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Congrès annuel et exposition de la SCO

#COS2024

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By subspecialty | Par surspécialité

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- Cornea, External Disease and Refractive Surgery | Cornée, maladies externes et chirurgie refractive
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- Hot Topics | Sujets d'actualité*
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Cataract Surgery | Chirurgie de la cataracte

Comparing the accuracy of TORIC intraocular lens calculations between the IOL Master 700 and iTrace

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Introduction

- The success of TORIC intraocular lens (IOL) relies on precision of biometric measurements and calculations[1].
- Two of the most common devices currently used to measure keratometry, IOL Master and Pentacam, showed discrepancies regarding the axis estimation and power[2,3].
- **Purpose:** To compare the residual power and axis of astigmatism from a six-week follow up appointment after cataract surgery to the expected residual astigmatism using calculations based on IOL Master 700 and iTrace keratometry.

Methods

- Single-center, prospective, non-interventional observational study conducted between September 2023 and February 2024.
- Patients booked for cataract surgery with a pre-existing regular corneal astigmatism between 0.75 and 5.0D and chosen to have a TORIC IOL were included in the study.
- Patients preoperatively underwent scans for the iTrace and IOL Master 700.
- All patients received a Johnson and Johnson monofocal (ZCU) or Eyhance (DIU) IOL calculated based on IOL Master 700 measurements. Separate calculations were made using iTrace measurements.
- We compared the estimated postoperative residual astigmatisms (power and axis) based on IOL Master 700 and iTrace to the actual residual astigmatism from a six week follow up.

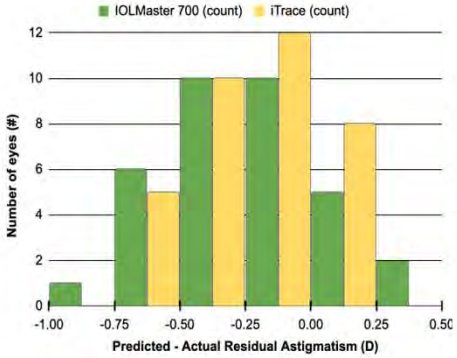
Results

Table 1: Study characteristics

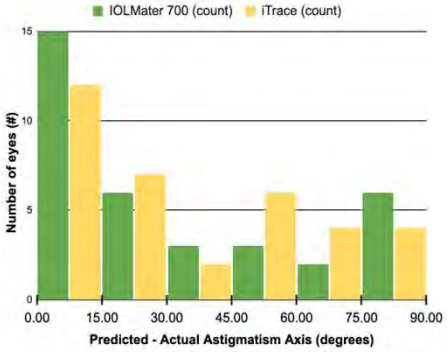
Demographics (35 eyes, 24 participants)			
Eyes (OD / OS)	18 / 17		
Gender (F / M)	10 / 14		
Lenses (DIU / ZCU)	30 / 5		
Age (years)	69.37 +/-8.58		
	Pre-op	Post-op	Paired T-Test
Sphere	- 4.57 +/- 3.48	- 0.46 +/- 0.38	$p = 3.89 \times 10^{-4}$
Cylinder	1.09 +/- 0.69	0.49 +/- 0.34	$p < 0.001$
Axis	88.53 +/- 59.85	85.29 +/- 52.59	$p = 0.408$
SE (D)	-2.39 +/- 3.68	-0.18 +/- 0.31	$p = 1.04 \times 10^{-3}$

Table 2: Astigmatism accuracy of the IOLMaster 700 (IOLM) and iTrace.

Comparison	Power		Axis	
	Mean Difference	P-Value	Mean Difference	P-Value
IOLM and Post Op	- 0.29 +/- 0.35	2.58×10^{-5}	30.94º +/- 30.55	0.50
iTrace and Post Op	- 0.24 +/- 0.26	7.28×10^{-6}	34.14º +/- 27.79	0.43
IOLM - iTrace Accuracy	- 0.05 +/- 0.25	0.253	19.20º +/- 25.30	0.324



Graph 1. Histogram of predicted and actual differences of residual astigmatism magnitude, with outliers removed.



Graph 2. Histogram of predicted and actual differences of residual astigmatism axis (no outliers).

Results

- No statistically significant difference was found in suggested power and axis of astigmatism between the iTrace and IOL Master 700.
- There was statistically significant differences between the predicted and actual post op astigmatism for both the IOL Master 700 and iTrace.
- For 77.14% of eyes, the IOL Master 700 astigmatism predictions were within +/-0.5 D of post op astigmatism, with 43% eyes being within +/-0.25D.
- For 85.71% of eyes, the iTrace astigmatism predictions were within +/-0.5 D of post op astigmatism, with 57% eyes being within +/-0.25D.
- Both biometers slightly underestimated astigmatism power, with a mean difference of -0.29D for the IOL Master 700 and -0.24D for the iTrace.

Conclusion

- The IOL Master 700 and iTrace performed similar in their suggested power and axis predictions.
- Both biometers trended towards underestimating astigmatism power by about a quarter diopter.
- A limitation of this study is sample size; with more postoperative data we can have better statistical significance and highlight differences between biometers more confidently.

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

COS 2024

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INTRODUCTION

- One-third of patients report anxiety before cataract surgery and 93% are unable to relay basic information about the procedure or its complications.[1]
- 95% of Canadians >15 years old use the Internet for health information[2], and the quality and credibility of this information is highly variable.[3]
- Studies have demonstrated that adequate preoperative education is associated with decreased patient anxiety, fewer complications, and increased patient satisfaction.[4]

OBJECTIVE

To investigate the effectiveness of a video, as compared to the pamphlet that is currently used, in reducing self-perceived anxiety and improving patient satisfaction with their cataract surgery experience.

METHODS

Single-centre RCT of participants undergoing their first cataract surgery and randomly allocated to receive one of two educational materials:

Video or **Pamphlet**

(https://youtu.be/5LgCQMR6LMQ)

Five days postoperatively, participants were asked to complete an online survey.

REDCap
Research Electronic Data Capture

RESULTS

175 Participants meeting inclusion criteria and consented for surgery

90 Participants randomized to receive the informational video

- **52 Participants** completed the survey
- **11 Participants** partially completed the survey
- **27 Participants** did not complete the survey

85 Participants randomized to receive the standard pamphlet

- **45 Participants** completed the survey
- **9 Participants** partially completed the survey
- **31 Participants** did not complete the survey

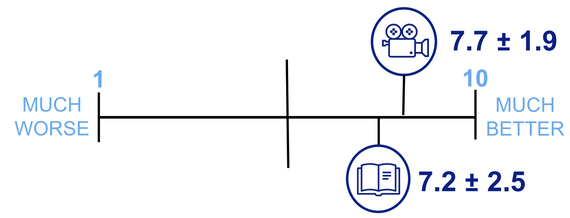
Survey Responses

# of respondents who agree/strongly agree		
20 Participants (37.7%)	*"I would describe myself as being an anxious person."*	**16 Participants (34%)**
44 Participants (84.6%)	*"I felt the information provided was clear and easy to understand."*	**45 Participants (97.8%)**
31 Participants (59.6%)	*"I felt the resource helped reduce my anxiety."*	**28 Participants (60.9%)**
40 Participants (76.9%)	*"I would recommend this resource to future patients."*	**37 Participants (82.3%)**

"I prefer to watch the video instead of reading a pamphlet."

"I prefer to read the pamphlet instead of watching a video."

"How did you find the cataract surgery, compared to what you were expecting?"



CONCLUSION

- Results suggest similar effectiveness of both a patient information video and the existing pamphlet for reducing self-perceived anxiety and for improving patient satisfaction.
- Preoperative educational videos are a cost-effective, accessible, and contact-free method for providing patients with accurate information before surgery and may be used as a supplement or in place of existing physical handouts.

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OPHTHALMOLOGY & VISUAL SCIENCES

nova scotia health

Setting the foundation for the development of a Patient- and Provider-Informed Cataract Surgery Care Model - Phase 1 and 2

COS 2024

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INTRODUCTION

- Lack of understanding of the barriers and disparities in accessing care for patients with cataracts [1]
- No appropriateness or prioritization criteria to help manage waitlists in a standardized way [2] [3]
- Limited implementation in clinical practice [4]

PURPOSE

Contribute to the design of an Appropriateness and Prioritization tool for cataract surgery by:

- Investigating barriers encountered by patients with significant visual impairment due to cataracts when accessing eye care
- Exploring the criteria and factors that influence referrals for cataract surgery made by primary eye care providers and identify possible efficiencies from initial referral to surgery

METHODS

- A qualitative descriptive multi-phase approach with semi-structured interviews was used
- **Phase 1**
  - Patients with visual acuity of 20/200 or worse due to cataracts
  - Comprehensive semi-structured interviews to gather insights on barriers and contributing factors hindering timely access to eye care
- **Phase 2**
  - Primary eye care providers (PEP), including optometrists, family physicians, and ophthalmologists
  - Comprehensive semi-structured interviews to gain a better understanding of the criteria used for referrals
- Audio recordings of these interviews were transcribed, and thematic analysis was performed
- Initial patterns across the data informed the generation of categories that were then grouped and refined into distinct themes for descriptive analysis

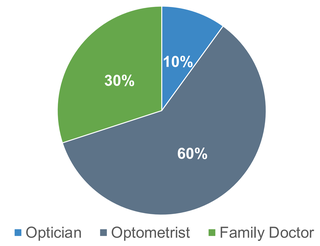
RESULTS

Phase 1

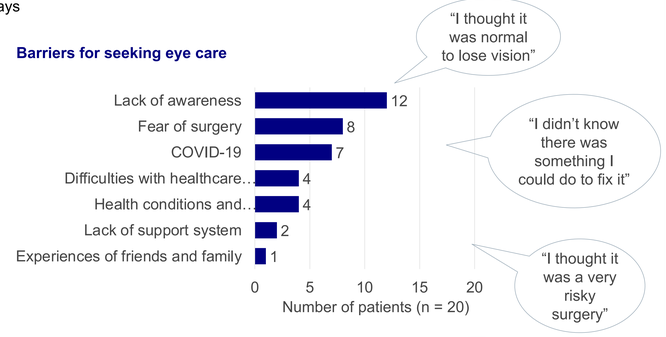
Baseline characteristics

- 20 patient interviews
- Mean age 71.1 ± 7.3 years
- Majority were female 65%
- Median (IQR) consult wait time: 47 (34 – 89) days
- Median (IQR) surgery wait time: 63 (50 – 182) days

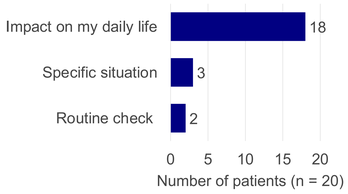
First point of contact



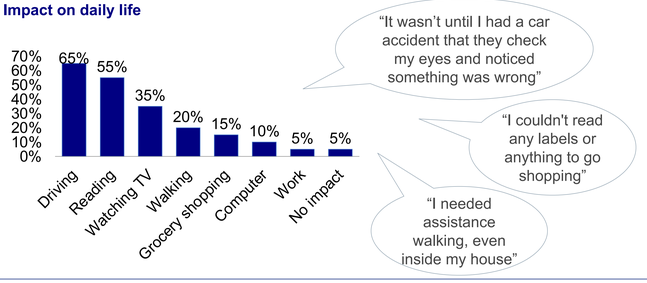
Barriers for seeking eye care



Motivators for seeking eye care



Impact on daily life

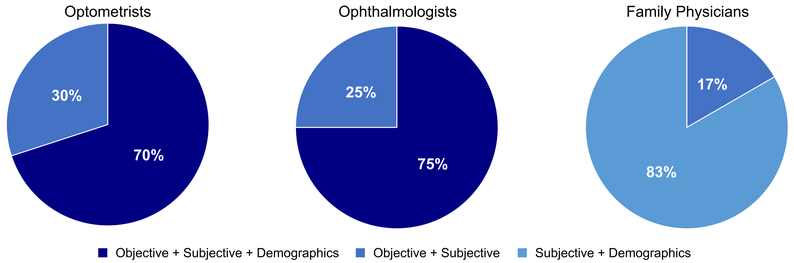


Phase 2

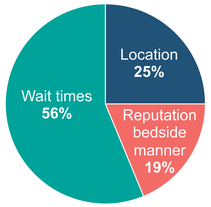
Baseline characteristics

- 20 provider interviews completed
  - 10 optometrists
  - 6 family physicians
  - 4 Ophthalmologists
- Mean years in practice: 12.1 ± 9.8 years

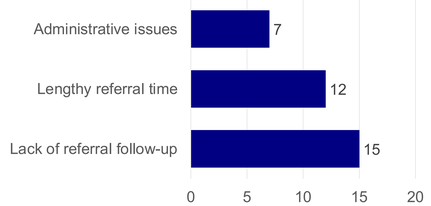
Criteria for cataract referral



Referral influencing factors



Barriers for referral



DISCUSSION

- Phase 1 showed that lack of awareness and fear of surgery are the main barriers to accessing care, underscoring the importance of patient education on eye health and the need for awareness efforts
- Phase 2 highlighted the differences in criteria used for referrals among PEPs, suggesting the potential efficiencies can be gain with a referral guidance tool that integrates both objective measures and patient-reported outcomes

CONCLUSION

Enhancing patient education—by improving the delivery methods and content—could substantially improve access to care. Educating referrers on these improved practices is essential. A referral tool that not only collects but also adeptly utilizes objective data alongside patient-perceived visual function is needed to streamline the referral process.

ACKNOWLEDGEMENTS

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COS 2024

Toxic Anterior Segment Syndrome after Cataract Surgery

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INTRODUCTION

Toxic anterior segment syndrome (TASS) is characterized by a sterile inflammatory reaction of the anterior segment, often occurring in outbreaks after anterior segment surgery.[1] Left untreated, TASS may cause damage to the corneal endothelium and trabecular meshwork leading to significant visual loss.[2] The diagnostic differentiation of TASS from early endophthalmitis is critical for effective management.

AIM

This study aimed to determine the etiology of TASS in temporally and geographically associated outbreaks at one private and one public surgical facility in British Columbia, Canada.

METHOD

- Retrospective observational study between Nov. 2020 – Aug. 2021
- TASS task force (authors R.C and S.P.H) investigated both sites after initial outbreak to provide detailed suggestions to prevent further TASS

TASS Task Force Suggestions Included:

- Reverse osmosis water filtration system instillation
- Sealing all reprocessing trays between site close and open
- Ensuring all devices were reprocessed by end of day, every day
- Acquisition of MDR machine that does not use detergent and is exclusively used for ophthalmic devices
- Maintenance of ventilation and leaking pipes when near stored or active equipment
- Switching to a dilution of intracameral Vigamox in exchange of community pharmacy prepared Cefuroxime
- Exclusive use of disposable cystotomes
- Discontinuation of nasal port incision
- Minimization of cannula manipulation
- Ensure TASS diagnosis through second opinion
- Number cataract trays to improve traceability
- Exclusive use of phaco-tips

RESULTS

- 34 TASS cases reported between two independent surgical sites
- 19 TASS cases from 360 cataract surgeries in a private facility
- 7/88 cases recorded as TASS prior to intervention at site one
- 12/ 272 cases recorded as TASS post intervention at site one

Significant reduction in TASS cases post-intervention using an alpha value of P = 0.05

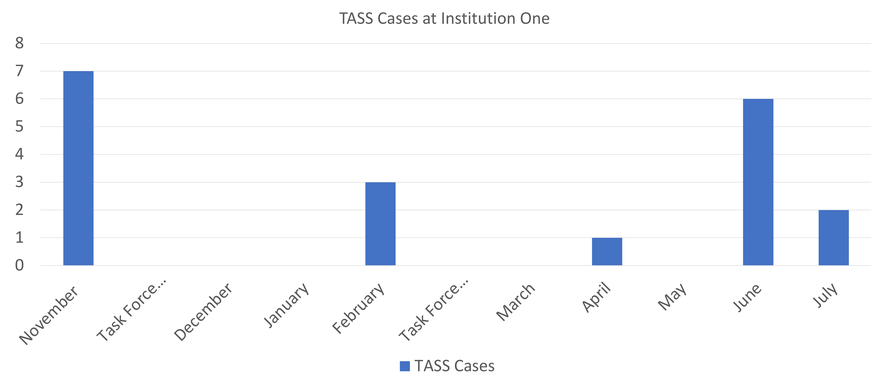

Figure 1.0 Bar chart highlighting the timeline of TASS incidence at institution one (private surgical centre). Case timeline depicts a consistent incidence of TASS during the observed period.

- 34 TASS cases reported between two independent surgical sites
- 15 TASS cases from 540 cataract surgeries in a public facility
- 12/76 cases recorded prior to intervention at site two
- 3/ 464 cases recorded prior to intervention at site two

Significant reduction in TASS cases post-intervention using an alpha value of P = 0.05

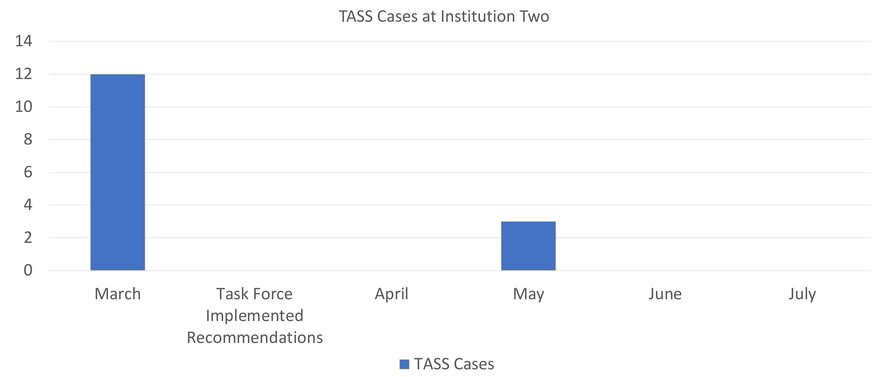

Figure 2.0 Bar chart highlighting the timeline of TASS incidence at institution two (public surgical centre). Case timeline depicts a high incidence of TASS prior to the implementation of TASS task force recommendations MDR on April 2, 2021.

CONCLUSION

Two geographically and temporally proximal, recurrent outbreaks of TASS were investigated and successfully managed. While we could not identify specific causes linking the two sites, we believe that the outbreak could be attributed to: (1) medical device reprocessing (MDR) issues, (2) use of reusable phaco tips, (3) poor water quality, and (4) off-site preparation of intracameral drugs. We found that TASS diagnostic criteria were variable, therefore, standardization by a third party is useful.

We recommend that cataract surgical facilities have a TASS prevention protocol which may include the following: surgeons to report all cases of sporadic TASS (provides useful and reliable logged data), clinical staff should compile monthly reports, including logging all changes of suppliers, changes in MDR protocols and changes in staff.

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Validation of a new Classification of Ophthalmological Complications (COC) using standardized cases

COS 2024

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INTRODUCTION

Complications are reported in a heterogenous manner in clinical trials with a lack of uniform and objective methods for outcomes reporting

AIM

To validate a new complications classification in ophthalmology using standardized cases

METHOD

- Survey of members of the CHU de Québec – Université Laval, Department of Ophthalmology, n=27
- Seven standardized scenarios representing each grade of the Classification of Ophthalmological Complications (COC) were rated for perception of severity using a 10-point scale and application of COC grading
- Differences in increasing severity perception and consecutive grades were evaluated
- Reliability of COC was assessed with percentage of correct answers in grading
- interrater correlation coefficient were calculated between respondents for COC grading

RESULTS

Grade definition	Standardized scenario	Median [Q1, Q3] severity perception	p*
Grade I: no change in treatment, routine drops, artificial tears, analgesics	Dry eyes requiring increasing artificial tears to four times daily	1 [1, 2]	**<0.001**
Grade II: ↑ duration / frequency drops, oral drugs other than analgesics	Rebound uveitis requiring increased duration and frequency of prednisolone 1% drops	2 [2, 3]	**<0.001**
Grade III: laser procedures, injections, procedures not requiring OR	Persistant macular edema requiring intravitreal triamcinolone injection postoperatively	4 [3, 5]	**0.001**
Grade IV: procedures requiring OR, IV drugs, hospitalization	Posterior capsule rupture with significant nucleus loss requiring a pars plana vitrectomy	6 [4, 7]	**<0.001**
Grade V: sight-threatening complication (e.g., endophthalmitis)	Endophthalmitis requiring a tap-and-inject	8 [7, 9]	**<0.001**
Grade VI: life-threatening complication requiring ICU management	Brainstem anesthesia secondary to retrobulbar block requiring ICU management	9 [9, 10]	**0.003**
Grade VII: death	Hospitalized post-corneal transplant patient dying from massive pulmonary embolism	10 [10, 10]	NA

*p-value = comparison of the perception of severity on 10-point scale of current grade to subsequent grade

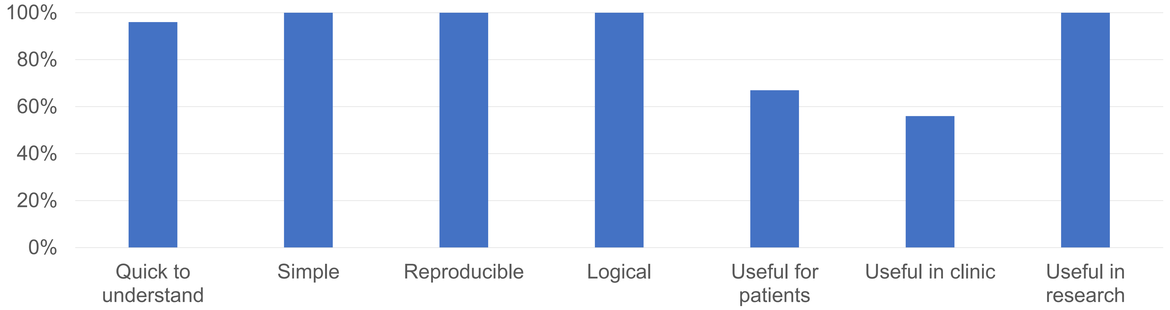
Inter-rater reliability measures

Single measures agreement: 0.952 (p<0.001)

Average measures agreement: 0.998 (p<0.001)

Correct answers: 90%

Figure 1: Evaluation of characteristics of the COC by raters



CONCLUSION

- The COC may be an interesting method to quantify morbidity in ophthalmology and improve complications reporting
- Deemed logical, simple, and reproducible by raters
- Grades follow the perception of complications severity
- High inter-rater reliability

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

Aqueous Humour Cytokine Levels in Fuchs Endothelial Corneal Dystrophy

COS 2024

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[3] Sunnybrook Research Institute, Toronto, Canada

INTRODUCTION

- Fuchs endothelial corneal dystrophy (FECD) is characterized by progressive corneal endothelium dysfunction and apoptosis of corneal endothelial cells and development of guttae.
- Although the pathogenesis of FECD is incompletely understood, genetic, endocrine, and environmental factors have been implicated in disease progression.
- Few reports have assessed the intraocular cytokine levels of patients afflicted with this disease.

AIM

This study aims to characterize the expression of pro- and anti-inflammatory factors in the aqueous humour of patients with FECD.

METHOD

- Patients with a diagnosis of either FECD with or without cataract, or cataract only requiring surgical intervention were prospectively enrolled in this study.
- There were 3 study groups: FECD phakic eyes that underwent combined Descemet's membrane endothelial keratoplasty (DMEK) and cataract extraction with insertion of intraocular lens (CE IOL) or Descemet stripping only (DSO) and CE IOL (group FP), pseudophakic eyes that underwent DMEK only (group FPs) and CE IOL control group (group cc).
- The primary outcome of this study is to investigate differential expression of aqueous cytokine in patients with FECD.
- An anterior chamber paracentesis was performed before surgery and aqueous humour was collected for analysis.
- Using multiplex bead array assays (MILLIPLEX®), the following 48 cytokines were assessed: sCD40L, EGF, Eotaxin, FGF-2, Flt-3 ligand, Fractalkine, G-CSF, GM-CSF, GROα IFNα2, IFNγ, IL-1α, IL-1β, IL-1ra, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12 (p40), IL-12 (p70), IL-13, IL-15, IL-17A, IL-17E/IL-25, IL-17F, IL-18, IL-22, IL-27, IP-10, MCP-1, MCP-3, M-CSF, MDC (CCL22) MIG MIP-1α, MIP-1β, PDGF-AA, PDGF-AB/BB RANTES TGFα, TNFα, TNFβ, VEGF-A.
- Kruskal-Wallis and Dunn's multiple comparison tests were used to compare cytokine expression levels in each group.

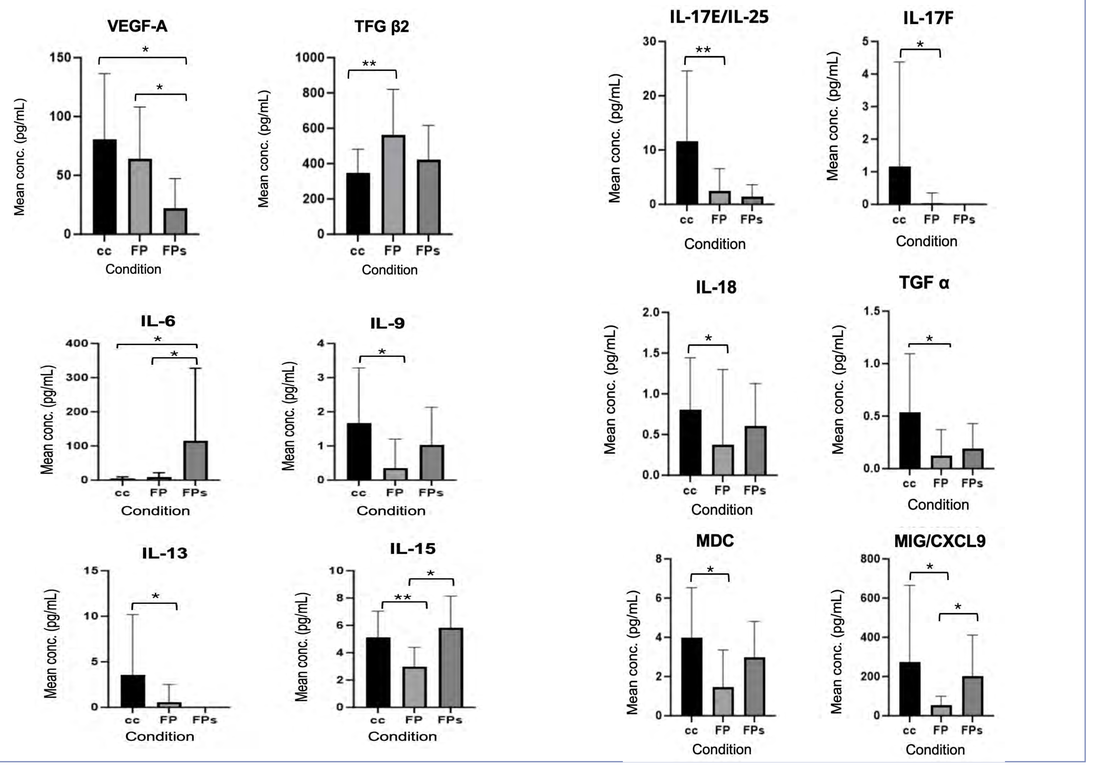
RESULTS

Table 1: Baseline Demographics

	Cataract control group (N = 18 patients)	Phakic FECD group (N = 32 patients)	Pseudophakic FECD group (N = 13 patients)
Mean age (years)	73.6	72.7	68.7
Female (%)	56	92	72
Male (%)	44	8	28

Table 2: Baseline Clinical Characteristics

	Cataract control group (N = 36 eyes)	Phakic FECD group (N = 40 eyes)	Pseudophakic FECD group (N = 13 eyes)
Surgical intervention	CE IOL (100%)	Combined DMEK and CE IOL (85%) Combined DSO and CE IOL (15%)	DMEK (100%)
Baseline VA (logMAR)	0.303	0.361	0.439
Baseline IOP (mmHg)	13.75	14.89	15.09
Baseline CCT	-	606	664
Presence of Corneal edema (%)	0%	33%	54%



CONCLUSION

- The aqueous humour of phakic FECD eyes has a distinct immunological profile when compared to eyes undergoing cataracts.
- TGFβ2 is upregulated in phakic FECD eyes when compared to cataract controls. However, TGFα is downregulated in phakic FECD eyes when compared to cataract controls.
- VEGF-A, IL-9, IL-13, IL-15, IL-17A and IL-17E/IL-25, IL-18, MDC, MIG/CXCL9 are all downregulated in phakic FECD eyes when compared to cataract controls.

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Comparison of Lipiflow® and TearCare®'s efficacy in relieving symptoms of dry eye caused by Meibomian Gland Dysfunction

COS 2024

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Université de Montréal | École d'optométrie

INTRODUCTION

Meibomian Gland Dysfunction (MGD) is one of the leading causes of dry eye. Not only is it a frequent reason of consultation among ophthalmologists and optometrists but it also drastically affects patients' quality of life. Its prevalence is estimated around 38-68% depending on the geographic region.[1]

The recommended control treatment is the application of warm compresses and lid hygiene. However, adherence to treatment often poses important challenges because of the chronic nature of this condition.

Lipiflow® and TearCare® are both technologies using heat, vibration and pressure to liquify obstructed glands and allow them to empty out their content more efficiently on the ocular surface.

AIM

The aim of this study was to compare Lipiflow® and TearCare® in their efficacy to relieve dry eye symptoms caused by MGD.

Figure 1. Severity of Meibomius gland atrophy[2]

METHOD

Using the Pubmed database, an in-depth search of clinical trials including Lipiflow® and/or TearCare® and published in the last 10 years was done. Using a list of inclusion criteria, 13 studies were included in the analysis. Different parameters, both subjective and objective, were analyzed.

Meng 2023[a]	Gupta 2021[c]	Hagen 2018[a]
Menucci 2022[a]	Booranapong 2020[a]	Badawi 2018[b]
Holland 2022[c]	Kasetsuwan 2020[a]	Finis 2014[a]
Zhao 2021[a]	Tauber 2019[a]	
Chester 2021[b]	Blackie 2018[a]	

a: Lipiflow® vs control; b: TearCare® vs control; c: Lipiflow® vs TearCare®

RESULTS

Figure 2. Tear Break-Up Time (TBUT)[3]

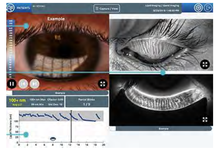
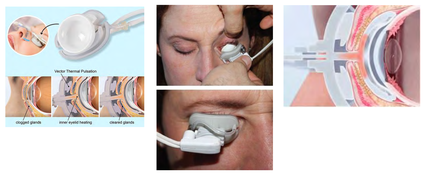


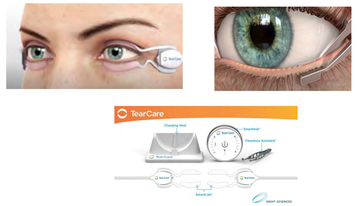
Figure 3. Lipid Layer Thickness (LLT)[4]

Figure 4. Schirmer Test[5]

Lipiflow® [6]



TearCare® [7]



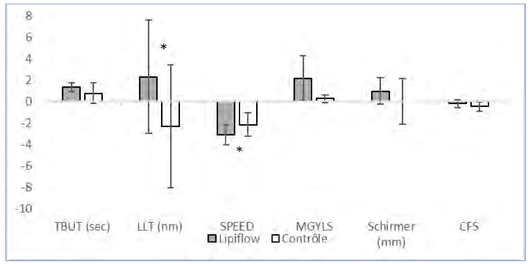


Figure 5. Mean (SD) comparison of different parameters at 1 month

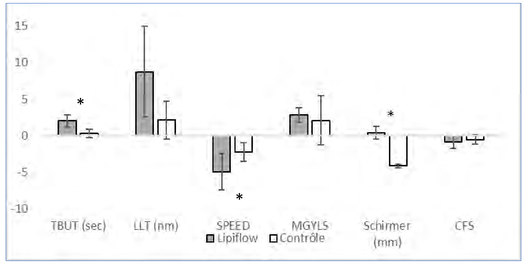


Figure 6. Mean (SD) comparison of different parameters at 3 months

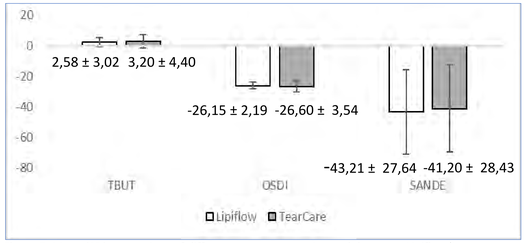


Figure 7. Mean (SD) comparison of different parameters at 1 month between Lipiflow® and TearCare®

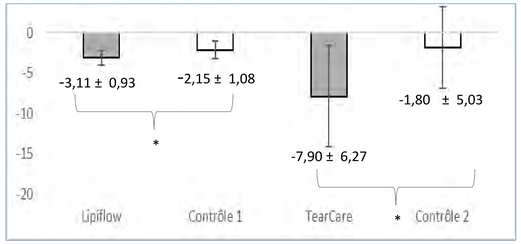


Figure 8. Mean (SD) comparison of SPEED changes at 1 month between Lipiflow® and TearCare®

There was no significant difference at 1 month between TearCare® and Lipiflow® regarding TBUT, OSDI and SANDE.

Both devices reduced patients' symptoms significantly on the SPEED questionnaire at 1 month compared to control groups.

Lipiflow® significantly improved LLT and SPEED score at 1 month and TBUT, SPEED and Schirmer test at 3 months when compared to control groups.

On average, Lipiflow® increased TBUT by (1,34 ± 0,40) sec and (2,03 ± 0,61) sec at respectively 1 and 3 months compared to control groups, in which the increase was of (0,78 ± 0,98) sec and (0,30 ± 0,61) sec respectively. The difference between the two groups was only significant at 3 months ($p < 0,05$). When comparing the two devices, TearCare® increased TBUT by (0,49 ± 0,63) sec more than Lipiflow®.

Regarding the SPEED questionnaire, Lipiflow® decreased significantly patients' score by respectively (-3,11 ± 0,93) at 1 month compared to control groups (-2,15 ± 1,08) ($p < 0,05$). TearCare® significantly lowered the score by (-7,90 ± 6,27) compared to control groups (-1,80 ± 5,03) ($p=0,001$) after the same follow-up time.

This study was limited by the small number of studies including TearcCare®, which could be explained by how recent TearCare® is when compared to Lipiflow®. Furthermore, among the studies including TearCare®, some were financed by Sight Sciences Inc.

CONCLUSION

Considering that the recommended control treatment for eye dryness associated with MGD is the application of warm compresses and lid hygiene, multiple factors should be taken into consideration to conclude which of the two treatments should be recommended to relieve patients' symptoms.

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[2]Carolina Eye Doctors; 2022; https://carolinaeyedocs.com/dr-garcia-talks-about-managing-our-friend-the-meibomian-gland/ ; accessed October 14th 2023

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[4]Johnson & Johnson Vision; 2023; https://www.jnjvisionpro.ca/products/lipiview-interferometer ; accessed October 14th 2023

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Differences in complications between staged and combined DMEK and cataract surgery

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COS 2024

VECTOR EYE CENTRE

INTRODUCTION

- Patients with cataracts and Fuchs endothelial corneal dystrophy (FECD) undergo cataract surgery and Descemet's membrane endothelial keratoplasty (DMEK).
- These two surgeries can be combined or staged.
- The current body of research does not definitively establish the superiority of one method over another in terms of clinical outcomes and complications (1,2).

AIM

This retrospective case series aims to compare the clinical outcomes associated with staged and combined DMEK and cataract surgeries performed by a surgeon at a single centre.

METHOD

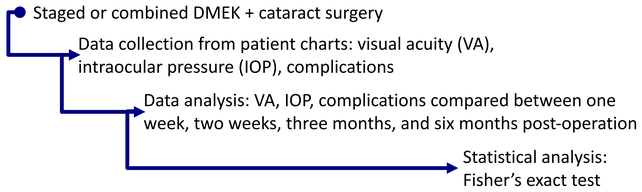

Figure 1. *A flow diagram depicting the methods of the study.*

- Staged procedures: 20 eyes (19 pseudophakic, one phakic) in 14 patients between May 2017-January 2023.
- Combined procedures: 24 eyes in 17 patients between January 2018-February 2023.
- Complications include high IOP (≥22 mmHg) and incomplete graft adherence requiring rebubbling.

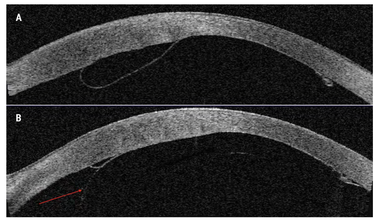

Figure 2. *A) Incomplete adherence of graft. B) Rebubbling: reattachment of graft after bubble injection (red arrow) (3).*

RESULTS

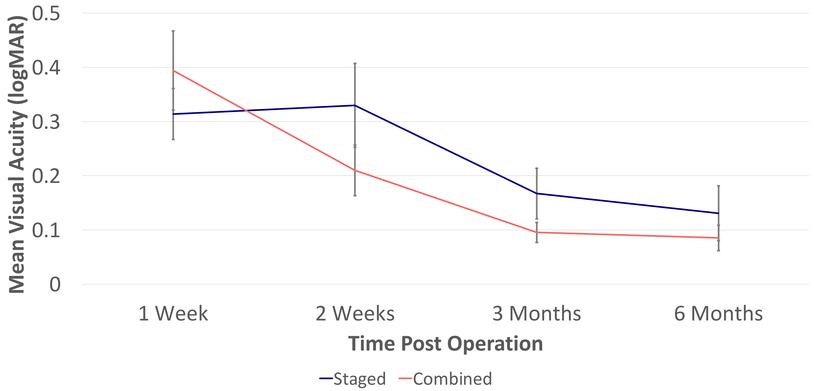

Figure 2. *Mean VA (logMAR) at one week, two weeks, three months, and six months post operation. Lower logMAR indicates higher visual acuity. Error bars signify standard error of the mean.*

There was no statistically significant difference in VA at one week (p=0.36), two weeks (p=0.19), three months (p=0.17), or six months (p=0.43) post-operation.

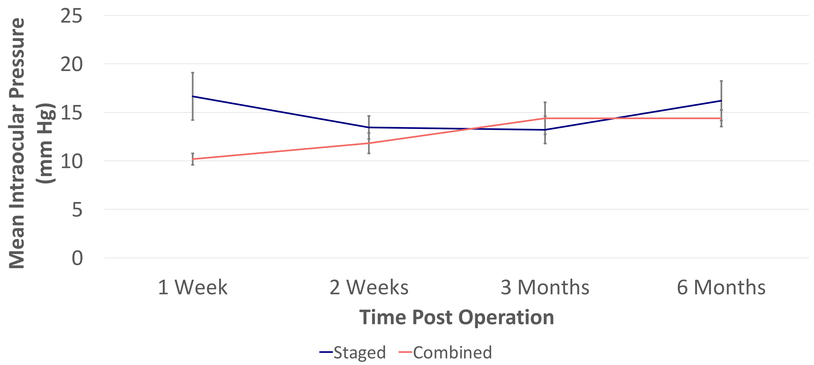

Figure 3. *Mean IOP (mm Hg) at one week, two weeks, three months, and six months post operation. Error bars signify standard error of the mean.*

Combined DMEK and cataract surgery had lower IOP one week post-operation (p=0.02). However, there was no statistically significant difference in IOP at two weeks (p=0.32), three months (p=0.59), or six months (p=0.42) post-operation.

RESULTS CONT.

Table 1. *Complications reported by each of 48 procedures. Certain eyes had more than one complication each.*

	Staged (n=20)	Combined (n=24)	Fisher's Exact
Number of eyes with high IOP (≥22 mmHg)	7 (35%)	6 (25.0%)	0.522
Rebubble for adherence completion	8 (40%)	4 (16.7%)	0.1024
Graft failure needing secondary DSAEK	4 (20%)	3 (12.5%)	0.6839
Inflammation (redness, tearing, irritation, light sensitivity)	2 (10%)	4 (16.7%)	0.6731
Allergic response	1 (5%)	0	0.4545
Temporal edema	1 (5%)	1 (4.16%)	1
Glares	0	1 (4.16%)	1
Floaters	0	1 (4.16%)	1
No reported complications	6 (30%)	11 (45.8%)	0.3585
Eyes with at least 1 complication	13 (65%)	13 (54.2%)	0.8061

The most prevalent complications were high IOP (≥22 mmHg) and incomplete adherence requiring rebubbling. There was no statistically significant difference between any single complication (p>0.05) or for overall number of complications (p=0.81).

