients had a progression of pre-existing cataract; none developed new cataracts. There were no cases of treatment-related intraocular pressure increase, occlusive retinal vasculitis or systemic AEs.

**Conclusions**: This phase 1 trial provides preliminary data on the safety and efficacy of the novel anti–IL-6 antibody RG6179 in patients with UME. Two phase 2 studies in DME (mono and combo) and two phase 3 trials in UME are currently underway to further assess the clinical potential of RG6179.

**Paper |** Article 4659

**Authors**: Mélanie Hébert, Daniel Chow *McGill University*, Anna Polosa *Hôpital Maisonneuve-Rosemon*t, Marie-Josée Aubin *Université de Montreal*.

**Author disclosure block**: M. Hébert: Grant/research support – Bayer., D. Chow: None., A. Polosa: None., MJ. Aubin: None.

**Title**: Evolution of electroretinography parameters in Birdshot chorioretinopathy by initial presentation

**Abstract body**:

**Purpose**: To characterize the evolution of electroretinography (ERG) parameters in Birdshot chorioretinopathy (BSCR) based on initial presentation.

**Study design**: Retrospective cohort study.

**Methods**: Patients with BSCR followed by the uveitis service of the Centre universitaire d'ophtalmologie – Hôpital Maisonneuve-Rosemont with ERG were considered for inclusion (n=100). These were categorized based on initial presentation: inflammatory presentation with hot disc, vasculitis, and cystoid macular edema (CME); CME only; and no inflammatory component. Systematic ERG monitoring was started around 2015 and consisted in measurements of cones a-wave response, cones b-wave response, retinal ganglion cell (RGC) PhNR response, rods b-wave response, rods-cones a-wave response, and rods-cones b-wave response. Differences between initial and final ERG parameters were compared using Wilcoxon signed-rank test and subsequently compared between presentation groups. Significance was adjusted for multiple comparisons using Bonferroni correction and significance was set at 0.008.

**Results**: Median [Q1, Q3] age at presentation was 58 [52, 64] years and 57% were female. Follow-up time was 5.0 [3.1, 6.4] years. Initial and final cones a-wave responses were 20.6 [15.5, 27.1] and 20.2 [14.8, 25.2] (p=0.049), cones b-wave response were 62.6 [41.0, 89.4] and 60.3 [39.0, 81.3] (p=0.002), retinal ganglion cell (RGC) PhNR response were 13.4 [7.8, 20.1] and 13.0 [7.0, 18.1] (p=0.731), rods b-wave response were 84.7 [52.1, 114.1] and 81.3 [47.9, 104.0] (p=0.007), rods-cones a-wave response 102.1 [73.1, 134.5] and 104.9 [80.5, 132.1] (p=0.002), and rods-cones b-wave response were 187.2 [122.6, 234.1] and 189.9 [131.3, 223.1] (p=0.33). There was data on initial presentation in 78 patients (156 eyes). Of these, 7 (9%) had inflammatory presentations, 13 (17%) had CME only presentations, and 58 (74%) had non-inflammatory presentations. When comparing differences in initial and final ERG measurements by presentation, there were no significant differences between presentations (p>0.05). There was however a possible signal in cones b-wave response with -4.4 [-21.2, 3.6] in inflammatory patients, -7.9 [-15.6, 0.7] in CME only patients, and -0.49 [-10.7, 7.6] in non-inflammatory patients (p=0.031).

**Conclusions**: There are multiple differences in ERG parameters between initial and final follow-ups in BSCR patients, particularly cones b-wave response, rods b-wave response, and rods-cones a-wave response. This did not however differ based on initial presentation.

**Paper |** Article 4595

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**Author disclosure block**: EL. You: None., A. Khatri: None., M. Kharel: None., QD. Nguyen: None.

**Title**: Beauty of Black and White: Autofluorescence Aided Differentiation of Serpiginous Choroiditis from Tubercular Serpiginous-Like Choroiditis

**Abstract body**:

**Purpose**: To characterize fundus autofluorescence (FAF) images for differentiating serpiginous choroiditis (SC) from tubercular serpiginous-like choroiditis (TB SLC).

**Study Design**: Retrospective cohort study

**Methods**: The index study is a retrospective comparative analysis of FAF images of 25 consecutive patients, 11 with TB SLC and 14 with SC. The diagnosis of SC was made based on the clinical appearance and FAF findings, while TB SLC was additionally considered in patients with positive laboratory investigations and/or radiological tests for tuberculosis (TB) exposure or infection and therapeutic response to anti-tubercular therapy. The characteristic features evaluated on FAF images were centrality, multifocality, and parapapillary involvement of the lesion with or without extension.

**Results**: Twenty-five patients (13 males, 12 females) with a mean age of 46.2 (SD 10.08) years were enrolled in the study. SC lesions were more central ($\rho$=0.92) and confluent ($\rho$=0.774). Parapapillary involvement was found to be associated with SC ($\rho$=0.690), and with extensions of the lesions along the arcades or the macular region, the association increased ($\rho$=0.786). Multifocality with peripheral lesions was negatively associated with SC ($\rho$=- 0.831).

