OPHTHALMOLOGY & VISUAL SCIENCES

35TH ANNUAL

RESEARCH DAY

April 8, 2025

Halifax Convention Centre

ABSTRACT BOOKLET

2025 RD

DALHOUSIE UNIVERSITY

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9:15-9:30am	Korolos Sawires	Investigating the risk and dose-response relationship for pentosan polysulfate sodium maculopathy: A systematic review and meta-analysis
9:30-9:45am	Aliénor Jamet	Neuroprotection of retinal ganglion cells in experimental glaucoma using a novel gene therapy construct AAV2-SYN1-TrkB-2A-mBDNF in adult and old mice
9:45-10:00am	Jeffrey Locke	Automated postprocessing and machine learning classification of ISCEV pattern electroretinograms (PERGs) and visual evoked potentials (VEPs)
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Time	Presenter	Presentation Title
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2:30-2:35pm	Abdelrahman Abuosba	Periocular neurotization: A scoping review of orbicularis oculi direct reinnervation techniques and outcomes in facial nerve palsy
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Q & A sessions are included as described below:

- Collaborative RD Keynote address (30 minutes to present, 15 minutes for Q&A)
- Ophthalmology Keynote address (35 minutes to present, 10 minutes for Q&A)
- Trainee presentations (12 minutes to present, 3 minutes for Q&A)
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Keynote Speakers

OPHTHALMOLOGY & VISUAL SCIENCES

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DOVS KEYNOTE

Dr. François Codère

Université de Montréal

Oculopharyngeal muscular dystrophy and other ocular myopathies affecting the eyelids

INTERDISCIPLINARY KEYNOTE

Dr. Muhammad Mamdani

University of Toronto

Applied artificial intelligence in healthcare

DALHOUSIE UNIVERSITY

Dr. François Codère

Dr. François Codère is a oculoplastic and orbital specialist who was born and raised in Quebec, trained at University of Sherbrooke in ophthalmology, following which he pursued further fellowship training in ocular pathology at McGill with Dr Seymour Brownstein and oculoplastics at University of Iowa with Dr Richard L Anderson

For the last 35 years Dr. Codère has contributed significantly to the field of oculoplastics in his multiple roles as director of oculoplastics and associate professor of ophthalmology at McGill University and University de Montreal. Dr. Codère is past Ophthalmologist-in-Chief at The Université de Montreal Eye Center, a division of University de Montreal. Dr. Codère has trained more than 40 fellows and authored more than 70 peer-reviewed publications in addition to many book chapters and numerous presentations throughout the world to fellow ophthalmologists. He directed the very popular endoscopic DCR course at the AAO which has been on the program for more than 20 years, He gave keynote lectures at the American and European Oculoplastic societies and was the guest speaker at numerous national ophthalmological societies.

Dr. Codère has also been very active in the AAO as a contributor to the BSCS, the ASOPRS and has travelled to destinations as far as Tunisia and China on humanitarian missions. He is especially renowned for his collaboration with several neurogenetic researchers on oculopharyngeal muscular dystrophy and for his work and dedication to endoscopic lacrimal surgery. He has lectured on all continents about his work. He is a founding member and past president of the Canadian Oculoplastic Society and has served on the Board of the COS (Canadian Ophthalmological Society) as secretary and as President. He was also the president of the COS Foundation. He was Treasurer and President of the Quebec Association of Ophthalmologists. He is an active member of the International Orbital Society.

Aside from ophthalmology Dr. Codère like outdoor life doing, skiing, cross-country skiing, cycling, hiking and golf.

Dr. Muhammad Mamdani

Dr. Mamdani is Vice President of Data Science and Advanced Analytics at Unity Health Toronto and Director of the University of Toronto Temerty Faculty of Medicine Centre for Artificial Intelligence Education and Research in Medicine (T-CAIREM). Dr. Mamdani's team bridges advanced analytics including machine learning with clinical and management decision making to improve patient outcomes and hospital efficiency. Dr. Mamdani is also Professor in the Department of Medicine of the Temerty Faculty of Medicine, the Leslie Dan Faculty of Pharmacy, and the Institute of Health Policy, Management and Evaluation of the Dalla Lana Faculty of Public Health. He is also adjunct Senior Scientist at the Institute for Clinical Evaluative Sciences (ICES) and a Faculty Affiliate of the Vector Institute, which is a leading institution for artificial intelligence research in Canada.

Dr. Mamdani holds a Doctor of Pharmacy degree from the University of Michigan, a fellowship in pharmacoeconomics from the Detroit Medical Centre, a Master of Arts degree in econometric theory from Wayne State University, and a Master of Public Health from Harvard University with a focus on statistics and epidemiology. He has previously been named among Canada's Top 40 under 40. Dr. Mamdani's research interests include pharmacoepidemiology, pharmacoeconomics, drug policy, and the application of advanced analytics approaches to clinical problems and health policy decision-making. He has published over 500 studies in peer-reviewed healthcare journals.

Acknowledgements

The Department of Ophthalmology and Visual Sciences would like to thank the following individuals for serving as judges for the 35th Annual Research Day:

Dr.François Codère
Département d'ophthalmologie
l'Université de Montréal,
Montreal, QC

Dr. Anuradha Mishra
Department of Ophthalmology and Visual Sciences
Dalhousie University
Halifax, NS

Dr. Erdit Celo
Department of Ophthalmology and Visual Sciences
Dalhousie University
Halifax, NS

We would also like to thank **Dr. Brennan Eadie**, Department of Ophthalmology and Visual Sciences, Dalhousie University, for moderating today's event.

Continuing Professional Development and Medical Education

Research Day is educationally approved by Dalhousie University Continuing Professional Development and Medical Education.

DALHOUSIE UNIVERSITY | CONTINUING PROFESSIONAL DEVELOPMENT & MEDICAL EDUCATION

This activity is an Accredited Group Learning Activity (Section 1) as defined by the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada, and approved by Dalhousie University Continuing Professional Development and Medical Education. You may claim a maximum of **6.5 hours** (credits are automatically calculated).

Through an agreement between the Royal College of Physicians and Surgeons of Canada and the American Medical Association, physicians may convert Royal College MOC credits to AMA PRA Category 1 Credits™. Information on the process to convert Royal College MOC credit to AMA credit can be found at: edhub.ama-assn.org/pages/applications.

Learning Objectives

At the end of the **2025 Research Day**, participants will be able to:

1. Examine and evaluate the current basic science and clinical research in vision sciences that is being carried out in the Department of Ophthalmology and Visual Sciences and beyond.
2. Demonstrate oral presentation skills needed to effectively present scientific research data.
3. Demonstrate skills related to defending their research results (thru Q&A format).

At the end of **Dr. François Codère's keynote** address entitled: "Oculopharyngeal muscular dystrophy and other ocular myopathies affecting the eyelids", participants will be able to:

1. Differentiate the most frequent ocular myopathies in relation to ptosis
2. Differentiate the transmission characteristics of these diseases
3. Discuss the surgical options available to correct ptosis in these diseases

At the end of **Dr Muhammad Mamdani's keynote** address entitled: "Applied artificial intelligence in healthcare", participants will be able to:

1. Review AI and machine learning applications and their relevance to clinical and surgical environments
2. Describe key opportunities and challenges in the implementation of AI in clinical practice.
3. Critically examine the implications of increasingly available AI solutions for clinicians, researchers, educators and trainees

Interdisciplinary Trainee Keynote Lunch

2025 RD

TRAINEE & KEYNOTE LUNCH

April 8, 2025
12:00-12:45pm
HCC Room 106

with special guests:

Dr. François Codère
Université de Montréal

Dr. Muhammad Mamdani
University of Toronto

Dr. Karim Lahdha
University of Toronto

We're inviting all Trainees to attend an informal lunch with our Keynote Speakers! Take the time to network, discuss research and career paths, and learn from esteemed clinician-scientists!