CONCLUSION

- Combined and staged DMEK and cataract procedures demonstrated:
  - Statistically similar clinical outcomes in VA, IOP (beyond the first week), and complications post-op.
- Surgical choice can consider factors beyond VA, IOP, and complications, such as surgical time, accessibility, risks, and cost benefits to improve patient-centered care.
- Future research should employ extensive randomized controlled trials to ascertain the relative superiority or comparability of staged and combined surgeries.

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Dysphotopsia and Location of Laser Iridotomy: A Systematic Review

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Ophthalmology & Vision Sciences
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Temerty Medicine

Introduction

- Laser peripheral iridotomy: **first line treatment** for occludable angles and primary angle closure
- Very frequently performed: **important to characterize side effect profile**
- **Location of LPI** can **affect** *rates of* **dysphotopsia**
- Most are mild and transient; however, some persist *indefinitely*
- Current data:
  - **2-16% prevalence** of post-LPI dysphotopsia in the literature
  - Severe dysphotopsias have been *suggested* to increase the risk of depression and social isolation

Purpose

- **Determine relationship between LPI location and new patient-reported linear dysphotopsias**; may potentially reveal ideal location

Methods

Databases: OVID, EMBASE

Search Dates: 1946 to 2022

Inclusion Criteria: Comparative studies, control-group not required: 3 studies included; reporting on 1756 eyes

Primary Outcome: incidence of new linear dysphotopsia based on LPI location (superior, inferior, nasal/temporal)

Statistical Analysis: Random effects meta-analysis

Results

Baseline Study Characteristics

- Average weighted age: **53.2±8.9 years**
- **Males: 26.9%** (n=236)
- **N=3 studies**: **prospective, randomized trials**
- **N=2/3: paired eye comparative studies**
- Population ethnicities:
  - N=559 (**63.7%**): **South India**
  - N= 150 (**17.1%**): **Iran**
  - N = 169 (**19.2%**): **Canada**

Risk of Bias

- **N= 1** study: **low concern**
- **N= 2** studies: **some concerns** (allocation concealment/masking)
- **GRADE** overall quality of evidence: **moderate** in all outcomes

LPI Location Characteristics

- Overall incidence of linear dysphotopsia:
  - **Superior LPI: 2.8%**
  - **Inferior LPI: 2.7%**
  - **Nasal/temporal LPI: 2.0%**
- Pooled data to compare superior v/s nasal/temporal LPI: **no significant difference** in linear dysphotopsia rate
- **At 6 months**: most common dysphotopsias are **glare (7.1%)** and **blurring (2.6%)**
  - Significantly less new linear dysphotopsia (0.4%)

Figure 1: PRISMA of Included Studies

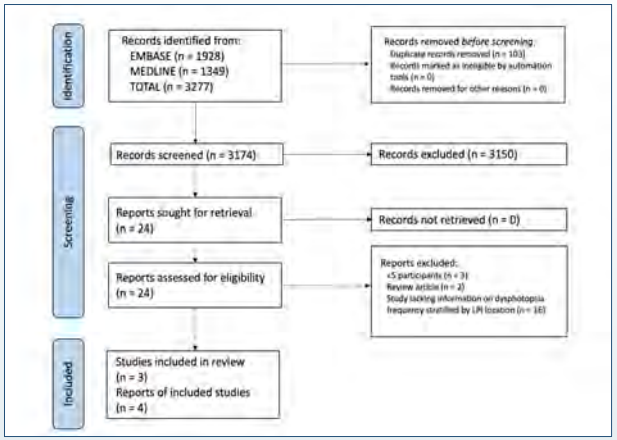
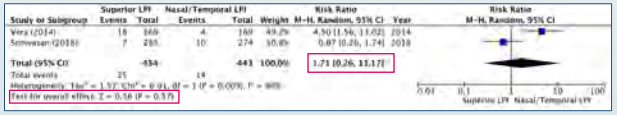


Figure 2: New-onset linear dysphotopsia in superior versus nasal/temporal laser peripheral iridotomy



Discussion

- The onset of new visual disturbances after LPI were **most commonly classified as linear dysphotopsia**
  - Other dysphotopsias: ghost images and blurring also significantly worse post LPI
- Conversely, **significant reduction in the frequency of halos and glare** after LPI
- A total **347** overall dysphotopsias reported pre-procedure and **298** reported post-procedure, suggesting that **LPIs may improve visual disturbances**
  - Future studies must *classify* type of dysphotopsia to accurately estimate effects
- Limitations:
  - **Data availability**
  - **Methods of comparison**
    - Different questionnaires
  - **Variable definitions**
    - Differing LPI laser energies
    - Monocular v/s binocular dysphotopsias
    - Variable follow up time

Conclusions

- **Location of LPI** does **not** significantly **affect linear dysphotopsia** frequencies
- Further research with **standardized questionnaires** is required
- Overall: **2-3% risk of linear dysphotopsia** post LPI
- **LPI** may lead to **resolution** of **pre-existing dysphotopsias**

Epidemiology of LASIK flap amputation: a systematic review and meta-analysis

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UNIVERSITY OF MIAMI HEALTH SYSTEM

INTRODUCTION

- Laser-assisted in situ keratomileusis (LASIK) is the most commonly performed laser refractive surgery globally.
- LASIK involves creation of a corneal epithelial-stromal flap under which excimer laser ablation of the stroma can be performed.
- The LASIK flap functions as an autologous 'bandage' and aids in patient comfort and rapid visual recovery.
- Construction and replacement of a LASIK flap creates a non-physiological potential space within which interface complications can occur.
- Management of flap interface complications is typically stepwise, with initial approaches directed at medical therapy, followed by surgical interventions.
- Amputation of a LASIK flap is reserved as a last-resort option.
- The indications, outcomes, and best practices surrounding LASIK flap amputation are unknown.

AIM

- The aim of this study is to examine the epidemiology (indications, outcomes, surgical approaches) of LASIK flap amputation through a systematic review and meta-analysis.

METHODS

- Systematic, reproducible literature search of 16 electronic databases, including MEDLINE, Embase, and Web of Science, as well as hand searching.
- Inclusion criteria: any study in which a LASIK flap was amputated regardless of study type or language.
- Exclusion criteria: studies in which patients presented with the flap already amputated.
- Primary outcomes: uncorrected visual acuity (UCVA) and best-corrected visual acuity (BCVA) after flap amputation.
- Secondary outcomes: indication for flap amputation, refractive error (spherical equivalent) post-flap amputation, and mean time to amputation from initial LASIK.
- Analyses were summarized using descriptive statistics and by calculating unilateral pooled means.

RESULTS

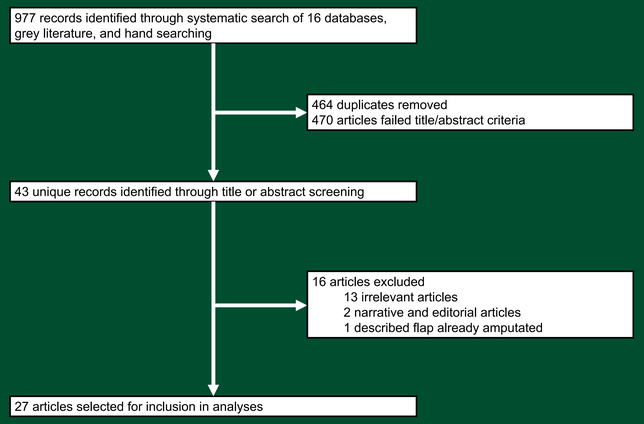

Figure 1. *PRISMA Flow Diagram for Study Selection*

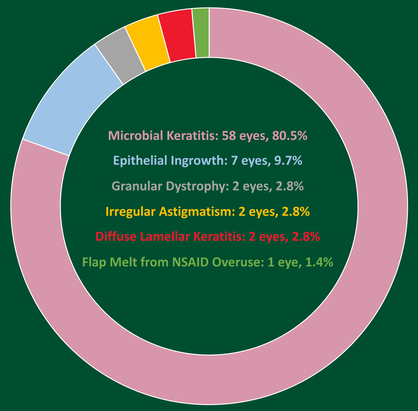

Figure 2. *Indications for LASIK Flap Amputation*

Figure 3. *Breakdown of Literature Comprising 72 Eyes*

Visual and Refractive Outcomes

Uncorrected Visual Acuity (UCVA): 0.52 logMAR (range -0.1 to 1.80)

Best-corrected Visual Acuity (BCVA): 0.33 logMAR (range 0 to 1.80)

Postoperative Spherical Equivalent: -0.31 diopters

Mean time from initial LASIK to flap amputation: 8.26 months

Figure 4. *Pooled Means of Primary and Secondary Visual and Refractive Outcomes*

CONCLUSIONS

- LASIK flap amputation remains an uncommon intervention, with utility in certain indications.
- Most patients achieve functional UCVA and BCVA.

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Eye bank pre-stripped versus surgeon-cut graft for Descemet membrane endothelial keratoplasty: a systematic review and meta-analysis

COS 2024

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INTRODUCTION

- Endothelial Keratoplasty (**EK**) is a technique which is used to replace the diseased endothelial layer of the cornea.
- Descemet Membrane Endothelial Keratoplasty (**DMEK**) is a type of EK which involves replacing both the corneal endothelium and Descemet membrane using a donor graft.
- DMEK is the preferred technique for diseases such as Fuchs endothelial corneal dystrophy (**FECD**) and pseudophakic bullous keratopathy.
- Donor grafts used in DMEK can come in the form of either Eye-Bank Pre-stripped (**EBP**) or Surgeon-Stripped (**SS**) grafts.

AIM

- Several studies compared EBP with SS grafts, but no consensus was reached on which type delivered better outcomes.
- This systematic review and meta-analysis aims to evaluate the safety and efficiency of DMEK with EBP compared to SS grafts.

METHOD

- A systematic review and meta-analysis was performed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. ***[Fig 1]***

Search Method:

- An electronic database search was performed independently by 2 authors using: Medline (Ovid), EMBASE, EMCARE and the Cochrane Central Register of Controlled Trials (CENTRAL).

Eligibility Criteria:

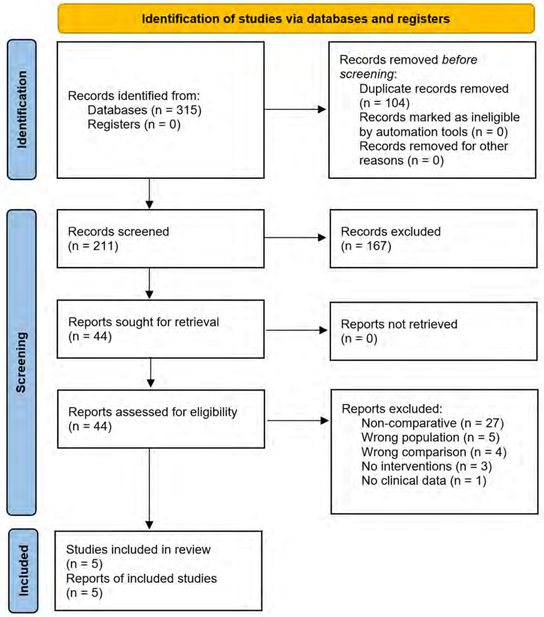
- All randomized control trials (RCTs) and observational studies comparing EBP tissue with SS tissue for DMEK were included.
- EBP tissue grafts were the intervention group, SS tissue grafts were the comparison group.
- No age, sex, or morbidity status restrictions were used.
- Eye-bank pre-loaded tissues were excluded.
- Case reports and single-arm observational studies with no comparison group were excluded.

Outcomes:

- **Primary**: Rebubbling rate; Corrected Distance Visual Acuity (**CDVA**).
- **Secondary**: Postoperative corneal thickness; endothelial cell loss; complication rates of graft failure, elevated intraocular pressure (**IOP**) and Irvine-Gass syndrome.

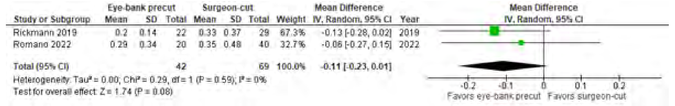
RESULTS

- **Five** studies with a total of **750 eyes** receiving DMEK grafts were eligible.
- **No significant difference** is found between EBP and SS grafts in terms of **rebubbling rates** (Odds Ratio (OR)=1.16, P=0.73). ***[Fig 2]***
- **No significant difference** is found between EBP and SS grafts in terms **of postoperative CDVA** (Mean Difference (MD)=-0.11, P=0.08). ***[Fig 3]***
- **Postoperative corneal thickness** and **endothelial cell loss** were **not significantly different** between EBP and SS tissue grafts.
- **All complication rates** including **graft failure** (OR=1.12, P=0.86), **elevated IOP** (OR=1.79, P=0.29) **and Irvine-Gass syndrome** (OR=1.78, P=0.49) were **not significantly different**. ***[Fig 4, 5]***

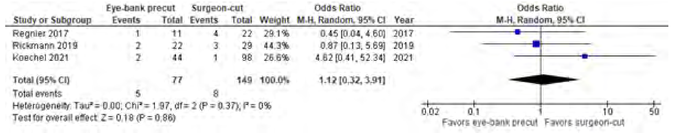


[Fig 1]: Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of study selection.

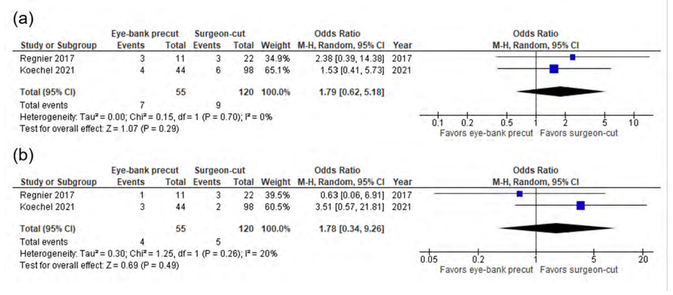
[Fig 2]: Forest plot comparing the odds ratio for rebubbling after Descemet membrane endothelial keratoplasty with eye bank pre-stripped versus surgeon prepared grafts.



[Fig 3]: Forest plot comparing the mean difference in corrected distance visual acuity after Descemet membrane endothelial keratoplasty with eye bank pre-stripped versus surgeon-prepared grafts.



[Fig 4]: Forest plot comparing the odds ratio of graft failure after Descemet membrane endothelial keratoplasty with eye bank pre-stripped versus surgeon prepared grafts.



[Fig 5]: Forest plot comparing the odds ratio of elevated intraocular pressure (A) or Irvine-Gass syndrome (B) after Descemet membrane endothelial keratoplasty with eye bank pre-stripped versus surgeon-prepared grafts.

CONCLUSION

- Although the evidence is limited due to the number of studies identified, the results of the meta-analysis suggests that EBP grafts are a comparable option to SS grafts in patients undergoing DMEK.
- Further clinical studies are needed to further support the efficacy of EBP tissue grafts.

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From Touch to Telemetry: A Scoping Review of Intraocular Pressure Measurement Methods Following Boston Keratoprosthesis

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Introduction

- Boston Keratoprosthesis (BKPro) is an artificial corneal transplant device to treat corneal blindness in high-risk patients
- Its use has expanded to management of chemical burns, corneal neovascularization, neurotrophic corneas, and hypotony[1]
- With an incidence of 64-80% of postoperative glaucoma, BKPro patients are uniquely at risk of this major cause of irreversible visual loss[2,3,4,5]

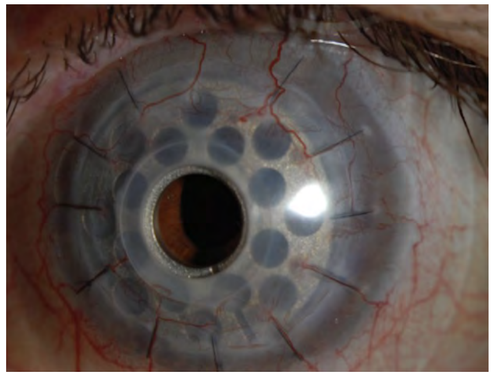

FIGURE 1: *Slit lamp of Left Eye with Boston Kpro and titanium backplate.* (Sun, et al. 2023)

The importance and challenges of IOP measurement following BKPro:

- As glaucoma can lead to permanent blindness,[4] it is therefore imperative to find reliable and effective means of screening
- The physical properties and stiff optic of the device makes the use of traditional methods such as Goldmann Applanation Tonometry not possible[2]

This scoping review aims to elucidate the effectiveness and any advantages or disadvantages of different IOP measurement methods available to BKPro patients.

Methods

A systematic literature search was conducted in OVID/MEDLINE with terms "intraocular pressure, "ocular tension" or "IOP" and "Boston Keratoprosthesis" or "Boston Kpro."

Included studies:

- Randomized controlled trials, case series, case reports, retrospective studies, systematic reviews and meta-analyses published until April 1st, 2023
- With at least one specified tonometry method
- With at least one listed advantage, disadvantage or effectiveness of the chosen method

Each respective method was compared and analysed using qualitative content analysis.

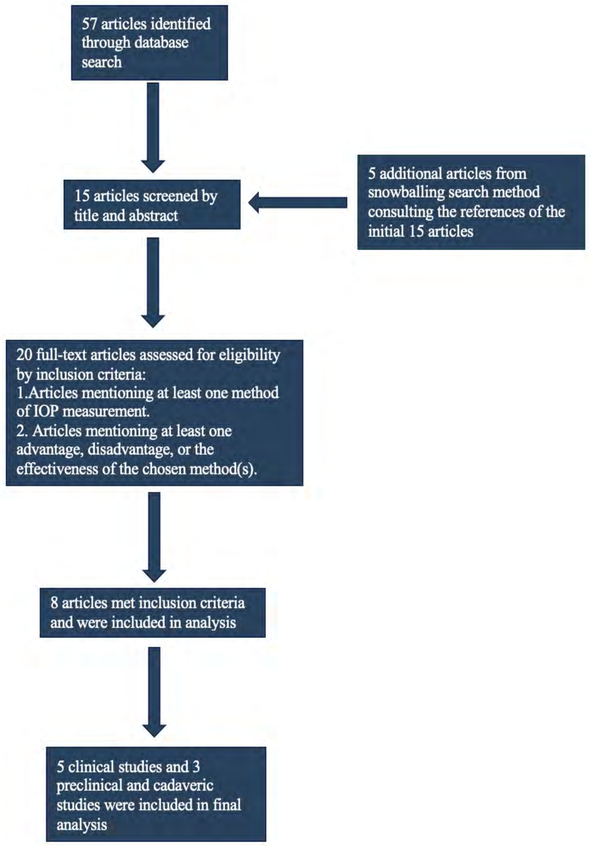

FIGURE 2: Search Strategy for the Scoping Review

Results

Clinical Studies:

- Digital palpation was mentioned as a selected method in all 5 clinical studies
- Scleral pneumatonometry was preferred over digital palpation unless reliability was compromised[6] and yielded significantly higher IOP values than the Diaton tonometer.[7]
- The implantable Eyemate-IO intraocular system showed satisfactory agreement with finger palpation measurements[8]
- Most noted the imprecision and gross estimation associated with digital palpation.[6,7,9,10] but classifying the pressures into categories and ranges can help with the unreliability of the method[10]

FIGURE 3: *Digital Palpation (Wolvaardt, Elmien & Stevens, 2019)*

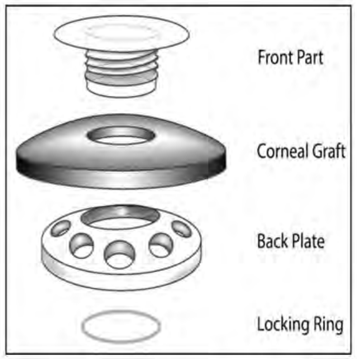

FIGURE 4: *Schematic of Boston Keratoprosthesis. (Moorefield's Eye Hospital, NHS, 2021)*

Preclinical Studies:

- An implantable IOP transducer (Mesotech) tested in animals, was easily implanted and well-tolerated[11]
- Pneumotonometry in six cadaver eyes before and after BKPro found that serial scleral IOP measurements can help determine true IOP before or after BKPro[12]
- The Schiotz tonometer had the highest accuracy of IOP at the temporal sclera and corneoscleral limbus when compared to the Tono-pen[13]

Discussion & Conclusion

- While there are many advancements in the field, digital palpation remains a common choice in practice despite being vulnerable to high intra- and interindividual variability[14]
- These studies have suggested the use of pneumatonometry on the sclera when the central cornea is not available for measurement,[15] and that telemeric IOP measurements with the Eyemate-IO sensor has an advantage of detecting IOP peaks[8]
- While the future may lie in miniaturizing the IOP sensor to monitor the IOP postoperatively in an accurate fashion, the small sample of literature examining the effectiveness and safety of these different methods highlights a limitation in this review and invites future study

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Incidence of Endothelial Keratoplasty (DMEK and DSAEK) Following Cataract Surgery in Patients with Fuchs' Endothelial Corneal Dystrophy

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1 INTRODUCTION

- Fuchs' Endothelial Corneal Dystrophy (FECD) is a hereditary disease affecting patients above the age of 50 with progressive endothelial degeneration.[1,2]
- Cataracts are common and their surgery can lead to up to 13% of endothelial cell loss.[3]
- Not all cases require corneal grafts ; triple-DMEK aims to minimize sequential surgeries.[4]
- Studies show that a majority (83-92%) with pachymetry > 600 µm don't need transplants within 12 years.[4]
- Evaluating the need for corneal transplantation post-cataract surgery in FECD patients is crucial for procedure choice.

2 AIM

- To investigate the incidence of endothelial keratoplasty (EK: DMEK and DSAEK) in patients with FECD who have undergone phacoemulsification and intraocular lens implantation
- Provide insights into early triple-DMEK

3 METHODS

- Single center, retrospective cohort study. Ethics approval was obtained from the Institutional Review Board of the CHUM
- 62 FECD patients who had cataract surgery between January 2014 and September 2021 were included
- Excluded: aphakic patients, those with ocular comorbidities contributing to endothelial cell loss (acute angle-closure glaucoma, chemical or thermal burns, chronic uveitis)
- Primary outcome measure: Incidence of patients requiring DMEK or DSAEK
- Secondary outcome measure:
  - Endothelial cell count, pre-phaco and post-EK CCT difference, incidence of graft rejection, time between phaco and EK, rebubbling rate, graft rejection rate and final BCVA

4 RESULTS

- 109 eyes included, 62 patients, 39 female (62.9%)
- Mean follow up time was 60.71 months (SD 31.33 months)
- 53% had grade II Fuchs, most eyes did not have (grade 0, 39.7%) or had minimal (grade I, 32.35%) corneal edema
- Mean endothelial cell count 1771.40 cells/mm^2 (n=10)

Group 1: CCT < 600 µm

- N=26/109 (24%) , mean CCT: 553.54 µm

Group 2: CCT > 600 µm

- N= 28/109 (26%), mean CCT: 656.18 µm

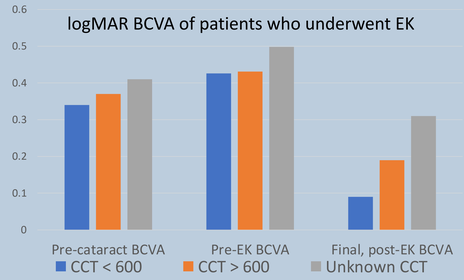
Group 3: Unknown CCT

- N= 55/109 (50%), 30% with a corneal edema score of 1 or higher

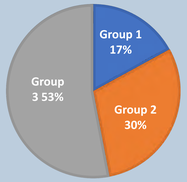
- 70/109 eyes needed EK after phacoemulsification
  - Cumulative incidence of EK: **0.13 case/eye-years**
- Time between phacoemulsification and EK: 27.70 months
- Rebubbling rate: n=14 (20%)
- Graft failure/rejection: n= 15 (21%) at a 5-year follow up
- The mean pre-phaco CCT was 626.13 µm and pre-EK CCT was 636.63 µm **(+10.55 µm, p=0.75)** for patients receiving an EK
- The mean pre-EK CCT was 595.09 µm and post-EK CCT was 559.27 (**-35.8 µm, p=0.22**).
- In patients receiving EK, pre-phaco mean BCVA was 0.37 logMAR (20/45), decreasing to 0.45 logMAR (20/55) pre-EK and finalized at 0.19 logMAR (20/30) post-EK.

Characteristic	Total eyes (n=109),	patients (n=62)
Age, Mean (range)	72.00	31-92
Left eye, No. (%)	50.00	45.87%
Female, No. (%)	39.00	62.90%
Pre-cataract BCVA, mean (SD), logMAR	0.38	0.26
Phaco parameters		
Cataract grade (n, percentage)		
Grade I	13.00	16.88%
Grade II	37.00	48.05%
Grade III	16.00	20.78%
Grade IV	9.00	11.69%
Mean anterior chamber depth, SD (mm)	3.03	0.36
Fuchs grade (n, percentage)		
Grade I	11.00	21.15%
Grade II	28.00	53.85%
Grade III	11.00	21.15%
Grade IV	2.00	3.85%
Pre-cataract corneal edema grade (n, percentage)		
Grade 0	27.00	39.71%
Grade I	22.00	32.35%
Grade II	9.00	13.24%
Grade III	3.00	4.41%
Grade IV	3.00	4.41%
Grade V	4.00	5.88%
Pre-cataract corneal edema mean		
<600 microns (mean, SD)	1.09	1.62
>600 microns (mean, SD)	1.14	0.96
Unknown CCT (mean, SD)	1.33	1.61
Pre-cataract specular microscopy parameters		
Pre-cataract CCT, SD	606.76	52.19
<600 microns (n, percentage)	26.00	48.15%
Mean CCT, SD (microns)	553.54	34.05
>600 microns (n, percentage)	28.00	51.85%
Mean CCT, SD (microns)	656.18	44.80
Phacoemulsification Cumulative dissipated energy		
<600 microns (median, SD)	7.45	105.02
>600 microns (median, SD)	5.83	5.36
Unknown CCT (median, SD)	6.24	4.54

EK stats	Total eyes (n=70),	patients (n=49)
Pre-EK parameters		
Mean pre-EK central corneal thickness (CCT), SD (microns)	636.63	53.61
Pre-EK CCT – Pre-phaco CCT (microns), p-value	+10.55	0.75
Time between phacoemulsification and EK (mean, SD), months	27.70	35.30
Cumulative incidence of EK (case/ eye-years)	0.13	
Rebubbling (n, percentage)	14.00	20.00%
Graft failure/rejection (n, percentage)	15.00	21.00%
EK parameters		
N eyes needing EK	70	
Group CCT < 600 microns	12	17%
Group CCT > 600 microns	20	28.57
Unknown CCT	38	54.29
Type of EK		
DSAEK (n, percentage)	30	42.86%
DMEK (n, percentage)	40	57.14%
Mean post-EK CCT, SD (microns)	574.05	112.44
Post-EK CCT – pre-EK CCT mean difference, p-value	-35.82	0.22
Final CCT – pre-phaco CCT mean difference, p-value	-45.58	0.14



% OF EYES NEEDING EK



5 CONCLUSION

- Our observed rate of 0.13 cases per eye-year surpasses previously reported literature rates.
- Group 2 (CCT > 600 µm) exhibits a higher EK percentage than Group 1 (CCT < 600 µm), nearing significance (p=0.058).
- No significant CCT difference pre-phaco and pre-EK,
  - Pre-emptive EK proves beneficial.
  - Pachymetric changes don't signal corneal decompensation.
  - Subclinical corneal edema and symptomatic diffraction from minimal corneal guttata noted.
- Final BCVA improves compared to pre-EK and pre-phaco BCVA with consecutive surgery.
- Limitations include referral bias, retrospective nature, inconsistent data, and reliance on ECD or separate pachymetry testing (not Pentacam).
- Urgent need for comparative, prospective studies between triple-DMEK and staged procedures for concrete suggestions on optimal sequence.

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Incidence of Primary Acquired Melanosis in Pterygium Specimens

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1 INTRODUCTION

- Pterygia are a common chronic inflammatory and degenerative pathology, defined as a wing-shaped conjunctival growths on the cornea.[1,2]
- They represent fibrotic changes induced by UV ray damage and are typically clinically benign.[3]
- Due to pterygia's association with inflammation and sun damage, concomitant disease is not rare, leading more physicians to send specimens for pathology.
- Primary acquired melanosis (PAM), or melanoma in situ, is an acquired conjunctival pigmentation most often affecting Caucasian patients over the age of 60.[4]
- There is a high risk of malignant transformation in PAM lesions, thus requiring a high level of suspicion in order to diagnose and treat the lesion properly.[5]
- Both lesions affect similar patient age groups and share similar risk factors.
- The rate of coexistence has been quoted as 2.5% in Ecuador, an equatorial country. No studies have evaluated this coexistence in North America. [2]

2 AIM

- To determine the incidence of PAM within pathology specimens of presumed clinically benign pterygium cases seen at a tertiary center between 2010 and 2023.
- Patient characteristics and risk factors will be studied.

3 METHODS

Retrospective chart review conducted at a tertiary center in Montreal, Quebec

- All consecutive patients operated for pterygium between 2010 and 2023 were included
- Pathology reports were obtained from the hospital's electronic record system or directly from the pathology department
- Specimens were submitted by all ophthalmologists, including comprehensive and cornea specialists.

The following data was collected

- Age, sex and results of pathology report.
- If PAM was diagnosed, further information such as risk factors, past ocular history and ethnicity was collected.

4 RESULTS

1695 pterygia were excised between 2010 and 2023

- 925 patients were male (55%)
- Average age was 57 years old

1277 specimens were sent for pathology (75%)

- 1230 pterygia (96%)
- 47 unexpected findings
  - 13 nevus or melanosis
  - 5 Salzmann nodules
  - 4 OSSN
  - **2 PAM**
  - 23 other

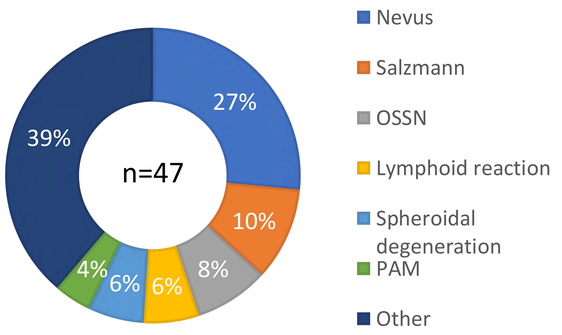
There were two unexpected findings of PAM.

The first was in a 68-year-old French Canadian man known for an autoimmune disease, treated with methotrexate and a DMARD (disease modifying antirheumatic drug).

The second was in a 74-year-old Greek man with a history of radiation for a metastatic epidermoid cancer, with metastasis to the cervical ganglion chain in 2017. The pterygium had been noted since 2017 but was not deemed clinically significant until 2023.

Demographic data		
Male (n, %)	701	55%
Age (mean, SD)	57.67	17.05
Pathology report results (n=47)		
Nevus (n, %)	13	27.1%
Salzmann (n, %)	5	10.42%
Carcinoma in Situ (n, %)	4	8.33%
Lymphoid reaction (n, %)	3	6.25%
Spheroidal degeneration (n, %)	3	6.25%
Primary acquired melanosis (n,%)	2	4.17%
Pyogenic granuloma (n, %)	2	4.17%
Cyst (n, %)	2	4.17%
Other (n, %)	6	16.67%
Transcription error (n, %)	7	14.58%

Timing of missing pathology for 418 specimens	
2010-2014	256
2015-2019	135
2020-2022	26



Other: Cyst, pyogenic granuloma, hemangioma, band keratopathy, sarcoidosis, granulation tissue, fibrosis, choristoma, acrochordon

PAM	Patient 1	Patient 2
Gender	M	M
Age (years)	68	74
Ethnicity	French-Canadian	Greek
Pathology	Melanocytic intraepithelial proliferation, compatible with PAM grade 2-3	Melanocytic intraepithelial proliferation, compatible with PAM grade 1

5 CONCLUSION

- To our knowledge, this is the first study evaluating the presence of PAM within pterygia specimens in North America.
- In our cohort, we found a low incidence of unexpected PAM within pterygium specimens, in a city with relatively low UV exposure.
- We had 4% of specimens representing pathology other than pterygia, two of which had pathology reports consistent with PAM.
- One of our patients had been followed for 5 years prior to excision, demonstrating no suspicious signs that justified an excision.

Given the different management approaches for PAM and pterygia, it is important to submit all specimens for pathological evaluation, even in the absence of apparent risk factors and with low clinical suspicion.

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Pediatric Bacterial Keratitis: Clinical Features, Causative Organisms, and Outcome During a 13-year Study Period

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BACKGROUND

- Childhood infectious keratitis represents an important cause of preventable blindness and amblyopia
- Microbial keratitis is the most common acquired (nontraumatic) indication for corneal transplantation

AIM

To review the clinical features, causative organisms, complications, and outcomes of pediatric bacterial keratitis cases at a tertiary eye hospital.

METHOD

- This is a retrospective study at a tertiary eye center on clinically diagnosed pediatric patients with bacterial keratitis in 2007-2019.
- Poor outcomes were labelled if any of the following was present: final best-corrected visual acuity (VA) worse than 20/200, a drop in best-corrected VA by one line or more, perforated corneas, endophthalmitis, and graft failure.

RESULTS

- The study included 43 cases of pediatric bacterial keratitis.
- Female and male patients represented 60.5% and 39.5% of the sample, respectively, with a mean age of 9.3 ±5.9 years.
- The rate of culture positivity was 60.5%.
- The only factor associated with a poor outcome on multivariate analysis, was poor presenting visual acuity (P = 0.020).
- Corneal perforation was associated with the development of endophthalmitis (P < 0.001).
- Culture-positive bacterial keratitis was associated with infiltrates ≥ 2 mm (P = 0.039)
- Gram-positive and gram-negative bacteria exhibited 100% sensitivity to the tested fluoroquinolones

Table 1. Clinical features and associated risk factors

Factor	N (%)
Ocular surface disease	10 (23.3)
Contact lens wear	13 (30.2)
Recent ocular surgery	3 (7.0)
Recent ocular trauma	19 (44.2)
Poor presenting VA (<20/400)	12 (27.9)
Central infiltrate	14 (32.6)
Infiltrate size ≥ 2 mm	16 (37.2)
AC reaction 2+ or more	30 (76.9) *
Hypopyon	20 (46.5) *

*This variable has missing data

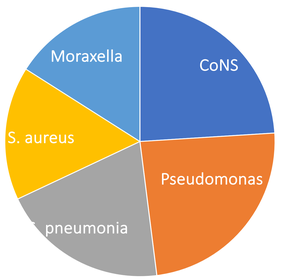
Table 2. Univariate and multivariate analysis of factors associated with poor outcome

	Odds ratio	CI	P value	Adjusted P value (OR)
Poor presenting VA	7.25	2.92-17.86	**<0.001**	**0.020 (25.00)**
OSD	10.88	2.11-56.13	**0.002**	0.796 (1.55)
Suture related	7.75	0.62-96.63	0.071	
Previous ocular surgery	8.00	0.64-99.77	0.065	
Ocular trauma	0.46	0.10-2.1	0.302	
Topical drops	40.00	5.68-281.65	**<0.001**	0.125 (8.00)
Infiltrate ≥ 2 mm	12.50	2.19-71.36	**0.001**	0.581 (2.10)
Hypopyon	7.00	1.27-38.48	**0.015**	0.363 (4.02)
Positive cultures	3.33	0.61-18.14	0.149	

Table 3. Complications associated with pediatric bacterial keratitis

Complications	%
Visually significant scar	55.0
Cataract	14.0
Perforation	9.3
Corneal neovascularization	7.0
Persistent epithelial defect	7.0
Endophthalmitis	4.7

Causative organisms



CONCLUSION

- Gram-positive bacteria were the most common cause of pediatric microbial keratitis.
- Fluoroquinolones provided excellent coverage on susceptibility testing and might be administered to treat mild cases of pediatric bacterial keratitis
- Poor presenting visual acuity is associated with poor outcome

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Visual And Safety Outcomes Of Posterior-chamber Phakic ICL For Low Vs High Myopia:
An Eight-year Retrospective Study

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COS 2024

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INTRODUCTION

- Evo Implantable Collamer Lens (ICL Model V4c; STAAR Surgical, Monrovia, CA) is a single piece posterior chamber phakic refractive intraocular lens with a central port
  - The central port eliminates the need for iridotomy
- EVO ICL Model V5 includes a larger optical zone diameter (5.0–6.1 mm)

PURPOSE

- To evaluate the efficacy and safety of EVO ICL (model V4c) and EVO+ ICL (V5) for the correction of low, intermediate and high degrees of myopia, with or without astigmatism

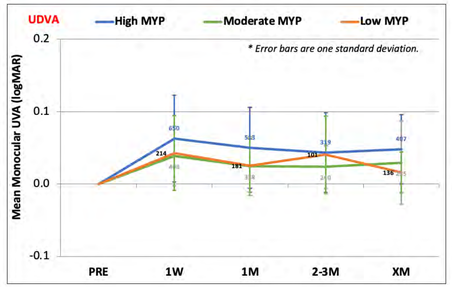
METHOD

- Retrospective, single-center study (Toronto, Canada)
- Patients receiving EVO /EVO+ ICLs (spherical or TORIC) between 2016 and 2023
- 3 groups, based on preoperative manifest refraction spherical equivalent (MRSE):
  - Low myopia (LM, < -6 D)
  - Intermediate myopia (IM, 6-9D)
  - High myopia myopia (HM, > -9 D)
- Outcome measures included:
  - Uncorrected visual acuity (UCVA)
  - Best-corrected visual acuity (BCVA)
  - Spherical equivalent (SE)
  - Endothelial cell density (ECC)
  - Intraocular pressure (IOP)
  - ICL vault
  - Adverse events

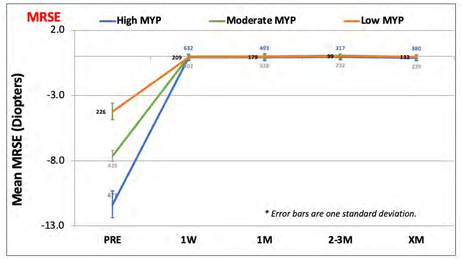
RESULTS

- A total of 1332 myopic eyes
  - Mean age 29.5±5.1 years (range 18-39 years)
  - Mean follow-up of 8.5 ± 7.3 months
- Comparing:
  - LM – 226 eyes, Baseline MRSE -4.2 ± 1.3D
  - IM – 429 eyes, MRSE -7.6 ± 0.85D
  - HM – 677 eyes, MRSE -11.3 ± 2.0D

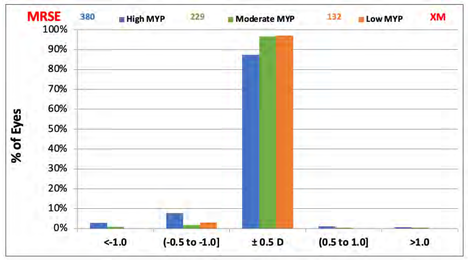
Post-operative UDVA at last follow-up in the LM (0.02 LogMAR), IM (0.03) and HM (0.05) groups were all excellent.