**Conclusions**: Centrally involving lesions with confluency on FAF is strongly associated with SC. Parapapillary involvement alone is considered characteristic for SC, but the current study has demonstrated that extension of this lesion along the arcades or the macular region is even more characteristic for SC.

**Paper |** Article 4249

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**Author disclosure block**: R. Remtulla: None., K. Oliver: None.

**Title**: Machine Learning-Based Prediction of Need for Disease-Modifying Antirheumatic Drugs in the Treatment of Autoimmune Uveitis

**Abstract body**:

**Purpose**: Autoimmune uveitis is a prevalent yet growing ocular health condition. Its treatment often involves challenging immunosuppression regimens, necessitating extensive investigations and coordination with allied services. However, determining which patients will require such care can be a complex task, typically established later in the course of the disease. Fortunately, advances in machine learning have enabled enhanced predictive capabilities through computational modeling. In this study, we aim to develop a neural network capable of predicting the need for immunosuppression in the management of autoimmune uveitis.

**Study Design**: Retrospective analysis of prospectively collected data.

**Methods**: We utilized a dataset of 54 patients with autoimmune uveitis, sourced from The National Eye Institute and The University Medical Center Utrecht, which includes patients with anterior uveitis, intermediate uveitis, and Behcet's uveitis. Patient-specific information, including age, biological sex, diagnosis, and the use of disease-modifying antirheumatic drugs (DMARD), was made available. A neural network with a single layer and 15 nodes was constructed using Matlab. The network was trained with the Scaled Conjugate Gradient algorithm for classification tasks. Data splitting was performed with a 75/10/15 split for training, validation, and test sets, respectively. Input factors included diagnosis, age, and biological sex, with DMARD use as the output. Sensitivity, specificity, total accuracy, and area under the curve (AUC) were calculated for each dataset.

**Results**: Using the described methodology, the neural network completed training in 47 epochs with a gradient of descent of 0.063. The performance graph displayed favorable cross-entropy across training epochs. The network exhibited an accuracy of 82.9% in the training set, 100% in the validation set, and 87.5% in the test set, resulting in a total accuracy of 85.2%. Importantly, the network maintained strong specificity, with a specificity of 83.3% in the training set and 100% in both the validation and test sets. The total network specificity was 88.9%. The AUC in the training set was 0.898, in the validation set was 1.00, in the test set was 0.805, and the overall AUC was 0.905.

**Conclusion**: Despite a relatively small sample size, our neural network demonstrated high specificity in predicting DMARD use in patients with autoimmune uveitis. This predictive model employed a surprisingly small number of input factors while still achieving a respectable AUC. This study offers a proof of concept, indicating that machine learning applications have the potential to guide treatment decisions and improve the management of autoimmune uveitis in this complex patient population

**Paper |** Article 4649

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**Title**: A retrospective study of Biofeedback training in Low Vision patients

**Abstract body**:

**Purpose**: To analyze the effectiveness of Biofeedback training (BT) in patients with low vision in the short and long term outcomes.

**Study design**: We propose a retrospective cohort study comparing pre-and-post BT visual function data in different groups of diseases.

**Methods**: Patients treated with audio-visual BT on the MAIA microperimeter were analyzed pre-BT, short term follow up (< 6 months) and long term follow up (> 6 months). Outcomes were monocular best corrected visual acuity (BBCVA) for distance, binocular near vision, reading speed (RS), fixation stability (FS), average retinal sensitivity in the 10-2 program, and preferred retinal (PRL) locus relocation.

**Results**: A total of 223 patients were included in the study. Average age was 56.68 ± 2.24 years. 123 (55%) were female and 100 (45%) were male. In the short-term follow-up, BCVA for distance improved 0.08 ± 0.11 logMar ($p<0.001$) in the trained eye, 0.06 ± 0.14 logMar ($p<0.001$) in the fellow eye, and near vision increased 0.04 ± 0.10 logMar ($p<0.001$) . Regarding microperimetry measures, fixation stability improved 1.31 ± 7.32o2 ($p=0.019$) in the trained eye and 1.57 ± 5.68o2 ($p=0.03$) in the fellow eye. There was no significant difference in retinal sensitivity values or PRL relocation before and after training. Comparing short and long term results, there was no significant difference in BCVA for the trained eye, for the fellow eye and for near vision. FS improved 2.92 ± 8.78o2 ($p=0.034$) in the trained eye in the long term. However, the fellow eye showed a similar FS comparing long term to baseline.

**Conclusion**: Biofeedback training delivered significant improvement in BCVA for distance and near, and fixation stability in patients with low vision in the short and long term follow ups. BCVA for distance and near were not significantly different between short and long term, showing that the improvements were sustained over time. Fixation stability in the trained eye improved more in the long term giving evidence that the effect of the training could improve in the course of time. Since retinal sensitivity and PRL relocation were not significantly different, this study suggests that the improvements promoted by BT in visual functions are due to better fixation stability. As a safe and

cost-efficient rehabilitation technique, this study brings evidence that BT is a relevant visual rehabilitation for patients with low vision due to various diseases and different age groups.