**RSVP REQUIRED,
SPACE LIMITED**

Abstracts

Investigating the risk and dose-response relationship for pentosan polysulfate sodium maculopathy: A systematic review and meta-analysis

Brendan K. Tao[1]; **Korolos Sawires[2]**; Kate Lim[2]; Fahad Butt[3]; Thanansayan Dhivagaran[3]; R. Rishi Gupta[4]; Amit Mishra[4]

[1]Faculty of Medicine, University of British Columbia, Vancouver, British Columbia, Canada
[2]Faculty of Medicine, Dalhousie University, Halifax, Nova Scotia, Canada
[3]Faculty of Medicine & Dentistry, University of Western Ontario, London, Ontario, Canada
[4]Department of Ophthalmology & Visual Sciences, Dalhousie University, Halifax, Nova Scotia, Canada

Background and Purpose:

Pentosan Polysulfate Sodium Maculopathy (PPSM) is a progressive retinal pigmentary disorder linked to prolonged oral PPS use. While observational studies suggest a dose-response relationship, no study has systematically pooled the risk of PPSM across different exposure levels. As such, the purpose of this study was to quantify the relative risk (RR) of PPSM in patients using PPS and to model the association between cumulative drug exposure and PPSM risk.

Methods:

A systematic review and meta-analysis was conducted using Medline, Embase, and CENTRAL databases from inception to September 15, 2024. Eligible studies reported PPSM incidence and included cumulative PPS dose data. Two independent reviewers performed study selection, data extraction, and risk of bias assessment (ROBINS-E tool), with a third reviewer resolving conflicts. The primary outcome was the RR of PPSM among PPS users compared to non-users, stratified by cumulative dose.

Results:

Five studies including 141,785 patients (6,432 PPSM cases) met inclusion criteria. A linear dose-response model indicated a 0.1% increase in PPSM RR per gram increase in cumulative dose (logRR = 0.00101, 95% CI: 0.0005-0.0015, $p < 0.0001$). Patients with ≥2,000 g cumulative dose had a RR of 7.39 (95% CI: 4.17-13.10), while those with ≤500 g had a RR of 1.65 (95% CI: 1.12-2.43) compared to non-users. Findings remained consistent after sensitivity analyses excluding high-risk studies ($I^2 = 63.7\%$).

Conclusion:

This meta-analysis, based on moderate certainty evidence (GRADE), provides evidence of a dose-dependent increase in PPSM risk, particularly at higher cumulative doses. These findings emphasize the need for cautious long-term PPS prescribing, dose minimization strategies, and routine ophthalmic monitoring for patients on PPS therapy. Further research incorporating patient-level data is needed to refine risk stratification and mitigate confounding factors.

Neuroprotection of retinal ganglion cells in experimental glaucoma using a novel gene therapy construct AAV2-SYN1-TrkB-2A-mBDNF in adult and old mice

Jamet, J. Aliénor[1, 2]; Hooper, L. Michele[1,3,4]; Agosto, A. Melina[1,3]; Chauhan, C. Balwantray[1,2,3,4]

[1]Retina and Optic Nerve Research Laboratory, Dalhousie University, Halifax, Canada. Departments of [2]Medical Neuroscience, [3]Physiology and Biophysics, and [4]Ophthalmology and Visual Sciences, Dalhousie University, Halifax, Canada.

Background and Purpose:

As an adjunct to lowering intraocular pressure (IOP), gene therapy with recombinant adeno-associated viral (AAV) vectors may enhance retinal ganglion cell (RGC) survival in glaucoma. The efficacy of boosting brain derived neurotrophic factor (BDNF) expression, an agent essential for the survival of RGCs that is blocked during glaucoma, is limited by downregulation of its receptor, TrkB. We investigated whether mature BDNF (mBDNF) and TrkB expression will generate a sustained neuroprotective benefit for RGCs in experimental glaucoma (EG).

Methods:

Thy1-YFP-H and C57BL/6, adult (3-months) and old (20-months), mice received an intravitreal injection of AAV2 TrkB-2A-mBDNF. After 3 weeks, the retinas were analysed by western blots (WB). Experimental (Ex) and contralateral control (Co) eyes were compared with individual retinal extracts to target BDNF, TrkB and phosphorylated-Akt (p-Akt), an anti-apoptotic marker upregulated by BDNF. To assess neuroprotection pre-EG onset, aged mice received either an intravitreal injection of AAV2 TrkB-2A-mBDNF (treated) or hSYN1-mCherry (sham) 3 weeks before EG induction with the hydrogel model and followed for 56 days. To evaluate post-EG onset, adult mice received treatment or sham AAV injection 3 weeks after EG induction and followed for 63 days. IOP was monitored weekly and RGC density was estimated with either Brn3A or RBPMS IHC.

Results:

There was a significant upregulation of mBDNF and TrkB in Ex eyes with a 20- and 100-fold increase in mBDNF/BDNF ratio in adult and old mice, respectively (Adult: mean(SD); Ex, 0.62(0.21); Co, 0.03(0.03); n=15; $p<0.01$; Old: Ex, 0.84(0.15); Co, 0.006(0.01); n=15; $p<0.01$) and a 12- and 14-fold increase in TrkB/β-actin ratio in adult and old mice, respectively (Adult: Ex, 0.50(0.23); Co, 0.04(0.03); n=15;$p<0.01$; Old: Ex, 0.28(0.22); Co, 0.02(0.02); n=15;$p<0.01$). The p-Akt/Akt ratio was 2- and 3-fold higher in adult and old mice, respectively (Adult: Ex, 0.73(0.20); Co, 0.34(0.09); n=13;$p<0.01$; Old: Ex, 0.11(0.03); Co, 0.04(0.01);n=15;$p<0.01$). In pre-injected old mice, there was a significantly higher RGC density in treated vs. sham eyes (2606(64) and 2316(117) cells/mm^2, respectively; n=16;$p<0.01$). Untreated Co eyes had RGC density of 2900(210) cells/mm^2 (n=16) indicating a 15% RGC loss ($p<0.01$) with a doubling IOP (EG, 20.8(4.9); Co, 9.8(0.7) mmHg; n=16;$p<0.01$) in this model. In post-injected adult mice, there was a non-significantly higher RGC density in treated vs. sham eyes (3077(56) and 2615(514) cells/mm^2, respectively; n=6;$p=0.10$). Untreated Co eyes had RGC density of 3175(213) cells/mm^2 (n=6;$p=0.05$).

Conclusion:

The results show that mice treated with this AAV are more environmentally prepared to sustain neuroprotection of RGCs pre- and during EG.

Automated Postprocessing and Machine Learning Classification of ISCEV Pattern Electroretinograms (PERGs) and Visual Evoked Potentials (VEPs).

Locke, Jeff [1,2,4], Cote, Patrice [1,2], Newman, Aaron [3]

[1]Department of Ophthalmology and Visual Sciences, Dalhousie University, Halifax. [2]Department of Biology, Dalhousie University, Halifax. [3]Department of Psychology and Neuroscience, Dalhousie University, Halifax. [4]Department of Ophthalmology and Visual Sciences, IWK/Nova Scotia Health Authority, Halifax.

Background and Purpose:

Low signal-to-noise ratios and small amplitudes of evoked responses necessitate extensive trial averaging for reliable datasets. Despite bandpass filtering, artifacts often persist and are traditionally addressed through visual inspection, a method prone to bias and variability. Likewise, classification of evoked responses as pathological or normal relies on subjective clinical judgement. This study evaluates an automated artifact removal approach combined with machine learning (ML) for classifying the International Society for Clinical Electrophysiology of Vision (ISCEV) standard pattern electroretinograms (PERGs) and visual evoked potentials (VEPs) by comparing major peaks to population norms.