- Post-operative MRSE comparable across groups:
  - LM (-0.05 ± 0.23 D)
  - IM (-0.04 ± 0.34 D)
  - HM (-0.11 ± 0.44 D)

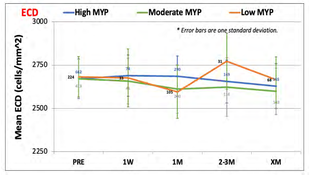


- Proportion of eyes (%) achieving within -/+0.50D of target:
  LM 97.2% IM 96.3% HM 86.4%

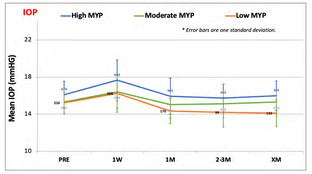


- No change in CDVA at last follow up:
  - LM 91%
  - IM 88%
  - HM 86%

- No significant loss in ECD across the groups at all follow-ups



- Post-op IOP rise of >5mmHg:
  LM 2.3% IM 3.2% HM 4.2%



- Efficacy Index (ratio of postop UCVA/pre-op BCVA)
- Safety Index (ratio of postop BCVA/pre-op BCVA)

Group	Efficacy Index	Safety Index
LM	0.97	1.00
IM	0.96	0.99
HM	0.99	1.1

CONCLUSION

- This study demonstrates the safety and efficacy of ICL surgery for low to high myopia
- ICL is able to provide very accurate refractive results, with minimal risk of loss of CDVA, endothelial cell loss, or increased intraocular pressure.
- In particular, low myopes, who would otherwise be poor candidates for laser vision correction (thin CCT, forme-fruste keratoconus), would do well with ICL implantation

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Probing Mechanisms and Improving Management of Glaucoma Following Boston Keratoprosthesis Surgery

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BACKGROUND

- **Glaucoma is the most common vision-threatening complication after Boston keratoprosthesis type 1 (KPro) surgery.**
- Patient selection is key to inform glaucoma development after KPro.
- Glaucoma management – **surgically** (with glaucoma draining devices (GDD) or laser) or **medically** – is extremely challenging in KPro eyes as no guidelines exist.
- The inflammatory mechanisms that perpetuate glaucoma progression are unknown.
- Animal models are needed to understand the pathophysiology better.

Purpose To understand how glaucoma develops and progresses in KPro eyes and to determine how to best manage it long-term.

MATERIAL & METHODS

OBJECTIVES

1. Identify glaucoma risk factors in KPro patients
2. Assess the best timing for glaucoma surgery
3. Determine the best GDD
4. Characterize the tear cytokines in KPro eyes with glaucoma
5. Establish an animal model of glaucoma in KPro

STUDY DESIGNS

1 2 3

Case-control study and 2 case series

Patients with KPro > 1 year
± glaucoma
± glaucoma surgery

4

Cross-sectional study

KPro patients ± glaucoma
With no ocular surface disease

5

Experimental animal study

BALB/c mice with implanted mini KPro and C57BL/6 cornea carrier

RESULTS

1) What are the risk factors for glaucoma development in KPro? (3)

- **High preoperative IOP** signals a higher risk for glaucoma development (P=0.035) and progression (P=0.012) after KPro.
- **Stromal/ endothelial disorders** are less associated with glaucoma progression after KPro (P=0.010).

RESULTS

2) What is the best timing for glaucoma surgery and KPro? (4)

- Glaucoma progression is worse when glaucoma surgery is after KPro (100%) compared to before (74%, P=0.016).
- In eyes with preexisting or new onset glaucoma, no increase in complications was observed with glaucoma surgery compared to medications only (P >0.05).
- **Glaucoma surgery should be performed as early as possible** in KPro eyes to maintain visual potential (BCVA>20/200).

3) What is the preferred GDD in KPro eyes?

- Baerveldt implant (BGI) had higher success rates compared to the Ahmed (AGV) (P=0.039).
- Complications were similar between AGV and BGI (37.1% vs 33.3%, P=0.832).
- ***Comparison to AVB (2011) and ABC (2015) studies***: BGI had higher success rates, and AGV, lower complication rates

4.1) What cytokines are elevated in KPro eyes with glaucoma versus in KPro eyes alone, and how do they correlate with clinical parameters? (5)

- **IL-1β** and **IFN-γ levels** were positively correlated with CDR and IOP (P<0.05).
- **TNF-α** and **FGF-2 levels** were positively correlated with CDR (P<0.05).

4.2) What are the mechanisms that cause glaucoma in KPro eyes?

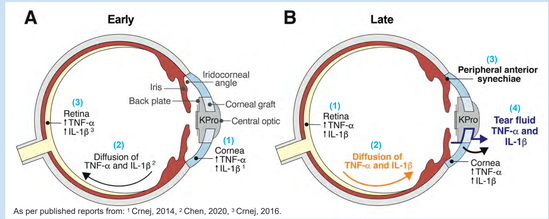

FIG 1. Proposed diagrammatic illustration of glaucomatous inflammation in an aphakic eye implanted with KPro

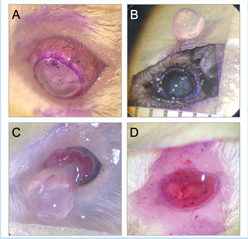

FIG 2. Array of complications during mini KPro in mice. Lens capsule nicking (A), lens extrusion (B, C), retinal detachment (D).

5) Is a mouse model of glaucoma in KPro feasible? (6)

- Microsurgical obstacles and the slow learning curve make mouse KPro outcomes and reproducibility dependent on a great deal of practice in mice
- Most rabbit keratoprosthesis models in the literature involve intrastromal pockets
- **Ideal KPro animal model**: allogeneic corneal carrier and full-thickness 360° corneal excision in a large eye
- Future studies: Animal model with a larger eye (rabbit) to be prioritized

CONCLUSION

- Glaucoma development & progression in KPro eyes is a long-lasting and multifactorial process that goes on for several years.
- Most probable glaucoma mechanisms in KPro:
- IOP-independent inflammatory pathways (mediated by TNF-a and IL-1b, shown for the first time in humans) prolong optic nerve damage;
- Post-surgical angle closure: IOP-elevation with obstruction of aqueous flow through the trabecular meshwork and synechiae formation.

Significance:

- Inform risk profiling for transplant recipients
- Improve surgical management for glaucoma
- Inform development of novel treatment strategies (against TNF-α and IL-1β)

Future studies: Prospective cohort studies on surgical glaucoma management and longitudinal tear fluid collection

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Safety of Perfluorohexyloctane Ophthalmic Solution in the Treatment of Patients With Dry Eye Disease

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BACKGROUND

- Due to the chronic nature of dry eye disease (DED), most patients require long-term management
- Perfluorohexyloctane ophthalmic solution (PFHO; MIEBO®) is a single-entity, water-free, preservative-free ophthalmic drop[1,2]
  - PFHO forms a monolayer at the air-tear film interface to inhibit evaporation[1,2]
  - PFHO is approved in the United States for treatment of the signs and symptoms of dry eye disease (DED)[3]
  - PFHO was investigated in 3 randomized, controlled trials (RCT; SEECASE[4], GOBI[5], MOJAVE[6]) and a longer-term extension study (KALAHARI[7])

OBJECTIVE

- To provide a comprehensive evaluation of the safety of PFHO in patients with DED based on data from the clinical development program

METHODS

Table 1. PFHO Clinical Development Studies

Study	Phase	Design	Treatment
SEECASE[4]	Phase 2	8-week, randomized, double-masked, saline-controlled trial	PFHO BID (n=111) PFHO QID (n=114) Control: saline (0.9%) solution (n=111)
GOBI[5]	Phase 3	8-week, randomized, double-masked, saline-controlled trial	PFHO QID (n=303) Control: saline (0.6%) solution (n=294)
MOJAVE[6]	Phase 3	8-week, randomized, double-masked, saline-controlled trial	PFHO QID (n=311) Control: saline (0.6%) solution (n=309)
KALAHARI[7]	Phase 3	52-week, open-label extension of GOBI	PFHO QID (n=208)

BID = twice daily; PFHO = perfluorohexyloctane; QID = four times daily.

- Participants: adults (≥18 years) with self-reported DED and clinical signs of DED and Meibomian gland dysfunction
- Safety assessments: adverse event (AE) monitoring, visual acuity, slit-lamp biomicroscopy, dilated fundoscopy, and intraocular pressure (IOP)

RESULTS

Table 2. Baseline Characteristics

	All RCTs* (n=1553)	KALAHARI (n=208)
Age, years, mean (range) ≥65 years, n (%)	56.4 (19-88) 566 (36.4)	61.2 (19-88) 94 (45.2)
Female sex, n (%)	1164 (75.0)	146 (70.2)
Race, n (%) Asian Black White Other	 184 (11.8) 185 (11.9) 1154 (74.3) 30 (1.9)	 29 (13.9) 43 (20.7) 133 (63.9) 3 (1.4)

*Baseline characteristics of the PFHO and control groups were comparable.
PFHO = perfluorohexyloctane; RCT = randomized, controlled trial.

Table 3. Ocular Adverse Event Summary

Adverse Events, n (%)	All RCTs		KALAHARI
	PFHO (n=839)	Saline (n=714)	PFHO (n=208)
Any ocular AE	87 (10.4)	73 (10.2)	29 (13.9)
Severe ocular AE	1 (0.1)	1 (0.1)	1 (0.5)
Serious ocular AE	0	0	0
Treatment-related AE*	46 (5.5)	35 (4.9)	13 (6.3)
Ocular AE leading to discontinuation	1 (0.1)	4 (0.6)	5 (2.4)
Most common AE Blurred vision	16 (1.9)†	3 (0.4)	3 (1.4)‡

*As reported by the investigator.
†No other individual ocular AE had an incidence ≥1% in the PFHO group.
‡No individual ocular AE had an incidence ≥2% during the longer-term KALAHARI study.
AE = adverse event; PFHO = perfluorohexyloctane; RCT = randomized, controlled trial.

- Severe ocular AEs
  - PFHO: eye irritation in 1 RCT patient (considered treatment related); eyelid irritation in 1 KALAHARI patient
  - Saline: eye irritation in 1 RCT patient
- Ocular AEs leading to discontinuation
  - PFHO: eye irritation in 1 RCT patient; increased lacrimation, blurred vision, and chalazion in 1 KALAHARI patient each (considered treatment related), and dry eye and increased IOP in 1 KALAHARI patient each (considered not treatment related)
  - Saline: allergic conjunctivitis, conjunctivitis, dry eye, and punctate keratitis in 1 RCT patient each (considered treatment related)
- No findings in visual acuity, slit-lamp biomicroscopy, dilated fundoscopy, or IOP assessments were indicative of safety concerns with PFHO use

CONCLUSIONS

- Findings across the clinical development program indicated that PFHO was safe and well tolerated in patients with DED
- The AE profile of PFHO was similar to that of the control group
- PFHO directly targets tear evaporation
- PFHO seems appropriate for longer-term treatment of patients with DED

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DISCLOSURES

CCC reports serving on advisory boards, speakers bureaus, or as a consultant for AbbVie, Aequus Pharmaceuticals, Aurion Biotech, Bausch + Lomb, Johnson & Johnson, Kala Ophthalmics, Labtician Ophthalmics, Novartis, Santen Pharmaceutical, Sun Pharmaceutical Industries Ltd., Théa Pharma, and Valeo Pharma; and has received research funding from Claris Bio and CorNeat. JDS reports serving on advisory boards, speakers bureaus, or as a consultant for 1-800-DOCTORS, AbbVie Inc, Aerie, Alcon, Aldeyra Therapeutics, Inc, Allergan, ArcScan Inc, Avedro, Inc, Bausch + Lomb, Bio-Tissue/TissueTech, Inc, BioLayer, Bruder Healthcare Company LLC, Claris Bio, Clearside Biomedical, Clearview, Clementia Pharmaceuticals, Dompé, Eleven Optical, Eyedetec Medical, Inc, EyeGate, Eyevance Pharmaceuticals LLC, Fortress Biotech, Glaukos Corporation, Hovione, Imprimis Pharmaceuticals Inc, Inspire Pharmaceuticals, Inc/Merck & Co, Inc, Ista Ionis Pharmaceuticals, Johnson & Johnson/TearScience/Vistakon, Kala Pharmaceuticals, Kowa Pharmaceuticals America, Inc, LacriSciences Vision, Inc, LayerBio, Inc, Lenstatin LLC, Lumenis Be Ltd, Lux Biosciences, Inc, Mallinckrodt, Mati Therapeutics, Inc, MedEdicus LLC, Mitotech, SA, Nicox, NovaBay Pharmaceuticals, Inc, Novaliq GmbH, Novartis Pharmaceuticals Corporation, Noveome Biotherapeutics, Inc/Stemnion, Inc, OcuCure Therapeutics, Inc, Ocular Therapeutix, Inc, Oculis, Okogen, Inc, Omeros Corporation, Oyster Point Pharma, Inc, Parion Sciences, PentaVision LLC, Pfizer Inc, Portage, Quidel Corporation, Rapid Pathogen Screening, Inc, Santen Pharmaceutical Co, Ltd, ScienceBased Health, Shire, Sun Pharmaceutical Industries Ltd, Surrozen, Synergel, Takeda Pharmaceutical Company Limited, Talia Technology, TearLab Corporation, TearSolutions, Topcon Healthcare, and TopiVert Pharma Limited; conducting clinical research for AbbVie Inc, Alcon, Aldeyra Therapeutics, Inc, Allergan, ArcScan Inc, Avedro, Inc, Bausch + Lomb, Clearside Biomedical, Clearview, Clementia Pharmaceuticals, Dompé, EyeGate Research, EyeRx Research, Fortress Biotech, Inc, Glaukos Corporation, Hovione, InSite Vision, Inc, Inspire Pharmaceuticals, Inc/Merck & Co, Inc, Ionis Pharmaceuticals, Johnson & Johnson/TearScience/Vistakon, Kala Pharmaceuticals, LacriSciences Vision, Inc, Lux Biosciences, Inc, Mimetogen Pharmaceuticals, Mitotech, SA, NeoMedix Corporation, Novaliq GmbH, Novartis Pharmaceuticals Corporation, Ocular Therapeutix, Inc, Okogen, Inc, Oyster Point Pharma, Inc, Parion Sciences, Pfizer Inc, Rapid Pathogen Screening, Inc, Rutech, Santen Pharmaceutical Co, Ltd, Senju Pharmaceutical Co, Ltd, Shire, TearSolutions, Inc, Topcon Healthcare, and XOMA/Servier; investor, shareholder, or stock interests in 1-800-DOCTORS, Alphaeon (parent company: Strathspey Crown), BioLayer, Eyedetec Medical, Inc, EyeGate Research, EyeRx Research, Inc, Eyevance Pharmaceuticals LLC, LacriSciences Vision, Inc, LayerBio, Inc, Mati Therapeutics, Inc, NovaBay Pharmaceuticals, Inc, Noveome Biotherapeutics, Inc/Stemnion, Inc, OccuHub, OcuCure Therapeutics, Inc, Okogen, Inc, Oyster Point Pharma, Inc, Rapid Pathogen Screening, Inc, Shire, and TearLab Corporation. JT reports serving as an investigator for Alcon, Aramis Biosciences, Bausch + Lomb, Claris Bio, Novaliq, Novartis, Oyster Point Pharma, Sylentis, Tarsus, TearSolutions, Trefoil Therapeutics, and Visus Therapeutics. JG and JLV are employees of Bausch + Lomb. EEP reports having nothing to disclose.

Canadian Ophthalmological Society (COS) Annual Meeting ● May 30–June 2, 2024 ● Toronto, Ontario, Canada

Spatial transcriptomics of the human corneal endothelium in healthy and FECD individuals

COS 2024

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INTRODUCTION

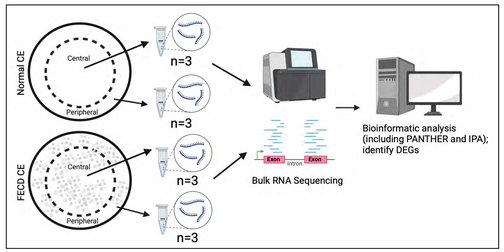
- The corneal endothelium (CE) is the innermost layer of the cornea and is composed of a monolayer of corneal endothelial cells (CECs) that rest on a specialized basement membrane called Descemet's membrane.[1]
- Fuchs endothelial corneal dystrophy (FECD) is the leading cause of CE dysfunction and is characterized by the formation of guttae and progressive CEC loss. FECD first manifests with central corneal guttae followed by peripheral corneal involvement. Clinically, spatial differences in endothelial cell density between central and peripheral corneal zones have been reported in FECD patients, whereby the central zone is more damaged than peripheral zones.[2]
- There is evidence that the CE is not a homogenous population of CECs, and that spatial differences exist with differential gene expression patterns. RNA-based transcriptomic analyses have not been extensively used to characterize cellular differences in the human CE between central and peripheral spatial domains in healthy and FECD tissues.[3,4]

AIM

- To characterize CEC populations isolated from the central and peripheral domains in healthy and FECD individuals by bulk RNA sequencing (RNA-seq).

METHOD

- The central 8 mm and peripheral rims from healthy human cadaveric donors (n=3), and FECD cadaveric donors (n=3) were dissected for RNA-seq.
- A list of differentially expressed genes (DEGs) was generated for 5 comparisons: normal central and peripheral CE; FECD central and peripheral CE; normal and FECD central CE; normal and FECD peripheral CE; and normal and FECD CE.
- DEGs were grouped in categories by molecular function and further analyzed by an over-representation (enrichment) test using a PANTHER Go-Slim molecular function annotation dataset. Additional pathway analysis was performed in Cytoscape where enrichment maps were generated for each gene list.



RESULTS

• Spatial differences between the central and peripheral CE in a normal tissue

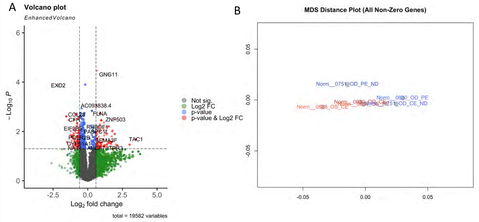


Figure 1. Confirmations of the RNA-Seq data profile in a healthy corneal endothelium between the central and the peripheral spatial domains. A) Volcano plot of differentially expressed genes (DEGs) shows 86 upregulated and 82 downregulated genes (in red) in patients with Fuchs endothelial corneal dystrophy (FECD) from a total of 19,582 expressed genes. Blue dots represent genes with p-value > 0.05, but $Log_2FC < 0.59$, while green dots represent genes with p-value < 0.05, but $Log_2FC > 0.59$. Gray dots represent genes with p-value > 0.05 and $Log_2FC > 0.59$ and are therefore not significant. **B)** Multidimensional scaling (MDS) plot reveals the proportions of variance between the central and the peripheral groups. The variation in data along the two principal components is plotted along the x- and y-axes.

Table 1. Top 20 upregulated and top 20 downregulated genes in a healthy corneal endothelium between the central and the peripheral spatial domains.

Upregulated			Downregulated		
Gene Symbol	log_2FC (C/P) †	*P* Value✢	Gene Symbol	log_2FC (C/P) †	*P* Value✢
RP11-707G18.1	0.650758818	3.45E-05	EXD2	-2.1267956	1.35E-04
GNG11	1.490578589	4.90E-05	ELP6	-0.8820773	0.00199839
AC093838.4	0.606409562	8.91E-04	CCL28	-0.7965152	0.00205822
FLNA	0.886245767	0.00188239	EDN3	-1.5441259	0.00244433
ZNF503	2.006034736	0.00322187	TBC1D4	-0.6268893	0.0025063
GABBR1	0.977333362	0.00350909	TMEM45B	-0.7050558	0.0029891
DHX36	1.166904312	0.00431013	CFH	-0.9680763	0.00334824
RN7SL853P	0.882313716	0.00511077	FGF9	-1.3867984	0.00346203
STAB1	1.511196684	0.00625606	ING4	-0.7641795	0.00458372
RP11-186B7.4	0.874182123	0.00650968	CFHR1	-0.7360377	0.00564471
RHBDF1	0.699401736	0.00652178	CA3	-0.8216713	0.00616536
CTD-3252C9.4	1.344953801	0.00671525	PAPPA	-0.6683357	0.0070377
RASA3	1.137228409	0.0079512	EIF2B5	-1.0603036	0.00757136
C5orf45	0.728632967	0.00837155	RP11-205K6.3	-0.9262743	0.00787377
RP11-181G12.2	1.355567123	0.00914761	TMZD1	-0.6056064	0.00895178
COL3A1	1.78375571	0.00922754	ORS1E2	-0.6771846	0.00923006
RP11-73M18.6	0.880629246	0.00930418	ARHGDIB	-0.9122549	0.00927647
NEAT1	1.758640013	0.00983735	ABHD14A-ACY1	-1.2185768	0.00977354
MIR4639	0.894754513	0.00993062	RPE	-0.6541437	0.0108719
PABPC1L	0.603112552	0.01012605	E2F5	-0.6811843	0.01107453

†This means Log2 Fold Change(Central/Peripheral).
✢P value was calculated by Wald test DESeq2.

• DEGs between normal vs. FECD CE

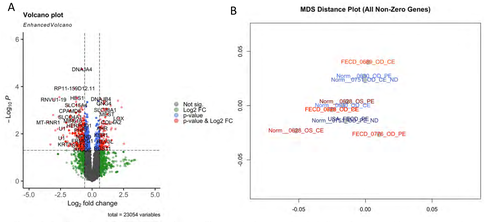


Figure 2. Confirmations of the RNA-Seq data profile genes in the corneal endothelium of patients with FECD compared to non-FECD controls. A) Volcano plot of differentially expressed genes (DEGs) shows 130 upregulated and 239 downregulated genes (in red) in patients with Fuchs endothelial corneal dystrophy (FECD) from a total of 23,054 expressed genes. Blue dots represent genes with p-value > 0.05, but $Log_2FC < 0.59$, while green dots represent genes with p-value < 0.05, but $Log_2FC > 0.59$. Gray dots represent genes with p-value > 0.05 and $Log_2FC > 0.59$ and are therefore not significant. **B)** Multidimensional scaling (MDS) plot reveals the proportions of variance between the control and FECD groups. The variation in data along the two principal components is plotted along the x- and y-axes.

Table 2. Top 20 upregulated and top 20 downregulated genes in the corneal endothelium of patients with FECD compared to non-FECD controls.

Upregulated			Downregulated		
Gene Symbol	log_2FC (FE/CN) †	*P* Value✢	Gene Symbol	log_2FC (FE/CN) †	*P* Value✢
DNAJB4	0.70889066	3.37E-04	DNAJA4	-0.7890435	1.84E-05
MT-TH	2.05084658	3.98E-04	RP11-159D12.11	-1.387151	1.19E-04
CTD-2349P21.9	0.9166116	4.13E-04	CH17-373J23.1	-2.5920212	2.82E-04
RP11-45M22.2	1.01715099	4.18E-04	SLC47A1	-1.272223	2.98E-04
GNG4	0.94171232	5.17E-04	HES1	-1.1847207	3.05E-04
COL4A1	1.47752588	6.40E-04	RNU1-19	-3.0533248	3.54E-04
MT-TS2	2.342505	7.54E-04	KB-1732A1.1	-1.2704214	4.42E-04
SOX11	0.93063959	8.55E-04	SLC15A4	-1.2645143	6.09E-04
LBH	0.89030701	8.72E-04	EN01-AS1	-1.0481405	6.23E-04
SCHIP1	1.1574852	8.77E-04	RNU5D-1	-1.9178168	6.35E-04
SLC38A1	1.04457588	9.75E-04	SHMT1	-0.7995588	7.35E-04
MIR6739	0.97296243	0.00101866	RP11-332H18.3	-0.886121	8.33E-04
MIR570	0.76161781	0.00107394	GOLGA2P10	-0.7620914	9.47E-04
MEST	1.19459699	0.0014782	CPAMD8	-1.7540899	0.0010712
SEMA3E	1.0439475	0.00200147	HYKK	-1.0538689	0.00109808
LOX	2.11028721	0.00222871	LA16c-380F5.1	-0.9048011	0.00116966
LAMC1	0.65367591	0.00244754	IGF2	-1.2834592	0.00127305
ETS1	0.92541302	0.00288125	FAHD2B	-1.0594919	0.00153624
COL4A2	1.52163398	0.00324004	RNU11	-3.0848826	0.00159804
MIR6728	0.76562881	0.00349484	C19orf47	-1.0284236	0.00183545

†This means Log2 Fold Change(FECD/Control).
✢P value was calculated by Wald test DESeq2.

• Enrichment analyses of the CE

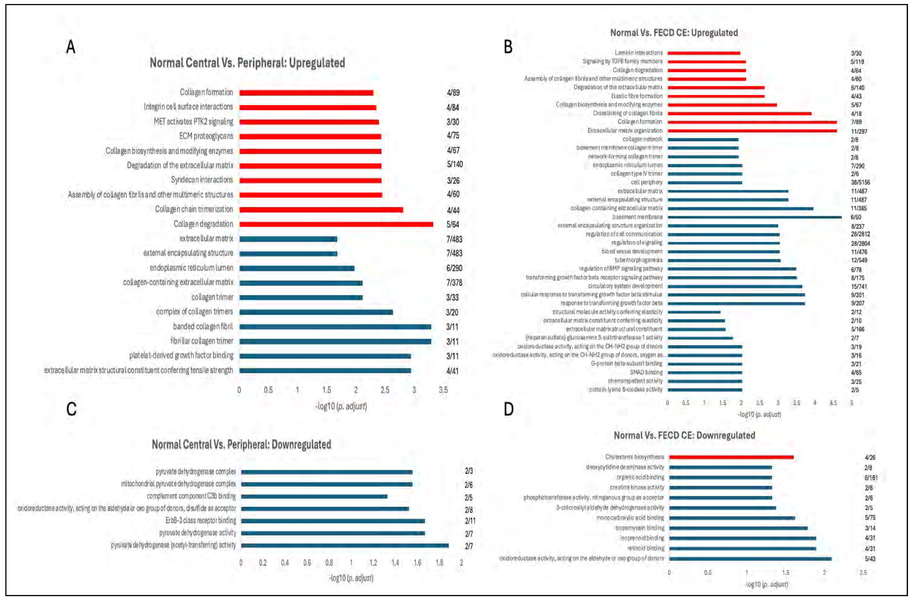


Figure 3. Enrichment analyses of the corneal endothelium. A) Enrichment analysis of upregulated differentially expressed genes (DEGs) between the healthy central and peripheral corneal endothelium. Shows the top gene ontology (GO) terms (in blue) and the top 10 most enriched Reactome pathways (in red) of the DEGs for upregulated genes. **B)** Enrichment analysis of upregulated DEGs in the corneal endothelium of patients with FECD compared to non-FECD controls. Shows the top GO terms (only the top 10 GO: Biological Process terms; in blue), and the top 10 most enriched Reactome pathways (in red) of the DEGs for upregulated genes. **C)** Enrichment analysis of downregulated DEGs between the healthy central and peripheral corneal endothelium. Shows the top GO terms of the DEGs for downregulated genes. **D)** Enrichment analysis of downregulated DEGs in the corneal endothelium of patients with FECD compared to non-FECD controls. Shows the top GO terms (in blue) and the most enriched Reactome pathways (in red) of the DEGs for downregulated genes. In each panel, the x-axis represents the − log10 adjusted P value, which was used to rank the enriched pathways based on the statistical significance. The numbers beside the x-axis represent the number of differentially expressed genes in the pathway (term) over the total number of genes in said pathway (term), i.e., intersection size/term size.

CONCLUSION

- There are spatial differences in gene expression, particularly in ECM proteins, between central and peripheral CECs. These genes are important in maintaining CEC function in the healthy CE.
- This supports that the CE is composed of a heterogeneous population of CECs, which can become altered in FECD.
- Future experiments will investigate individual genes to determine how they may affect the normal functioning of CEC biology.
- Future experiments using single cell RNA-seq will further characterize these cellular populations and will provide valuable insight into fundamental corneal biology and FECD pathogenesis.

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Inflammatory keratitis and Trastuzumab

COS 2024

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INTRODUCTION

Although it is principally known for its cardiotoxic adverse effects[1,2], the antineoplastic molecule trastuzumab, as well as other antineoplastic agents, exhibits notable ocular adverse effects in emerging literature[2,3,4,5,6,7,8]. The documented ocular damages attributed to trastuzumab are dry eye syndrome, conjunctivitis, keratitis, and, rarely, ischemic maculopathy[4]. Due to its high vessel density, abundant cell surface receptors and dependency on cellular signaling cascade, and populations of rapidly dividing cells, the eye has a high risk of toxicity[5]. Furthermore, the spectrum of complications caused by anticancer treatment extends from superficial damage to complete blindness. Consequently, it becomes imperative to recognize and monitor the ocular effects associated with agents like trastuzumab. In this context, we present the case report of a woman who developed subepithelial keratitis while undergoing trastuzumab therapy.

AIM

This case report aims to provide a comprehensive description of the presentation of a subepithelial inflammatory keratitis observed in a patient undergoing trastuzumab treatment.

METHOD

To conduct the literature review, we used the following databases:

- ScienceDirect (Elsevier)
- PubMed

Photos were taken at the slit-lamp at each visit to document the evolution of the disease.

RESULTS

A 63-year-old female diagnosed with breast cancer, has presented corneal haze, corneal edema, epithelial folds, and reduction of visual acuity following cataract surgery. A diagnosis of subepithelial inflammatory keratitis has been established. A causal relationship has been identified between the corneal inflammation and the trastuzumab, as evidenced by the amelioration of symptoms upon discontinuation of treatment.

The patient had been receiving trastuzumab-emtansine (Kadcycla) for a duration of one year preceding her cataract surgery. The molecule was then changed for trastuzumab-deruxtecan (Enhertu) about 3 months after her cataract surgery because of a neoplastic progression under trastuzumab-emtansine.

Corneal haze was the first clinical sign of keratitis observed and appeared around a month following cataract surgery. HSV keratitis was suspected and excluded after a negative PCR and unsuccessful antiviral treatment. The keratitis was initially controlled with topical 1% prednisolone acetate but recurred upon tapering. The patient eventually experienced a severe recurrence that did not respond to oral prednisone. This led to discontinuation of trastuzumab for several weeks, resulting in the resolution of inflammation even after tapering oral prednisone and topical 1% prednisolone.

The current management of the patient's cancer involves oral administration of Xeloda. She remains asymptomatic with regards to any ocular manifestations.

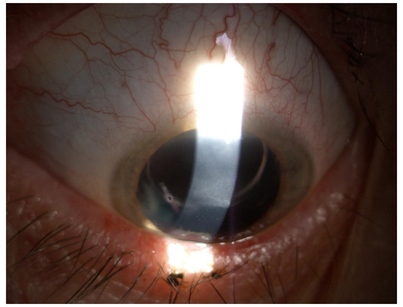

Figure 1. Slit-lamp photograph showing superior paracentral subepithelial corneal haze one month after cataract surgery.

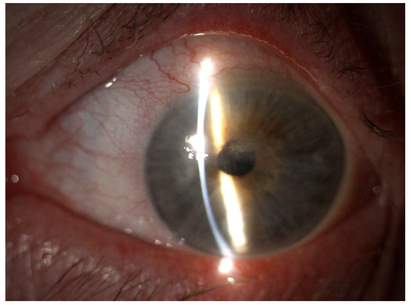

Figure 2. Slit-lamp photograph showing superior paracentral subepithelial corneal haze a year after cataract surgery.

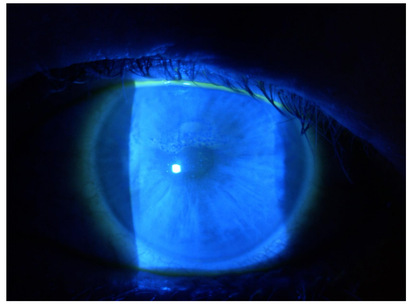

Figure 3. Slit-lamp photograph after the application of fluorescein showing epithelial edema under cobalt blue filter.

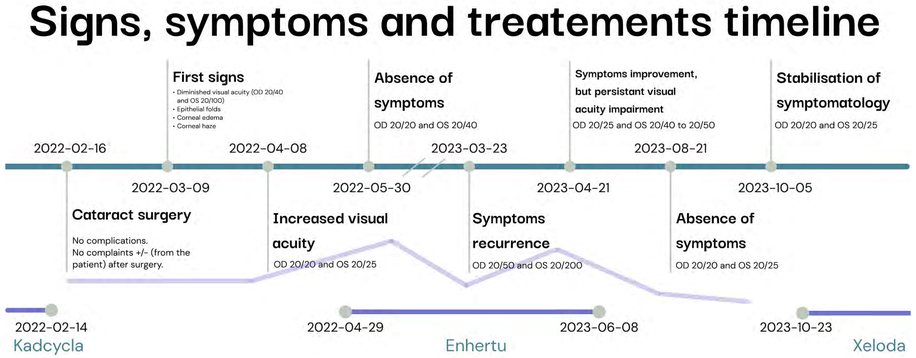

Figure 4. Timeline illustrating the evolution of symptoms alongside anti-neoplastic treatments and intensity of topical prednisolone. The symptoms evolution is represented and described by the blue line. The chronology of cancer treatments is represented by the purple straight lines. The intensity of prednisolone treatment is summarized by the translucent purple line.

CONCLUSION

The antineoplastic agent trastuzumab carries notable ocular risks such as subepithelial inflammatory keratitis as evidenced by this case report and the literature.

Those effects could be explained by the action of trastuzumab on HER2 receptor which is from the EGFR family. EGFR are strongly expressed throughout the corneal epithelium and play a role in proliferation and migration of the corneal epithelial cells and in corneal repair[2,9].

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Visual And Safety Outcomes Of Posterior-chamber Phakic ICL For Low Vs High Myopia:
An Eight-year Retrospective Study

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COS 2024

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INTRODUCTION

- Evo Implantable Collamer Lens (ICL Model V4c; STAAR Surgical, Monrovia, CA) is a single piece posterior chamber phakic refractive intraocular lens with a central port
  - The central port eliminates the need for iridotomy
- EVO ICL Model V5 includes a larger optical zone diameter (5.0–6.1 mm)

PURPOSE

- To evaluate the efficacy and safety of EVO ICL (model V4c) and EVO+ ICL (V5) for the correction of low, intermediate and high degrees of myopia, with or without astigmatism

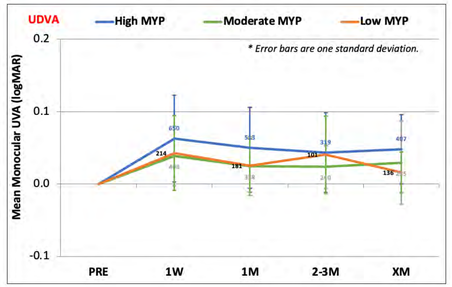
METHOD

- Retrospective, single-center study (Toronto, Canada)
- Patients receiving EVO /EVO+ ICLs (spherical or TORIC) between 2016 and 2023
- 3 groups, based on preoperative manifest refraction spherical equivalent (MRSE):
  - Low myopia (LM, < -6 D)
  - Intermediate myopia (IM, 6-9D)
  - High myopia myopia (HM, > -9 D)
- Outcome measures included:
  - Uncorrected visual acuity (UCVA)
  - Best-corrected visual acuity (BCVA)
  - Spherical equivalent (SE)
  - Endothelial cell density (ECC)
  - Intraocular pressure (IOP)
  - ICL vault
  - Adverse events

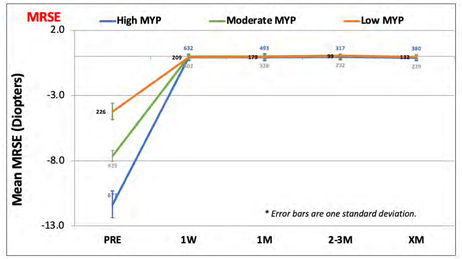
RESULTS

- A total of 1332 myopic eyes
  - Mean age 29.5±5.1 years (range 18-39 years)
  - Mean follow-up of 8.5 ± 7.3 months
- Comparing:
  - LM – 226 eyes, Baseline MRSE -4.2 ± 1.3D
  - IM – 429 eyes, MRSE -7.6 ± 0.85D
  - HM – 677 eyes, MRSE -11.3 ± 2.0D

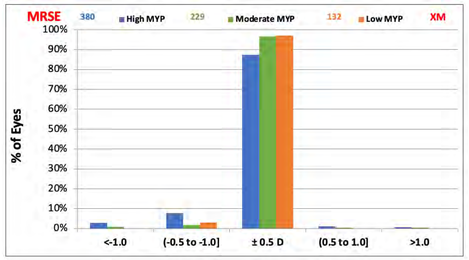
Post-operative UDVA at last follow-up in the LM (0.02 LogMAR), IM (0.03) and HM (0.05) groups were all excellent.



- Post-operative MRSE comparable across groups:
  - LM (-0.05 ± 0.23 D)
  - IM (-0.04 ± 0.34 D)
  - HM (-0.11 ± 0.44 D)

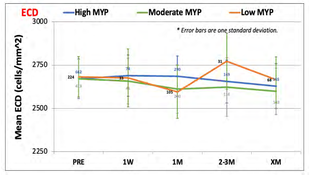


- Proportion of eyes (%) achieving within -/+0.50D of target:
  LM 97.2% IM 96.3% HM 86.4%

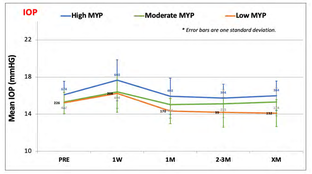


- No change in CDVA at last follow up:
  - LM 91%
  - IM 88%
  - HM 86%

- No significant loss in ECD across the groups at all follow-ups



- Post-op IOP rise of >5mmHg:
  LM 2.3% IM 3.2% HM 4.2%



- Efficacy Index (ratio of postop UCVA/pre-op BCVA)
- Safety Index (ratio of postop BCVA/pre-op BCVA)

Group	Efficacy Index	Safety Index
LM	0.97	1.00
IM	0.96	0.99
HM	0.99	1.1

CONCLUSION

- This study demonstrates the safety and efficacy of ICL surgery for low to high myopia
- ICL is able to provide very accurate refractive results, with minimal risk of loss of CDVA, endothelial cell loss, or increased intraocular pressure.
- In particular, low myopes, who would otherwise be poor candidates for laser vision correction (thin CCT, forme-fruste keratoconus), would do well with ICL implantation

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Association Between Sociodemographic Factors with Diabetic Retinopathy in the National Health Interview Survey: A Cross-sectional, Population-Based Analysis

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PURPOSE & BACKGROUND

- Diabetic retinopathy (DR) is one of the most common microvascular complications of diabetes and the leading cause of blindness in working class adults in the United States
- DR is predicted to develop in 40% of Americans and risk factors include longer duration of diabetes, poor glycemic control, and high blood pressure
- The impact of social determinants of health (SDH) on diabetes and its complications has been expanded in recent years. According to the American Diabetes Association, the prevalence of diabetes is associated with almost all aspects of SDH, including income, education, occupation, housing, environment, food insecurity, access to healthcare, and social support

The **aim of our study** is to investigate the relationship between sociodemographic and healthcare access factors with DR prevalence in a large, nationally representative sample of the United States population.

METHODS

This cross-sectional analysis included respondents to the 2017 National Health Interview Survey (NHIS) who answered the question:

"Have you ever been told by a doctor or other health professional that you had diabetic retinopathy?"

The association between diabetic retinopathy prevalence and sociodemographic factors in the following five domains were analyzed:

Univariable and multivariable logistic regression was used to examine the association between DR prevalence and sociodemographic factors in the **following domains**:

1. **Education Access:** highest educational level
2. **Healthcare Access and Quality:** health status, disability, insurance status and the participant's usual place for health care.
3. **Economic Stability:** income relative to poverty threshold, delay of medical care due to cost, and employment status.
4. **Social and Community Context:** age, sex, sexual orientation, race/ethnicity, marital status, parental status, and citizenship.
5. **Neighbourhood and Built Environment:** geographic location (i.e. Northeast, Midwest, South and West).

RESULTS

From the **26,699 NHIS participants** who answered the DR question, **266 (1.0%)** self-reported a DR diagnosis.

Most participants were **aged 50-64 (26.11%), were married (38.72%), had advanced degrees (36.12%), were currently or recently employed (71.05%), and identified as White (74.34%).**

Multivariable analysis found a significant association between DR prevalence and the following social determinants of health:

Poorer health status ***(OR=6.10; 95%CI=3.75-9.92; p<0.001)***

Disability ***(OR 2.07; 95%CI 1.33 - 3.21; p=0.001)***

No employment status ***(OR= 1.77; 95%CI= 1.12 - 2.81; p=0.015)***

Living in Southern America ***(OR= 1.85; 95%CI= 1.072-3.20; p=0.028).***

Having a usual place for healthcare (OR 0.28; 95% CI 0.12 - 0.69; p=0.005) and female sex (OR= 0.58; 95%CI= 0.42 - 0.82; p=0.002) was negatively associated with DR prevalence.