Methods:

Monocular PERG (ISCEV 1.0°) and VEP (ISCEV 1.0°, 0.25°) data were collected from 121 participants (normal: n=39 , abnormal: n=82; mean age: 48, range 13-80years) with a total of 452 channels classified as normal and 278 channels classified as abnormal. Raw data were processed using Python-MNE. Artifact rejection utilized a data-driven threshold based on the standard deviation of each trial relative to all trials in the step, with artifact rejection thresholds set at four standard deviations. Processed data were classified as normal or abnormal using supervised ML algorithms, with training data classified using age-matched lab norms for P50, N95, and P100 peaks. ML models were trained on 80% of the data and tested on 20%. Data collection is ongoing.

Results:

The automated artifact removal approach demonstrated high sensitivity in excluding noisy trial across all ISCEV protocols. Logistic regression (LR) and support vector machine (SVM) combined with Stochastic Gradient Decent (SGD) achieved the highest accuracies (91.3%) and precision (83.3%) for PERG classification. VEP 1.0° classification also performed well with SVM and SVM+ SGD (accuracy 91.3%; precision 80%). Classification of VEP 0.25° was more robust with LR, SVM and SVM+SGD (accuracy 95.45%, precision 100%). Overall, there was lower accuracy and precision if the classification of channels originating from left eye testing.

Conclusion:

ML methods show strong potential for automating artifact removal and classification of electrophysiological responses, yielding promising results for PERG and VEP classification. These findings highlight the need for larger, diverse datasets to improve performance across protocols. Ongoing recruitment aims to refine accuracy and precision by stratifying participants by age and ocular health status.

Molecular Genetic Testing for Inherited Retinal Dystrophies in Maritime Canada

Gupta, Arjav[1], DiCostanzo, N[2], Locke, J[2], Wallace, K[2], Beis, J[3], MacKay S[3], & Robitaille, J[2]

[1]NOSM University; [2]Department of Ophthalmology & Visual Sciences, Dalhousie University; [3]Maritime Medical Genetics, IWK Health

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Background and Purpose:

Inherited retinal dystrophies (IRDs) comprise a varied group of conditions that collectively represent a leading cause of blindness worldwide. Due to significant clinical similarities, most IRDs require genetic testing to confirm the cause. We sought to evaluate the genotypic, geographic and ethnic distribution of IRDs in Maritime Canada.

Methods:

Retrospective Chart Review. Genetic testing and clinical data were reviewed retrospectively from charts of patients who were offered genetic testing by the Maritime Medical Genetics service for an IRD between 2018 and June 2024.

Results:

Genetic testing was completed in 256 individuals (247 probands) clinically diagnosed or suspected of having an IRD since 2018, including 51.6% male and 48.4% female (average age 46.3 years, range 1-91 years). Provinces of residence included Nova Scotia (n = 141, 55%), New Brunswick (n = 90, 35%) and Prince Edward Island (n = 25, 10%). Ethnic origins were recorded for 171 patients: 147 (86%) were Caucasian, of which 45 (26%) were Acadian. The remainder were Asian (n = 18, 11%), African (n = 3, 2%) and South American (n = 3, 2%). 148 (58%) participants had a pre-test diagnosis of retinitis pigmentosa. In total, 616 variants were found in the cohort, including 259 pathogenic variants (42%), 102 likely pathological variants (17%) and 255 variants of uncertain significance (VUS) (41%). A molecular diagnosis was possible in 192 (75%) individuals: among probands, the most frequently reported gene variants were in *USH2A* (n = 70), *ABCA4* (n = 58), *RHO* (n = 14), *RPGR* (n = 12), *EYS* (n = 11). Among Acadians, *USH2A* (n = 33) was the predominant cause, with the five most common *USH2A* variants found predominantly in the Acadian probands.

Conclusion:

Most patients tested for an IRD in Maritime Canada received a positive result, and were Caucasian, in keeping with the region's population demographics. A founder effect was evident with patients of Acadian descent contributing to the distribution of IRD variants.

Luminance and Thresholding Limitations of Virtual Reality Headsets for Visual Field Testing

Lee, Freddy[1]; Redden, Liam[2]; Eng, Vivian[3]; Eadie, Brennan[3]

[1]Department of Ophthalmology and Visual Sciences, Nova Scotia Health, Halifax.
[2]Dalhousie Medical School, Halifax.
[3]Eadie Technologies Inc., Halifax.

Background and Purpose:

To assess the luminance, luminance range, and achievable threshold light sensitivity levels of commonly employed virtual reality (VR) devices for visual field testing.

High quality VR devices have gained popularity in entertainment, and more recently in visual field testing for glaucoma. Using VR devices can increase access to testing, improve focus, aid patients with mobility limitations, and decrease costs. VR devices produce varying luminance of white stimuli by using red, green, and blue (RGB) parameters of values between 0-255. Conventional perimetry is required to produce maximum luminance of 3183cd/m^2.

Methods:

Literature review was completed for the hardware specifications of VR headsets that have been developed for visual field testing. Luminance data was extracted from technical specifications in publications and manufacturers.

The luminance of the three most employed VR headsets for visual field testing were measured using a spectroradiometer at the recommended eye relief with a 4mm pupil/aperture, at 0, 10, 20, and 30 degrees from fixation. The achievable thresholds were modelled assuming a background luminance of 10, 1, and minimum cd/m2 for each VR headset and compared to the standard Humphrey Field Analyzer (HFA).

Results:

Literature review revealed that the three most employed Virtual Reality devices for visual field testing were: (1) Pico Neo, (2) Oculus Quest, and (3) HTC Vive. The maximum reported luminance was 250cd/m^2 for the HTC VIve Pro. Information on luminance measurement was not consistently available, with only handheld spectrometers identified.

Handheld spectrometer significantly overestimates luminance compared to standard spectroradiometer across all RGB values. Measured luminance varies significantly across aperture size. Maximum luminance from peripheral stimuli up to 30 degrees decreases across all RGB levels. Assuming conventional background of 10cd/m^2, best performance with lowest thresholding was with HTC Vive at 16dB, corresponding to luminance of 80cd/m^2 at 0 degrees. Oculus Quest 2 and Pico Neo 3 had minimum threshold of 20dB.

Conclusion:

VR can offer many advantages in VF testing; however no commercially available device was reported to produce maximum luminance greater than 5% of requirements for conventional perimetry. HTC Vive, Oculus Quest, and Pico Neo were most employed VR headsets for VF testing. Empirically, these platforms are not able to achieve sufficient maximum luminance to achieve standard threshold sensitivities compared to HFA.

Current VR technology is not designed—nor has the capacity—to threshold at mid to low dB ranges, which limits accuracy in diagnosing and monitoring VF defects seen in glaucoma.

Comparative Analysis of Retinal Layer Thickness Measurement Using High-Resolution Optical Coherence Tomography

Sung Uk Baek[1], Glen P. Sharpe[1], Balwantray C. Chauhan[1]

Department of Ophthalmology and Visual Sciences, Dalhousie University, Halifax, Nova Scotia, Canada.

Background and Purpose:

The newly introduced high-resolution optical coherence tomography (HR-OCT) provides enhanced axial resolution, enabling more detailed visualization than standard SPECTRALIS OCT (SD-OCT) (both Heidelberg Engineering). Differences in optical resolution between these two devices may affect retinal layer segmentation, leading to potential discrepancies in measured thickness. This study aimed to describe the differences in retinal layer thickness measurements between SD-OCT and HR-OCT.

Methods:

This prospective study included 65 eyes from 34 subjects (17 glaucoma patients and 17 healthy controls). Subjects underwent SD-OCT and HR-OCT imaging on the same day. SD-OCT images were acquired and set as baselines, followed by HR-OCT imaging registered to the baseline images, resulting in colocalized scans from each device. Automated segmentation was applied to a horizontal macula B-scan, and thickness data were extracted from 1024-pixel segmentation lines and exported using the HEYEX software.

To assess intra-device variation, 10 eyes underwent repeated SD-OCT and HR-OCT scans. Reliability was analyzed by comparing SD1 vs. SD2 and HR1 vs. HR2.

Results:

Thickness differences between devices were analyzed using 65,000 data points per layer. The mean difference of 'SD-OCT minus HR-OCT' varied by layer: nerve fiber layer (NFL, 2.025 µm), ganglion cell layer (GCL, -1.101 µm), inner plexiform layer (IPL, 0.439 µm), inner nuclear layer (INL, -2.651 µm), outer plexiform layer (OPL, 0.991 µm), outer nuclear layer (ONL, -1.735 µm), and total retinal thickness (-0.529 µm).

Adjacent layers showed a complementary pattern, with differences in one layer inversely related to the next (e.g., NFL positive, GCL negative). Larger differences were observed in the perifoveal region and at the temporal/nasal scan margins.

Inter-device variation (SD1-HR1) was significantly greater than intra-device variation (SD1-SD2, HR1-HR2) across all layers (ANOVA, $P < 0.001$). Intra-device differences were minimal, with SD1-SD2 averaging under 0.5 µm and HR1-HR2 under 1 µm.

Conclusion:

The retinal layer thickness did not differ substantially between devices, with an average difference of less than 3 µm across all layers. However, hyperreflective bands (NFL, IPL, and OPL) appeared thinner on HR-OCT compared to SD-OCT, while hyporeflective bands (GCL, INL, and ONL) appeared thicker on HR-OCT. Our hypothesis is that the blurriness of SD-OCT images may cause hyperreflective structures to appear slightly larger than HR-OCT.

10-year outcomes of trabeculectomy with mitomycin-C (MMC): A retrospective study

Mohammad Abdullah[1], Tianwei E. Zhou[1], Freddy Lee[1] Marcelo T. Nicolela [1], Paul E. Rafuse[1]

[1]Department of Ophthalmology and Visual Sciences, Dalhousie University

Background and Purpose:

Glaucoma is an optic neuropathy characterized by progressive retinal ganglion cell loss and visual field deterioration. While age and family history are key non-modifiable risk factors, intraocular pressure (IOP) is the only modifiable one, making IOP-lowering therapy essential. Trabeculectomy (TRAB) remains the gold-standard surgery for refractory cases, particularly in normal tension glaucoma. Previous long-term studies predate the uniform use of mitomycin-C (MMC). This study examines the 10-year outcomes of TRAB-MMC in Atlantic Canada.

Methods:

This retrospective review analyzed patients who underwent TRAB-MMC, with or without cataract surgery, at Victoria General Hospital, Halifax. Patients had surgery by two glaucoma specialists between 2000 and 2014, with at least 10 years of follow-up. Data collected included demographics, glaucoma type, surgery type, bleb revisions, secondary procedures, IOP measurements, and MD.

Eyes were grouped based on the percentage of visits meeting the IOP target (<12 mmHg): Group A (<50% of visits) and Group B (≥50%). The primary outcome was MD change over 10 years, with secondary outcomes including complications, secondary surgeries, and bleb revisions.

Results:

As of February 2025, 39 eyes were included. The mean age at surgery was 62.9 ± 10.2 years, with a male-to-female ratio of 20:19. Primary open-angle glaucoma was the most common diagnosis (19 eyes, 48.7%), followed by normal tension glaucoma (7 eyes, 17.9%) and pseudoexfoliation glaucoma (5 eyes, 12.8%). Baseline mean IOP and MD were 18.2 ± 5.4 mmHg and -9.6 ± 5.6 dB, respectively. Over 10 years, postoperative mean IOP was 11.6 ± 3.7 mmHg, with an MD slope of -0.3 ± 0.52 dB/year.

Groups A (n=19) and B (n=20) showed no significant differences in baseline MD, preoperative IOP, or age. At one year, Group A had a higher mean IOP (14.5 ± 4.6 mmHg) than Group B (10.2 ± 4.5 mmHg, P = 0.0082), with a faster MD decline (-0.53 vs. -0.17 dB/year, P = 0.0315).

Conclusion:

This study presents early results from a long-term follow-up of patients with TRAB-MMC, with or without phacoemulsification. Overall, the rates of progressions observed in this study were relatively slow, particularly considering this high-risk population who had moderate to advanced baseline field defect and were probably progressing prior to surgery. The rate of change was partially slow in the group with more consistent low IOPs. Further data collection and analysis are ongoing with the aim to identify key factors associated slower or no visual field progression following trabeculectomy.

Aligned Perspectives: Co-Creating Patient Education for Strabismus Surgery

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Background and Purpose:

The most common surgery performed in pediatric ophthalmology practice is the correction of strabismus, a misalignment of the eyes that can occur at any age. Many pediatric ophthalmologists also specialize in adult strabismus surgery. Adult strabismus is commonly the result of childhood-onset forms of strabismus that can reappear over time. When a patient is diagnosed with strabismus, information about the condition, including a discussion of surgical treatment, is provided. Educating adult patients, parents of young children and children about strabismus and outcomes of strabismus surgery, including possible risks and complications, falls within the role of the pediatric ophthalmologist. Although these discussions are needed so patients can build knowledge and have sufficient information for informed decision-making, they include the use of complicated terminology and concepts and take place at the end of long visits. Patient education materials (PEMs) are written, auditory, visual or multimedia knowledge translation tools for the distribution of important clinical information. PEMs have been shown to facilitate informed consent, improve follow-up rates, increase patient understanding of diagnosis, and reduce pre-operative anxiety. Since patient understanding and retention of information affects their ability to manage a condition and affect their health outcomes, PEMs are an invaluable resource to any clinician. The purpose of this study is to co-create PEMs for strabismus surgery that addresses both patient and clinician needs.

Methods:

This study will utilize a mixed-methods approach for the co-creation of PEMs about strabismus surgery. The RE-AIM framework will be used to assess the implementation outcomes throughout these phases of the study. The first phase of this study will be PEM co-creation. In this phase, we will conduct virtual group meetings following a nominal group approach to identify PEM content, format, delivery preferences and barriers/solutions to delivery. The second phase of this study will be done in collaboration with Dalhousie's MedIT to create a PEM based on patient feedback on content and formatting. The US Agency for Healthcare Research and Quality's PEMAT tool will be applied to ensure that PEM is accessible to the widest range of patients. The third phase of this study will be clinic rollout, where the implementation of the PEM will be assessed using the APEASE framework.

Results:

This project is still in progress, with results yet to come.

Conclusion:

We predict that patients will want to receive information regarding strabismus surgery via visual or audiovisual PEMs.

Preoperative Educational Video for Patients Undergoing Cataract Surgery: A Randomized Controlled Trial

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Background and Purpose:

Studies have demonstrated that adequate preoperative education is associated with less anxiety, fewer complications, and increased patient satisfaction. Patient information videos are a contact-free, cost-effective, and accessible method for preparing patients for cataract surgery. The purpose of this study is to investigate the effectiveness of a video, as compared to the current standard NSHA pamphlet, to reduce self-perceived anxiety and improve patient satisfaction with their cataract surgery experience.

Methods:

This is a single-center prospective randomized controlled trial involving patients undergoing cataract surgery at the Victoria General Hospital or Halifax Vision Surgical Center. An educational video was developed capturing the patient experience of undergoing cataract surgery. Following informed consent, participants were randomized to receive the online educational video or the NSHA cataract surgery pamphlet within one week of their surgery. Five days postoperatively, participants received an email to complete a REDCap survey. The primary outcomes of this study were self-perceived level of anxiety and patient satisfaction with their cataract surgery experience. A projected sample size of 264 participants was calculated to detect an effect size of 0.35 with a power of 80%.