CONCLUSION

Multiple **sociodemographic factors** are associated with **DR prevalence.** Health care providers and policymakers should tailor future interventions to address social determinants of health in a holistic model of DR screening and care.

Becoming a Micro-revolutionary: A Workshop on How to Respond to Microaggressions and Facilitate Bystander Training

COS 2024

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INTRODUCTION

- Discrimination towards health-care professionals is a longstanding problem within the medical field.
- For example, in 2018, in the Canadian National Resident Survey, 77.1% of trainees reported experiencing an incident of harassment or intimidation from verbal comments.
- Unfortunately, there are few medical education resources and a lack of curricula available to address this.

AIM

- Adapted from the literature, a workshop was created to teach students, allied healthcare professionals and staff physicians on how to recognize and respond to microaggressions.
- The aim of this study is to assess the impact of the workshop and toolkit for both responding to microaggressions and advocating for change on an interpersonal level.

METHOD

Literature Search

- Search conducted on Ovid Medline, Embase and Web of Science to identify articles on microaggressions, harassment and discrimination among health-care professionals.
- Search strategy was then refined to find educational resources on previous frameworks and workshops to address workplace microaggressions.

Workshop Development

- Based on a toolkit of communication techniques from Hock et al. at Wills Eye Hospital as well as the ERASE framework, an interactive workshop was developed.
- A novel framework entitled "ACT FIERCE" was developed.
- The workshop combines didactic teaching, interactive teaching, as well as role-play scenarios to practice the framework.

Workshop Delivery

- The workshop was first piloted at the University of Toronto Department of Ophthalmology grand rounds.
- It was then delivered to two other Internal Medicine departments and one Ophthalmology department in Ontario.
- Participants completed pre-and post-questionnaires regarding the objectives of the presentation and their ability to respond to microaggressions as an individual or bystander.

RESULTS

ACT FIERCE Framework:

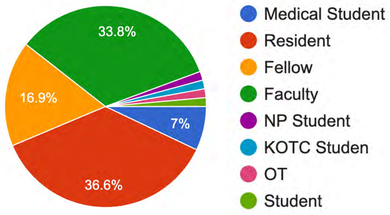
ACKNOWLEDGE MICROAGGRESSIONS
C"SEE" MICROAGGRESSIONS
TRAUMA RESPONSE (FIGHT, FLIGHT, FREEZE, FAWN)

FOCUS ON FEELINGS
INTENT FROM IMPACT
EGALITARIANISM/EQUALS
RESPOND TO THE ACT AT THE APPROPRIATE TIME
CHECK-IN WITH SELF AND OTHERS
EMPOWER OTHERS TO RESPOND

Pre-Workshop Questionnaire:

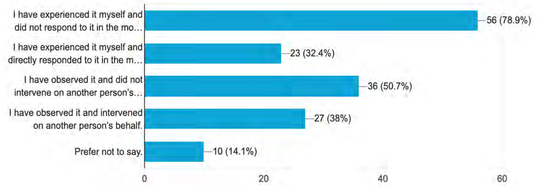
A total of 71 individuals completed the pre-workshop questionnaire.

A)



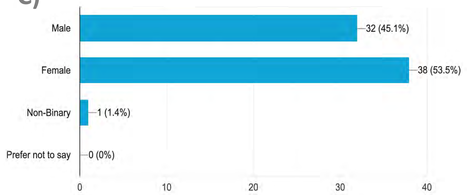
A) Level of clinical training of individuals who completed the pre-workshop questionnaire.

B)



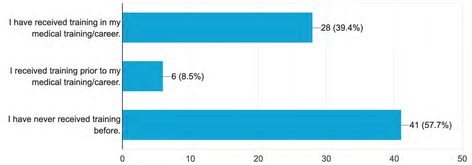
B) Bar graph demonstrating pre-workshop questionnaire answers to whether individuals have experienced microaggressions themselves and did not respond, experienced them and directly responded, observed them and did not intervene or observed them and intervened.

C)



B) Reported sex of individuals who filled out the pre-workshop questionnaire.

D)

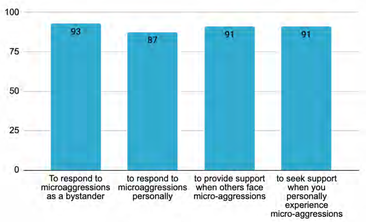


D) Bar graph demonstrating responses to whether workshop attendees had received trainings on micro-aggressions previously in their careers.

Post-Workshop Questionnaire:

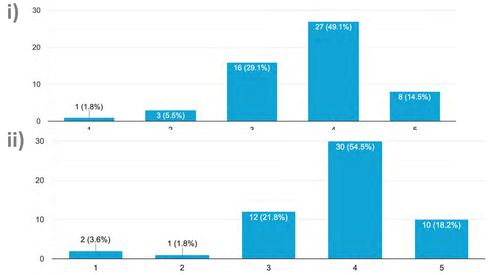
A total of 55 individuals completed the pre-workshop questionnaire.

E)



E) Bar graph demonstrating the percentage of individuals who, after the workshop, would feel comfortable responding to microaggressions or providing support after experiencing a microaggression.

F)



F) Bar graph demonstrating how likely individuals who attended the workshop would feel on a scale of 1 (not likely) to 5 (likely) using the FIERCE strategy (i) individually and (ii) as a bystander

CONCLUSION

- 57.7% of participants reported that they had never received previous training on microaggressions.
- 78.9% of all participants reported they have experienced a microaggression and did not respond.
- 81.8% of attendees felt that the training helped prepare them to respond to microaggressions and 94.5% would use the ACT FIERCE strategy in the future.
- Despite the high prevalence of individuals experiencing microaggressions in healthcare environments, there is scant guidance on how to address them or intervene on behalf of others.
- This workshop fills this void by preparing healthcare professionals on how to become a micro-revolutionary and respond to microaggressions.
- The ACT FIERCE framework should be widely adopted across diverse institutions.

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Differential Sex-Based Enrollment into US-Registered Glaucoma Clinical Trials: A Cross-Sectional Study using the Global Burden of Disease Database

COS 2024

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Evidence suggests under-enrollment of minority demographics in clinical trials for some ophthalmic diseases. Equitable representation in trials ensures evidence-based treatment selection for diverse patient populations.

METHOD

"Glaucoma" was searched in ClinicalTrials.gov and the studies were put through an initial screening phase. For each study, the Global Burden of Diseases (GBD) database was used to ascertain an expected disease burden in females (prevalence ratio), calibrated to each study's included age range, countries of study, and initiation year. The primary outcome was participant-to-prevalence ratio (PPR) calculations of female trial participants and Secondary outcomes included raw percentage enrollment of females, as well as variance in absolute and PPR enrollment across trial characteristics.

CONCLUSION

High-quality, US-registered, glaucoma-related trials enrolled acceptable proportions of females based on their absolute enrollment and constitutive disease burden. Enrollment trends predominately held across study characteristic variables. To promote study generalizability, future trial enrollment should aim to achieve equitable and diverse demographic representation.

RESULTS

From 1061 records, we identified 177 trials (N=38,475; 56.2% female) for inclusion in the study. The pooled female PPR was 1.05, 95% CI [1.02-1.08]). Nearly all trial characteristics (masking, phase, study site, sponsor site, year, and intervention type) did not indicate instances of female over- or under-representation by PPR, although studies published prior to 1997 were indeterminate on whether they under-enrolled female participants. Overall, the mean female PPR was 1.05 [95%CI 1.02, 1.08], indicating equitable female enrollment after adjusting for glaucoma disease burden. All trial characteristics (masking, phase, study site, sponsor site, year, and intervention type) did not indicate instances of female over- or under-representation with the majority of PPR estimates and their 95% CIs spanning within 0.8 and 1.2.

Characteristic	*Total N; %*	*Female % of Total*	*p-value*	*PPR sex mean; 95%CI)*	*p-value*
Overall	38475	21639; 56.24%		1.05; 1.02-1.08	
Masking					
Double	22480	12624; 56.16%		1.06; 1.02-1.09	
Triple	7424	4151; 55.91%	0.96	1.05; 0.97-1.12	0.79
Quadruple	8571	4864; 56.75%		1.03; 0.96-1.1	
Trial Phase					
Phase I	289	160; 55.36%		0.98; 0.8-1.15	
Phase II	7148	4191; 58.63%		1.11; 1.06-1.16	
Phase III	24852	13909; 55.97%	<0.001*** I|II, I|III, II|III, II|NA, III|IV, III|NA	1.03; 0.98-1.09	0.08
Phase IV	4296	2402; 55.91%		1.03; 0.98-1.09	
Phase Not Applicable (NA)	1890	977; 51.69%		1; 0.91-1.09	
Site Location					
Site US	21297	12380; 58.13%		1.07; 1.04-1.11	
Site Foreign	10005	5258; 52.55%	0.01*** Foreign | Mixed	1.03; 0.97-1.09	0.03*** US | Foreign, US | Mixed
Site Mixed	7173	4001; 55.78%		1.01; 0.96-1.06	
Sponsor Location					
Sponsor US	12918	7147; 55.33%		1.04; 0.99-1.09	
Sponsor Foreign	24946	14154; 56.74%	0.24	1.05; 1.02-1.09	0.53
Sponsor Mixed	611	338; 55.32%		1.07; 0.8-1.34	
Study Initiation Date					
<1997	844	401; 47.51%		0.79; 0.77-0.82	
1997-2008	12748	7288; 57.17%	0.42	1.02; 0.98-1.06	0.001***
2009-2020	22768	12819; 56.3%		1.07; 1.03-1.11	
Intervention					
Pharmacological	37277	20989; 56.31%	0.03***	1.05; 1.02-1.08	0.95
Non-Pharmacological	1198	650; 54.26%		1.06; 0.97-1.14	
p-value					

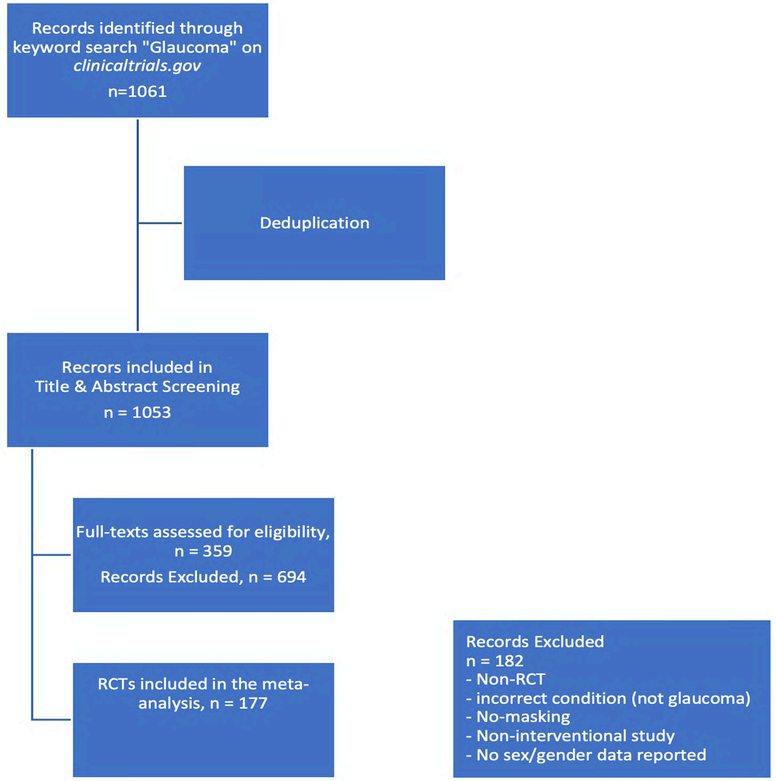

Figure 1: PRISMA Flow diagram of study methods and clinical trial selection for inclusion

Table 1:

Absolute enrollment (N; percentage) and participation-to-prevalence ratios (PPR_{sex} with mean and 95% CIs) are depicted. Kruskal-Wallis tests compared female enrollment across trial characteristics. ***Significant post-hoc comparison for whether sub-groups of characteristics differed significantly in the absolute number of females that each of their included trials enrolled, or their individual PPR values. For multiple levels, significant pairs are co-depicted in format (x|y).

REFERENCES

None.

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None.

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Enrollment Disparity by Sex, Race and Ethnicity to Clinical Trials for Age-Related Macular Degeneration: A Cross-Sectional Study

COS 2024

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INTRODUCTION

- Evidence indicates **disparate enrollment** of some demographics into trials for certain ophthalmic diseases
- Representative trial enrollment is necessary to accurately draw conclusions on intervention safety and efficacy for real-world populations

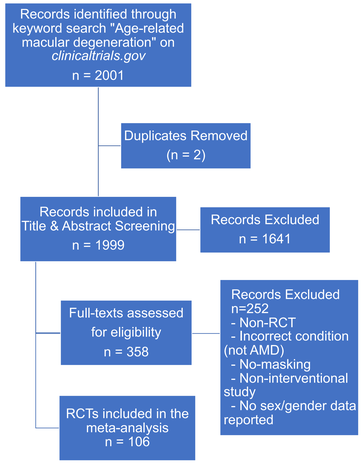
AIM

This study investigates demographic inequities in age-related macular degeneration (AMD) trial enrollment for US-registered randomized controlled trials (RCTs). We analyzed:

1. Enrollment characteristics in biological sex in AMD-related trials compared to disease burden data
2. Absolute enrollment of female, racial, and ethnic groups
3. Enrollment variation by demographics across trial characteristics

METHODS

- Clinicaltrials.gov was searched with "age-related macular degeneration" to identify RCTs with double, triple, or quadruple masking
- Trial (e.g., study location, phase, masking, trial initiation year, and sponsor origin) and demographic data were collected
- Sex-based AMD disease burdens were retrieved from the Global Burden of Disease database to calculate **pooled female population-to-prevalence ratios (PPRs)**
- Equitable trial enrollment was defined as PPR between **0.8-1.2**



- Raw race and ethnicity data were collected from each trial
- Demographic proportions were evaluated across trial characteristics using the Kruskal-Wallis test (alpha=0.05) followed by post-hoc comparisons

TABLES

Characteristic	Total	Female; %	PPR_{sex} (Mean; 95%CI)
Overall	77939	36109.4; 46.33%	0.88; 0.82-0.94
Double	15376	8810; 57.3%	0.85; 0.81-0.89
Triple	33121	17127; 51.71%	0.86; 0.8-0.92
Quadruple	29442	10172.4; 34.55%	0.91; 0.78-1.04
p-value		0.46	0.28
Phase I	78	49; 62.82%	0.95; 0.75-1.15
Phase II	6574	3901; 59.34%	0.87; 0.83-0.92
Phase III	42101	17355.4; 41.22%	0.89; 0.77-1.02
Phase IV	2665	1282; 48.11%	0.89; 0.77-1.02
Phase Not Applicable (NA)	26521	13522; 50.99%	0.93; 0.74-1.11
p-value		<0.0001* II|III, II|IV, II|NA	0.21
US Site	57707	23756.4; 41.17%	0.85; 0.8-0.91
Foreign Site	7784	4213; 54.12%	0.82; 0.75-0.88
Mixed Site	12448	8140; 65.39%	0.97; 0.8-1.14
p-value		0.12	0.38
US Sponsor	62678	27625.4; 44.08%	0.9; 0.79-1.02
Foreign Sponsor	13087	7218; 55.15%	0.84; 0.79-0.89
Mixed Sponsor	2174	1266; 58.23%	0.92; 0.85-1
p-value		0.59	0.48
<=1999	3683	2060.4; 55.94%	0.81; 0.72-0.91
2000_2009	29778	10580; 35.53%	0.91; 0.72-1.09
2010_2020	44478	23469; 52.77%	0.86; 0.82-0.89
p-value		0.93	0.26
Drug	77124	35576.4; 46.13%	0.87; 0.81-0.94
Device/Procedure	815	533; 65.4%	0.96; 0.8-1.11
p-value		0.49	0.21

*Table 1: Female Enrollment Among Included Age-Related Macular Degeneration Trials. Enrollment (N; %) and participation-to-prevalence ratios (mean PPR sex and 95% CIs) are shown. *Indicates group statistical significance, with significant pairs depicted below (X\|Y)*

Characteristic	Total of Reported Race	Caucasian; %	Asian; %	Black; %	AI/AN; %	NH/PI; %	Mixed; %	Race Not Reported; %	Hispanic; %
Overall	70631	57917; 82%	2952; 4.18%	5253; 7.44%	255; 0.36%	11; 0.02%	19; 0.03%	4224; 5.98%	1708; 4.31%
Double	12437	11241; 90.38%	798; 6.42%	51; 0.41%	6; 0.05%	5; 0.04%	9; 0.07%	327; 2.63%	262; 0.66%
Triple	31361	24061; 76.72%	1308; 4.17%	5136; 16.38%	234; 0.75%	0; 0%	4; 0.01%	618; 1.97%	1200; 3.02%
Quadruple	26833	22615; 84.28%	846; 3.15%	66; 0.25%	15; 0.06%	6; 0.02%	6; 0.02%	3279; 12.22%	246; 0.62%
p-value		0.75	0.14	0.13	0.38	0.11	0.82	0.83	0.94
Phase I	24	23; 95.83%	0; 0%	0; 0%	0; 0%	0; 0%	0; 0%	1; 4.17%	1; 0%
Phase II	4634	4173; 90.05%	398; 8.59%	16; 0.35%	6; 0.13%	3; 0.06%	4; 0.09%	34; 0.73%	81; 0.2%
Phase III	39398	34390; 87.29%	1312; 3.33%	128; 0.32%	21; 0.05%	8; 0.02%	15; 0.04%	3524; 8.94%	601; 1.51%
Phase IV	2029	1036; 51.06%	854; 42.09%	0; 0%	0; 0%	0; 0%	0; 0%	139; 6.85%	0; 0%
Phase Not Applicable (NA)	24546	18295; 74.53%	388; 1.58%	5109; 20.81%	228; 0.93%	0; 0%	0; 0%	526; 2.14%	1025; 2.58%
p-value		<0.0001* II|III, II|IV, II|NA	0.05	0.2	0.74	0.72	0.37	<0.0001* II|III, II|IV, II|NA	0.04***
US Site	53619	44283; 82.59%	659; 1.23%	5216; 9.73%	237; 0.44%	5; 0.01%	10; 0.02%	3209; 5.98%	1332; 3.36%
Foreign Site	5095	3081; 60.47%	1834; 36%	2; 0.04%	0; 0%	0; 0%	0; 0%	178; 3.49%	15; 0.04%
Mixed Site	11917	10553; 88.55%	459; 3.85%	35; 0.29%	18; 0.15%	6; 0.05%	9; 0.08%	837; 7.02%	361; 0.91%
p-value		0.04* US|Foreign, Foreign|Mixed	0.09	0.01* US|Foreign, Foreign|Mixed	0.05	0.11	0.08	0.43	<0.0001* US|Foreign, Foreign|Mixed
US Sponsor	57898	47790; 82.54%	696; 1.2%	5222; 9.02%	242; 0.42%	7; 0.01%	12; 0.02%	3929; 6.79%	1444; 3.64%
Foreign Sponsor	10750	8302; 77.23%	2128; 19.8%	21; 0.2%	13; 0.12%	4; 0.04%	7; 0.07%	275; 2.56%	239; 0.6%
Mixed Sponsor	1983	1825; 92.03%	128; 6.45%	10; 0.5%	0; 0%	0; 0%	0; 0%	20; 1.01%	25; 0.06%
p-value		0.14	0.18	0.32	0.4	0.83	0.76	0.33	0.16
<=1999	3666	3595; 98.06%	1; 0.03%	55; 1.5%	0; 0%	0; 0%	0; 0%	15; 0.41%	18; 0.05%
2000_2009	26051	23100; 88.67%	189; 0.73%	47; 0.18%	7; 0.03%	5; 0.02%	1; 0%	2702; 10.37%	136; 0.34%
2010_2020	40914	31222; 76.31%	2762; 6.75%	5151; 12.59%	248; 0.61%	6; 0.01%	18; 0.04%	1507; 3.68%	1554; 3.92%
p-value		0.55	0.11	0.67	0.76	0.89	0.55	0.69	0.49
Drug	70333	57626; 81.93%	2951; 4.2%	5250; 7.46%	255; 0.36%	11; 0.02%	19; 0.03%	4221; 6%	1696; 4.27%
Device/Procedure	298	291; 97.65%	1; 0.34%	3; 1.01%	0; 0%	0; 0%	0; 0%	3; 1.01%	12; 0.03%
p-value	0	0.2	0.06	0.73	0.3	0.46	0.39	0.21	0.76

*Table 2: Race and Ethnicity Enrollment Among Included Age-Related Macular Degeneration Trials. Enrollment (N; %) is shown for each reported category. AI/AN, American Indian or Alaskan Native; NH/PI, Native Hawaiian, or Other Pacific Islander. *Indicates group statistical significance, with significant pairs depicted below. *** Significant KW result with non-significant post-hoc comparison.*

RESULTS

- 106 eligible trials were included from 1999 records
- All trials (N=77,939) reported sex demographics with a **pooled female PRR of 0.88** (95% confidence interval [CI]: 0.82, 0.94)
- Female enrollment was 36,109 **(46.3%)** out of 77,939 participants
- Of the 74 trials that adequately detailed race, **Caucasians** comprised the **largest group** (N=57,917; **82%** of total participants)
- Only 37 trials adequately detailed ethnicity

CONCLUSION

- Female enrollment was **representative** compared to their disease burden and held consistent across trial characteristics (e.g. study phase, region, sponsor, initiation year, intervention)
  - Increased confidence in their generalizability to this population
- **Race** and **ethnicity** were often **under-reported**
- Minority groups (e.g. Black or African American, Asian, American Indian or Alaskan Native, Hispanic, etc.) composed **minority of participants** across trial characteristics
- Future studies should prioritize representative racial and ethnic enrollment to **optimize trial result generalizability**

Evaluating the feasibility and impact of the 'Look out!' bedside vision screening tool in a long-term care setting

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BACKGROUND & OBJECTIVES

- Falls are the second most common cause of death resulting from unintended injury worldwide.[1]
- The prevalence of falls increases with age, with visual impairment being a significant risk factor for falls and related injuries amongst the elderly.[1,2,3]
- The 'Look out!' bedside vision screening tool (**Figure 1**) is a validated vision assessment created by the United Kingdom Royal College of Physicians.[4] It includes 5 sections: glasses use, distance vision, near vision, peripheral vision, and eye movements.[4]

Figure 1: 'Look out!' user guide.

- **The purpose of this study was to assess the feasibility of the 'Look out!' bedside vision screening tool in a long-term care setting, with a focus on equitable access to ophthalmological care for the elderly.**

STUDY DESIGN

- This prospective quality improvement study was designed by a multidisciplinary committee consisting of ophthalmologists, a geriatrician, a statistician, and a long-term care medical director.
- Between June 2019 and February 2020, the 'Look out!' bedside vision screening tool was used on residents of St. Joseph's Villa long-term care facility in Dundas, Ontario. All screeners received training prior to tool implementation.

STUDY DESIGN (continued)

- Residents who were able to proficiently communicate in English were included. Exclusion criteria were as follows: moderate to severe dementia, known visual impairment that was untreatable, and residents who routinely saw an optometrist or ophthalmologist.
- Feasibility of the tool was gauged based on the number of study participants able to complete the assessment, those unable to complete the assessment, and the average time taken for completion.

Figure 2: Percentage of study participants able to complete the 'Look out!' bedside assessment

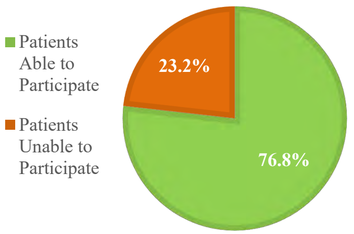
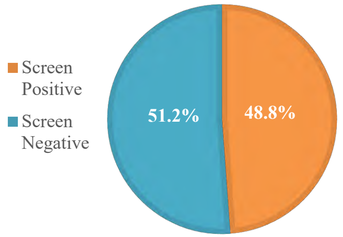


Figure 3: Percentage of participants screening positive for visual impairment amongst those who completed the assessment



RESULTS

- Of 56 study participants screened at the St. Joseph's Villa long-term care home, 43 (76.8%) were able to complete the assessment, while 13 (23.2%) were unable (**Figure 2**): 11 (84.6%) due to cognitive impairment, 1 (7.6%) due to being in too much pain to be assessed, and 1 (7.6%) due to feeling sick.
- Amongst participants who completed the assessment, 21 (48.8%) screened positive for visual impairment and 22 (51.2%) screened negative (**Figure 3**).
- The average time for completion was 5.55 minutes.

DISCUSSION

- This is the first study to assess feasibility of the 'Look out!' bedside vision screening tool in a long-term care setting in Canada.
- A previous study looking at screening for visual impairment in elderly patients with hip fractures provides evidence that bedside assessment by nurse screeners or other suitably trained members of the health care team can reliably identify those patients with impaired vision.[5] Similarly, the examiners in our study were able to reliably deliver the bedside vision assessment after one training session.
- The bedside vision screening tool demonstrated good feasibility with an average assessment time of five and a half minutes. However, despite an exclusion criteria of moderate to severe dementia, nearly a quarter of study participants were unable to complete the assessment mainly due to cognitive impairment. This highlights the need for an alternative tool for residents with cognitive impairment.
- Of those participants who completed the assessment, nearly half screened positive for visual impairment that would benefit from further examination by an optometrist or ophthalmologist. This suggests a large proportion of long-term care residents may have visual impairment amenable to treatment that could reduce the risk for falls.

CONCLUSION

- The 'Look Out' bedside vision screening tool demonstrated good feasibility, with over 75% of study participants completing the task efficiently and nearly half screening positive for visual impairment.
- This study advocates for objective vision screening in the long-term care setting to potentially reduce fall risks and associated healthcare costs, while promoting equitable access to vision care in this vulnerable population.

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Advancing eye care through innovation, education, and advocacy

L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

"Eyes Closed, Open Heart": a Sporting and Scientific Event to Raise Awareness on Visual Impairment

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LES YEUX FERMÉS LE COEUR OUVERT

INTRODUCTION

- Around **1.5 million** Canadians live with visual impairments, and the number is increasing.
- **80%** of Canadians have never worked with someone with a visual impairment.
- **22%** of severely sight-impaired Canadians are low-income, compared to **8.7%** in the general population.
- The unemployment rate among those with visual disabilities is **14.5%.**

AIM

Promote inclusion for visually impaired in the Canadian society.

- Enhance informational access about visual impairement
- Dismantle stigma
- Improve job market accessibility
- Combat isolation

DESCRIPTION OF THE EVENT

Name of Event: Eyes Closed, Open Heart
Date and Location: Saturday, November 4th, 2023; Montreal, Quebec
Organizing Committee: 4 medical students and 3 members of the Foundation for the Blind of Quebec
Sport Featured: Goalball - a sport adapted for people with visual impairments

1. Morning Session (9 AM to 1 PM) - Kids' Segment (Ages 11-12)

- Goalball tournament with 12 teams, each consisting of 4-5 children
- Neurosensory activities conducted while blindfolded and other amusements
- Lunch provided for all participating children
- Medal ceremony to all participants

2. Afternoon Session (1 PM to 5 PM) – Adults' Segment

Conferences, followed by a buffet/cocktail for networking opportunities

1. Maryam Ganni: World champion public speaker with a visual impairment
2. Dr. Arthurs and Dr. Robillard: Optometrist/ophthalmologist specialized in low vision
3. Jean-Benoit Bergeron: 3rd-year medical student with a visual impairment
4. Benoit Haché: Paralympic goalball athlete

RESULTS

Total number of people who attended the event: **178**
Number of children who participated in the tournament: **58**
12 children had a visual deficiency
46 children did not have a visual deficiency
In every team, one participant had a visual deficiency
Number of participants in the afternoon conferences: **65**
Number of volunteers during the day: **34**

The event reached more than 50,000 people through:

- TV reportage
- Radio conference
- Promotional video (15,000 views combined)
- Presentation at an Ophthalmology meeting
- Distribution of more than 2,000 flyers at 15 schools in Montreal and 3 hospital Ophthalmology Departments
- More than 10,000 clicks on our website

Raised 13,000$ in sponsorship and donations

Profit was donated to the Foundation for the Blind of Quebec: **2,000$**

78% of the participants were not involved in any way in the visual deficiency cause.

All the 46 children without a visual deficiency participating in the event had never played goalball before.

Photos of the Day of the Event

Poll using Google Forms was shared before and after the event:
n= **33**

POLL RESULTS

- **66%** didn't know the sport of goalball. (**5%** post-event)
- **59%** didn't feel comfortable guiding someone with a visual impairment. (**1%** post-event)
- **44%** didn't know someone who lives with a visual impairment. (**0%** post-event)
- **50%** would say they have low or no knowledge about the world of visual impairment. (**27%** post-event)
- **72%** had low knowledge or no idea about the services available in Canada for people with visual impairments. (**33%** post-event)
- **84%** were motivated or very motivated to get involved in helping people with visual impairments.
- Of course, **100%** of the participants would like a second edition of this event!

CONCLUSION

- Misinformation about visual impairment is prevalent in Canada.
- Continued promotion and event organization on this topic are crucial for engaging and educating Canadians about the inclusion and welfare of those with visual impairments.

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Gender and visible minority status on training experiences among Canadian ophthalmology residents and fellows

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BACKGROUND & OBJECTIVE

- Women and visible minority (VM) trainees are typically underrepresented in surgical specialties compared to men and non-visible minorities (NVM).
- Recent evidence has shown that mistreatment frequently occurs among general surgery residents, especially women and VMs, and is associated with burnout.[1]
- **The objective of this study was to investigate the implication of gender and VM status on training experiences among Canadian ophthalmology residents.**

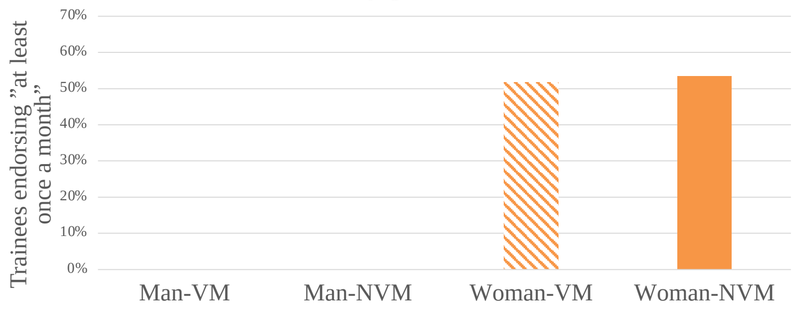
METHODS

- An 107-item questionnaire was emailed between Nov 2022 to Jan 2023 to all Canadian ophthalmology residents and fellows part of the 2022-2023 academic year.
- The survey used Likert scales and open-ended responses for the following sections: 1) Demographics, 2) Importance of Diversity, 3) Interpersonal Relationships and Supports, 4) Professional Opportunities, 5) Professional Interactions, and 6) Personal Thoughts.
- The questionnaire was adapted from an original survey used among Canadian general surgery residents (Mocanu et al., 2020).[1] Ethics approval was granted by the Dalhousie University Research Ethics Board.

RESULTS

- Of 240 Canadian ophthalmology trainees, 102 (42.5%) completed the survey.
- Most respondents were men (57 [54.3%]), VMs (68 [64.8%]), Canadian medical graduates (96 [92.3%]), non-immigrants (56 [54.4%]), heterosexual (97 [92.4%]), and under the age of 30 (58 [55.8%]). Of the trainees, 36 (34.3%) identified as VM men, 21 (20.0%) as non-VM men, 32 (30.5%) as VM women, and 16 (15.2%) as non-VM women.

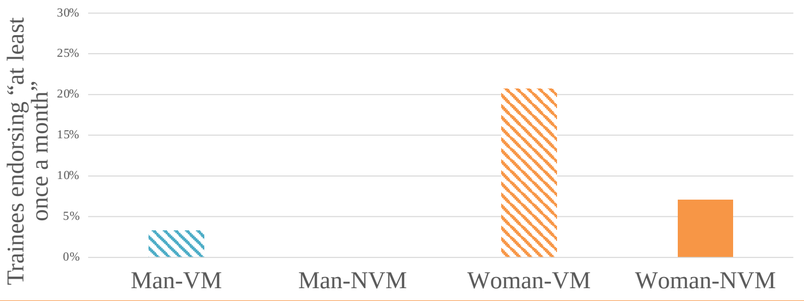
Figure 1: "Patients dismiss my medical expertise because of my gender."



RESULTS (continued)

- Over half of women endorsed at least monthly dismissal of medical expertise by patients (Fig 1). Twenty-nine (96.7%) VM men and 18 (100.0%) non-VM men never experienced this during their training ($p < 0.0001$).
- Six (20.7%) VM women endorsed dismissal of medical expertise due to ethnicity at least once a month (Fig 2). Nineteen (63.3%) VM men and 17 (94.4%) non-VM men never experienced this during residency ($p=0.0246$).

Figure 2: Patients dismiss my medical expertise because of my ethnicity."



RESULTS (continued)

- When asked if trainees had collegial relationships with their attendings, 13 (68.4%) non-VM men "strongly agreed" compared to 14 (46.7%) VM women, 11 (33.3%) VM men, and 2 (15.4%) non-VM women ($p=0.0032$).
- Thirteen (29.5%) women "agreed" or "strongly agreed" they have fewer opportunities at work than their peers due to gender, compared to 4 (8.0%) men ($p=0.0003$).

DISCUSSION

- This is the first study to assess how gender and VM status impact Canadian ophthalmology trainee experiences.
- Our study found that non-VM men were more likely to have better interpersonal relationships at work. Differences in surgical opportunities were predominantly associated with gender bias against women. Difference in perceived competence were predominantly associated with a gender bias against women, mainly from patients compared to attendings and allied health.
- A similar study among Canadian general surgery residents found that 1 in 3 women residents reported weekly dismissal of medical expertise, women were concerned with fewer training opportunities, and VM women were less likely to have collegial relationships with staff or feel valued at work.[1] These are similar to our results among Canadian ophthalmology residents.

CONCLUSION

- These results suggest that interventions are required to improve training experiences among women Canadian ophthalmology trainees.
- Suggested interventions include raising awareness, recruitment of a diverse faculty (with diverse selection committees), and formal mentorship programs.

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COS 2024

Gender Inclusivity in Author Submission Guidelines and its Relation to Research Metrics in Ophthalmology Journals

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PURPOSE

- Gender-diverse identities have been historically underrepresented in clinical research.
- Although ophthalmologic and other professional societies endorse the use of gender-inclusive practices in clinical environments, it is unclear whether these attitudes are reflected in academic communities.
- **This study evaluated the prevalence of gender inclusive author submission guidelines across ophthalmology journals.**

OBJECTIVES

1. Investigate the proportion of journals with "gender-inclusive" author submission guidelines and the elements of the gender-inclusive content within these guidelines.
2. Review the association between "gender-inclusivity" in author submission guidelines with publisher, origin country, and journal/source/influence metrics (Clarivate Analytics).

METHODS

A **cross-sectional study** of author guidelines written for ophthalmology researchers from ophthalmology journals indexed by the 2021 Journal Citations Report (Clarivate Analytics) was conducted.

- Independent reviewers rated journals on six criteria:
  - i. included examples of gender inclusive language;
  - ii. recommended the use of gender-inclusive language;
  - iii. distinguished between sex and gender;
  - iv. provided additional educational resources for authors on gender-inclusive language;
  - v. provided a policy permitting name changes (e.g., in case of gender and name transition); and/or
  - vi. whether journals provided a statement that affirmed their commitment to inclusivity.
- Journals were deemed "gender-inclusive" if they satisfied **at least one** inclusivity criteria.

RESULTS

- Across 94 journals, **29.8% journals were rated as gender-inclusive.**
- Inclusive-rated journals had **significantly higher relative impact factor, citations, and article influence scores** compared to non-inclusive journals.
- Furthermore, inclusive journals tended to **occupy more competitive journal impact factor (JIF) quartiles**, while the opposite trend was noted among non-inclusive journals.
- Of the 29.8% of journals that were rated as inclusive, the three most common domains were **the inclusion of an inclusivity statement** (71.4% of inclusive journals), **distinguishing between sex and gender** (67.9%), and **provision of additional educational resources on gender reporting for authors** (60.7%).

Table 1: Summary of included journals, stratified by language, country of origin, and journal impact factor.

Characteristic	All Ophthalmology Journals (N=94)
Language	
English	89 (2 mixed; 94.7%)
German	4 (4.3%)
French	1 (1.1%)
Portuguese	1 (1.1%)
Turkish	1 (1.1%)
Country (Top 10)	
United States	31 (33.0%)
United Kingdom	26 (27.7%)
Germany	5 (5.3%)
Switzerland	4 (4.3%)
New Zealand	4 (4.3%)
Netherlands	3 (3.2%)
Egypt	2 (2.1%)
Iran	2 (2.1%)
Australia	2 (2.1%)
Canada	1 (1.1%)
Journal Impact Factor Assigned	62 (65.96%)

Table 2: Comparison of inclusive versus non-inclusive journals, stratified by journal characteristics.

Characteristic	"Inclusive" Journals (N=28)	"Not Inclusive" Journals (N=66)
Language (Top 5 most represented)		
English	28 (100%)	61 (including 2 mixed; 92.4%)
German	0	4 (6.1%)
French	0	1 (1.5%)
Portuguese	0	1 (1.5%)
Turkish	0	1 (1.5%)
Country (Top 10 most represented from inclusive journals)		
United States	10 (35.7%)	21 (31.8%)
United Kingdom	10 (35.7%)	16 (24.2%)
Germany	0	5 (7.6%)
Switzerland	0	4 (6.1%)
New Zealand	4 (14.3%)	0
Netherlands	0	3 (4.5%)
Egypt	0	2 (3.0%)
Iran	0	2 (3.0%)
Australia	1 (3.6%)	1 (1.5%)
Canada	1 (3.6%)	0
Spain	1 (3.6%)	0
Korea	0	1 (1.5%)
Nordic Countries (Denmark, Finland, Norway, and Sweden)	1 (3.6%)	0
Publisher (Top 9 most represented from inclusive journals)		
Elsevier	13 (46.4%)	0
BioMed Central	3 (10.7%)	0
Dove Medical Press	3 (10.7%)	0
Wiley	3 (10.7%)	0
Springer	2 (7.1%)	0
American Medical Association	1 (3.6%)	0
Korean Ophthalmology Society	1 (3.6%)	0
Mary Ann Liebert	1 (3.6%)	0
SAGE Publications Inc	1 (3.6%)	0

Table 3: Comparison of inclusive versus non-inclusive journals, stratified by journal metrics.

Characteristic	Journals Rated as Inclusive (N=28) [Median, interquartile range (IQR)]	Journals Not Rated as Inclusive (N=66) [Median, interquartile range (IQR)]	Bootstrapped Median Difference; 95% confidence interval) *Indicates statistical significance
Absolute Metrics			
Total Citations	3766	2272	1664.25 [-997.8, 4232.8]
Citable Items	103	104	1 [-50.5, 51]
Total Items	85	93	-5 [-48.76, 53.53]
JIF (2021)	4.19	2.27	1.84 [0.71, 3.49] *
JIF Quartile			
Q1	9 (32.1%)	6 (9.1%)	Not applicable
Q2	4 (14.3%)	12 (18.2%)	Not applicable
Q3	4 (14.3%)	12 (18.2%)	Not applicable
Q4	1 (3.6%)	14 (21.2%)	Not applicable
Not Assigned	10 (35.7%)	22 (33.3%)	Not applicable
JIF (5-year)	4.16	2.45	1.68 [0.69, 4.23] *
Immediacy Index	0.916	0.516	0.39 [-0.09, 1.92]
Relative Metrics			
JCI (2021)	1.11	0.59	0.49 [0.12, 0.71] *
Eigenfactor (Normalized)	0.64	0.40	0.81 [0.14, 1.4] *
Influence Score of Articles	0.94	0.53	0.42 [0.09, 0.73] *
JIF %ile	75.8	40.3	35.49 [12.91, 54.84] *
Open Access Gold (%)	19.7	9.83	10.09 [-4.96, 88.39]

Table 4: Summary of the domains of inclusivity assessed across included journals.

Characteristic	Journals Satisfying Criteria (from total of 94 journals)
Provides examples of gender inclusive language	13
Recommends use of gender-neutral language	13
Distinguishes definitions of sex versus gender	19
Provides resources for authors	17
Name change policy option	7
Inclusivity statement for research	20
Recommends "women-centred language"	0

CONCLUSION

- A **minority** of ophthalmology journals have gender-inclusive author submission guidelines, and inclusive journals have greater metrics of research influence.
- **We recommend that ophthalmology journals commensurately update their author submission guidelines to advance gender equity of both authors and study participants and promote the inclusion of gender-diverse communities.**

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Gender Trends in Canadian Medicine and Surgery: The Past 30 Years

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Purpose

The number of women entering medicine has steadily increased since the 1970s, and graduating classes are now nearly 60% female. However, the proportion of practicing female surgeons is not rising at the same rate. We therefore sought to examine gender distribution across each stage of medical training in Canada.

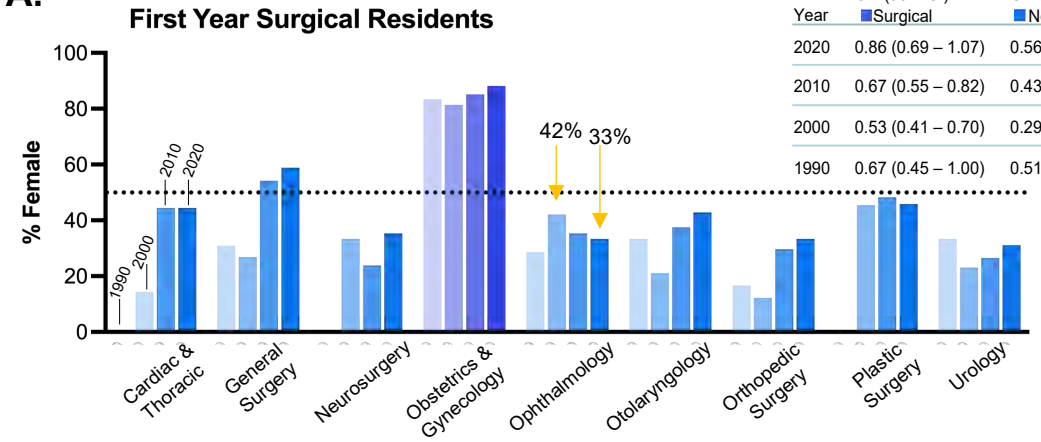
Methods

- Data from the AFMC on graduating MDs, the CAPER annual census on residents, and the CIHI on practicing physicians were compiled for the past 30 years
- Gender data were compiled and confirmed directly with universities for heads of departments of Internal Medicine, Family Medicine, and divisions of Surgery
- Trends were analyzed with linear regression and odds ratio in R

Results

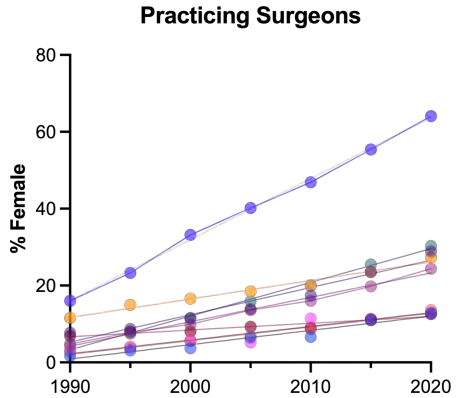
Into the present decade, female students are much less likely to enter surgical specialties apart from Ob/Gyn (OR 0.56, 0.44-0.71) (**A**), resulting in a slow increase in practicing female surgeons of less than 0.5% per year in many surgical disciplines and projected parity decades or centuries in the future (**B**).

A.



Year	OR (95% CI) Surgical	OR (95% CI) Non-Ob/Gyn Surgical
2020	0.86 (0.69 – 1.07)	0.56 (0.44 – 0.71)
2010	0.67 (0.55 – 0.82)	0.43 (0.35 – 0.54)
2000	0.53 (0.41 – 0.70)	0.29 (0.21 – 0.40)
1990	0.67 (0.45 – 1.00)	0.51 (0.33 – 0.80)

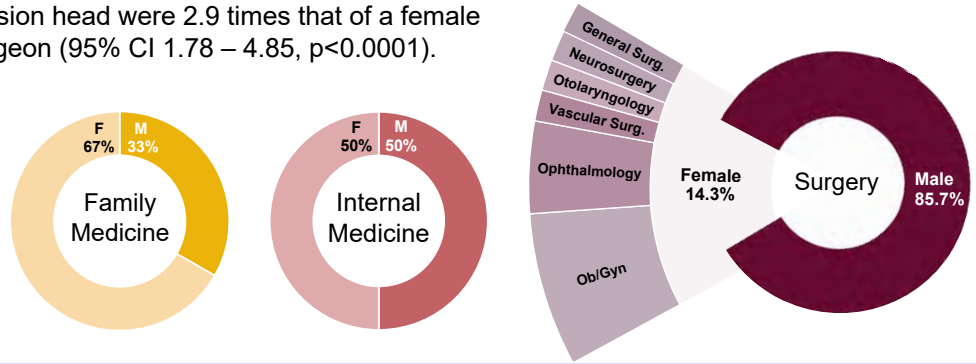
B.



	% Female 1990	% Female 2020	Slope	Projected Parity
Ob/Gyn	16	64.1	1.59	*2012*
General Surgery	4.2	30.3	0.88	2043
Plastic Surgery	7.7	28.9	0.71	2053
Otolaryngology	4.8	24.4	0.64	2062
Ophthalmology	11.6	27.3	0.48	2070
Urology	1.7	12.8	0.37	2123
Neurosurgery	3.1	13	0.36	2125
Orthopedics	2.6	13.6	0.36	2124
Cardiac Surgery	6.9	12.6	0.18	2237

(**C**) Heads of departments of family medicine (67% female) and internal medicine (50% female) were aligned with the proportion of female practicing physicians, whereas the odds of a male surgeon being division head were 2.9 times that of a female surgeon (95% CI 1.78 – 4.85, p<0.0001).

C.



Conclusions

While the past three decades have seen a shift in the pool of medical trainees to majority female, the rise in female representation within surgical fields and in positions of leadership has remained slow, underscoring the need to identify and address barriers to surgical interest and career progression that may disproportionately affect female students.

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SEX OR GENDER REPORTING IN OPHTHALMOLOGY CLINICAL TRIALS AMONG US FDA APPROVALS, 1995-2022

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Introduction

- Sex (biological characteristic, related terms include male, female, intersex) and gender (aspect of identity, related terms include man, woman, and genderfluid) are increasingly recognized as important determinants of disease epidemiology and health outcomes[1]
- Several national and international efforts (e.g. NIH Revitalization Act, SAGER guidelines) have been made to promote the inclusion of sex and gender minority (SGM) groups in research[1]
- As critical determinants of scientific rigor, reproducibility, and equity, sex and gender should be appropriately considered in clinical trial design and reporting

Objective

To evaluate the accuracy of sex and gender reporting and extent of sex- and gender-based analyses in ophthalmology clinical trials associated with US Food and Drug Administration (FDA) drug approvals between January 1, 1995 and December 31, 2022

Methods

- In this cross-sectional study, the following trial documents were reviewed by pairs of independent reviewers in decreasing order of priority: peer-reviewed publication, ClinicalTrials.gov report, and FDA medical and statistical reviews
- Data on study characteristics, sex and gender reporting and analysis, and journal characteristics were extracted in duplicate
- The main outcome measures were the proportion of trials that:
  - Correctly applied sex and gender terminology (defined as non-interchangeable use of 'sex,' 'gender,' sex-related terms, and gender-related terms)
  - Reported the method of assessing participant sex or gender
  - Conducted sex- or gender-based analyses
- Chi-square test and Wilcox rank sum test were used to examine whether publication year, including time periods before and after revisions to the NIH Revitalization Act and introduction of the SAGER guidelines (i.e. 2001, 2016, and 2017), ophthalmic subspecialty, number of study sites, trial phase, sample size, affiliation with a peer-reviewed publication, journal publication model, and journal influence metrics differed between studies that applied sex and gender terminology incorrectly vs. correctly

Results

Table 1. Characteristics of 85 studies corresponding to 34 FDA drug approvals

Characteristic	No. of studies (%)	
	All studies (n = 85)	Studies with peer-reviewed publications (n = 32)
Data source		
Peer-reviewed publication	32 (37.6)	NA
ClinicalTrials.gov	6 (7.1)	NA
FDA medical review and FDA statistical review	47 (55.3)	NA
No. of studies per drug, median (IQR)	3.0 (1.8-3.0)	2.0 (1.0-2.8)
Condition that the drug treats		
Allergic conjunctivitis	25 (29.4)	4 (12.5)
Bacterial conjunctivitis	1 (1.2)	1 (3.1)
CMV retinitis	7 (8.2)	0
Dry eye disease	4 (4.7)	4 (12.5)
Exudative AMD	12 (14.1)	9 (28.1)
Glabellar lines	2 (2.4)	0
Neurotrophic keratitis	3 (3.5)	2 (6.3)
Ocular hypertension/glaucoma	20 (23.5)	3 (9.4)
Postoperative inflammation	4 (4.7)	2 (6.3)
Thyroid eye disease	2 (2.4)	2 (6.3)
Uveal melanoma	1 (1.2)	1 (3.1)
Vitreomacular adhesion and traction	4 (4.7)	4 (12.5)
Ophthalmic subspecialty		
Comprehensive/cataract	2 (2.4)	0
Cornea and external disease	33 (38.8)	11 (34.4)
Glaucoma	20 (23.5)	3 (9.4)
Ocular oncology	1 (1.2)	1 (3.1)
Ophthalmic plastic surgery	4 (4.7)	2 (6.3)
Retina	23 (27.1)	13 (40.6)
No specific subspecialty	2 (2.4)	2 (6.3)
Year of publication		
2017-2022	18 (21.2)	10 (31.3)
2011-2016	15 (17.6)	12 (37.5)
2005-2010	14 (16.5)	8 (25.0)
1999-2004	19 (22.4)	2 (6.3)
≤1998	19 (22.4)	0
Country of origin		
US	69 (81.2)	27 (84.4)
Italy	3 (3.5)	2 (6.3)
Belgium	2 (2.4)	1 (3.1)
Canada	2 (2.4)	0
Austria	1 (1.2)	1 (3.1)
France	1 (1.2)	1 (3.1)
India	1 (1.2)	0
Netherlands	1 (1.2)	0
Spain	1 (1.2)	0
No corresponding author	4 (4.7)	0
RCT phase		
1	1 (1.2)	1 (3.1)
2	8 (9.4)	3 (9.4)
3	72 (84.7)	28 (87.5)
Not reported	4 (4.7)	0
No. of study sites		
Single-center	13 (15.3)	3 (9.4)
Multicenter	72 (84.7)	29 (90.6)
Sample size, median (IQR)	330.0 (120.0-596.0)	431.5 (177.3-712.3)
Power calculation		
Sufficient sample size	30 (35.3)	20 (62.5)
Insufficient sample size	13 (15.3)	6 (18.8)
Calculation not conducted	42 (49.4)	6 (18.8)
Journal publication model		
Subscription	NA	6 (18.8)
Open-access	NA	2 (6.3)
Hybrid	NA	24 (75.0)

34 drugs corresponding to 85 RCTs were included, of which 32 RCTs had a peer-reviewed publication. **Only 19.5% trials** applied sex and gender terminology correctly. No study reported the method of sex and gender data collection nor enrolled persons from SGM groups.

Table 2. Quality of sex or gender reporting among 85 included studies

Characteristic	No. of studies (%)	
	All studies (n = 85)	Studies with peer-reviewed publications (n = 32)
Terms used		
Sex	53 (62.4)	19 (59.4)
Gender	54 (63.5)	14 (43.8)
Both sex and gender	28 (32.9)	5 (15.6)
Sex-related terms[a]	80 (94.1)	28 (87.5)
Gender-related terms[b]	35 (41.2)	17 (53.1)
Both sex- and gender-related terms	33 (38.8)	15 (46.9)
Sex-nonbinary or gender-expansive terms	0	0
Only sex, gender, 1 sex-related term, or 1 gender-related term was used	1 (1.2)[c]	0
No sex and gender terminology used	3 (3.5)	2 (6.3)
How terms were used		
Correct use of sex and gender terminology[d]	16 (19.5)	9 (30.0)
Incorrect use of sex and gender terminology[d]	66 (80.5)	21 (70.0)
Sex and gender terminology used interchangeably[d]	48 (58.5)	15 (50.0)
Sex-related terms used incorrectly to refer to gender[d]	17 (20.7)	5 (16.7)
Gender-related terms used incorrectly to refer to sex[d]	1 (1.2)	1 (3.3)
Disaggregation of data by sex or gender		
Demographics (total only)	23 (27.1)	10 (31.3)
Demographics (each group)	59 (69.4)	20 (62.5)
Dropout	1 (1.2)	0
Primary outcome	5 (5.9)	0
Secondary outcome	0	0
Adverse events	5 (5.9)	0
Both primary outcome and adverse events	2 (2.4)	0
Data not disaggregated but sex- or gender-specific analysis was performed		
Primary outcome	20 (23.5)	2 (6.3)
Secondary outcome	2 (2.4)	1 (3.1)
Adverse events	3 (3.5)	0
Both primary outcome and adverse events	3 (3.5)	0
Discussion of sex and gender		
Defined sex or gender	0	0
Explained why sex or gender was chosen	0	0
Reported how sex or gender data were collected	0	0
Discussed findings of sex- or gender-based disaggregation and/or analysis for primary outcome	0	0
Discussed findings of sex- or gender-based disaggregation and/or analysis for at least one secondary outcome	0	0
Discussed findings of sex- or gender-based disaggregation and/or analysis for adverse events	2 (2.4)	0
Discussed sex- or gender-related implications for external validity	3 (3.5)	1 (3.1)
Discussed how sex and gender may interact with other sociodemographic factors to impact outcomes	0	0

Results

- Few studies disaggregated data by, performed analysis specific to, or discussed implications of sex and gender
- Studies with incorrect application of sex and gender terminology were more likely than those with correct application to have **later** publication years (2008.5 vs. 2001.0, $P<.001$), **lower** number of study sites (21.5 vs. 22.0, $P<0.001$), **larger** sample size (349.5 vs. 298.0, $P<.001$), and **higher** journal influence metrics ($P<.001$ for all)
- The following features were not correlated with incorrect terminology use: association with a peer-reviewed publication (vs. no association), more than one study site (vs. one study site), a trial phase of III (vs. trial phase I/II), sufficient sample size (vs. insufficient or uncalculated sample size), specific ophthalmic subspecialties, and publication before the year 2001 (vs. after), 2016 (vs. after), and 2017 (vs. after)

Discussion

- This study aligns with extensive evidence that sex and gender are poorly reported and analyzed in several medical disciplines[2-6]
- More rigorous integration of sex and gender appears warranted for FDA and presumably other ophthalmology trials to improve their validity, reproducibility, and equity
- Several strategies may help to improve reporting and analysis of sex and gender:[2-6]
  - In parallel with health, funding, regulatory, and government agencies, scholarly journals should mandate comprehensive incorporation of sex and gender in all stages of research
  - In participant-facing research, sex- and gender-sensitive practices should be implemented to create an inclusive environment
  - Research teams and leadership in academic institutions/organizations should include individuals from sex, gender, racial, and ethnic minority populations
  - In cases where expedited access to vision-saving therapy is required, the extent and implications of underrepresentation should be reported, data should be disaggregated, and sex- and gender-based postmarket surveillance strategies should be implemented

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The reporting of racial and ethnic data in Canadian ophthalmology literature

COS 2024

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INTRODUCTION

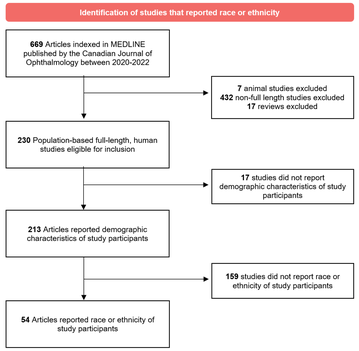
Health disparities are evident in the Canadian healthcare system, including ophthalmology and vision care. Vision loss and blindness affect approximately 1.2 million Canadians. Inequities in ocular health have been identified by several studies, and arise from the social determinants of health (SDOH), such as race and ethnicity.

OBJECTIVE

Our study aimed to determine the frequency of sociodemographic information reporting in contemporary Canadian ophthalmology literature, and when race or ethnicity was reported, what the quality and extent of reporting was. These findings may help identify disparities experienced by equity-deserving groups perpetuated through research exclusion, promote more equitable and inclusive research practices in ophthalmology, and provide insight into study generalizability and ways to improve sociodemographic reporting.

METHODS

- All full-length primary studies involving human participants published in the *Canadian Journal of Ophthalmology (CJO)* from January 2020 to December 2022 were included.
- All studies were screened by two independent reviewers.



- The well-established PROGRESS-Plus framework, which summarizes factors that stratify opportunities for health, was used.
- The quality of racial and/or ethnic reporting was assessed using the ICMJE Uniform Requirements for Manuscripts.

RESULTS

Overall, 669 studies were screened. A total of 432 non-full-length studies, 17 reviews, and 7 animal studies were excluded. An additional 17 studies did not report sociodemographic characteristics of study participants. Of the 213 eligible studies, most were conducted in Canada (93/213, 43.7%) or the United States (52/213, 24.4%).

Sociodemographic characteristics reported in eligible studies included age (97.18%), sex or gender (88.26%), comorbidities (25.35%), level of education (5.16%), socioeconomic status (2.82%), and occupation (1.14%). Of the 213 included studies, 54 (25.35%) reported racial or ethnic data. Studies conducted in Canada were 1.84 times less likely than studies conducted outside Canada to report race or ethnicity (p=0.018), but 13 times more likely to report level of education (p<0.001).

Table 1. Population sociodemographic characteristics reported in Canada compared to other countries.

Sociodemographic characteristic*	No. of studies (%)			p value
	Canada [n = 93]	Other Countries [n = 120]	Total [n = 213]	
Place of residence	6 (6.65)	2 (1.67)	8 (3.76)	0.082
Race and/or ethnicity	16 (17.20)	38 (31.67)	54 (25.35)	**0.018**
Occupation	3 (3.23)	0 (0)	3 (1.41)	0.082
Gender and/or sex	84 (90.32)	104 (86.67)	188 (88.26)	0.521
Religion	0 (0)	0 (0)	0 (0)	-
Education	10 (10.75)	1 (0.83)	11 (5.16)	**<0.001**
Socioeconomic status	5 (5.38)	1 (0.83)	6 (2.82)	0.088
Social capital	3 (3.23)	1 (0.83)	4 (1.88)	0.32
Age	88 (94.62)	119 (99.17)	207 (97.18)	0.088
Comorbidities	25 (26.88)	29 (24.17)	54 (25.35)	0.751

Bold values represent statistical significance. *Sociodemographic characteristics evaluated are based on the PROGRESS-Plus framework, which summarizes equity-relevant factors that stratify opportunities for health.

When stratified by year, no significant increases in the proportion of racial or ethnic reporting was observed between 2020 to 2022 (23.26% to 22.52%, p=0.789).

Table 2. Population sociodemographic characteristics reported in included studies stratified by year.

Sociodemographic characteristic*	No. of studies (%)			p value
	2020 [n = 4]	2021 [n = 36]	2022 [n = 151]	
Place of residence	0 (0.00)	0 (0.00)	8 (5.30)	0.053
Race and/or ethnicity	10 (23.26)	10 (27.78)	34 (22.52)	0.789
Occupation	0 (0.00)	0 (0.00)	3 (1.99)	0.241
Gender and/or sex	32 (74.42)	27 (75.00)	129 (85.43)	0.059
Religion	0 (0.00)	0 (0.00)	0 (0.00)	-
Education	0 (0.00)	1 (2.78)	10 (6.62)	0.058
Socioeconomic status	0 (0.00)	0 (0.00)	6 (3.97)	0.095
Social capital	0 (0.00)	0 (0.00)	4 (2.65)	0.175
Age	40 (93.02)	32 (88.89)	135 (89.40)	0.540
Comorbidities	4 (9.30)	2 (5.56)	48 (31.79)	**<0.001**

Bold values represent statistical significance. *Sociodemographic characteristics evaluated are based on the PROGRESS-Plus framework, which summarizes equity-relevant factors that stratify opportunities for health.

Table 3. Quality of reporting of racial and/or ethnic demographic data.

Characteristic	No. of studies (%), [n = 54]
How race and/or ethnicity was determined	
Self-reported	6 (11.11)
Parent/Caregiver report	0 (0.00)
National registration identity	1 (1.85)
Personal or parent birth country	0 (0.00)
Unspecified	47 (87.04)
How race and/or ethnicity was classified	
Race	18 (33.33)
Ethnicity	17 (31.48)
Race/Ethnicity	9 (16.67)
Both race and ethnicity	4 (7.41)
Immigration	1 (1.85)
Nationality	1 (1.85)
Visible minority	1 (1.85)
Not classified	3 (5.56)
Quality of reporting*	
The authors reported why the racial and/or ethnic classification in the study was used	3 (5.56)
The authors reported why race or ethnicity were assessed in the study	13 (24.07)
The authors indicated whether the classification options were defined by the investigator or participant	3 (5.56)
The authors defined the variable race	1 (1.85)

*Based on the International Committee of Medical Journal Editors (ICMJE) Uniform Requirements for Manuscripts.

Few studies provided information on how racial or ethnic data was collected (12.96%), why the racial or ethnic classification reported in the study was used (5.56%), why race or ethnicity were assessed in the study (24.07%), whether the classification options used were defined by the investigator or the participant (5.56%), defined the variable race (1.85%), or specified that race or ethnicity was self-reported (11.1%). No study met all ICMJE requirements for the reporting of racial or ethnic data.

Table 4. Quality and extent of reporting of Indigenous participants.

Characteristic*	No. of studies (%)
Did the study report Indigenous participants? [n=54]	
Yes	10 (18.52)
No	44 (81.48)
How were Indigenous participants classified [n=10]	
Indigenous	1 (10.00)
Aboriginal	3 (30.00)
Inuit, Metis, or First Nations	2 (20.00)
American Indian or Alaska Native	2 (20.00)
Maori	1 (10.00)
Native American	1 (10.00)
How were Indigenous participants in Canada classified [n=6]	
Indigenous	1 (10.00)
Aboriginal	3 (30.00)
Inuit, Metis, First Nations	2 (20.00)
Engagement with Indigenous partners or participants [n=10]	
Establishing Key Partnership (e.g., working with local partners, ensuring representation)	0 (0.00)
Know your partners (respect for history, culture, governance structure, acknowledgement of colonialism impact on health)	0 (0.00)
Engage early and often (open and honest communication at all stages of work)	0 (0.00)
Be transparent (communicate purpose for collecting indigenous identity data, risks/benefits, shared decision-making)	0 (0.00)
Indigenous engagement was NOT conducted or not mentioned	10 (100.00)

*Based on the Canadian Institute for Health Information (CIHI) Guidance on the Use of Standards for Race-Based and Indigenous Identity Data Collection and Health Reporting in Canada.

Some studies reported Indigenous participants (18.52%), and no studies reported engagement with indigenous partners or participants in any capacity throughout the research process.

CONCLUSION

The degree of sociodemographic reporting in Canadian studies published in the Canadian Journal of Ophthalmology is low, including the reporting of participant rural or urban residence, socioeconomic status, and race or ethnicity. In particular, the reporting of racial and ethnic data is inconsistent, limited, and non-adherent to reporting guidelines. Few studies involved Indigenous participants, none of which engaged with these participants at any stage of the research process. Increased reporting of sociodemographic data is needed to better understand and address disparities in the ocular health of Canadians. A comprehensive literature or scoping review on social determinants of eye health in Canada may also provide insight into relevant sociodemographic factors in a Canadian context, and inform future research and policy priorities.

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Scan QR for references

Glaucoma | Glaucome

COS 2024

A Critical Masquerade: Ciliary Body Choroidal Melanoma Presenting as Angle Closure Glaucoma

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INTRODUCTION

Uveal melanoma (UM) originates from the choroid, ciliary body, or iris and is the most common primary intraocular malignant tumor in adults[1].

On average, 52% of the UM eventually results in metastasis by 35 years[2], while ciliary body and choroid involvement leads to poorer prognosis with approximately 80% metastasis in 10 years[3,4].

UM presenting as acute-angle-closure glaucoma is a very rare and easily missed diagnosis.

Here, we present a very unusual case of secondary angle closure that is a critical diagnosis not to miss.

CASE SUMMARY

A 74-year-old male presented to a community emergency department (ED) with acute-angle-close glaucoma, after topic treatment in ED he was referred urgently to a comprehensive ophthalmologist who confirmed angle closure. The patient underwent urgent Nd:YAG iridotomy in the left eye (OS).

After this did not alleviate his symptoms, the eventual discovery of a posterior segment mass was noted, and the patient was promptly referred to the Ocular Oncology Service. He presented with blurry vision and increased intraocular pressure (IOP) in OS and was treated with acetazolamide and topical prednisolone and brimonidine/timolol eye drops to manage his IOP. Clinical exam and multimodal imaging demonstrated an almost 360-degree choroidal mass involving the ciliary body with an inferior exudative choroidal and retinal detachment (Fig 1). He was diagnosed with T4b UM. He was treated with primary enucleation and metastatic workup was negative at the time of treatment, no orbital extension was noted at the time of surgery and the sclera was intact.

Nine months later, he developed locoregional melanoma recurrence in the medial aspect of the left eye socket (Fig 2). Further imaging confirmed metastasis to liver (Fig 3), bone, left lymph nodes, lung, and bowel/serosa confirmed by PET-CT (Figure 4) and biopsy. His metastatic melanoma was initially managed with first line tebentafusp and switched to second line nivolumab plus ipilimumab due to greater than expected progression on tebentafusp.

RESULTS

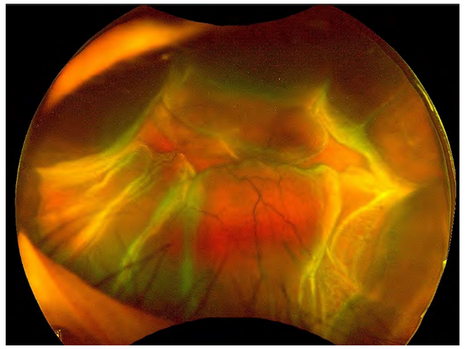

Fig. 1. Fundus image of patient's left eye. Choroidal mass encircling close to 360-degrees and exudative retinal and choroidal detachment.

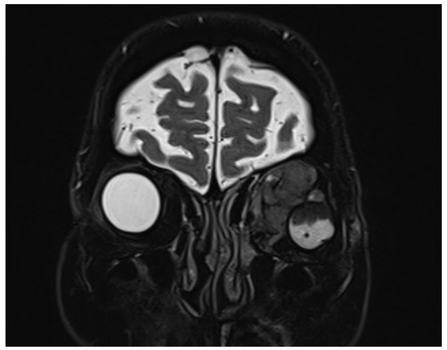

Fig. 2. MRI with contrast 9 months post enucleation demonstrating a multi-lobar left orbital mass causing displacement of the implant.

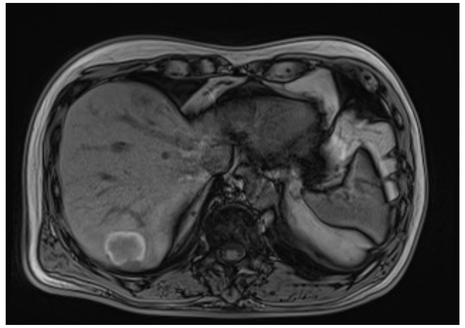

Fig. 3. Post-enucleation liver MRI with contrast demonstrating a large hyperintense lesion as well as some focal hypointense lesions – prompting further investigations and staging

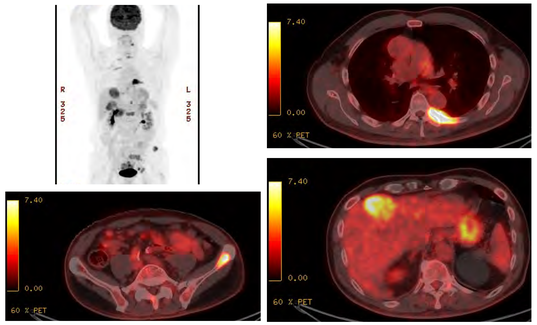

Fig. 4. Positron emission tomography (PET) of the patient 9 month after enucleation. PET-scan showed recurrent metastatic melanoma spreading to liver, bone, LNs and serosa

DISCUSSION

UM presenting as acute-angle-closure glaucoma is very rare and easily missed diagnosis despite it is a highly fatal condition[5]. Some common contributing factors for missed diagnosis including shallow anterior chamber and narrow angle, mass or pigmentation present since childhood, or family history of glaucoma[5].

There are various mechanisms by which the tumours might obstruct the aqueous outflow. The most common mechanism is the anterior displacement of the lens-iris diaphragm due to the mass effect of the posterior tumour. Other tumour related mechanisms include iris bombe, peripheral anterior synechiae, and neovascularization[5].

Treatment of the primary tumour is of the highest importance to resolve the glaucoma. Episcleral plaque radiotherapy (PRT) is the most common globe-conserving therapy for UM[6] and is delivered through suturing the radioisotopes-containing curvilinear plaque onto the sclera and removing it after 2-7 days. PRT is most suitable for small and medium UM, and a large lesion (diameter > 15mm and thickness > 10mm) typically does not receive sufficient dose[6]. In comparison, enucleation is often indicated in large tumours with orbital or optic nerve involvement[6].

The UM with ciliary body and choroid involvement has the highest risk of metastasis and often requires systemic treatment. The first line therapy is tebentafusp, a type of immune-mobilizing monoclonal T-cell receptor, that redirect T-cells to the tumour cells with 73% overall survival rate in 1 year[2]. In case tebentafusp fails, a combined therapy of immune checkpoint inhibitors nivolumab and ipilimumab could be considered with 52-56% overall survival rate in 1 year[2].

CONCLUSION

- This case highlights the clinical features of high-risk UM involving the ciliary body and choroid with an atypical presentation of angle-closure glaucoma with no prior visual symptoms.
- Physicians should be cautious with patients presented with unilateral angle-closure glaucoma refractory to medications and consider the diagnosis of an occult UM to avoid delayed intervention and undesired outcome for patients.

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CONTACT INFORMATION

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A Retrospective Study: Five-Year Outcomes after Ahmed or Baerveldt Valve Implantation in a Tertiary-Care Center

COS 2024

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INTRODUCTION

The Ahmed Baerveldt Comparison study and the Ahmed versus Baerveldt study yielded important results in randomized controlled trials. Glaucoma reoperation rates varied between 18 to 21% in the Ahmed cohort compared to 9 to 11% in the Baerveldt cohort. Rates of corneal edema and corneal grafts varied between 7 to 8% in the Ahmed cohort versus 4 to 26% in the Baerveldt cohort.[1,2]

AIM

To compare glaucoma reoperation rates and the risk of corneal decompensation requiring corneal graft in Ahmed and Baerveldt valve implants in a tertiary-care center.

METHOD

Retrospective cohort study

- Inclusion: Patients operated with at least one glaucoma drainage device at the CHU de Québec – Université Laval between 2000 and 2021.
- Exclusion: Less than 6 months of follow-up.

Primary outcome: Glaucoma reoperation rates at follow-up (i.e., new glaucoma drainage device, trabeculectomy, implant revision, cyclophotocoagulation) or incidence of corneal decompensation leading to corneal graft.

Secondary outcomes: IOP below 21 mmHg, >20% IOP reduction from baseline, topical IOP-lowering medication use, and oral medication use (e.g., acetazolamide or methazolamide).

RESULTS

- This study included **275 eyes** that completed the **five-year follow-up**, of the 914 initially included eyes
- Patients were mostly diagnosed with open angle glaucoma (48%), followed by uveitic glaucoma (12%)
- Median age [Q1, Q3] at first implantation was 66 [55, 73] years
- 51.3% of patients were men
- Mean baseline IOP was 25 [19, 32] mmHg in Ahmed patients and 19 [16, 25] mmHg in Baerveldt patients (p<0.001)
- Patients were on 3 [2, 4] different topical medications

Primary Outcomes

1. 43 Ahmed eyes (42%) and 69 Baerveldt eyes (40%) required a **glaucoma reoperation** (p=0.71)
2. In the Ahmed group, 19 eyes (19%) required a **corneal graft** compared to 39 eyes in the Baerveldt group (23%) (p=0.44).
3. In both cohorts combined, **35% of eyes** that underwent **implantation of more than one valve in the same eye suffered corneal decompensation requiring a graft** compared to 18% with only one valve (p=0.017).

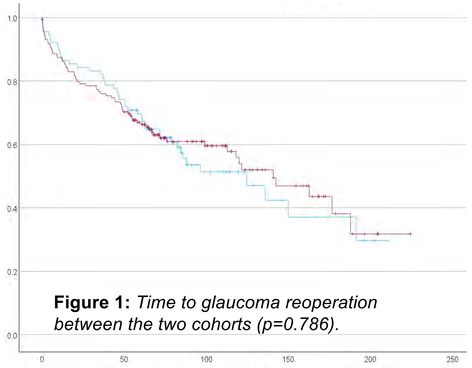

Figure 1: *Time to glaucoma reoperation between the two cohorts (p=0.786).*

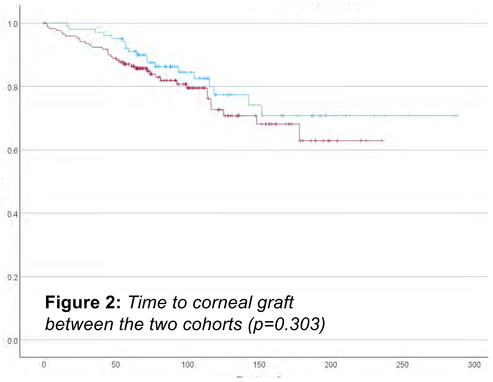

Figure 2: *Time to corneal graft between the two cohorts (p=0.303)*

- In both cohorts combined, median time to glaucoma reoperation was 38 months [10, 64] and median time to corneal graft was 56 months [32, 93].
- Between the two cohorts, as shown in figures 1 and 2, the time did not differ significantly.

Secondary Outcomes

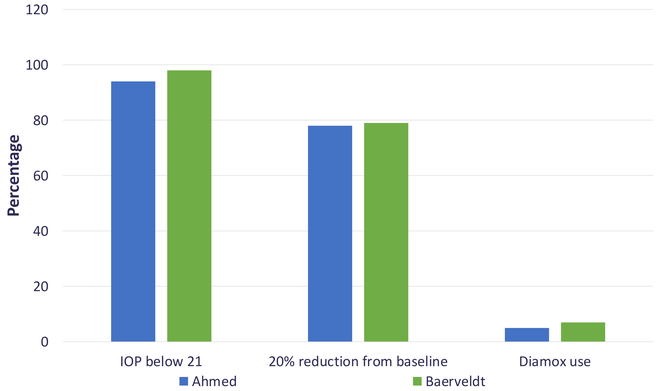

Figure 3: *Percentage of patients with IOP below 21 mmHg (p=0.06), > 20% reduction from baseline (p=0.81) and Diamox use (p=0.50) in the two cohorts at 12 months follow-up.*

- Patients were on 2 [1, 3] topical medications at five-years follow-up.
- Median IOP was 12 [9, 14] in the Ahmed, compared to 11 [8, 14] mmHg in the Baerveldt group (p=0.179)

CONCLUSION

Reoperation rates and corneal decompensation rates requiring graft were similar in the Ahmed and Baerveldt groups at five-years follow-up. In both cohorts combined, the rate of corneal decompensation requiring a graft was more elevated in eyes with more than one valve implant. Both valves reached similar success outcomes. However, the Baerveldt implant was associated with a higher rate of decrease in IOP below 21mmHg.

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None

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Assessing the Medical Reasoning Skills of GPT-4 in Complex Ophthalmology Cases

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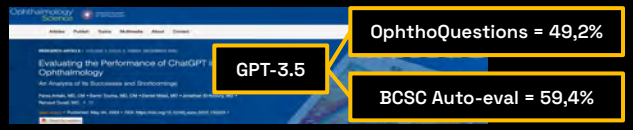
GPT //

GPT-4, a state-of-the-art LLM, demonstrates remarkable performance on ophthalmology exam questions

Large Language Model (LLM) : type of AI that generates text, trained on large amounts of unlabeled data

Our team published the first project exploring the performance of LLMs in ophthalmology questions (150 citations)



In this study, we explored GPT-4's medical reasoning capacities in complex ophthalmology cases from JAMA Ophthalmology's Clinical Challenges

Methods //

422 Challenges → Classified by OKAP section (13) → GPT-4

- Title
- Case
- Figure description

Human evaluation
- 3 attendings + 3 residents
- 5 challenges per section
- 47 challenges total

Diagnosis? (Open-ended)

Next Step? (MCQ)

GPT-4 · Attendings · Residents

GPT-4 Prompt Engineering

Zero-Shot Prompting	Zero-Shot Plan-and-Solve+ Prompting
You are an expert in ophthalmology. I will present you with the title and text of a clinical challenge case without the figures. I will then ask you "What would you do next?" along with 4 options. Pick the best option and explain your reasoning, then propose a potential diagnosis.	You are an expert in ophthalmology. I will present you with the title and text of a clinical challenge case without the figures. I will then ask you "What would you do next?" along with 4 options. Let's first prepare relevant information and make a plan to determine the diagnosis. Then, let's carry out the plan, explain your reasoning step by step (pay attention to commonsense and logical coherence) and state a definitive diagnosis. After, let's answer the question step by step (pay attention to commonsense and logical coherence).

Results //

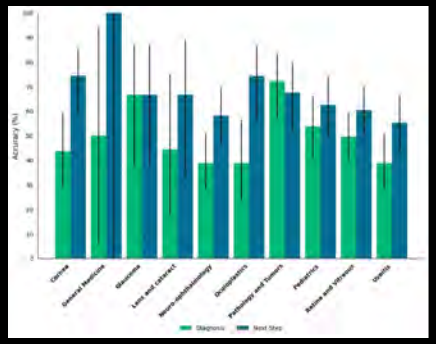
GPT-4-ZS PS+ >> GPT-4-ZS

ZS PS+ prompting outperformed traditional ZS prompting in diagnostic accuracy (p = 0.006), but did not show a statistically significant difference in accuracy for determining the next step (p = 0.18)

Prompting Strategy	Diagnostic Accuracy	Next Step Accuracy
Traditional Zero-Shot	41.5% [36.9 %, 46.2 %]	60.4 % [55.7 %, 65.0 %]
Zero-Shot PS+	47.9% [43.2 %, 52.7 %]	63.0 % [58.3 %, 67.5 %]

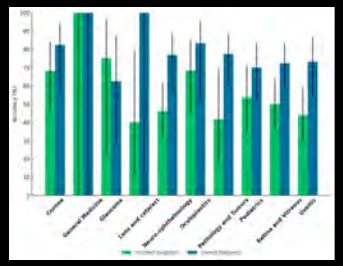
GPT-4 ZS PS+ Accuracy by Subspecialty

Using ZS PS+ prompting, GPT-4 achieved mean accuracies of 48.0% and 63.0% in diagnosis and next step, respectively



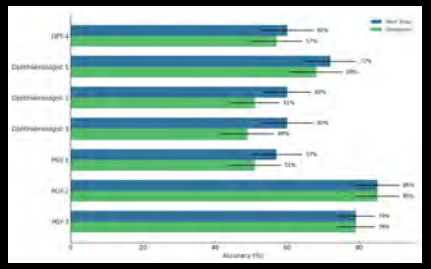
Accuracy of GPT-4 next step predictions based on correctness of initial diagnosis

The next step prediction was 3x more likely to be accurate when the initial diagnosis was correct (p<0.001)



GPT-4 vs Humans

No significant differences were found in diagnostic accuracy and decision-making between attendings and GPT-4. Senior residents outperformed GPT-4 in diagnosis (p = <0.001 and 0.049) and next step (p = 0.002 and 0.020)



Does GPT-4 rival ophthalmologists?

?