Results:

At present, 382 participants consented to participate in this study; 185 participants were randomized to receive the informational video and 197 participants were randomized to receive the standard pamphlet. A total of 220 participants (57.6%) completed or partially completed the post-operative survey, of which 108 participants received the informational video and 112 participants received the standard pamphlet. 31 participants (28.7%) in the video group described themselves as “being an anxious person”, compared to 35 participants (31.3%) in the pamphlet group. Approximately 63.0% of participants in the video group agreed that the educational resource they received helped reduce their anxiety with regards to surgery, compared to 54.5% of participants in the pamphlet group. 68 participants (63.0%) in the video group and 57 participants (50.9%) in the pamphlet group preferred the intervention they received, instead of the alternative offered in the study.

Conclusion:

The results indicate a preference for a video as a patient education tool, as more participants found that it reduced their anxiety prior to their cataract surgery. An educational video may be used as a supplement or in place of the current standard of care, while providing several additional advantages. Barriers to accessing educational materials, including preoperative visual acuity and internet access, should be considered when selecting materials.

Characterizing Claudin-5 Expression in the Inner Blood-Retinal Barrier in Acute and Chronic Models of Experimental Glaucoma

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Background and Purpose:

Inner blood retinal barrier (iBRB) integrity is critical for optimal retinal functioning. The iBRB forms a selective barrier, and is composed of endothelial cells that line capillaries within the superficial, intermediate, and deep capillary plexuses. The endothelial cells are connected through tight-junction proteins, such as claudin-5. Although claudin-5 downregulation has been shown in several neurodegenerative diseases in the brain, changes in claudin-5 expression and subsequent iBRB dysfunction are not well understood in the retina. Moreover, whether changes in iBRB integrity precede retinal ganglion cell (RGC) degeneration in models of experimental glaucoma (EG) must be explored to better understand glaucomatous pathology. This study seeks to explore changes in claudin-5 expression in the iBRB and the timeline of these potential changes in relation to RGC degeneration in acute and chronic EG models.

Methods:

Adult C57Bl/6 mice will be divided into 4 groups: control, optic nerve transection (ONT), acute EG where intraocular pressure (IOP) is elevated by a pressure column, and chronic EG induced by an intracameral injection of a temperature sensitive hydrogel. In ONT, retinas will be processed following 3 and 5 days of ONT. In acute EG, IOP will be elevated for 30 minutes at 90mmHg, and retinas will be processed 5 and 7 days following IOP elevation. In chronic EG, weekly IOP measurements will be acquired using rebound tonometry and retinas will be processed following 2 weeks (no notable RGC loss), and 4 weeks (significant cell loss) of chronic IOP elevation. At baseline, and the timepoints described, retinal function will be evaluated using electroretinography. Additionally, fluorescein angiography will be performed to monitor vascular leakage. Following the final timepoints, a subset of retinas will used for Western Blot analysis to quantify claudin-5 protein across injury models, and the other for immunohistochemistry in retinal wholemounts, stained for Brn3a (RGC marker), claudin-5, and lectin (blood vessel marker). Brn3a-positive cell density will be quantified for each timepoint in each group, and changes in claudin-5 and lectin expression will be compared to control retinas and reported as relative fluorescence intensity.

Results:

Results of the current study are preliminary and ongoing. Claudin-5 immunofluorescence co-localizes with lectin and can be visualized in the three capillary plexuses (superficial, intermediate and deep capillary plexuses) in retinal wholemounts from control mice.

Conclusion:

Results of this work will improve our understanding of the influence of iBRB disruption and the role it may play in RGC structural and functional loss in models of EG.

Ab-Interno Canaloplasty for the Management of Uncontrolled Pseudoexfoliation Glaucoma with Dislocated IOL: A Case Report

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Background and Purpose:

Pseudoexfoliation glaucoma (PXG) is a complex form of open-angle glaucoma, often compounded with zonular instability and intraocular lens (IOL) dislocation. The purpose of this case report is to highlight the role of ab-interno canaloplasty in complex anterior segment surgery. Minimally invasive glaucoma surgery (MIGS), including ab-interno canaloplasty,analoplasty, offers a less invasive alternative to traditional glaucoma surgeries. This technique enhances aqueous outflow via Schlemm's canal dilation, but its role in complex anterior segment surgery remains underexplored.

Methods:

We present a case of a 77-year-old female with PXG, a dislocated posterior chamber IOL (PCIOL), and uncontrolled intraocular pressure (IOP) despite maximal medical therapy. She underwent combined ab-interno canaloplasty using the iTrack Advance microcatheter with anterior vitrectomy, PCIOL explantation, and anterior chamber intraocular lens (AC-IOL) implantation. The procedure involved circumferential insertion of the microcatheter into Schlemm's canal, followed by pressurized viscodilation. Postoperative outcomes, including IOP control, visual acuity, and disease progression, were assessed over 18 months.

Results:

Preoperatively, IOP was 35 mmHg in the right eye despite multiple antiglaucoma medications. Following surgery, IOP decreased to 15 mmHg at six months and remained stable at 16 mmHg at 18 months with a single topical medication. Best-corrected visual acuity improved from 20/200 preoperatively to 20/30+ at six months and 20/20 at 18 months. Optical coherence tomography (OCT) demonstrated stable retinal nerve fiber layer thickness, and glaucoma progression analysis showed no disease progression. No postoperative complications were observed.

Conclusion:

Ab-interno canaloplasty with the iTrack Advance microcatheter effectively controlled IOP and reduced medication dependence in a patient with dislocated PCIOL and uncontrolled PXG. The combination of canaloplasty with anterior segment surgery resulted in favorable visual and pressure outcomes, with no complications. This case highlights the potential of ab-interno canaloplasty in complex anterior segment procedures, warranting further studies to validate its long-term efficacy.

Proteomic Analyses for Different Stages of Primary Open Angle Glaucoma – A Pilot Study of 8000 Markers with Stringent Criteria

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Background and Purpose:

Primary open-angle glaucoma (POAG) makes up 90% of glaucoma cases in developed countries and is associated with trabecular meshwork (TM) dysfunction, leading to increased intraocular pressure (IOP). In the literature, several studies investigated the biomarkers in different types of glaucoma. **However, there is a lack of unbiased studies linking biochemical profiles of aqueous humor (AH) to glaucoma stages**. To address this gap, this study explores proteomic biomarkers in the AH of POAG patients at early and advanced stages to uncover biological pathways that may influence disease progression.

Methods:

In this prospective comparative study, three groups (control, mild glaucoma, advanced glaucoma; n = 10/group) were identified and consented. Glaucoma staging was based on visual field mean deviation (MD) values within 6 months of enrollment. AH samples (100 µL/eye) were collected prior to any intraocular surgery. The samples were subjected to quantitative multiplex analysis using L8000 RayBio® Biotin-Label Based Antibody Arrays. Patient demographics and clinical data, such as IOP, visual fields and OCT measurements, were also collected and incorporated in the principal component analysis (PCA). Significantly differentially expressed biomarkers were identified using Wilcoxon or t test (FDR<0.01) for advanced glaucoma versus control, advanced glaucoma versus mild glaucoma, and mild glaucoma versus control.

Results:

The advanced glaucoma group had a decision IOP of 18.8+/-4.5 mmHg, a visual field MD of -13.7+/-7.7 dB, an average RNFL thickness of 60.4 +/- 10.9 µm, and an average GCC of 55.9 +/-10.0 µm. These parameters for the mild glaucoma group were: 15.6+/-5.9 mmHg, -4.7+/-3.2 dB, 67.5+/-7.5 µm, and 59.7+/-7.6 µm, respectively; and for the control group were: 12.1+/-2.1 mmHg, -1.0+/-2.5 dB, 83.4+/-17.2 µm and 68.2+/-14.8 µm, respectively.