Performance ≠ clinical competency
Non-specialized LLM
Future of LLMs = multimodality

Michael G. DeGroote SCHOOL OF MEDICINE

Ophthalmology & Vision Sciences UNIVERSITY OF TORONTO

ASSOCIATION BETWEEN SOCIODEMOGRAPHIC FACTORS AND GLAUCOMA IN THE NATIONAL HEALTH INTERVIEW SURVEY

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Introduction

- Glaucoma is a common disease that places substantial psychosocial burden on patients and healthcare systems.[1,2] Thus, it is important to identify risk factors for glaucoma development and progression
- In glaucoma, the impacts of social determinants of health (SDH) on disease prevalence,[3,4] late presentation,[5-7] and healthcare utilization[6,8] have been investigated
- However, SDH-related factors beyond age, race, socioeconomic status, health literacy, and educational attainment have received relatively little attention

Objective

To leverage the 2017 National Health Interview Survey (NHIS) and evaluate associations between SDH-related factors and the prevalence of glaucoma diagnosis as well as glaucomatous vision loss

Methods

- In the 2017 NHIS, which was the most recent NHIS iteration to ask glaucoma-related questions, participants were asked if they had, "ever been told by a doctor or other health professional that [they] had glaucoma?" Participants who responded "yes" to this question were also asked if they had, "lost any vision because of glaucoma?"
  - The primary outcome was self-reported glaucoma diagnosis
  - The secondary outcome was self-reported glaucomatous vision loss
- Several independent variables across the five SDH domains were investigated (see Table); the associations between these variables and each glaucoma outcome were analyzed using univariable and multivariable logistic regression
- Unadjusted and and adjusted odds ratios (ORs) were considered statistically significant if the point estimate indicated at least a 25% change (OR≥1.25 or OR≤0.80) in relative odds compared with the reference category and were associated with a P value that was less than or equal to 0.01
- Participants were excluded from analysis if they were <18 years old or were missing one or more outcomes or exposures of interest
- Variation inflation factors (VIF) were examined to assess multicollinearity between SDH-related factors. As per convention, VIF ≤5 was considered acceptable

Results

Table. Logistic regression analysis of glaucoma diagnosis

	Univariable Analysis				Multivariable Analysis			
Category	Unadjusted Odds Ratio	99% CI		*P*-value	Adjusted Odds Ratio	99% CI		*P*-value
AGE[1] (years)								
18-25	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
26-35	1.34	0.29	6.31	0.62	1.35	0.28	6.54	0.63
36-49	**4.17**	**1.24**	**14.07**	**0.003**	**4.56**	**1.30**	**15.99**	**0.002**
50-64	**11.57**	**3.61**	**37.07**	**<0.001**	**9.29**	**2.75**	**31.36**	**<0.001**
65-84	**37.14**	**11.61**	**118.80**	**<0.001**	**24.64**	**7.06**	**86.05**	**<0.001**
85+	**73.97**	**22.69**	**241.12**	**<0.001**	**44.10**	**12.11**	**160.52**	**<0.001**
SEX[2]								
Male	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Female	**1.28**	**1.02**	**1.60**	**0.005**	1.11	0.87	1.42	0.25
SEXUAL ORIENTATION[3]								
Heterosexual	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Gay, lesbian, bisexual, or other	0.64	0.27	1.54	0.192	1.13	0.46	2.79	0.73
RACE[4]								
Non-Hispanic White	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Hispanic	**0.60**	**0.42**	**0.86**	**<0.001**	1.07	0.65	1.75	0.73
Non-Hispanic Black	**1.35**	**1.01**	**1.80**	**0.007**	**1.87**	**1.37**	**2.55**	**<0.001**
Non-Hispanic Asian	0.74	0.42	1.31	0.17	1.13	0.60	2.13	0.61
Non-Hispanic other	1.08	0.41	2.83	0.84	1.59	0.54	4.70	0.27
MARITAL STATUS[5]								
Married or cohabitating	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Single, never married	**0.38**	**0.27**	**0.54**	**<0.001**	0.83	0.55	1.26	0.26
Divorced, separated, or widowed	**2.25**	**1.82**	**2.78**	**<0.001**	0.97	0.77	1.22	0.74
PARENTAL STATUS[6]								
Parent to a minor	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Not a parent to a minor	**4.00**	**2.75**	**5.82**	**<0.001**	1.46	0.92	2.31	0.04
U.S. CITIZENSHIP[7]								
Yes	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
No	**0.38**	**0.18**	**0.80**	**0.001**	0.77	0.31	1.89	0.45
EDUCATION[8]								
College or more advanced degree	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Some college	1.16	0.85	1.58	0.23	1.14	0.83	1.58	0.28
High school graduate or general education diploma	1.25	0.96	1.62	0.03	0.94	0.69	1.27	0.59
Less than a high school degree	**1.58**	**1.16**	**2.15**	**<0.001**	0.92	0.62	1.36	0.58
REGION[9]								
Northeast	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Midwest	1.09	0.78	1.54	0.49	1.14	0.81	1.60	0.34
South	0.97	0.70	1.35	0.81	0.89	0.63	1.24	0.36
West	0.86	0.58	1.28	0.33	0.89	0.60	1.34	0.47
INCOME[10]								
≥5x poverty threshold	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
3-5x poverty threshold	1.18	0.85	1.63	0.20	1.04	0.74	1.46	0.78
1-3x poverty threshold	**1.49**	**1.14**	**1.96**	**<0.001**	1.15	0.83	1.58	0.26
<1x poverty threshold	1.35	0.93	1.94	0.04	1.27	0.80	2.02	0.18
DELAYED MEDICAL CARE DUE TO COST[11]								
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	0.98	0.67	1.43	0.88	1.26	0.81	1.96	0.18
EMPLOYMENT STATUS[12]								
Currently or recently employed	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Not recently employed	**4.52**	**3.60**	**5.67**	**<0.001**	1.27	0.95	1.70	0.04
HEALTH STATUS[13]								
Good	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Fair	**2.42**	**1.81**	**3.24**	**<0.001**	1.26	0.89	1.77	0.08
Poor	**3.51**	**2.38**	**5.19**	**<0.001**	**1.54**	**1.00**	**2.37**	**0.01**
INSURANCE STATUS[14]								
Private	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Public	**3.09**	**2.48**	**3.86**	**<0.001**	1.27	0.98	1.66	0.02
Other coverage	**2.49**	**1.62**	**3.83**	**<0.001**	1.31	0.82	2.09	0.13
Uninsured	**0.43**	**0.20**	**0.92**	**0.004**	0.76	0.33	1.75	0.39
USUAL PLACE FOR HEALTHCARE[15]								
Yes	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
No	**0.41**	**0.25**	**0.68**	**<0.001**	1.11	0.67	1.85	0.60

95% CI = 95% confidence interval. All odds ratios and 95% confidence intervals are presented relative to the reference (Ref) group. Statistically significant results are bolded. Sample sizes for univariable analysis: [1]n=26,696; [2]n=26,696; [3]n=25,723; [4]n=26,696; [5]n=26,644; [6]n=26,696; [7]n=26,649; [8]n=26,607; [9]n=26,696; [10]n=26,696; [11]n=26,687; [12]n=26,658; [13]n=26,688; [14]n=26,602; [15]n=26,514. Sample size for multivariable analysis: n=25,456.

Results

- Of 26,742 NHIS respondents, 26,696 (99.8%) indicated whether they had ever been given a glaucoma diagnosis; 880 (3.3%) indicated yes. Mean age was 60.0 ± 18.6 and the majority were female (54.8%)
- In age-adjusted multivariable regression (n=25,456), non-Hispanic Black race (OR=1.87, 99% CI=[1.37, 2.55], *P*<0.001, compared to non-Hispanic White race) and poor health status (OR=1.54, 99% CI=[1.00, 2.37], *P*=0.01, compared to good health status) were significant predictors of glaucoma diagnosis
- For glaucomatous vision loss, having an income below the poverty threshold (OR=2.41, 99% CI=[1.12, 5.20], *P*=0.003, compared to income ≥5 times the poverty threshold) was the only significant predictor in univariable analyses
- No SDH-related factors were significantly associated with glaucomatous vision loss in multivariable analysis (n=848)
- Multicollinearity was minimal, with variation inflation factor<1.6 for all independent variables

Discussion

- This cross-sectional analysis of the 2017 NHIS found that increasing age, non-Hispanic Black race, and poor health status were significantly associated with self-reported glaucoma diagnosis. No SDH-related factor was predictive of glaucomatous vision loss
- Study limitations included the inability to infer causality, self-reported nature of outcomes, inability to adjust for clinical and health behaviour confounders, small number of patients with glaucomatous vision loss, and overall poor representation of Hispanic ethnicity and Hispanic Asian race compared to U.S. Census population estimates
- Further investigation into the impact of SDH-related factors on glaucoma and of underlying mechanisms is warranted
- Increased physician awareness and targeted public health interventions will help promote holistic glaucoma care and reduce inequities in ocular health

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Association Of Pre-residency Publications With Research Productivity In Residency, Fellowship, And Academic Career Choice Among Canadian Ophthalmologists

COS 2024

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INTRODUCTION

- Research productivity during medical school may predict academic potential in residency and later.[1]
- Pre-residency research output is associated with pursuing an academic career in several specialities but remains unexplored in the Canadian Ophthalmology landscape.[2]

AIM

This study aims to assess whether the research output of **medical students** who matched into a Canadian Ophthalmology residency program influences their subsequent **research productivity** during residency, decision to pursue a fellowship, or engagement in academic practice.

METHODS

Retrospective database study in May 2023

↓

Residents from all 15 Canadian Ophthalmology residency programs between 2004 and 2015

↓

Resident names, dates of training, residency program, gender, fellowship, practice setting

↓

Publication count, type of publication, and H-index extracted from Scopus

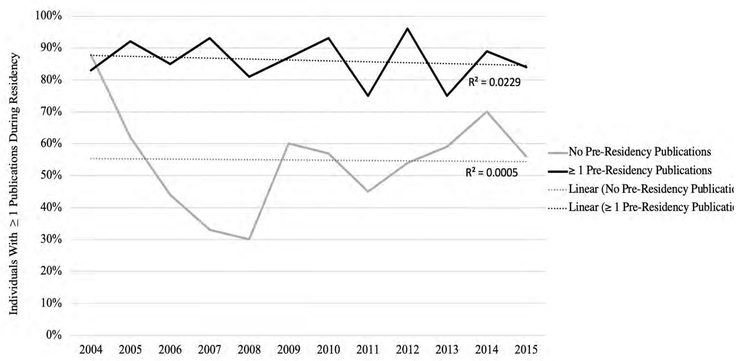
↓

Descriptive statistics, Fischer's exact test, Welch's test (or Mann-Whitney U test), regression models (binary logistics regression, negative binomial model)

RESULTS

- 369 first year ophthalmology residents from all 15 Canadian ophthalmology residency programs
  - Ontario: 132 trainees
  - West Canada: 81 trainees
  - East Canada: 156 trainees
  - Cohort 2004 – 2009: 157 trainees
  - Cohort 2010 – 2015: 212 trainees
- 187 trainees with pre-residency publications had significantly higher research productivity during residency compared to 182 without pre-residency publications, with a mean of 5.17 ± 5.97 vs. 1.60 ± 2.38 ($p < 0.001$) publications on any topic
- Significant positive correlation between research publications before and during residency ($r(367) = 0.50$, $p < 001$)
- Of those with pre-residency articles, 87% (162/187) published ≥1 article during residency, whereas only 54% (98/182, $p < 0.001$) of those without pre-residency articles did so

Figure 1. Comparison of Canadian ophthalmologists with ≥1 publication(s) during residency, separated according to pre-residency publication status (0 versus ≥1) and according to cohort year.

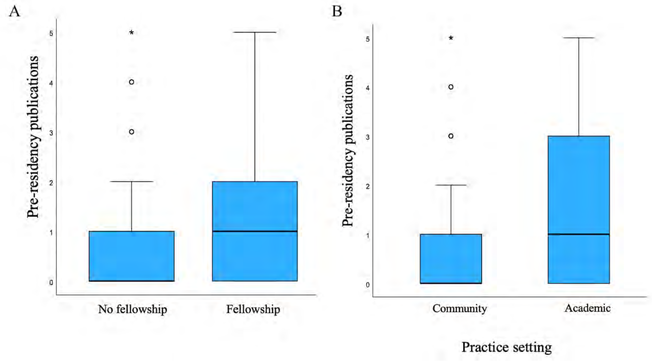


Characteristic	Residency Publication Count	
	RR, (95% CI)	p-value
Sex (female)	0.61, 0.46 – 0.80	0.23
Pre-residency publication count	**1.17, 1.09 – 1.27**	**<0.001**
Pre-residency H-index	0.99, 0.87 – 1.12	0.86
Match Year		
2004 – 2009	reference	
2010 – 2015	**1.57, 1.22 – 2.01**	**<0.001**
Residency Program		
West Canada	0.85, 0.61 – 1.17	0.23
East Canada	**0.55, 0.42 – 0.73**	**<0.001**
Ontario	reference	

There was a positive association between pre-residency research output and research output during residency.

Research productivity was increased in cohort 2010 – 2015 compared to 2004 – 2009 and was lower in Eastern Canada compared to Ontario.

Figure 2. Pre-residency publication productivity comparisons between residents based on (A) fellowship status, and (B) practice setting.



	Odds Ratio, 95% CI	
Predictors	Fellowship	Academic Practice
Sex (female)	1.03, 0.67 – 1.61	0.97, 0.61 – 1.54
≥ 1 pre-residency publication	**2.9, 1.74 – 4.83****	**1.85, 1.07 – 3.20***
Pre-residency H-index	1.03, 0.88 – 1.21	**1.25, 1.04 – 1.51***
Match Year		
2004 – 2009	reference	
2010 – 2015	**0.55, 0.35 – 0.85***	**0.36, 0.23 – 0.57****
Residency Program		
West Canada	0.82, 0.46 – 1.55	1.03, 0.56 – 1.89
East Canada	0.71, 0.43 – 1.19	0.81, 0.48 – 1.40
Ontario	reference	reference

** denotes to significance of $p < 0.001$, * denotes significance of $p < 0.05$
CI = confidence interval

CONCLUSIONS

Pre-residency research output is a significant predictor of research productivity during residency and subsequent career choices, suggesting that pre-residency publishing reflects a propensity towards an academic trajectory.

Residents who published 1 or more articles before entering residency were almost 3 times more likely to pursue fellowship training.

Residents who published 1 or more articles before entering residency were almost twice as likely to practice in an academic setting.

Resident publication count moderates this association, underscoring the role of the residency program environment in fostering research productivity. Addressing barriers like mentorship, funding, and curriculum may be key to incentivizing trainees to pursue academic medicine.

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Analysis of Retracted Articles in Ophthalmology

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BACKGROUND

- Retracted articles: correct the literature and alert readers to articles containing seriously flawed or erroneous content or data that their findings and conclusions cannot be relied upon
- Although retractions are uncommon, with around five retractions per 10 000 articles published, numerous papers have highlighted an increasing rate of retractions over time
- It has been shown that retracted papers continue to be cited without reference to the retraction

OBJECTIVES AND METHODS

- Objectives: to identify and characterize retracted articles within the field of ophthalmology between 1966 and 2023
- Study design: bibliometric analysis
- Search strategy: carried out on the PubMed database, using the following terms: "Retracted Publication" [Publication Type] AND journal article [Publication Type] AND "eye diseases" [MH] AND 1966:2023 [DP]
- One hundred and fifty-one articles were retrieved
- Reasons for retraction were assessed by consulting retraction notices on the publisher's website and were categorized using Retraction Watch Database (RWDB) classification
- The number of citations of the articles was retrieved using the Web of Science (WoS) database
- SPSS Statistics Version 26 was used to conduct statistical analysis. Descriptive statistics were mainly used. Statistical significance was set at a value of $p<0.05$.

RESULTS

Figure 1: Lifespan of 151 Retracted Articles in the Field of Ophthalmology.

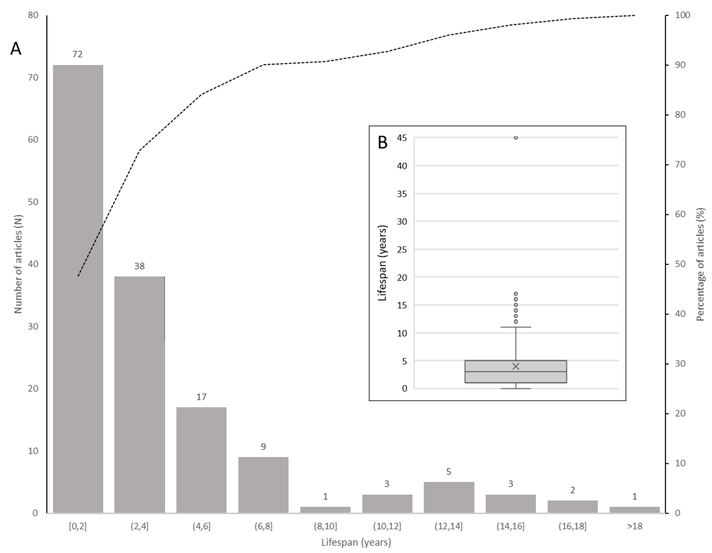

Table 1: Subspecialties Covered in 151 Retracted Articles in the Field of Ophthalmology.

Ophthalmic Subspecialty	Number of Articles Retracted, N (%)
Ocular Oncology	37 (24.5)
Posterior Segment	37 (24.5)
Ocular Surface	17 (11.3)
Anterior Segment	16 (10.6)
Pediatrics	12 (7.9)
Oculoplastics	9 (6.0)
Neuro-ophthalmology	8 (5.3)
Ocular inflammation/immunology	8 (5.3)
Refractive	4 (2.6)
Other	3 (2.0)

Table 2: Frequencies of Reasons of Retraction.

Reason of Retraction	Frequency of retraction reason, N (%)
Plagiarism/duplication	67 (38.7)
Error/unreliable results	47 (27.2)
Falsification/manipulation	17 (9.8)
Ethical issues	15 (8.7)
Authorship issues	14 (8.1)
N/A – Others	13 (7.5)
Sum of reasons of retraction	173 (100.0)

Figure 2: Number of Authors with Retracted Articles per Country.

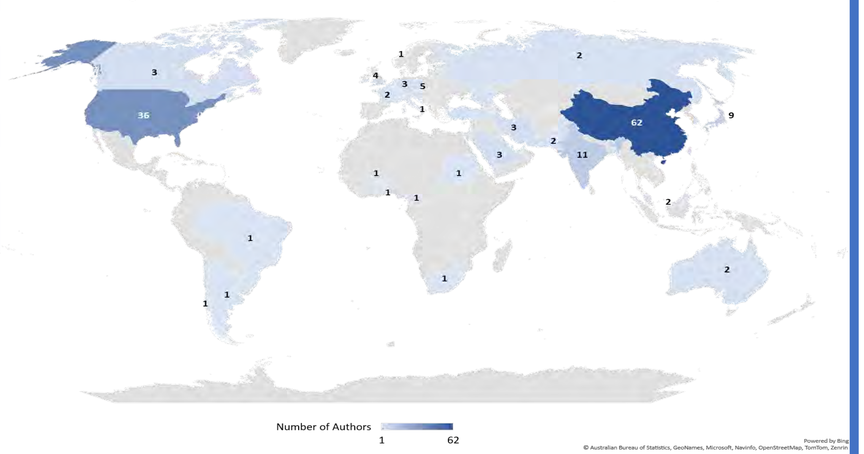

Table 3: Citations per Article Over Time.

Citations per article (N)	Median	Q1	Q3
Before retraction	4.0	1.0	16.0
Post-retraction*	1.0	0.0	5.0
Total	12.0	4.8	26.3

CONCLUSIONS

- 72 (47.7%) of articles were retracted within 2 years of publication, suggesting issues were identified relatively soon after dissemination.
- Main reason for retraction was plagiarism/duplication (38.7%), followed by error/unreliable results (27.2%). A subset of articles displayed multiple reasons for retraction, highlighting complex scenarios that led to their withdrawal.
- Retracted articles persist in being cited, contrary to expectations. However, there is a noteworthy reduction in the number of citations following retraction.

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DISCLOSURES

- I have NOT had a financial affiliation or otherwise with a commercial organization that may have a direct or indirect connection to the content of this presentation.
- I will NOT discuss off-label use and/or investigational use of drugs or devices.

The Concentration-Dependent Structural Effects of Pilocarpine on the Anterior Segment of the Eye: A Randomized Controlled Trial

COS 2024

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INTRODUCTION

Pilocarpine is commonly used for pre-treatment in patients undergoing laser procedures, including selective laser trabeculoplasty ("SLT") and laser peripheral iridotomy ("LPI") for glaucoma.

Pilocarpine has been shown to cause a number of structural changes in the anterior segment including a decrease in anterior chamber depth ("ACD") and either an increase or decrease in anterior chamber angle ("ACA"), depending on the value at baseline.

There appears to be no evidence describing a concentration-dependent relationship of Pilocarpine's effects. Furthermore, very few studies have demonstrated Pilocarpine's effects using anterior segment optical coherence tomography (AS-OCT), and to our knowledge, none using the CASIA SS-1000 OCT ("CASIA").

AIM

In order to address the effects of pilocarpine induced changes in anterior segment, we conducted a direct comparative study to measure the dose dependent relationship of pilocarpine on pupillary constriction (miosis) and ACD (accommodative spasm) in a glaucoma practice patient population. A priori determination of the concentration and duration dependent changes induced by pilocarpine in the anterior chamber by AS-OCT can in turn, help optimize the usage of pilocarpine in pre-laser treatment.

METHOD

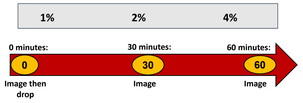
In this single blinded randomized control trial, 110 patients undergoing SLT or LPI were enrolled.

The participants were divided into three subgroups, each pretreated with either a drop of 1% (group 1), 2% (group 2), or 4% (group 3) to the eye undergoing treatment prior to the laser procedure. Eligible patients were equally randomized to one of the three groups with a website-generated randomization schedule

Exclusion criteria included a history of ocular trauma, intraocular surgery, or previous laser treatment.

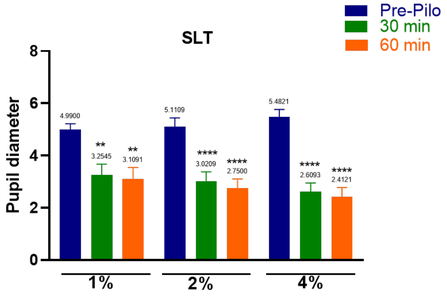
After an initial baseline ASOCT scan, a drop of pilocarpine was instilled into the study eye, concentration per randomization. The images were scanned in 2D mode using the autoalignment function. The same imaging protocol was repeated at 30 and 60 minutes after pilocarpine administration. The image quality was assessed during the acquisition by the operator. Only the images from the horizontal alignment were used for the analysis. Scleral spur landmark was manually identified by two different researchers in the CASIA image analysis software.

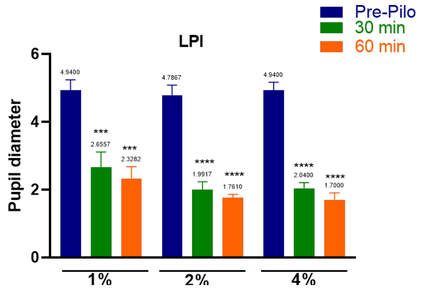
All parameters in each subgroup were compared to baseline as well as to the other subgroups in order to identify concentration-dependent relationships as well as predictability of structural changes based on baseline measurements.



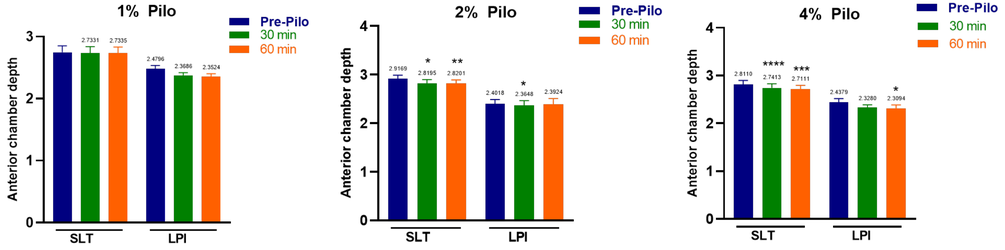
RESULTS

Pupil Diameter Following Pilocarpine Administration

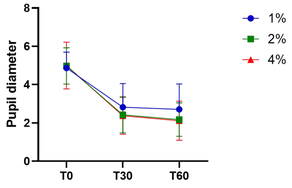


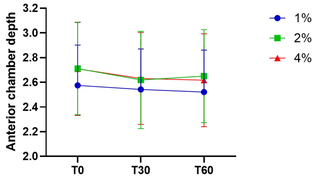


Anterior chamber depth following pilocarpine administration



Anterior chamber depth over time following pilocarpine administration





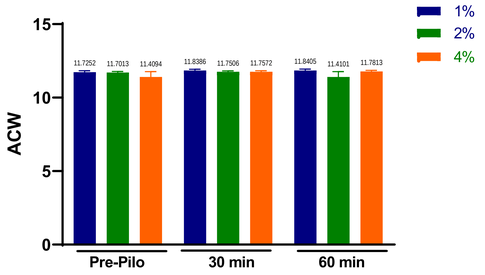
Group (PD)	P-value
1%- Pre- vs 30 min	****
2%- Pre- vs 30 min	****
4%- Pre- vs 30 min	****

Group (PD)	P-value
1%- 30 min vs 60 min	**
2%- 30 min vs 60 min	****
4%- 30 min vs 60 min	****

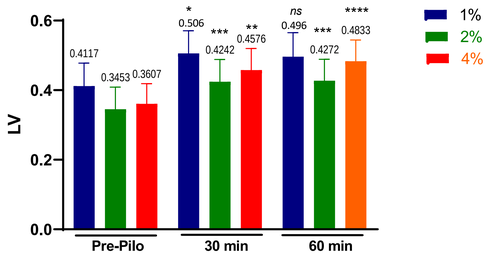
Group (ACD)	P-value
1%- Pre- vs 30 min	ns
2%- Pre- vs 30 min	***
4%- Pre- vs 30 min	****

Group (ACD)	P-value
1%- 30 min vs 60 min	ns
2%- 30 min vs 60 min	ns
4%- 30 min vs 60 min	ns

Anterior chamber width following pilocarpine administration



Lens Volt following pilocarpine administration



CONCLUSION

- In this study, we have identified: a. the duration of maximum effect of pilocarpine, b. a concentration dependent relationship to differentiate the beneficial effects of Pilocarpine from the potentially detrimental effects of Pilocarpine. We have demonstrated that pilocarpine induced decrease in pupillary diameter is consistent at both 30 and 60 min and across different concentrations of pilocarpine. Whereas the effect on ACD is maximum only at 30 min. The pupillary changes were equally significant in 1% compared to 4% and ACD changes were less significant in 1%. The decrease in ACD is less significant in eyes undergoing LPI compared to SLT.

- Our results suggest that **pupillary constriction** ("beneficial") is achieved at **1%,** the **AC shallowing** effect ("detrimental") **jumps significantly at 2%**
- **1% appears to maximize constriction while limiting AC shallowing**
  - The data suggest 1% as optimal concentration as pre-treatment for laser procedures
  - While pupillary diameter continues to change at 60 min. (groups 2&3) , the maximum change in anterior chamber depth (ACD) was at 30 min.
  - No statistically significant changes in ACW, LV or AOD

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Patient participants

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Effect of 10.0 Nylon Ripcord on Outflow Facility of the PreserFlo® MicroShunt

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COS 2024

Ophthalmology & Vision Sciences UNIVERSITY OF TORONTO

INTRODUCTION

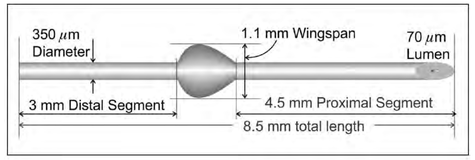
The PreserFlo® MicroShunt gained Health Canada approval in 2021 and is currently approved for the treatment of primary open angle glaucoma in patients on maximally tolerated medical therapy. Despite a more desirable safety profile then traditional bleb forming glaucoma interventions, hypotony remains a common complication.[1,2] Inserting a 10-0 Nylon ripcord suture into the Microshunt has been hypothesised to increase outflow resistance, therefore reducing the risk of postoperative hypotony.

AIM

To measure the effect of a 10.0 nylon ripcord on the in-vitro outflow facility of the PreserFlo® MicroShunt.

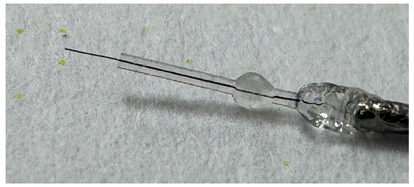
METHODS

The PreserFlo® MicroShunt was inserted into a 26G cannula and sealed with cyanoacrylate gel glue. The cannula was then attached to IV tubing and attached to a fluid reservoir at fixed perfusion heights equivalent to 10 and 20 mmHg, perfusing ~1000 ul for multiple timed runs. The perfusion time and volume were then measured to determine outflow facility. A 10.0 nylon suture (Ethilon® CS160-6) was then inserted into the MicroShunt spanning the full length (8mm) (Picture 1) of the Microshunt. The tests were then repeated with the suture inserted at half the length (4 mm) of the Microshunt and the outflow facility was again measured at 14 cmH_2O (10 mmHg) and 28 cmH_2O (20 mmHg) perfusion pressures.(Figure1, Picture 2)



RESULTS

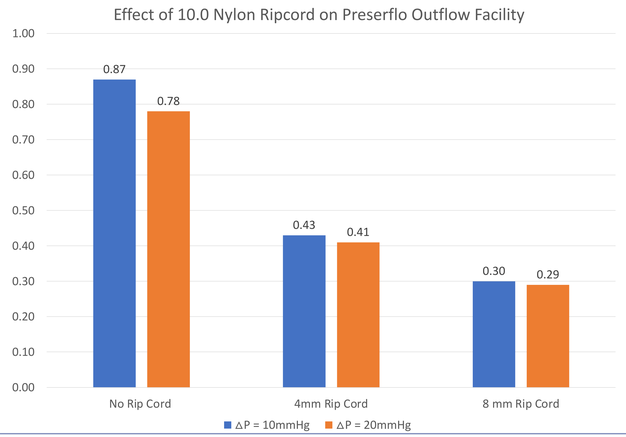
The outflow facility of the MicroShunt without a ripcord was 0.87 ± 0.03 ul/min/mmHg at 10 mmHg and 0.78 ± 0.12 ul/min/mmHg at 20 mmHg perfusion pressure. With the 10.0 nylon ripcord in place at 8mm, the outflow facility was significantly reduced to 0.30 ± 0.03 ul/min/mmHg ($p<0.001$) at 10 mmHg and 0.29 ± 0.02 ul/min/mmHg ($p<0.001$) at 20 mmHg perfusion pressure. With the ripcord at 4mm the outflow facility was measured at 0.43 ul/min/mmHg($p<0.001$) at 10mmhg and 0.41 ul/min/mmHg($p<0.001$) at 20mmhg. There was no significant difference in outflow facility between 10 and 20 mmHg perfusion pressure ($p=0.51$).



Picture 1

Fluidics Comparison of MIBS Devices

	Xen 45	Xen 63	Preserflo
Internal Diameter	45 um	63 um	70 um
Length	6 mm	6 mm	8.5 mm
Outflow facility	~ 0.33 ul/min/mmHg	~ 1.24 ul/min/mmHg	~ 1.32 ul/min/mmHg
IOP drop within tube (assuming 2 ul/min outflow)	~ 6 - 7 mmHg	~ 1.6 mmHg	~ 1.5 mmHg



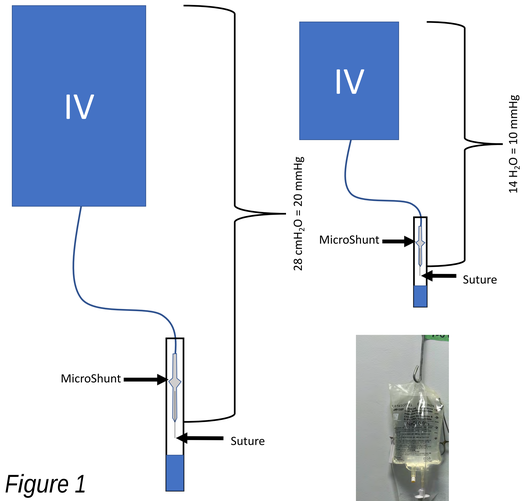


Figure 1

Picture 2

CONCLUSION

The PreserFlo® Microshunt is an incisional glaucoma procedure developed with the intent of providing substantial IOP-lowering efficacy while reducing many of the adverse events and postoperative management requirements associated with trabeculectomy and tube shunt implantation. The introduction of a 10.0 nylon riprcord can reduce the outflow facility by a factor of ~3.0. As the designed outflow facility of the MicroShunt will produce ~1.5-2.0 mmHg of pressure drop along the device at human physiologic aqueous flowrates of ~2.4 ul/min, the placement of a removable 10.0 nylon ripcord during surgery could raise the pressure drop along the device to ~4.5-6.0 mmHg. This procedural modification could mitigate the risk of early hypotony, the most commonly observed adverse event associated with the MicroShunt.[1,2]

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Kahook Dual Blade Goniotomy Versus Trabecular Micro-Bypass Stent (iStent inject): Surgical Outcomes in Combination with Phacoemulsification

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No financial interest declared by all authors

COS 2024

UNIVERSITÉ DE SHERBROOKE

INTRODUCTION

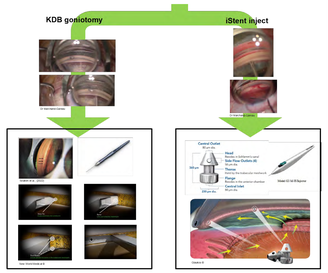
MIGS procedures constitute a group of surgical interventions with a high safety profile, low risk of serious complications such as hypotony, choroidal effusions, or choroidal hemorrhages. They allow for enhancement of physiological outflow mechanisms with minimal disruption of normal anatomy. The level of IOP reduction is often inferior to traditional filtering surgery but should be at least 20%. Alternatively, patients who do not experience an IOP decrease should attain the reduction of at least one medication.

AIM

To compare the efficacy and safety of Kahook Blade Dual (KDB) goniotomy and trabecular micro-bypass stent (iStent inject) for microinvasive glaucoma surgery (MIGS) with cataract extraction.

METHOD

- Study design:
  - Retrospective, single-center, observational, longitudinal case series
  - Phaco-KDB group: n=34. Phaco-iStent group: n=142
  - Retrospective data collection (chart review) of patients who have undergone either:
    - KDB + cataract extraction, or
    - iStent inject + cataract extraction
- Our inclusion criteria are:
  - Patient having undergone either iStent inject or KDB at *Hôtel-Dieu de Sherbrooke* hospital
  - Clinical diagnosis of glaucoma defined as characteristic glaucomatous changes to the optic nerve head (glaucomatous disc features, e.g. optic disc excavation or notch, thinning of neuroretinal rim, peripapillary atrophy, loss of nerve fibre layer, splinter disc hemorrhage) with or without visual field defect.
  - Age > 18 years old
- Our exclusion criteria are:
  - Complicated phacoemulsification surgery (vitreous loss, vitrectomy, IOL implantation outside of the lens capsule)
  - Ocular comorbidities limiting potential postoperative visual gains (optic atrophy, neovascular age-related macular degeneration).
  - Inability to visualize nasal trabecular meshwork
  - Elevated episcleral venous pressure and acute or chronic ocular inflammation



RESULTS

Figure 1: Success Rate in Achieving 20% IOP Reduction and IOP ≤ 19mmHg after MIGS Combined with Cataract Extraction

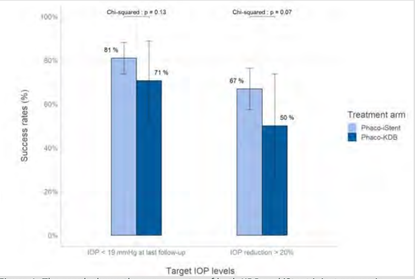


Figure 1: The graph shows the success rates of both KDB and iStent inject groups in achieving a 20% reduction in IOP and IOP <19 mmHg at last follow-up . The graph shows that 67% in the iStent inject group and 50% in the KDB group achieved a 20% reduction in IOP with a p-value of 0.07. Also, 81% in the iStent inject group and 71% in the KDB group, achieved <19 mmHg at last follow-up was with a p-value of 0.13.

Figure 2: Comparison of Average Intraocular Pressure Reduction between KDB and iStent Inject groups at Different Time Points

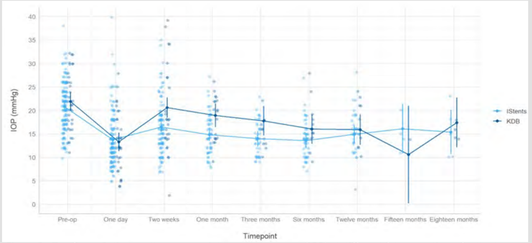


Figure 2 : The figure 2 displays the average intraocular pressure (IOP) at different follow-up times for the two groups: KDB and iStent inject. Both groups had a significant reduction in IOP following the surgery at any follow-up time.
Although the iStent inject group appeared to have lower IOP measurements at all time points (except at the 15 months period), the difference between the two groups was not statistically significant at any point.
The increase in intraocular pressure (IOP) observed at 2 weeks (more in the KDB group than in the iStent group) may be attributed to a steroid response.

Figure 3: Comparison of Average Intraocular Pressure Reduction between Kahook Dual Blade Goniotomy and iStent Inject groups

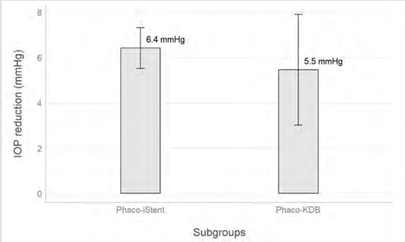


Figure 3: The figure 3 shows the comparison between the KDB and iStent inject groups in terms of the mean IOP reduction at the last follow-up.
The mean IOP reduction for the iStent inject group was 6.3 mmHg and for the KDB group was 5.9 mmHg, and there was no statistically significant difference between the two groups (p=0.47). Both groups achieved a significant reduction in IOP from baseline at the last follow-up visit

Figure 4: Comparison of Pre-op and Last Follow-up Number of Medications in KDB and iStent Inject Groups after MIGS Combined with Cataract Extraction

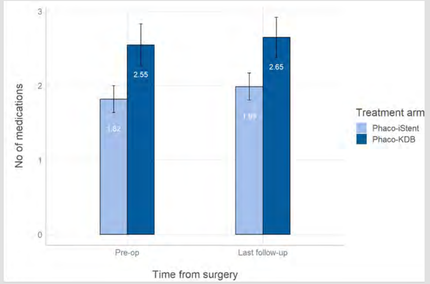
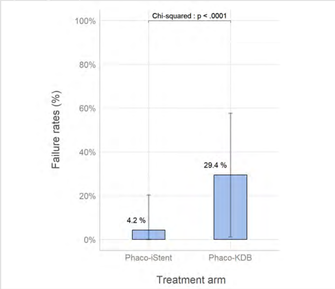


Figure 4: The figure 4 shows the number of medications required by patients in the KDB and iStent inject groups pre-op and at the last follow-up. The number of medications did not decrease in both groups from pre-op to the last follow-up. The KDB group had a higher number of medications at both pre-operative and last follow-up time points. This difference may be attributed to the fact that the KDB group had more severe glaucoma compared to the iStent inject group, as the severity of the disease can affect the number of medications required.

Figure 5: Comparison of post-operative failure rate between Kahook Dual Blade Goniotomy and iStent Inject groups



Secondary outcomes:
Figure 5 displays the post-operative failure rates of Kahook Dual Blade Goniotomy compared to iStent Inject groups
The proportion of failure cases was 4,2% in the iStent Inject group and 29,4% in the KDB group (p=<.0001). Therefore, KDB demonstrated a statistically significant higher failure rate than iStent in our study.

Figure 6: Comparison of type and rate of post-operative adverse events between Phaco-iStent and Phaco-KDB

Post-op adverse events	iStent Inject	Kahook Dual-Blade	P-value
Rebound uveitis	8/142 (5,6%)	2 (5,9%)	
Microhyphema/ Hyphema	3/142 (2,1%)	10 (29,4%)	
Ocular Hypertension	13/142 (9,2%)	7 (20,56%)	
CME	-	2 (5,9%)	
ERM	-	1 (2,9%)	
Suprachoroidal cleft	-	1 (2,9%)	
Cyclodialysis cleft	-	1 (2,9%)	
Hypotony	-	1 (2,9%)	
Complication rates	22/142 (15,5%)	16/34 (47,1%)	

Secondary outcomes
- *Figure 6 displays the comparison of type and rate of post-operative adverse events between Phaco-iStent and Phaco-KDB groups.*
- *The KDB group experienced more adverse events (47,1%) than the iStent group (15,5%).*
- *The most common complications in the iStent group were rebound uveitis (5,6%) and ocular hypertension (9,2%%).*
- *The most common complications in the KDB group were microhyphema/hyphema (29,4%) and ocular hypertension (20,6%)*
- *KDB group experienced additional complications such as CME, ERM, suprachoroidal cleft, cyclodialysis cleft and hypotony.*

DISCUSSION

Comparing our study and the previous study (Barkander et al., 2023):

- Both studies found KDB and iStent Inject achieve clinically significant IOP lowering with no significant difference between the two groups.
- Previous study reported significant reduction in glaucoma meds, especially in the KDB group; our study found no difference.
- Previous study showed KDB slightly better in achieving 20% IOP reduction, our study showed iStent Inject slightly better, but no statistically significant difference found in either study.
- Differences in results between studies could be attributed to surgeon experience and comfort with the procedures, as well as patient populations. (Previous study: KDB procedure was performed more frequently than iStent Inject procedure. Our study: iStent Inject procedure was performed more frequently than KDB procedure)
- Both studies suggest KDB and iStent Inject are safe and effective microinvasive glaucoma surgery procedures when combined with cataract extraction. However, reversible adverse events were reported in our study and were significantly more frequent in the Phaco-KDB group (p<.0001).
- Failure rate was higher in Phaco-KDB (29,3%) than Phaco-iStent (4,23%) (p<.0001), while previous study reported a higher failure rate in Phaco-iStent group. Our KDB group had higher mean glaucoma medication numbers initially and less patients with phakic lenses compared to our iStent Inject group suggesting more severe cases of glaucoma in the KDB group.

CONCLUSION

- Phaco-KDB and Phaco-iStent inject both showed clinically significant IOP-lowering effect when combined with phacoemulsification. Phaco-KDB and Phaco-iStent inject showed similar magnitude of IOP reduction
- However, Phaco-KDB showed higher failure rates and higher reversible adverse events rate than Phaco-iStent procedure, which could be attributed to more severe glaucoma cases in the KDB group.
- Mean follow-up duration was 18 months for both groups. Long-term data collection ongoing to better assess safety and efficacy, aiming for a mean follow-up duration of 2 years
- Larger prospective and multicentered studies with longer follow-up times needed to:
  - assess safety, efficacy, and cost-effectiveness of different MIGS options
  - confirm findings and provide more robust evidence
  - help choose the right MIGS for the right patient

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Efficacy and Security of the Preserflo® Microshunt as Second-line Surgical Treatment in Patients with Refractory Glaucoma

COS 2024

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INTRODUCTION

- Glaucoma is a major cause of vision loss worldwide and is a challenging disease to treat since many patients develop **refractory glaucoma** during the course of their disease.
- There is no established consensus as to which **surgical option** should be prioritized in patients with refractory glaucoma after a prior glaucoma surgery.
- Approved by Health Canada in 2021, **Preserflo® microshunt** is a glaucoma drainage device that can be implanted as a minimally invasive glaucoma surgery by creating a subconjunctival filtrating bleb.
- Few studies analyze the role of Preserflo® as a **second-line surgical option** in patients with refractory glaucoma.

AIM

- Evaluate the **efficacy** and **security** of the Preserflo® microshunt as a second-line surgical treatment for patients who had a prior glaucoma surgery with **conjunctival involvement**.

METHOD

- **Retrospective study** at CHU de Québec-Université Laval and CIUSSS Saguenay-Lac-Saint-Jean
- **6 months** follow-up study
- Preserflo® microshunt implantation at our centers between **November 2021 and March 2023** were reviewed.

Preserflo® implanted
n= **157**

Included
n = **52**

Excluded
-First-line n= **90**
-Third-line n= **6**
-Post GATT n= **4**
-No follow-up n= **2**
-Fourth-line n= **1**

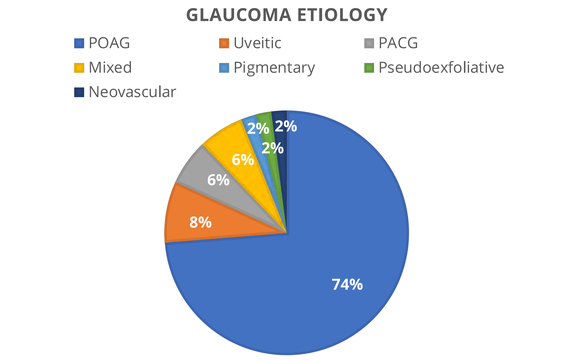
- All patients who had undergone **one prior failed** glaucoma surgery with **conjunctival involvement** (Trabeculectomy, Xen® implant, Ahmed valve and Baerveldt valve) on the same eye by the time of implantation were **included**.
- We analyzed pre-, intra- and post-operative data and complications

RESULTS

- **52** eyes of **49** patients were included in the study

Table 1. Baseline characteristics of patients

Characteristic	Total n (%) or mean ± SD (n = 52)
Age, years	67 ± 12
Female sex	30 (58%)
Affected eye (left)	23 (42%)
Baseline visual acuity, logMAR	0.26 ± 0.35
Pachymetry, µm	537 ± 51
Lens status	
Aphakic	0 (0%)
Phakic	17 (33%)
Pseudophakic	35 (67%)
Time after first surgery, months	78 ± 99



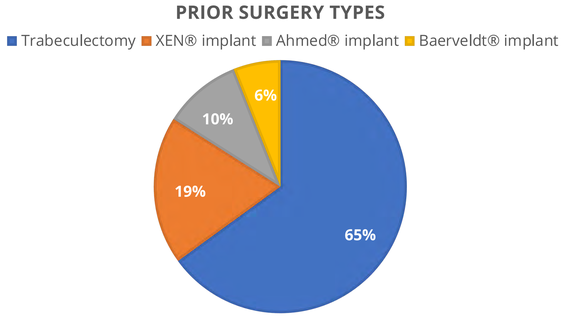


Table 2. Mean Intraocular pressure (IOP) during follow-ups

Time	IOP (mmHg) ± SD
Baseline	21.1 ± 7.5
1 week	7.3 ± 5.6
1 month	10.8 ± 7.3
3 months	11.6 ± 5.0
6 months	12.0 ± 3.4

Table 3. Mean number of medications during follow-ups

Time	Medications, n ± SD
Baseline	3.2 ± 0.8
1 month	0.23 ± 0.79
3 months	0.28 ± 0.78
6 months	0.7 ± 1.3

Table 2. Surgical success at 6 months of follow-up

Characteristic	Total, n (%)
Qualified success at 6 months	40 (77%)
Complete success at 6 months	25 (48%)

Table 4. Complications associated with Preserflo® microshunt implantation

Complications	Total (n = 52) n (%)
Transient hypotonia	9 (17%)
Severe hypotonia with loss of anterior chamber	2 (4%)
Hyphema	4 (8%)

CONCLUSION

- Our study shows that the Preserflo® microshunt is an **efficient** and **safe** option for patients with refractory glaucoma who need a second surgery after prior failure.

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No conflict of interest to declare

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Exploring Attitudes And Perceptions Of Medical Students And Ophthalmologists Regarding The Role Of Artificial Intelligence In Ophthalmology

COS 2024

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INTRODUCTION

Artificial intelligence (AI) is transforming the field of ophthalmology by enabling more accurate and efficient diagnoses, improving patient outcomes, and facilitating innovative research.[1]

However, AI training is not conventionally included in medical school or residency training curricula.[2]

AIMS

- To explore the views of Canadian medical students and ophthalmologists on the integration of AI training into medical education, specifically within the field of ophthalmology.
- To clarify their current understanding, highlight perceived needs, and outline potential barriers, benefits, and challenges associated with this educational advancement.

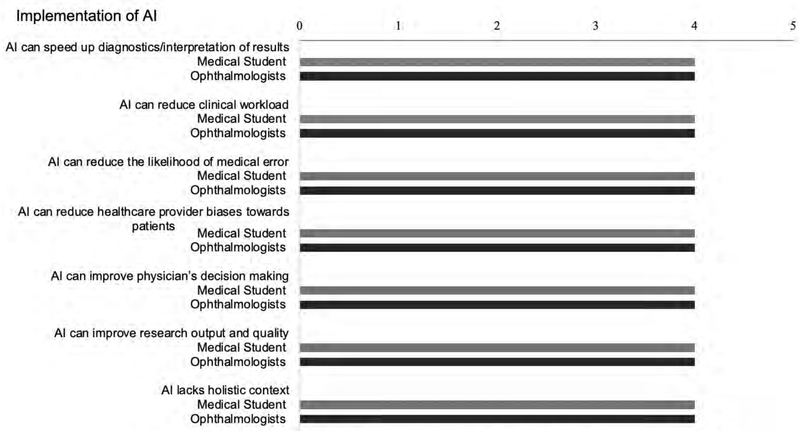
METHODS

Participants were recruited from 16 Canadian medical schools and all 15 Canadian ophthalmology programs. A bilingual web-based questionnaire with 25 questions for trainees and 26 for ophthalmologists was distributed in May 2023

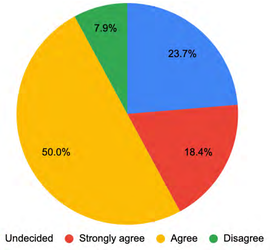
- Socio-demographics
- Implementation of AI
- Existing familiarity and knowledge of AI
- Advantages and disadvantages of AI
- Fears about AI

RESULTS

- 125 medical students from all 16 Canadian medical programs and 38 ophthalmology faculty from 12 Canadian institutions participated in the study
- Ophthalmology faculty held diverse rank positions, with the majority (84%) working in academic settings and had an average practice duration of 23.6 years.
- Both medical students and ophthalmologists strongly agreed that AI will play a significant role in ophthalmology (median: 4; IQR: 3 - 5).
- Both groups indicated a moderate understanding of AI (median: 3; IQR – Interquartile range: 2 - 3).

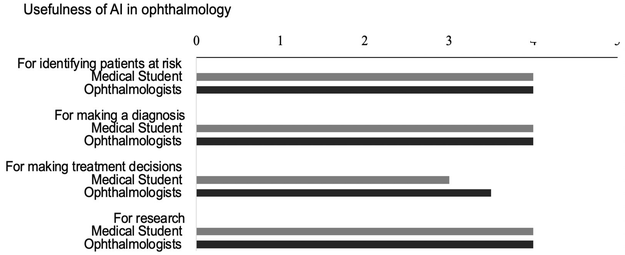


Responses are rated from 1 = strongly disagree to 5 = strongly agree. Bar graphs represent median values.



Percentage of ophthalmologists that agree that advantages outweigh the disadvantages of AI use in ophthalmology

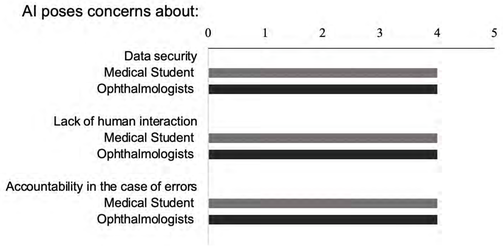
Most medical students (71%) and ophthalmologists (69%) indicated that AI will have no impact on their job prospects in ophthalmology.



Responses are rated from 1 = not at all useful to 5 = extremely useful. Bar graphs represent median

Level of priority regarding AI teaching

- Both medical students and ophthalmologists indicated a medium level of priority in teaching AI in the **UGME curriculum** and **UGME ophthalmology** curriculum (median: 3; IQR: 2 – 4).
- Teaching AI in the **ophthalmology residency** curriculum was rated as high priority by both groups (median: 4; IQR 3 – 4).



Responses are rated from 1 = strongly disagree to 5 = strongly agree. Bar graphs represent median values.

CONCLUSIONS

- Our findings indicate that both medical students and ophthalmologists are aware of the potential applications of AI in ophthalmology.
- Both groups strongly agreed that integrating AI in the ophthalmology curriculum would be beneficial. There were low concerns regarding AI replacing the roles of ophthalmologists.
- Most commonly, AI was deemed most useful in identifying at-risk patients, making diagnoses, and to facilitate research.
- Our results are consistent with those reported in radiology, pathology, and cardiology, where both trainees and faculty indicated their desire for AI teaching to be integrated in the medical curriculum.

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Macular Microcirculation Perfusion Heterogeneity Analysis with Optical Coherence Tomography Angiography (OCTA) in Glaucoma

COS 2024

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INTRODUCTION

The disruption of vascular autoregulation has been implicated in the pathogenesis of glaucomatous optic neuropathy[1-3].

Optical coherence tomography angiography (OCTA) can be used to visualize the 3-D retinal vasculature. Serial acquisitions of OCTA can be used to determine the temporal and spatial heterogeneity of retinal perfusion. We introduce a multi-step 3D registration protocol used to calculate the pixel-wise perfusion heterogeneity in the macula.

AIM

To compare the perfusion heterogeneity in the macular microcirculation of patients with open angle glaucoma (OAG), normal tension glaucoma (NTG), and controls, using a novel robust OCTA-based quantification algorithm.

METHOD

Study Design:
Prospective cross-sectional observational study.

Inclusion Criteria:
Patients with a diagnosis of open angle glaucoma (OAG) and normal tension glaucoma (NTG), or healthy controls.

Exclusion Criteria:
Patients with known ocular surgery, coexisting retinal pathologies, floaters, and systemic vascular conditions (i.e. hypertension).
Patients with fixation difficulty, significant motion artifacts, or media opacities hindering image quality.

Imaging and Processing:
Patients were given dilating eye drops and underwent 10 serial acquisitions using PlexElite 9000 swept-source OCTA, followed by post-acquisition 3D image registration, averaging, and pixel variation analysis. See Imaging Protocol panel (**Figure 1,** right).

RESULTS

A total of 111 patients were imaged; of which, 28 patients (9 control, 10 open angle glaucoma (OAG), and 9 normal tension glaucoma (NTG)) met our inclusion criteria and did not meet any of the exclusion criteria (**Table 1**).

There was no significant difference between the coefficient of variation (CoV) values across the three groups (p = 0.124). (**Figure 2**)

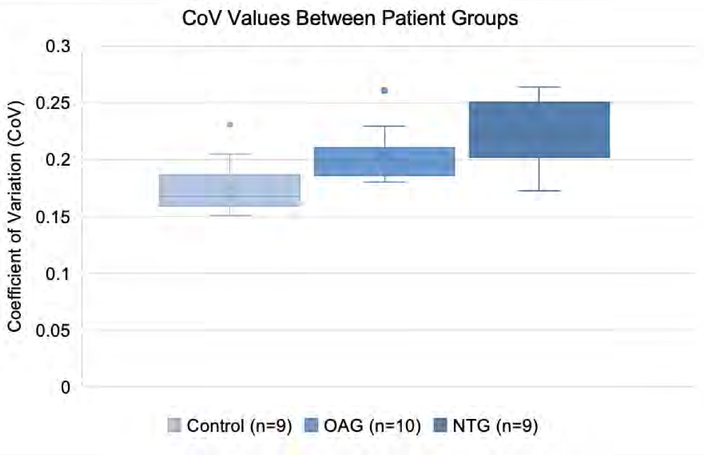

Figure 2. *Summary of coefficient of variation (CoV) distribution between groups. OAG = Open Angle Glaucoma, NTG = Normal Tension Glaucoma*

	Control (n = 9)	Open Angle Glaucoma (n = 10)	Normal Tension Glaucoma (n = 9)
Age in years (SD)	58.7 (10.4)	67.4 (6.6)	60.8 (10.3)
Gender (M:F)	4:5	3:7	3:6

Table 1. *Patient demographics and perfusion heterogeneity summary. Age values are shown as mean with standard deviation in parentheses. CoV = Coefficient of variation. Higher value indicates greater perfusion heterogeneity. SD = Standard deviation.*

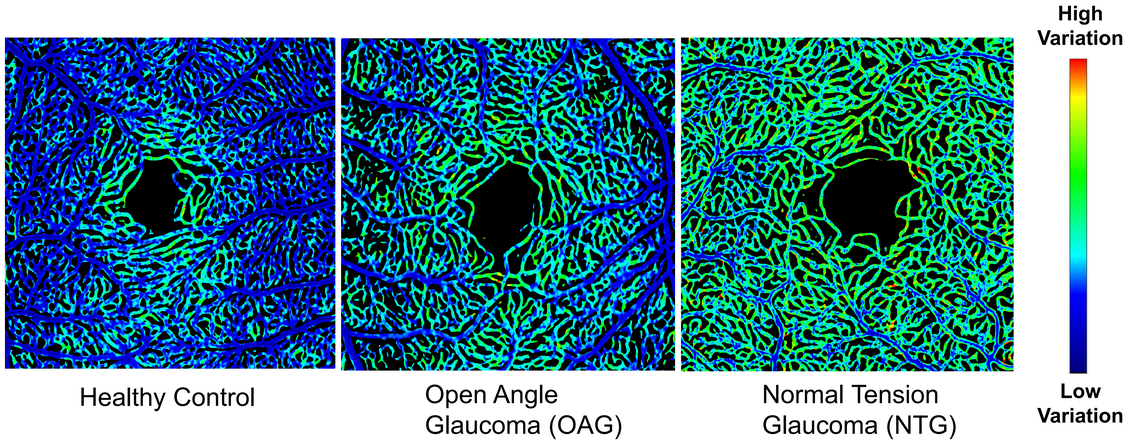

Figure 3. *Representative coefficient of variation (CoV) maps of healthy control (left), open angle glaucoma (OAG) (middle), and normal tension glaucoma (NTG) (right).*

IMAGING PROTOCOL

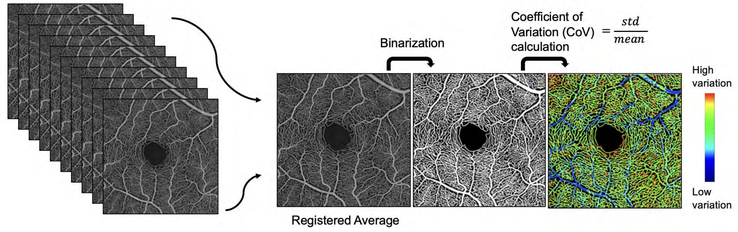

Figure 1. Ten serial OCTA acquisitions were taken (2-3 seconds per volume), followed by multivolume registration, averaging, binarization, and calculation of the pixel-wise coefficient of variation (CoV) to determine spatial and temporal perfusion heterogeneity.

CONCLUSION

OCTA with 3D image registration and pixel variation analysis provides a non-invasive, robust method to assess perfusion heterogeneity in the retinal microvasculature. Imaging a larger sample size of patients is warranted to elucidate the relationship between vascular dysregulation and glaucoma.

ACKNOWLEDGEMENTS

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One-year Clinical Outcomes of Hydrus Microstent Implantation by Visual Field Severity

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Introduction

- Minimally Invasive Glaucoma Surgery (MIGS) is becoming increasingly popular in the surgical management of glaucoma
- Associated with less complications than traditional procedures
- Hydrus MicroStent is an innovative device which reduces intraocular pressure (IOP) by bypassing the trabecular meshwork
- MIGS surgery is more likely indicated for mild and moderate visual field severity (VFS)
- Few have studied the outcomes of Hydrus according to glaucoma severity

Purpose

Our study aims to determine the 12-month performance and safety of Hydrus Microstent by visual field severity for patients with open-angle glaucoma (OAG).

Methods

Study design
- Retrospective, single center, comparative study

Data collection
- Patients who underwent Hydrus Microstent implantation combined with phacoemulsification between 2020 and 2023

Main outcomes
- IOP, number of glaucoma medications, complete and qualified surgical success(defined as target IOP reached without and with drops respectively) at baseline and 1 day, 1 week and 1,3,6,12 months postoperatively. Complications and need for additional surgery were also noted.
- For each outcome, results were obtained for all patients, followed by an analysis by visual field severity (VFS)

Statistical analysis
- Paired sample t-test, One-way ANOVA with Bonferroni correction, Kaplan-Meier Survival Analysis.

Results

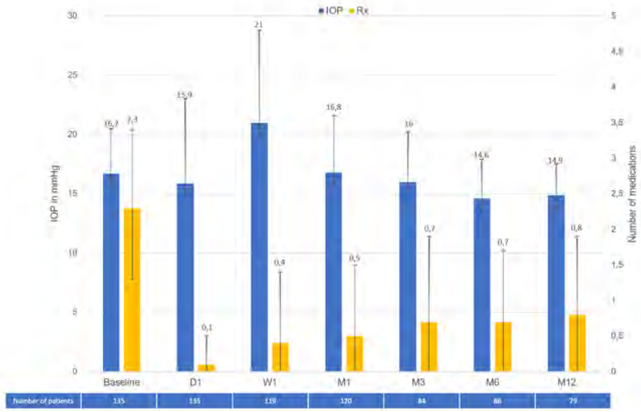
Age (years)	73.1 (SD: 7.6)
Right eye	50.7%
Male	51.5%
Positive family history of glaucoma	37.8%
Diabetes	16.2%
Previous laser/surgery :	
Cataract surgery	2.9%
Laser trabeculoplasty	21.3%
Glaucoma filtering surgery	0%

Glaucoma type :	
POAG	58.8%
Pigment dispersion syndrome	9.6%
Normotensive glaucoma	5.9%
Combined mechanism glaucoma	6.6%
Pseudoexfoliative glaucoma	5.1%
Other	14.0%

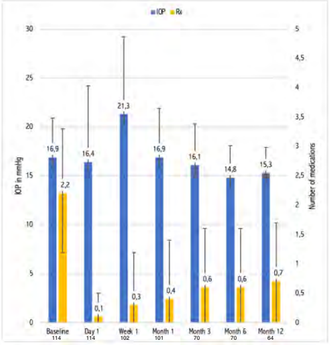
Table 1. Demographics

	All patients	Mild	Moderate	Severe	*p value*
Number of eyes	138	93	21	24	
Tmax	23.2 (5.8)	23.1(5.0)	21.3(5.3)	25.4 (8.3)	0.060
Pachymetry	539.6 (36.5)	540.7 (38.2)	532.2 (35.3)	540.8 (29.5)	0.674
C/D ratio	0.7 (0.1)	0.6 (0.2)	0.7 (0.2)	0.8 (0.1)	<0.001
RNFL	73.8 (16.0)	77.7 (14.0)	70.6 (18.0)	59.7 (14.3)	<0.001
GCL	65.7 (13.0)	68.1 (11.9)	62.0 (11.4)	58.0 (16.4)	0.004
Mean (SD) IOP, mmHg	16.7 (3.9)	17.3 (4.1)	15.7 (2.8)	15.2 (3.4)	0.032
Mean (SD) medications, n	2.3 (1.1)	2.2 (1.1)	2.4 (0.9)	2.6 (1.3)	0.147
Mean (SD) BCVA, logMAR	0.36 (0.40)	0.29 (0.25)	0.35 (0.24)	0.63 (0.76)	0.001
MD (SD)	6.27 (7.1)	2.5 (1.8)	8.3 (1.7)	20.3 (5.7)	<0.001

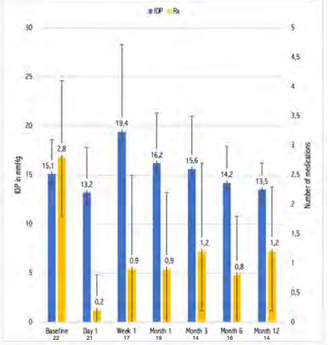
Table 2. Baseline characteristics for all patients and by VFS



Graph 1. IOP and number of medications change from baseline to 12 months for all patients combined

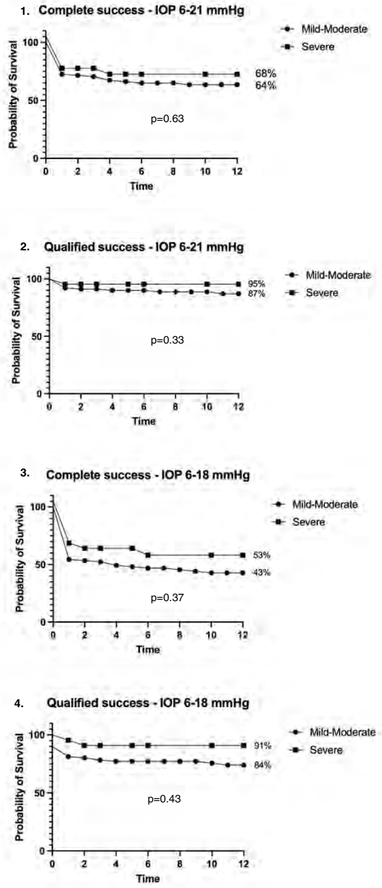


Graph 2. IOP and number of medications change from baseline to 12 months for MILD and MODERATE VFS combined



Graph 3. IOP and number of medications change from baseline to 12 months for SEVERE VFS

Group comparison showed no statistically significant difference of IOP between both groups from day 1 to 12 months. No statistically significant difference between number of medication was neither found.



Complication	Total percentage (%)	Within 3 months (%)
Steroid response	23.5	100
IOP spike	3.0	100
Hyphaema	3.7	100
Inflammation/uveitis	5.9	90
Clinically significant hypotony	0	-
Endophthalmitis	0	-
Retinal detachment	0	-
Choroidal detachment	0	-
Corneal edema	1.5	100
Macular oedema	1.5	50
Additional surgeries	3 (2.2%)	0
Preserflo MicroShunt	2	50
Trabeculectomy	1	0

Table 3. Postoperative complications

Complete and qualified survival curves 1 to 4: Comparison of survival curves between mild-moderate and severe visual field severity shows no statistically significant difference.

Conclusion

- Hydrus Microstent leads to reduction of IOP and use of medications for all patients combined, including patients with mild, moderate, and severe visual field severity
- At 12 months, mean reduction of IOP from baseline was -7.4, -7.1 and -6.8 mmHg for mild, moderate and severe visual field severity respectively. Mean reduction of the number of medication was -1.8, -2.0 and -1.9 for mild, moderate and severe visual field severity respectively. There was no statistically significant difference in IOP nor in number of medication reduction following Hydrus Microstent implantation between the three groups (p=0.945 and p=0.556 respectively).
- Hydrus Microstent leads to reduction of IOP and medications for all patients combined, including for mild, moderate, and severe VFS. Complications were rare, the majority occurring early during follow-up.
- Up to 58.5% of our patients achieved 1 year of follow-up. Further study with increased sample size once complete follow-up is achieved could help reveal significance of difference between VFS.

No disclosures.

One-year Clinical Outcomes of Preserflo MicroShunt Compared to Non-Penetrating Glaucoma Surgery

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Introduction

- Non-Penetrating Glaucoma Surgery (NPGS), is known to effectively reduce intraocular pressure (IOP) by creating an alternative drainage path for aqueous humor with a better safety profile compared to trabeculectomy.
- Minimally Invasive Glaucoma Surgery (MIGS) show effective results with fewer surgical risks
- Preserflo Microshunt is an ab-externo subconjunctival MIGS stent made of a biocompatible material and a reduced lumen.
  - Reduces inflammation and fibrosis post-operatively
  - Regulates the flow and prevents ocular hypotony.

Purpose

Our study aims to compare the effectiveness and safety of Preserflo MicroShunt compared to NPGS in patients with open-angle glaucoma.

Methods

Study design

- Retrospective, multicenter, 2 surgeon, comparative study of patients between 2020 and 2023

Main outcomes

- IOP, number of glaucoma medications, complete and qualified surgical success(defined as target IOP reached without and with drops respectively) at baseline and 1 day, 1 week and 1,3,6,12 months postoperatively.
- Complications and need for additional surgery were also noted.

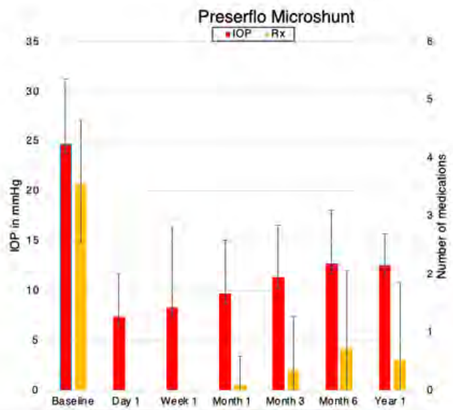
Statistical analysis

- Paired sample t-test, independent t-test, Kaplan-Meier Survival Analysis.

Results

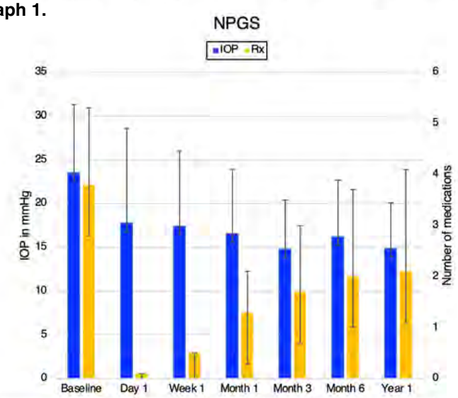
Baseline Characteristics of Subjects Receiving Preserflo MicroShunt and NPGS			
	Preserflo(n=52)	NPGS (n=53)	p
Age median (SD)	66.6 (SD 11.6)	66.9 (SD 9.1)	0.88
Left eye, n (%)	27 (51.9%)	32 (60.4%)	0.55
Female, n (%)	24 (46.2%)	30 (56.6%)	0.56
Diabetes, n (%)	6 (11.5%)	6 (11.3%)	1.00
Preop VA (log MAR), median (SD)	0.34 (0.41)	0.20 (0.32)	0.06
Decision IOP, median (SD)	24.7 (6.5)	23.5 (7.8)	0.40
Tmax, media (SD)	39.7 (SD 12.0)	37.00 (SD 13.00)	0.70
Decision medication classes, median (SD)	3.50 (1.1)	3.8 (1.2)	0.20
Disease type, n (%)			
Primary open angle glaucoma	26 (50.0%)	39 (73.6%)	0.015
Combined mechanism glaucoma	1 (1.9%)	2 (3.0%)	
Pseudo exfoliative	1 (1.9%)	1 (1.5%)	
Pigment dispersion glaucoma	4 (7.7%)	9 (13.4%)	
Uveitic glaucoma	3 (5.8%)	1 (1.5%)	
Other	17 (32.5%)	1 (1.5%)	
Preop MD, media (SD), dB	12.9 (5.9)	11.4 (8.03)	0.27
Previous ocular laser/surgery, n (%)			
Cataract surgery	42 (80.8%)	34 (63%)	0.08
Laser trabeculoplasty	29 (55.8%)	39 (72%)	0.07
Glaucoma Filtering Surgery	16 (30.8%)	2 (3.8%)	<0.001

Table 1. Demographics



	Baseline	Day 1	Week 1	Month 1	Month 3	Month 6	Year 1
N	52	43	51	52	49	39	19
IOP(mmHg)	24.7	7.4	8.3	9.7	11.3	12.7	12.5
Number of medication	3.5	0	0	0.1	0.3	0.7	0.5

Graph 1.



	Baseline	Day 1	Week 1	Month 1	Month 3	Month 6	Year 1
N	51	44	45	51	47	47	46
IOP (mmHg)	23.5	17.8	17.4	16.6	14.8	16.2	14.9
Number of medication	3.8	0.1	0.5	1.3	1.7	2.0	2.1

Graph 2.

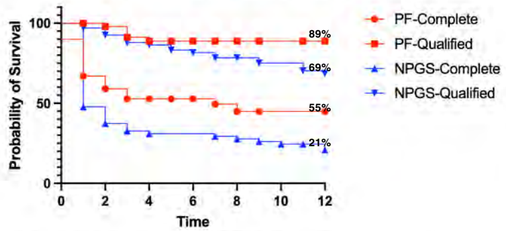
Graph 1 and 2 : IOP and number of medication change over 1 year

Group comparison showed significant difference of IOP between both groups from day 1 to 12 months. There was significant difference of number of medication from week 1 to 12 months.

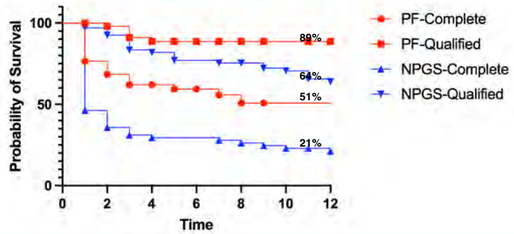
COMPLICATIONS	PRESERFLO (N=52)	NPGS (N=51)	p
Hyphema	13.5% (7)	1.9% (1)	0.025
Uveitis	0	3.8% (3)	
Clinical hypotony	17.3% (9)	3.8% (2)	0.024
Choroidal detachment	21.2% (11)	3.8% (2)	0.007
Malignant glaucoma	1.9% (1)	0	
Wipe out syndrome	0	0	
Bleb leak	1.9% (1)	17% (9)	0.009
Second surgery	3.8% (2)	17% (9)	0.028
Révision de Preserflo	1.9% (1)	0	
Preserflo	0	3.8% (2)	
Bleb revision	1.9% (1)	1.9% (1)	
SLT	0	7.5% (4)	
Xen implant	0	1.9% (1)	
PF + SLT	0	1.9% (1)	
Needling			0.050
0	96.2% (50)	84.9% (45)	
1	3.0% (2)	11.3% (6)	
2	0	1.9% (1)	
3	0	1.9% (1)	
> 3	0	0%	

Table 2. Postoperative complications

Survival outcomes for IOP 6-21 mmHg



Survival outcomes for IOP 6-17 mmHg



Conclusion

- Both groups showed significant reduction in IOP and number of medications postoperatively
- Preserflo MicroShunt was superior to NPGS throughout the entire follow-up and had higher success rates at 1 year.
- A total of 69.2% were medication-free at 12 months following Preserflo MicroShunt compared to 32.8% for NPGS
- Clinical hypotony and choroidal detachments were more common in the Preserflo group. They occurred in the first 3 months postoperatively and were transient. NPGS showed higher rates of bleb leak and need for a second surgery postoperatively.
- Further research focusing on its effectiveness and safety is warranted to compare it to traditional glaucoma surgeries.

No disclosures.

COS 2024

Safety and efficacy of transconjunctival ab-externo XEN45 stent implantation

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University of Saskatchewan Department of Ophthalmology

INTRODUCTION

The XEN45 gel stent[1] is a prominent Minimally Invasive Glaucoma Surgery (MIGS) device, with favourable outcomes reported.[2]

The XEN stent is traditionally placed using an Ab Interno approach; however, both open- and trans-conjunctival Ab-Externo approaches exist.

Limited data is reported for transconjunctival Ab-Externo XEN placement.

AIM

Report the safety and efficacy outcomes of 109 XEN stents placed transconjunctival Ab-Externo.

METHODS

Design: Single-centre, single-surgeon retrospective cohort study. Primary outcomes assessed at 12 months

109 eyes of 104 patients performed between September 2020 and October 2022

Definition of Success (World Glaucoma Association)[3]

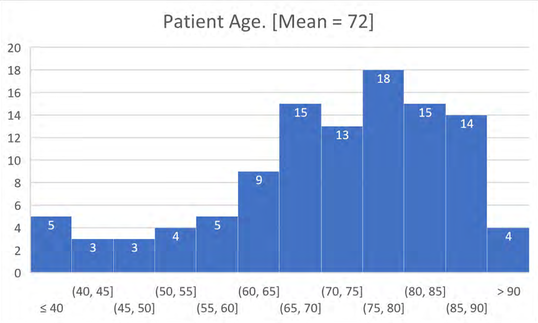
a) Complete Success: IOP ≤ 18 AND ≥20% IOP reduction from baseline at 12 months without glaucoma medications

b) Qualified Success: IOP ≤18 mm Hg and ≥20% reduction from baseline with glaucoma medications

c) Failure: reoperation for glaucoma, loss of light perception, or an IOP >18 mm Hg or <20% reduction from baseline with or without medications

RESULTS

Figures 1 & 2: *Patient Age and Glaucoma classification (n = 109 eyes)*



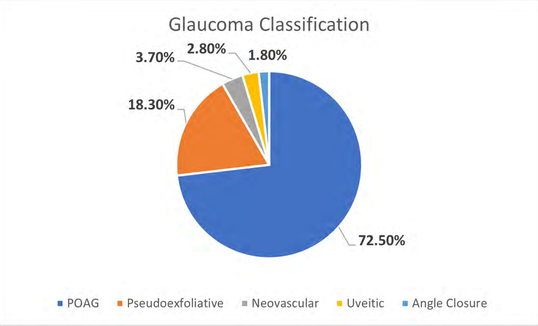


Figure 3: *Primary Outcome at 12 months follow up*

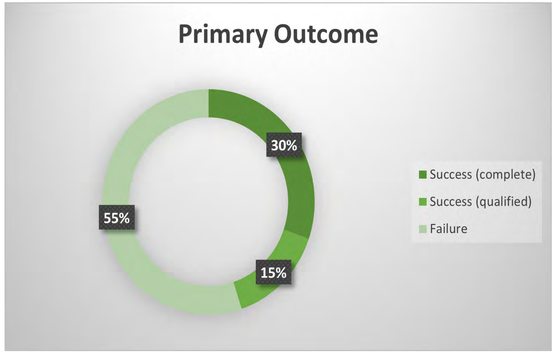


Figure 5: *Complications Encountered during 12 month follow up*

Complication	Description	Frequency	Percent
Xen-Related	Exposure or breakage of device	5	4.5%
Choroidal	Effusion/Detachment	5	4.5%
Infectious	Keratitis, Endophthalmitis	2	1.8%
Other	Corneal ulcer, retinal detachment	2	1.8%

Figure 4: *Primary Outcome compared to contemporary authors*

Study	%IOP reduction	Mean Medication @ 12 months	Success Definition	Success
Current Study	54.0%	0.8	WGA	45%
Tan et al. (2018)[5]	41.8%	0.7	IOP <21 & >20% reduction from baseline	87%
Gilman (2019)[6]	26.8%	0.6	Success [IOP<18 with or without 20% reduction	51%
Mansouri (2018)[7]	29.8%	0.4	IOP≤16 with no concomitant antiglaucoma medications at 12 months42%	42%
Podbielski (2022)[8]	27.9%	0.9	WGA	48%

CONCLUSION

The transconjunctival ab externo approach to XEN implantation significantly reduced IOP and medication use at 1-year and displayed an excellent safety profile. Our results suggest that the transconjunctival ab externo approach may be a reasonable alternative to the ab interno and open conjunctival ab externo approaches to XEN implantation.