AH samples underwent a multiplexed proteomic analysis of 8000 molecules. PCA, heatmaps and dendrograms from hierarchical clustering demonstrated clear clustering, consistent with their distinct clinical background. The Wilcoxon or t test identified numerous differentially expressed molecules when the 3 groups were compared between each other. Gene ontology (GO) analysis highlighted multiple pathways related to immune activation and regulation in the advanced glaucoma group when compared to the mild group.

Conclusion:

To our knowledge, this is the first study that simultaneous analyzed a large proteomic data set and correlated patients' proteomic profiles with clinical POAG staging. A deeper understanding of the proteomic signature of POAG will ultimately provide valuable insights towards the progression and management of these patients.

Factors influencing the survival of full-thickness skin grafts in the periocular region: A systematic review and meta-analysis

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Background and Purpose:

Full thickness skin grafts (FTSGs) can be used as part of a reconstructive strategy for the periocular region. Many factors can influence survival of FTSGs and clinicians use a variety of methods to ensure success of these procedures. Up to this point, there has been no comprehensive systematic review of factors influencing the survival of FTSGs for peri-ocular reconstruction. There have been individual studies centered around enrollment of participants pertaining to particular procedures such as ectropion repair, burn reconstructions, tumour excision etc. Our goal was to summarize that data currently available and systematically review the variables that are used to influence FTSG survival in the periocular region

Methods:

A systematic review of published literature pertaining to full thickness skin grafts in the periocular region from 1965 to December 2024 was undertaken through computerized search following PRISMA guidelines. Publication descriptors, methodological details, and overall results were extracted. Articles were assessed for methodological quality using either the MINORS or Cochrane ROB 2 instruments depending on the type of study. Meta-analysis was then performed of specific graft types using RevMan5 software.

Results:

Fifty-five studies were included. Most studies were retrospective and of 3rd and 5th level of evidence. Overall, the scientific quality was moderate with randomized controlled trials and non-comparative randomized studies generally being rated of higher quality. Studies consisted of graft donor sites from the eyelid, pre-auricular, posterior auricular area, clavicle, conchal bowl, mid-face and thoracic area. Implant sites included nasal ala and dorsum, upper and lower lids, forehead, and temple. Indications included post-resection for cancer resection, burns, ectropion repair, and lagophthalmos.

Conclusion:

Overall, studies were of moderate quality and investigated numerous sites of graft donor sites and were able to be used for various indications.

Comparison of Techniques for Obtaining Stereopsis Measurements in Young Children & Correlation of Stereopsis Thresholds with Visual Acuity

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Background and Purpose:

Stereoacuity testing is a sensitive indicator of binocular function and is often abnormal in ocular conditions such as strabismus, amblyopia and suppression. It can be valuable in young children, as cooperation and reliability of monocular vision testing often declines during examination.

Historic work identified a correlation between stereoacuity and visual acuity in a small cohort of healthy adults. This work is often referenced clinically, however has not been re-evaluated with current acuity charts using logarithmic standards (log minimal angle of resolution – logMAR), in individuals with ocular pathology, or in pre-verbal children.

This study aims to address the current gaps by evaluation the relationship between stereopsis and visual acuity values in those with no ocular pathology, those with ocular pathology, and pre-verbal children utilizing a large retrospective standardized clinic data base for literate subjects and prospective evaluation of a preferential looking method in pre-verbal children.

Methods:

The prospective stream will recruit 255 children aged five and younger to evaluate the testability, sensitivity, and specificity of a preferential looking stereopsis method (PASS 3) compared to current available option (Frisby), and the relationship between stereopsis thresholds and visual acuity on preferential looking testing (Teller).

The retrospective stream will review 8265 charts of unique patients at the IWK and measure the relationship between stereopsis thresholds and visual acuity (logMAR) based on acuity of the worse seeing eye and the interocular difference.

Both streams will subdivide subjects into normal (no ocular pathology), pathological (documented ocular pathology), and known nil (barrier preventing true clinical stereopsis).

Results:

Preliminary findings of PASS 3 (89 participants) show a high testability (92.1%), sensitivity (94.1%), and specificity (83.0%) compared to Frisby (68.5%, 84.6%, and 93.3% respectively) in children aged 5 and under. The data is currently trending with a positive correlation between finer stereoacuity and lower logMAR acuity thresholds in both the prospective and retrospective study groups of normal subjects.

Conclusion:

Preferential looking stereopsis testing (PASS 3) shows greater testability and sensitivity for measuring clinical stereopsis in children compared to the current alternative, with a positive correlation between finer stereopsis and normal acuity for age. This is essential in a pediatric population when examinations can be unpredictable, and stereopsis may be the only reliable measurement obtained. The retrospective review shows preliminary positive correlations between stereopsis thresholds and acuity, which can be important in the context of suspected non-organic vision loss. Data collection and analyses is ongoing 2025-2026.

Development And Assessment Of A Novel Computer Vision-based Bayesian Platform For Improved Diagnostic Accuracy Of Posterior Uveitis

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Background and Purpose:

Uveitis comprises intraocular inflammation of the iris, ciliary body, and or choroid and causes 5-20% of legal blindness in the developed world. Posterior uveitis, encompassing retinitis or choroiditis, can have an established diagnosis in 78.1% of patients when diagnosed by a uveitis specialist. However, 17% of the North American population lives in rural areas, preventing access to specialized care and delaying diagnosis and treatment, leading to extraneous testing.

Can automated analysis of fundus images (OPTOS wide-field images) by a novel computer-vision based Bayesian algorithm attain specialist-level diagnostic accuracy for posterior uveitis? This would reduce the burden on uveitis specialists and improve access and quality of care for patients, particularly in rural communities.

Methods:

Dataset Annotation: A training dataset of more than 1,000 fundus images, limited to posterior uveitis and sourced from Dalhousie and partnering universities, is annotated by uveitis specialists with salient features of posterior uveitis, including laterality, multifocality, pattern, location, and homogeneity of lesions.

Technical Development: The author's novel convolutional neural network with U-net segmentation parses the training dataset to i) identify pathologic versus normal fundi and then ii) segment the photos to identify the clinical features above. A rule-based, probabilistic Bayesian platform uses the presence or absence of each feature to determine the likelihood of a disease.

Testing: The model will be validated prospectively using at least 300 images of pathology. It will provide a ranked Bayesian-determined list of differential diagnoses ("algorithm-assisted diagnosis). 4-8 uveitis specialists will independently attribute their top diagnosis ("gold-standard diagnosis"). The algorithm-assisted diagnosis (top 1, 2, and 3) will be compared against the gold-standard for diagnostic accuracy. Fundus images on presentation will be tested against follow-up imaging to assess the model's internal reliability.

Periocular Neurotization: A Scoping Review of Orbicularis Oculi Direct Reinnervation Techniques and Outcomes in Facial Nerve Palsy

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Background:

Periocular neurotization is a surgical approach that can be indicated for the restoration of dynamic eyelid functions in patients with facial nerve palsy. The orbicularis oculi muscle, responsible for eyelid closure, can be the target of a variety of re-innervation techniques, such as direct nerve transfers and muscle transpositions. Despite increased interest in this type of intervention, the literature on methods and results of periocular neurotization are not well systematized.

Objective:

The objective of this scoping review is to map existing evidence on periocular reinnervation techniques that target the orbicularis oculi muscles. We seek to identify the efficacy of various approaches such as direct neurotization and muscle transposition of the orbicularis oculi. We aim to highlight gaps in the literature to inform future research and clinical practices.

Methods:

A systematic search of PubMed, Embase, and supplemental searching with citation chaining using google scholar to identify studies detailing periocular neurotization techniques. Articles will be screened based on predefined inclusion criteria focusing on neurotization techniques of the orbicularis oculi muscles in patients with facial nerve palsy.

Anticipated Results:

The review anticipates identifying various surgical techniques in periocular neurotization and related outcomes such as enhancements in blink restoration, eyelid static and dynamic symmetry, and corneal protection.

Clinical Safety, Efficacy, and Patient-Reported Outcomes in Dropless Cataract Surgery

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Background and Purpose:

Cataract surgery is one of the most commonly performed surgical procedures worldwide. Traditional postoperative management relies on patient-administered topical antibiotic and anti-inflammatory eye drops, which pose adherence challenges and increase the risk of infection and inflammation. An alternative approach, "dropless" cataract surgery, utilizes intracameral antibiotic injection combined with a subconjunctival steroid to eliminate the need for postoperative drops. While dropless cataract surgery has been widely adopted in some regions, its safety and efficacy in the Canadian healthcare setting remain understudied. Additionally, no studies have comprehensively evaluated patient-reported experience and satisfaction with this approach, which is critical in assessing overall treatment efficacy and acceptability. This study aims to evaluate the effectiveness of dropless cataract surgery in preventing postoperative complications, as well as identifying risk factors for intraocular pressure (IOP) elevation and other safety-related events. A secondary objective is to assess patient satisfaction, perceived convenience, and overall experience with dropless cataract surgery compared to traditional drop-based regimens.

Methods:

This retrospective cohort study includes patients who underwent elective, single-procedure phacoemulsification cataract surgery with a dropless protocol in Nova Scotia between January 1, 2020, and December 31, 2023. Eligible patients received an intracameral moxifloxacin 0.1% (0.5 mL) injection and a subconjunctival triamcinolone acetonide (TA) 10 mg/mL (0.4 mL) injection at the conclusion of surgery. Primary efficacy outcomes include rates of postoperative iritis, macular edema, and endophthalmitis occurring within 120 days of surgery. Safety outcomes include the incidence of IOP elevation ≥10 mmHg over baseline, absolute IOP ≥30 mmHg, new glaucoma diagnoses, and initiation of glaucoma treatment. Multivariable Cox proportional hazards modeling will identify potential risk factors for postoperative complications. A secondary outcome measure will assess patient-reported satisfaction, experience, and perceived convenience through survey.

Results:

Data collection and analysis are currently underway, with results expected by October 2025.

Conclusion:

Dropless cataract surgery appears to be a promising alternative to traditional postoperative drop regimens, potentially improving patient adherence and reducing medication burden. By incorporating patient-reported experience and satisfaction as a secondary outcome, this study aims to provide a comprehensive evaluation of both clinical and patient-centered outcomes. These findings will contribute valuable insights into the feasibility, safety, and overall acceptability of dropless cataract surgery in the Canadian healthcare setting, informing future clinical decision-making and best practices.

Defective Glycosylation of Congenital Stationary Night Blindness mGluR6 Mutants Impairs ELFN1 Binding

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Background and Purpose:

Rods mediate scotopic, colourless vision through glutamatergic synapses with ON-bipolar cells. Detection of glutamate and modulation of bipolar cell polarization is dependent on metabotropic glutamate receptor 6 (mGluR6), a G-protein coupled receptor. Our recent findings confirmed the presence four complex N-glycosylation sites in the extracellular domain of mGluR6 and demonstrated their importance for protein function. Mutation of glycosylation sites impacted trafficking, synaptic localization, and binding to transsynaptic partners ELFN1 and ELFN2. Given the demonstrated importance of glycosylation for mGluR6 function, its role in congenital stationary night blindness (CSNB) was considered.

Methods:

To investigate glycosylation profiles, a series of CSNB mGluR6 mutants were created through site directed mutagenesis. The ability of the mGluR6 mutants to interact with ELFN1 was tested with a pulldown assay. To assess glycosylation states, mutants were treated with glycosidases PNGase F and Endo H, resolved by SDS-PAGE, and detected by western blotting. In order to differentiate plasma membrane and intracellularly localized protein, a membrane impermeant biotinylation assay was used.

Results:

Pulldown experiments demonstrated that the CSNB mutants located in the ligand binding domain (LBD) are unable to bind ELFN1 and are also deficient in complex glycosylation. This is consistent with our previous findings indicating that mGluR6-ELFN binding is dependent on complex glycosylation. The fraction of protein resistant to EndoH, a glycosidase with activity specific to immature glycans, was reduced in all mutants. Furthermore, the proportion of EndoH-resistant mGluR6 can be correlated to the level of ELFN binding. Our surface biotinylation assay then revealed that immature forms of the CSNB mGluR6 mutants are present at the plasma membrane, in contrast to WT, which is present primarily in mature complex glycosylated form.

Conclusion:

Our results demonstrate that a set of CSNB mGluR6 mutants lacking complex glycosylation are unable to bind ELFN1. Furthermore, these mutants achieve plasma membrane localization with immature glycosylation, suggesting an alternative trafficking route that bypasses the Golgi.

Choroidal Thickness In Treatment Naïve Eyes Receiving Unilateral Intravitreal Anti-VEGF Injections

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Background and Purpose:

This study will examine the effect of anti-VEGF agents on the sub-foveal and peripapillary choroidal thickness after treatment in patients with age-related macular degeneration (AMD), diabetic macular edema (DME), branch retinal vein occlusion (BRVO) and central retinal vein occlusion (CRVO).

Vascular endothelial growth factor (VEGF) is a signaling molecule involved in a variety of retinal diseases. It can cause macular edema and growth of subretinal neovascular vessels which are prone to bleeding and contribute to poor vision. Anti-VEGF therapy has become the first-line therapy for AMD, DME, BRVO, and CRVO and is known to decrease neovascularization and macular edema in these conditions. Newer studies have also suggested that anti-VEGF can also reduce the choroidal thickness and change the existing vasculature of the retina, especially in the foveal avascular zone (FAZ) and peripapillary retina. Furthermore, it's unknown whether these effects are the same for all anti-VEGF agents.

In this study, we will analyze whether there is an effect of the available anti-VEGF injections (ranibizumab and aflibercept) on the sub-foveal and peripapillary choroidal thickness after treatment. We will observe patients and take serial optical coherence tomography (OCT) scans of their choroid after treatment with an anti-VEFG agent, as well as measure the FAZ with serial OCT-angiography scans, to document the change in these parameters after treatment.

Methods:

We aim to recruit 66 participants for our study. Potential participants are those assigned to be assessed by the staff ophthalmologist (principal investigator). Patients will be assigned a chronological study ID number that corresponds to a list that contain the anti-VEGF that was used (0.5 mg ranibizumab or 2 mg aflibercept).

Participants will undergo optical coherence tomography (OCT) and OCT angiography. The FAZ area in the superficial and deep plexus layers is the region of the fovea with no vasculature on OCTA. The parameters will be manually measured with the assistance of the machine's provider software. Best corrected visual acuity (BCVA) will be recorded in Snellen acuity and converted to logarithm of the minimum angle of resolution (logMAR) for statistical analysis, and converted back to Snellen acuity for data presentation.

Data will be checked for normality.SEP Normal data will be compared using a non-paired t-test. Non-normal data will be compared using non parametric tests. Categorical data: Chi squared test. Coefficients with 95% confidence intervals will be reported. A p-value of 0.05 will be considered for statistical significance. Data will be analyzed using SPSS (SPSS Inc., Chicago, IL).

Sequence Determinants of Pikachurin Axonal Trafficking and Trans-synaptic Complex Formation

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Background and Purpose:

Rod and cone photoreceptors (PRs) are specialized neurons that are responsible for the sensory transduction of visual stimuli. In the retina's outer plexiform layer (OPL), PRs transmit information to bipolar cells (BCs); this process is critical for normal vision. Pikachurin (PIKA) is a multi-domain heparan sulphate (HS) proteoglycan expressed in PRs and secreted into the synaptic cleft. PIKA knockout mice have structural defects in rod synapses and abnormalities in electroretinogram recordings, demonstrating its importance for normal vision. PIKA forms a trans-synaptic complex (TSC) with pre-synaptic dystroglycan (DG) and post-synaptic GPR179, as well as the post-synaptic cell adhesion molecule LRRTM4. Using a combination of in vitro and in vivo experiments, we aim to identify sequence determinants of PIKA-LRRTM4 binding and synaptic localization at PR terminals.

Methods:

Wild-type and mutant PIKA expression constructs with domains individually deleted were constructed. In vitro binding experiments were performed using a co-immunoprecipitation assay followed by western blotting. Synaptic localization was tested by subretinal injection and electroporation of plasmids expressing wild-type or mutant PIKA under the control of a murine opsin promoter for specific expression in PRs.

Results:

Our preliminary data suggest that a region of unknown function between a.a. 240-342 is necessary and sufficient for LRRTM4 binding. Treatment with heparinase suggests that heparin sulfates are located within a.a. 244-564, consistent with the known requirement of heparan sulfate for LRRTM4 binding. However, the LRRTM4-binding region was not required for correct PIKA localization at PR-BC synapses.

Conclusion:

We demonstrated that none of the known functional domains of PIKA are required for LRRTM4 binding, but rather a novel region, between the second fibronectin and first EGF-like domain, is required. This is in contrast to binding with GPR179, which is mediated by the C-terminal laminin G domain of PIKA. Our results additionally suggest that PIKA binding to LRRTM4 is not required for correct localization at PR-BC synapses.

Caring For Patients With Vision Loss: An Interprofessional Education Initiative

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Background and Purpose:

Interprofessional Education (IPE) is a vital component of healthcare training that fosters collaboration across disciplines to enhance patient care. Students in the Faculties of Medicine, Health and Dentistry at Dalhousie University are required to fulfill IPE course requirements in addition to their scheduled curriculum. This year, the "*Caring for Patients with Vision Loss*" IPE mini course was introduced to address the current lack of interprofessional education opportunities pertaining to vision care.

Methods:

This course involved three 90-minute synchronous sessions that included patient panel discussions, interactive learning modules and hands-on workshops with Vision Loss Rehabilitation Canada. Student experiences and perceptions of the course were assessed with a structured response survey using a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Following each session, students completed written self-reflections that were analyzed for recurring themes.

Results:

A total of 49 students enrolled in this course from the disciplines of Medicine (45%), Social Work (35%), Nursing (10%), Clinical Vision Science (8%) and Health Promotion (2%). The student experience survey received 32 submissions, marking a 65% response rate. Sessions were perceived as highly engaging, with 62.5% of participants strongly agreeing, and most (65.63%) reported increased confidence in their abilities to care for patients with vision loss. The competence of course facilitators received strong approval from 84.38% of participants and 93.75% of respondents would recommend this course to their peers. Student self-reflections highlighted the following themes 1) Provider misconceptions and stereotypes around vision impairment can lead to poor experience with the health care system; 2) Clear communication and descriptions can improve patient rapport and understanding; 3) Services offered by Vision Loss Rehabilitation Canada can benefit patients with vision impairment; and 4) There is value in educating health care professionals on the lived experiences of patients with vision impairment.

Conclusion:

This IPE mini course was designed to equip health professional students with the skills to provide accessible, compassionate, and effective care for patients with vision impairment. Students gained insight into the experiences of patients navigating the health care system, were educated on available support resources, and explored opportunities for local accessibility advocacy. This introductory course served as a strong first step in addressing the current educational gaps surrounding vision impairment. With positive participant feedback, we aim to continue developing this course in years to come.

Barriers Existing in Nova Scotia Hospitals for People Living with Sight Loss: A Qualitative Study

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Background and Purpose:

It is well understood that individuals living with sight loss face unique barriers in accessing health care. While there has been recent emphasis to prioritize accessible and equitable healthcare for all, health disparities continue to persist for those living with sight loss. Presently, only a small percentage of healthcare providers receive formal education on caring for patients living with sight loss, and hospitals are adopting new technologies that lack accessible features. The purpose of this study was to identify barriers that exist within healthcare institutions for individuals living with sight loss to inform on how changes can be made to improve their experience in accessing healthcare.

Methods:

This study comprised of one-on-one semi-structured interviews. Participants were individuals living with sight loss in Nova Scotia that have accessed care at a healthcare facility in the province and were ≥ 18 years old. The study was approved by the Nova Scotia Health Research Ethics Board. Participants were recruited through advertisement for the study in collaboration with the CNIB. Interviews were conducted using Microsoft Teams between June and October 2024. Interviews were transcribed and analysed using reflexive thematic analysis. Members of the research team independently grouped data into themes. Themes were then collectively reviewed, refined, and reconciled the themes with several iterations until full consensus was met.

Results:

A total of ten interviews were completed, with two major themes emerging. The first theme was that healthcare institutions commonly impose barriers stemming from a lack of universal design principles, such as electronic self-check-in kiosks for appointment registration, signage lacking brail or high-contrast fonts, waiting rooms that rely on a “take a number” system, and elevators lacking audio overlays. The second theme was that barriers often stem from unconscious ableism. For those that had been admitted, references were commonly made to employees entering rooms unannounced and under the assumption that they can be seen, leading to problems with things such as the delivery of food, as well as induced anxiety around the adjustment of IV lines or administration of medications.

Conclusion:

A variety of modifiable barriers exist within healthcare institutions that continue to make accessing health care daunting for individuals with sight loss. Greater emphasis should be placed on implementing accessible options within healthcare institutions. Additionally, more education needs to be provided to healthcare providers around awareness and education on people living with sight loss.

Risk of glaucoma associated with use of calcium channel blockers in patients with cardiovascular disease

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Background and Purpose:

Calcium channel blockers (CCBs) are one of the most prescribed agents for cardiovascular disease (CVD) globally and are frequently used as first line agents in treating hypertension. Recent epidemiologic studies have shown an adverse relationship between CCBs use and the incidence of glaucoma, however the studies had significant methodological limitations. The purpose of this study was to conduct the largest epidemiologic study to date and re-examine the association between CCBs and glaucoma with more robust methodology that may have biased the results of previous studies.

Methods:

This was a retrospective cohort study with a case control analysis from 2016-2023 using the IQVIA Ambulatory Database (USA). Three cohorts of new users (CCBs, angiotensin receptor blockers [ARBs] and thiazide diuretics, with the latter two being controls), were created and followed until first diagnosis of glaucoma or end of follow up period (December 2023). Cases included all patients with newly diagnosed open angle glaucoma (OAG) or primary angle closure glaucoma (PACG) as defined by ICD-9/10 codes and had to have no previous glaucoma codes prior to the date of the first antihypertensive prescription. For each case, four controls were matched by age and calendar time. Regular use of a CCB was defined as use of at least one prescription every three months in the year prior to the event date. Descriptive statistics was completed to examine differences in demographics and covariates between the three groups. A conditional logistic regression model was constructed to compute odds ratios (ORs) and account for confounders.

Results:

957, 758 patients with CVD were included in the study. 53.1% of the population were women and the mean age 59.4 years old ± SD 15.1. When compared to both thiazide and ARBs users, CCBs users did not have an increased risk for developing OAG (OR = 1.28, 95% confidence interval [CI] 1.06-1.53 and OR = 1.02, 95% CI 0.91-1.15 respectively). CCBs users did have an increased risk for PACG when compared to thiazide users (OR = 1.85, 95% CI 1.14-2.99), but not when compared to the ARBs group (OR = 0.94, 95% CI 0.72-1.24).

Conclusion:

Our study found that patients with CVD who used CCBs were at a greater risk for PACG when compared to the thiazide group, but not the ARBs group. Contrary to previously published reports, our study did not find patients on CCBs to be at a higher risk for developing OAG when compared to either thiazides or ARBs, and previous studies that demonstrated a harmful association between CCBs and glaucoma may be attributed to confounding factors such as CVD that was not isolated.

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