Inter-study comparison was challenging due to low utilization of the World Glaucoma association guidelines. Our experience agrees with the work of Mathew et al which report low (45.6%) utilization of WGA guidelines.[4]

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Advancing eye care through **innovation, education, and advocacy**

L'avancement des soins oculaires grâce à **l'innovation, la formation et la représentation**

Prompt Engineering with ChatGPT3.5 and GPT4 to Improve Patient Education Material on Retinal Diseases

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INTRODUCTION

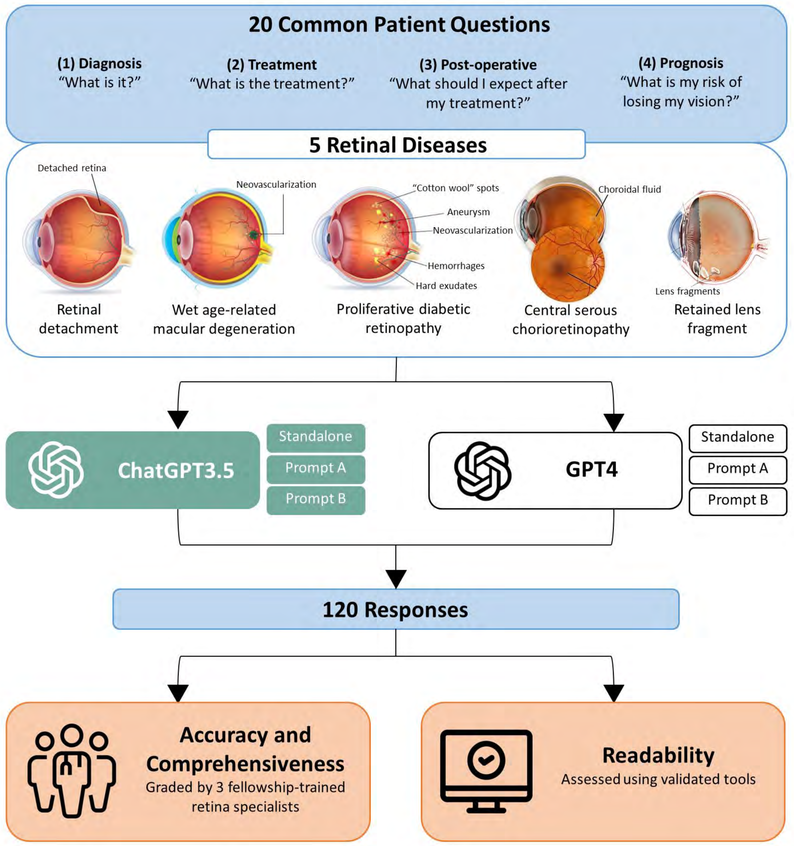
The average grade reading level of Canadians is grade 8 or lower.[1] However, ophthalmology patient education resources range from grade 10.4 to 12.6.[2,3]

ChatGPT3.5 and GPT4 are potential sources for tailored and accessible patient education. Engineering prompts to control output length and readability could improve generated responses.

AIM

Evaluate the effect of prompt engineering on the accuracy, comprehensiveness, and readability of ChatGPT-generated responses to common patient questions on retinal diseases.

METHOD



Prompt A

"…Please provide a thorough and comprehensive answer based on the latest, state-of-the-art ophthalmologic knowledge and on current established standards for treatment. Your patient does not have a background in the medical field; thus, you cannot assume the patient has deep knowledge of anatomy or physiology, nor about the jargon or specific terms of the field....The question is…"

Prompt B

Prompt A + "Your response needs to be limited to 300 words and must not exceed a Flesch-Kinkaid Grade Level of 8."

RESULTS

	ChatGPT3.5	GPT4	*P*
Accuracy			
Standalone	4.5 (0.5)	4.6 (0.3)	0.830
Prompt A	4.5 (0.5)	4.6 (0.3)	0.661
Prompt B	4.2 (0.3)	4.3 (0.1)	0.624
P (Kruskal Wallis)	**0.004**	**0.028**	
Post-hoc Dunn	S=A>B	S=A>B	
Comprehensiveness			
Standalone	4.6 (0.4)	4.7 (0.2)	0.501
Prompt A	4.6 (0.4)	4.5 (0.3)	0.523
Prompt B	4.0 (0.4)	4.0 (0.5)	0.667
P (Kruskal Wallis)	**<0.001**	**<0.001**	
Post-hoc Dunn	S=A>B	S=A>B	
Flesch-Kincaid Grade Level			
Standalone	12.0 (1.3)	12.2 (1.2)	0.586
Prompt A	9.8 (1.1)	9.7 (1.0)	0.687
Prompt B	8.8 (1.1)	8.6 (1.4)	0.533
P (ANOVA)	**<0.001**	**<0.001**	
Post-hoc Tukey	S>A>B	S>A>B	
% Jargon			
Standalone	8.3	8.1	0.734
Prompt A	6.1	6.1	0.662
Prompt B	5.0	5.1	0.923
P (Kruskal Wallis)	**0.006**	**<0.001**	
Post-hoc Dunn	S>A=B	S>A=B	

- There were no differences between ChatGPT3.5 and GPT4.
- Prompts A and B generated responses with lower grade reading levels and less jargon.
- When using prompt B, 25% of ChatGPT3.5 and 40% of GPT4 responses adhered to the grade 8 reading level limit.
- Accuracy and comprehensiveness were significantly lower with prompt B, but not with prompt A.

CONCLUSION

Prompt engineering can improve the readability of ChatGPT-generated responses to patient questions on retinal diseases while maintaining high accuracy and comprehensiveness.

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Topical Insulin in the Treatment of Glaucoma: a Phase I Clinical Trial

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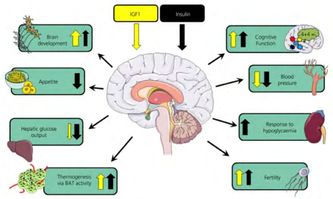
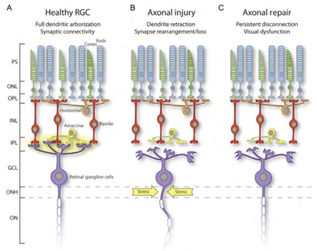
Introduction

- Glaucoma: one of the main causes of irreversible blindness: More than 80 million people affected worldwide[1]
- Significant burden on the economy : 2.9 billion $ in the US in 2012[2]
- Many patients **progress despite** adequate intraocular pressure control
- Patients present at irreversible, advanced stages
- **No therapy** available to this day that **can regenerate** lost ganglion cells
- Presence of insulin receptors in axons and dendrites of central nervous system and **retinal ganglion cells**
- Loss of insulin -> mitochondrial dysfunction -> microglia recruitment and inflammatory process -> hypoxic damage -> dendritic retraction
- Neurodegenerative diseases with dendritic etiology: Alzheimer, Parkinson, **glaucoma**[3]

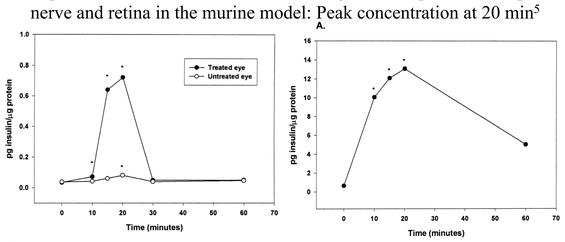


Preclinical Studies

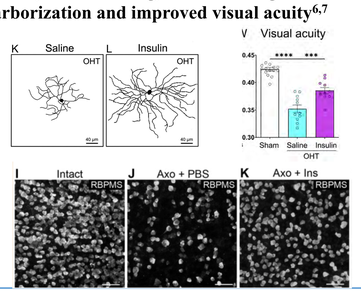
- Dendritic integrity important for retinal ganglion cell survival
- Dendritic retraction leads to loss of de connections with amacrine and bipolar cells and photoreceptor dysfunction[4]



- Topical insulin on the ocular surface has good absorption in the optic nerve and retina in the murine model: Peak concentration at 20 min[5]



- **Axotomy and ocular hypertension model of mice treated with topical insulin (15-35 units /kg) resulted in significant restoration of dendritic arborization and improved visual acuity**[6,7]



Objective

- To evaluate the safety of insulin eye drops of 100 IU and 500 IU
- Approved by Health Canada in April 2023

Methodology

- Phase I interventional, prospective, randomized, open label, double-blinded clinical trial
- First study on topical insulin for the treatment of glaucoma in humans
- Participants: **18 patients**

- Step I: 6 experimental patients (100U/mL insulin, 4 units/drop), once daily x 5 days
  3 control patients (artificial tears)

- Step II: 6 experimental patients (500U/mL insulin, 20 units/drop), once daily x 5 days
  3 control patients (artificial tears)
- Follow-up 1 month, 3 months and 6 months

Inclusion criteria:

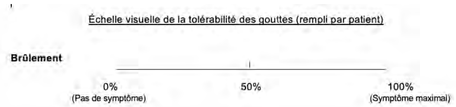
- Age >18 years
- Moderate glaucoma:
- Vertical C/D ratio 0.7-0.85 and/or;
- Moderate, non central visual field deficit (outside of 10 deg of fixatsion), i.e. mean deviation between -6 and -12 dB on HVF 24-2
- Non-diabetic (HbA1C) <5.9%
- Normal serum potassium (3.5-5.0 mMol/L)

Exclusion criteria:

-Ocular surgery<6 months from start of study
-Other ocular pathology leading to severe vision loss
-Systemic conditions leading to risk of hypoglycemia
-Restrictive diet (risk for hypoglycemia or hypokalemia)

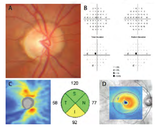
Primary outcomes:

-Topical or systemic side effects
-Ocular tolerability (questionnaire of symptoms)



Secondary outcomes:

-Visual acuity (VA)
-Intraocular pressure (IOP)
-# of anti-glaucomatous medications
-Visual field (Mean deviation-MD)
-OCT (RNFL + GCC) and OCT-A (flux index and perfusion density)



Results

Demographics	
N patients	9 (6 experimental, 3 controls)
Sex	F 2 M 7
Mean age (years)	61.44 (range 49-71)
Type of glaucoma POAG NTG PDG	 4 3 2
SLT	3/9
Mean Tmax (mmHg, SD)	26.22 (15.48)
Mean pre-treatment IOP (mmHg, SD)	14.11 (5.42)
Mean number of medication pre-treatment	1.78 (1.09), range 0-3
Patients with ocular surface pathologies	2 EBMD 3 with mild SPKs (trace to 0.5+)

Primary outcomes

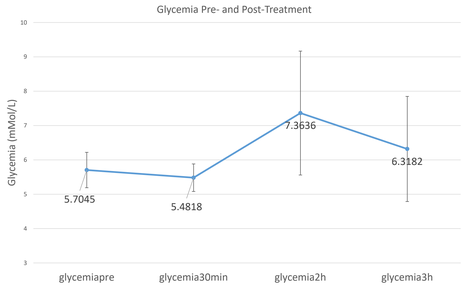


Figure 1: Glycemia post insulin instillation

- Glycemia **stable** 3h post-drop, no hypoglycemia(<4mmol/L).
- No symptomatic drop in glycemia
- Breaking of fast at 2h– real life scenario of patients eating during the day
- Potassium stable at 5 days (-0.06 mmol/L, p=0.6)

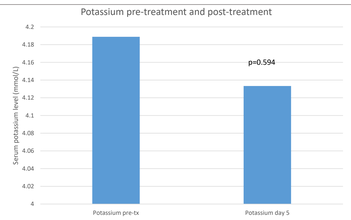
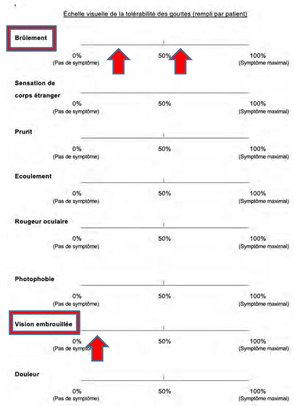


Figure 2: Serum postassium level pre- and post-treatment

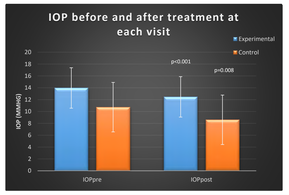
- No severe ocular side effects
- 2/6 experimental patients reported mild to moderate burning sensation
  - No deterioration during the week of treatment
  - Resolution of symptoms at each visit after artificial tears
- 1/6 patients reports transient blurry vision at 1 visit, resolved in 1-2 h

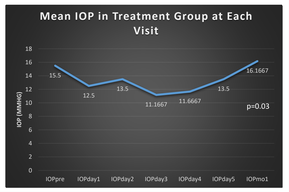


	Pre-treatment	Day 1	Day 2	Day 3	Day 4	Day 5
Cornea: N patients with PEEs	4	6	5	7	4 (1 patient de 0.5+ PEEs to 1+ PEEs), vision stable 20/20	5 (patient with previously worse PEEs better at visit)
Conjonctiva/sclera: N patients with hyperemia	3	4	4	3	3 (hyperemia from 0.5+ to 1+ in same patient with more PEEs)	3 (patient with previously worse hyperemia better at visit)

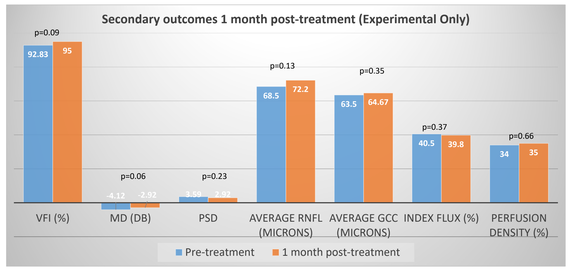
- No change in glaucoma drops
- 1 patient with worse PEEs: VA stable at 20/20 at each follow-up
- No deterioration of visual acuity at each visit
- All instances of PEEs or hyperemia are mild (grade 0.5 to 1+)

Secondary outcomes





No increase in IOP at each visit, or of mean IOP throughout follow-up



No deterioration in VA during treatment and at 1 month follow-up
No deterioration of secondary parameters at 1 month follow-up

Conclusion

Insulin at a concentration of 100IU/mL (4 units) once daily x 5 days is safe in moderate glaucoma

No significant systemic or topical side effects

- Few prospective studies (most are retrospective, not controlled)
- Most have small sample size (n=6-32)
- Inconsistent documentation, absent safety profile
- Mostly for treatment of corneal epithelial defects, no study on **glaucoma**
  - Fai et al[8]: **prospective**, 32 patients. Post epithelial debridement in vitrectomy **(0.5, 1 et 2U/day x 3 days)**
  - Wang et al.[9] : **retrospective**, improvement of neurotrophic ulcers with **1U 2-3x/day x 7-25 days**
  - Azmi et al.[10] : **prospective,** 160 patients. OSDI* non inferior to AT*; Schirmer significantly improved in diabetics with dry eye – **(1U 4x/day x 4 weeks)**

Next step: Step II, Phase I – Safety of insulin drops of **20 units (500U/mL)** DIE x 5 days

7/9 patients recruited, treatment in progress

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Structural, functional, and hemodynamic changes after optic disc haemorrhage in glaucoma

COS 2024

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INTRODUCTION

Optic disc haemorrhages (ODH) are commonly seen in patients with open angle glaucoma (OAG) and are associated with overall progression of the disease.[1-3]

The sequence of events following an ODH, leading to progression of structural and/or functional markers, is poorly understood.[4]

OBJECTIVE

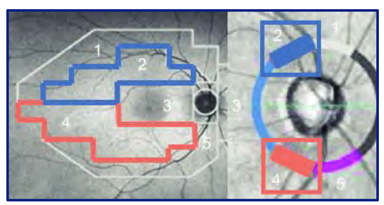
To evaluate long-term structural, functional, and perfusion density changes in areas topographically correlated to an ODH occurring in a sector of the optic disc in which the corresponding visual field is normal.

METHODS

Prospective case series of patients with OAG presenting with an ODH in an area of the disc with minimal or no damage observed on OCT and corresponding to a normal area of the visual field at baseline.

Patients were tested at baseline, 1, 2, 3, 6 and 12 months, and an exit visit performed at 43 to 49 months. At each visit, patients had OCT and OCTA (Spectralis, Heidelberg Engineering), and microperimetry (Compass, CenterVue) with a customized grid based on the location of their ODH, following structure-function maps derived from Garway-Heath et al studies (Fig. 1).[5,6]

Figure 1
Adapted from existing figures and concepts.[5,6]



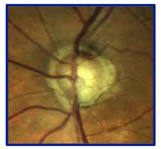
Analysis: Pointwise linear regression and t-test over the study period; only sectors topographically related to the baseline ODH were analyzed.

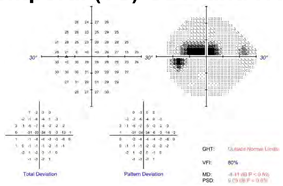
RESULTS

Testing process for patient #2

Fundus Photo and Humphrey Visual Field (HVF)

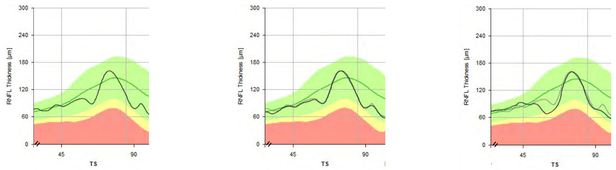
Baseline photo of superotemporal (TS) ODH and HVF.





OCT: RNFL in ODH Sector

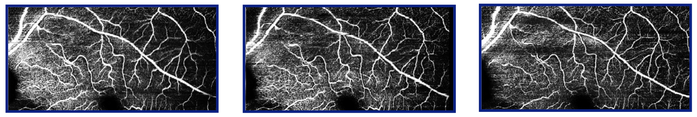
Portion of RNFL circle scan showing the TS sector.



Baseline | 6 Months | Final (47 months)

OCTA: Perfusion Density

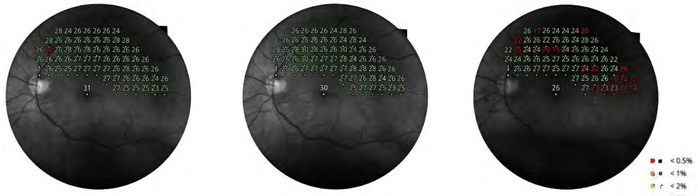
Binarized images for perfusion density analysis.



Baseline | 6 Months | Final (47 months)

Custom Microperimetry

65-point grid mapped to nerve bundles corresponding to the TS ODH.



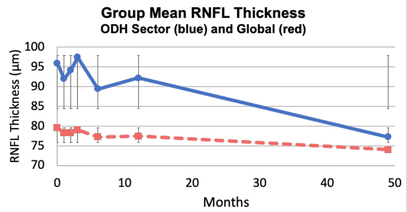
Baseline | 6 Months | Final (47 months)

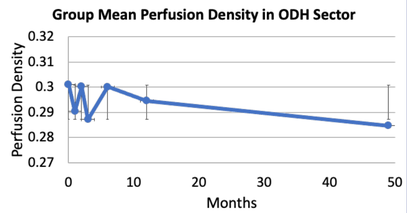
Test results for all patients

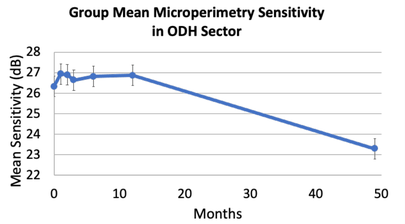
ODH sector testing by patient:

At baseline, 6 months, and final visit. Bold values are significant.

Patient ID (ODH Location)	RNFL Thickness (µm)	Perfusion Density	Mean Microperimetry Sensitivity (dB)
1. 74 F (OS TI)	111, **93**, **66**	0.29, 0.29, 0.27	26.0, 26.7, **22.1**
2. 71 M (OS TS)	115, 114, **107**	0.29, 0.26, 0.27	26.1, 26.3, **16.0**
3. 60 M (OS TI)	95, **89**, 88	0.28, 0.30, 0.27	27.4, 28.6, 29.2
4. 75 F (OD TI)	86, 84, **76**	0.34, 0.35, **0.32**	25.1, 25.5, 25.1
5. 64 F (OS TS)	78, 75, **58**	0.31, 0.30, 0.29	27.3, 27.0, 26.8
Group Mean (mean age 69)	96, **89**, **77**	0.30, 0.30, 0.28	26.3, 26.8, **23.3**







CONCLUSION

- Structural and functional changes in the location of the ODH can be observed in some patients, but typically after several months of time delay.
- This suggests ODH indicates sectors that are susceptible to progression but does not cause progression directly.
- Progressive changes are seen more frequently on OCT and microperimetry, but rarely on OCTA.
- 3 of 5 patients showed no functional changes in microperimetry, even after 4 years of follow-up.

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OPHTHALMOLOGY & VISUAL SCIENCES

Advancing eye care through **innovation, education, and advocacy**

L'avancement des soins oculaires grâce à **l'innovation, la formation et la représentation**

The effect of ginkgo biloba extract on macula and peripapillary perfusion examined using optical coherence tomography angiography

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INTRODUCTION

Ginkgo biloba extract (GBE) has been reported to improve ocular blood flow measured by Doppler ultrasound.[1]

OCT-A can provide quantifiable information about retina microvasculature in patients with glaucoma.[2]

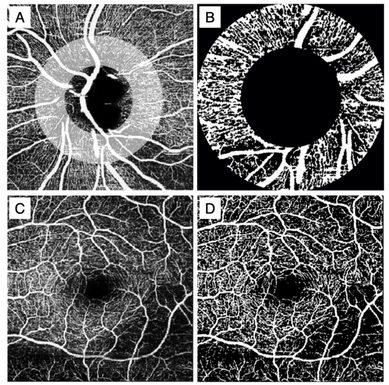
OBJECTIVE

Pilot study to evaluate the effect of GBE on OCT-A macula and peripapillary retina perfusion density among patients with early to moderate (> -10 dB MD) primary open-angle glaucoma.

METHODS

GBE group: patients with early to moderate open-angle glaucoma
Controls: matched by age, glaucoma severity, and treatments
Intervention: GBE 120 mg PO BID for four months
Main Outcome: perfusion density of superficial vascular complex at macula and peripapillary region
Analysis: OCT-A scans of macula and peripapillary retina

- 2D projection slabs of superficial vascular complex
- Student's t-test to compare perfusion density



Sample analysis for a subject from the GBE group.
(A) OCT-A of superficial vascular complex. Peripapillary region defined by 700 µm annulus (light grey);

(B) Binarized peripapillary region with perfusion density defined as proportion of pixels with flow (white) to total number of pixels;

(C) Macular region of OCT-A;

(D) Binarized macular region for analysis.

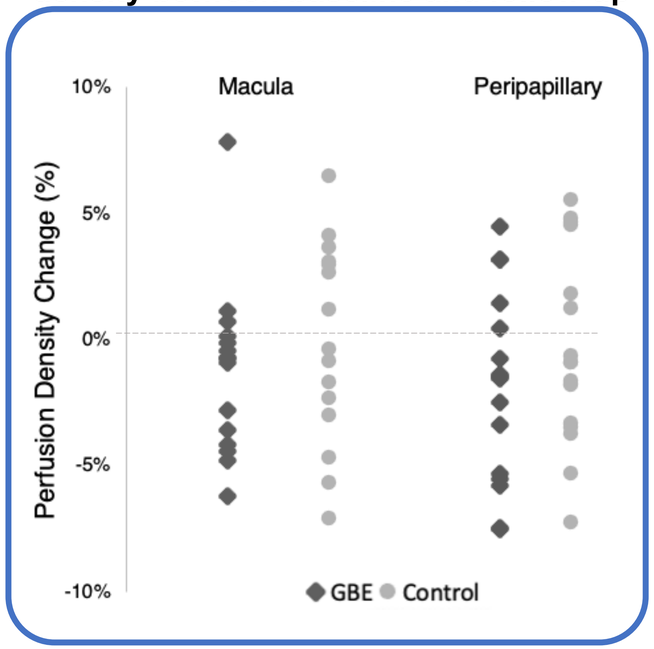
RESULTS

Subject demographics

	GBE	Control
Age (years)*	67 (48-77)	67 (55-80)
Sex		
Female	8	8
Male	9	9
BCVA (LogMar)**	0.08	0.07
Mean Deviation (dB)**	-3.45	-4.21
Follow-up (days)**	128.07	148.3
IOP (mmHg)*	16 (9-21)	14 (8-20)
Glaucoma Therapy		
Medication alone	7	3
Medication and SLT	4	5
SLT alone	6	9
Diabetes	1	0
Hypertension	1	0

*Values shown are median (range). **Values shown are mean.

Distribution of change in perfusion density between baseline and follow-up



Perfusion density in macula and peripapillary regions

	Macula				Peripapillary			
	Baseline	Follow-up	p	Change	Baseline	Follow-up	p	Change
GBE*	0.32 (0.04)	0.30 (0.04)	0.17	-4.00%	0.44 (0.05)	0.42 (0.04)	**0.02**	-5.02%
Control	0.29 (0.03)	0.30 (0.04)	0.64	1.68%	0.44 (0.04)	0.44 (0.04)	0.93	-0.19%
P	0.09	0.59			0.80	0.16		

Change = % difference in means between baseline and 4-month follow-up. *Values shown are mean (standard deviation).

DISCUSSION

Our findings of a 5% decrease in OCT-A perfusion density following GBE supplementation in glaucoma patients is unlikely to be clinically significant. Inter-visit variability reported in glaucoma ranges from 2.3-4.1% on optic nerve head scans, and 3.2-7.9% on macular scans.[3]

Variability in OCT-A interpretation has also been attributed to a learning effect over time from both operators and subjects.[4] It is also possible that OCT-A is not sensitive enough to detect changes in perfusion due to GBE or similar interventions.

CONCLUSION

Four months of GBE supplementation did not appear to cause clinically significant improvement in macula or peripapillary perfusion in patients with early to moderate primary open-angle glaucoma.

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The impact of COVID-19 on the wait times and severity of surgical glaucoma cases evaluated at a tertiary eye center

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INTRODUCTION

The Covid-19 pandemic greatly tested the ability of healthcare centres to offer elective services and treat chronic diseases.

Ophthalmology was one of the medical specialties most affected by the re-organisation of care.

Some studies have noted a significant increase in patients with uncontrolled IOP and in the number of terminal glaucoma cases during the pandemic.

AIM

To measure the impact of the Covid-19 pandemic backlog on the severity and surgical delays of surgical glaucoma cases at a tertiary ophthalmologic care center in Quebec, Canada.

METHODS

Design: Retrospective cohort study comparing a pre-pandemic period with an early post-pandemic restrictions period

Setting: Tertiary Academic Referral Center

Eligibility Criteria:

Surgical glaucoma cases operated on between March 1st and June 30th 2019 and the same period in 2021

Outcomes Measures

- Severity of glaucoma cases
  - IOP in mmHg
  - Number of topical glaucoma meds
  - Best corrected visual acuity (BCVA)
  - Visual field loss
  - Retinal nerve fiber layer thickness (RNFL)
  - Use of oral glaucoma medication
- Delays between referral, consultation and glaucoma surgery*

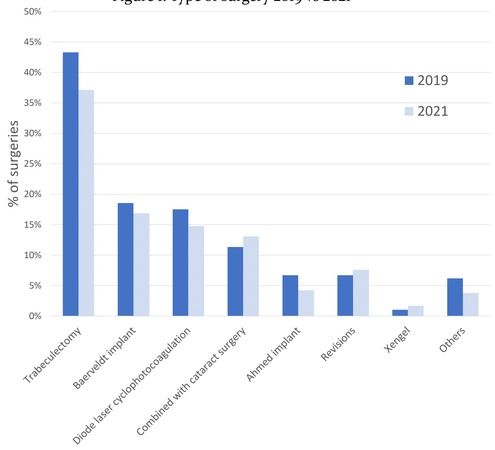
*Where applicable

RESULTS

- A total of 382 eyes were included in this study, with 181 eyes from 2019 and 201 eyes from 2021.
- Patient demographics were similar in both periods.
- Primary open angle glaucoma (POAG) was the most prevalent diagnosis throughout both time periods(2019: n=100, 55%; 2021: n=132, 66%; p=0.19).
- An increase in the number of patients taking oral glaucoma medications (acetazolamide) was observed, going from 45 in 2019 to 70 in 2021 (p=0.08).
- Delays in time from referral to consultation did not significantly differ between 2019 (122 ± 120 days) and 2021 (144 ± 136 days; p=0.09).
- Time waiting for surgery was also comparable between 2019 (43.0 ± 44.5 days) and 2021 (39.0 ± 41.8 days; p=0.13).

Criteria	2019	2021	p value
IOP at referral (mmHg)	23.3 ± 10.7	22.8 ± 10.9	0.36
IOP pre-op (mmHg)	21.1 ± 9.7	20.0 ± 9.5	0.14
Use of oral glaucoma medication (n)	45	70	0.08
RNFL (µm)	64.7 ± 18.1	65.2 ± 15.1	0.42
VF Mean Deviation (average dB)	-11.6 ±7.7	-11.6 ± 7.4	0.48
VF loss severity (n, %)			
Normal	11 (9)	9 (6)	0.37
Mild	24 (19)	26 (18)	0.78
Moderate	36 (28)	50 (34)	0.39
Advanced	34 (27)	43 (29)	0.65
Severe	23 (18)	18 (12)	0.21
Central VF deficit (n, %)	104 (57)	115 (57)	0.98
BCVA (LogMAR)	0.60 ± 0.73	0.55 ± 0.73	0.24
Number of glaucoma agents pre-op per patient (n)	3.0 ± 1	2.9 ± 1	0.27
Number of glaucoma agents post-op per patient (n)	1.5 ± 2	1.5 ± 1	0.40

Figure 1: Type of surgery 2019 vs 2021



DISCUSSION

Delays increased slightly in time to consultation while the time between initial consultation and surgery decreased between the two periods before and after the pandemic.

The severity of glaucoma measured by different criteria was similar in both time periods except that more patients took oral glaucoma medications in the post-pandemic restrictions period.

CONCLUSIONS

The pandemic and temporary restrictions had limited negative impact on wait list delays and the severity of glaucoma cases in our centre once restrictions were lifted. Despite the resulting backlog of ophthalmology cases, patients received comparable access to glaucoma surgery. More patients were treated with oral medications indicating a possible increase in an advanced presentation of uncontrolled glaucoma.

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Virtual Reality Application to Stimulate Visual Field Defects in Glaucoma for Patient Education

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Introduction

- Verbal description of vision loss alone can be difficult for patients to comprehend. Visual aids, on the other hand, are helpful in informing patients about glaucoma and its associated vision loss by showing patients how blindness can impact one's daily function. Computer simulations and virtual reality (VR) has been introduced as an interactive tool to experience virtual 3D imaging.
- In ophthalmology, VR application may be used to improve empathy and educate patients on the importance of long-term medical adherence and compliance by giving them a chance to experience more severe disease stages.

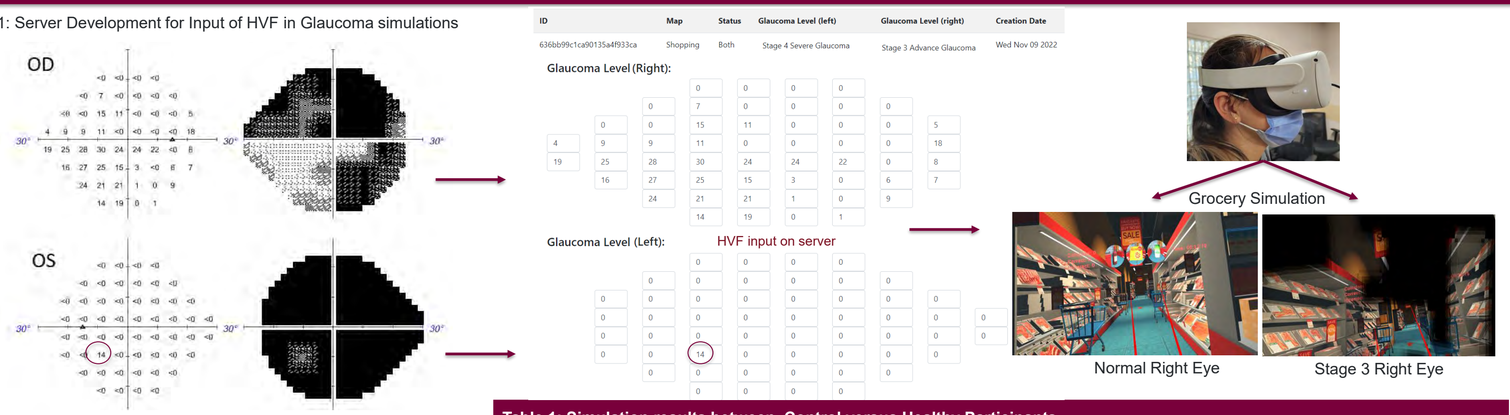
Objectives

- Pilot study: Access the impact of visual field defects on healthy participants using Oculus Virtual Reality simulations and measure the usability and satisfaction using a 5-point Likert Scale of the VR system.

Subjects and Methods

- 3 VR simulations were developed and viewed using the Oculus Meta Quest 2 Headset: Grocery Store, Kitchen, and Driving Simulation.
- Server was developed to input mild-advanced stages of glaucoma vision loss using existing Humphrey Visual Fields (HVF) categorized on Glaucoma Staging System (1) (Image 1).
- Results compared were: the time to complete the simulation, number of collisions, number of correct and incorrect objects selected, and number of infractions.

Image 1: Server Development for Input of HVF in Glaucoma simulations



- **Glaucoma Controls (n=3) and Healthy participants** (n=44) with best-corrected visual acuity better than 30/20 and normal visual fields completed the simulations with the HVF of controls imported on the simulations.

Results

- Healthy participants (n=44); mean age of 43.2 (SD 15.2) years; 61.5% female
- The results showed the controls took longer to complete the kitchen simulations by 170.63 seconds (95% CI, 135.5-205.7s), grocery simulation by 196.6 seconds (95% CL, 156.2-236.9s), and driving simulation by 31.3 seconds (95% CI, 0.35-62.3s).
- Controls had reduced number of collisions [-1.42 collisions (95% CI, -4.74 - 1.88)] and infractions [-0.17 (95% CI, -1.6 – 1.27] during the driving simulation; -0.02 collisions (95% CI, -1.06 – 1.0) grocery simulations; and -1.56 collisions (95%CI, -2.56 - -0.56) kitchen simulations.

Table 1: Simulation results between Control versus Healthy Participants

Simulation Design		Kitchen Simulation		Grocery Simulation		Driving simulation	
		Control (n=3)	Healthy (n=20)	Control (n=3)	Healthy (n=14)	Control (n=3)	Healthy (n=10)
Stage 3 OD / Stage 4 OS	Time (seconds)	331.6	179.0 ± 107.1	406.5	231.9±105.1	190.36	161.7 ± 55.8
	Collisions (No.)	2.0	3.33 ± 3.06	0.0	2.25 ± 2.91	3.0	10.0 ± 9.37
	Correct Objects / Incorrect objects (No.)	3.0 correct 0.0 incorrect	2.95 ± 0.23 correct 1.55 ± 1.75 incorrect	3.0 correct 0.0 incorrect	2.63 ± 0.50 correct 0.44 ± 0.81 incorrect	-	-
	Infractions (No.)	-	-	-	-	0.0	3.36 ± 1.74
Stage 2 OU	Time (seconds)	472.2	158.5 ± 68.8	392.02	201.33 ± 102.9	226.3	149.4 ± 62.1
	Collisions (No.)	2.0	3.42 ± 3.20	4	1.43 ± 1.98	10.0	4.6 ± 3.89
	Correct Objects / Incorrect objects (No.)	3.0 correct 2.0 incorrect	2.92 ± 0.28 correct 0.75 ± 0.96 incorrect	3.0 correct 2.0 incorrect	2.43 ± 0.51 correct 0.50 ± 0.85 incorrect	-	-
	Infractions (No.)	-	-	-	-	6.0	2.0 ± 2.16
Stage 2 OD / Stage 1 OS	Time (seconds)	278.96	169.9 ± 67.0	340	241.7 ± 74.9	186.31	215.9 ± 99.5
	Collisions (No.)	0.0	3.28 ± 4.75	1.0	1.13 ± 1.35	3.0	5.29 ± 4.68
	Correct Objects / Incorrect objects (No.)	3.0 correct 6.0 incorrect	2.57 ± 0.78 correct 0.85 ± 0.69 incorrect	1.0 correct 0.0 incorrect	2.37 ± 0.74 correct 0.13 ± 0.35 incorrect	-	-
	Infractions (No.)	-	-	-	-	1.0	2.14 ± 1.57

Results

- Two thirds of participants agreed that they enjoyed the experience with the simulations and do think the simulations would be helpful for educating patients with glaucoma.

Conclusion

- Patients with various degree of visual field loss had longer time to complete the simulations, reduced number of collisions, infractions, and number of incorrect objects selected when compared to healthy participants completing the same simulations with implemented visual field defects. This is due to glaucoma patients adjusting to there environment (simulation) before implementing the required task.
- Introducing this application within eye clinics will also help educate ophthalmologists, optometrists, medical trainees, social workers, nurses, patients and family members to have a better understanding of their glaucoma patient's needs and quality of life.

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Association Between Social Determinants of Health and Incidence of Age-Related Macular Degeneration in the National Health Interview Survey: A Population-Based, Cross-Sectional Analysis

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INTRODUCTION

- The relationship between the social determinants of health (SDH) and the incidence of age-related macular degeneration (AMD) are poorly understood.
- In this study, we assessed these relationships in a large, population-based sample of the United States civilian population.

METHODS

- Respondents to the National Health Interview Survey (NHIS) who were over 50 years old and answered a question about whether they had received a diagnosis of AMD were included.
- Primary outcomes included patient-reported diagnosis of AMD and vision loss due to AMD.
- Variables within the domains of demographics, socioeconomics, health status, and healthcare access were included in univariable and multivariable logistic regression analyses.

RESULTS

- 14,267 NHIS participants were included in our analysis.
- In our multivariable analysis, respondents aged 81+ had a significantly higher prevalence of AMD (OR=7.58, p<0.001) and odds of vision loss compared to younger patients (OR=4.57, p<0.001).
- Gay, lesbian, bisexual, or respondents with a sexual orientation of other (OR=0.45, p=0.03) had a significantly lower prevalence of AMD compared to heterosexual respondents.
- Black/African-American respondents (OR=0.23, p<0.001) and Asian-American respondents (OR=0.38, p=0.03) had a significantly lower prevalence of AMD than white respondents.

CONCLUSIONS

- Age, sexual orientation, race are significant determinants of a diagnosis of AMD.
- These determinants should be considered by policymakers and clinicians, and further investigation into possible third-variable explanations such as smoking and nutrition trends may be worthwhile.

Table 1. Univariable and multivariable logistic regression analysis of age-related macular degeneration diagnosis based on data from participants from the 2017 National Health Interview Survey.

	Univariable Analysis				Multivariable Analysis			
Category	Unadjusted Odds Ratio	95% CI		P-value	Adjusted Odds Ratio	95% CI		P-value
SEX								
Male	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Female	**1.41**	**1.15**	**1.74**	**0.001**	1.19	0.95	1.50	0.14
CITIZENSHIP								
Yes	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
No	**0.53**	**0.26**	**1.10**	**0.09**	0.98	0.44	2.18	0.96
SEXUAL ORIENTATION								
Heterosexual	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Gay, lesbian, bisexual, or other	**0.31**	**0.15**	**0.63**	**0.001**	**0.45**	**0.22**	**0.93**	**0.03**
RACE								
White only	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Black/African-American only	**0.22**	**0.14**	**0.35**	**<0.001**	**0.23**	**0.14**	**0.39**	**<0.001**
American Indian and Alaska Native	1.66	0.74	3.72	0.22	2.05	0.93	4.53	0.08
Asian only	**0.34**	**0.16**	**0.71**	**0.04**	**0.38**	**0.17**	**0.89**	**0.03**
Multiple race	1.19	0.56	2.56	0.65	0.90	0.35	2.30	0.82
EDUCATION								
College	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Some college	1.28	0.98	1.67	0.07	1.09	0.82	1.44	0.55
High school or general education diploma	1.18	0.92	1.50	0.19	0.89	0.67	1.17	0.40
Less than high school	1.03	0.76	1.40	0.84	**0.67**	**0.47**	**0.95**	**0.03**

Association Between Vision Difficulty and Sociodemographic Factors in Children: a Population-Based Analysis

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INTRODUCTION

- To determine the sociodemographic predictors of poor vision in children under the age of 18 in a large, nationally representative sample of the United States population.

METHODS

- Using data from the 2021 National Health Interview Survey (NHIS), participants under 18 years old for whom data were available on vision difficulty were included in our analysis.
- Our primary outcome was vision difficulty.
- Sociodemographic variables were investigated as predictors of visual difficulty.
- Logistic regression models were performed using Stata version 17.0 (StataCorp LLC, College Station, Texas).
- An odds ratio (OR) and 95% confidence interval (CI) were reported for analyses.

RESULTS

- The 2021 NHIS reported on 8,261 children, of which 7,373 had data pertaining to vision difficulty and were included.
- In both our univariable and multivariable analyses, there was an association between vision difficulty and increasing age ($p<0.01$ and $p<0.01$, respectively), being unable to afford medical care ($p<0.01$, $p=0.02$) and having public health insurance ($p<0.01$, $p=0.01$).
- Relative to children for whom the highest level of education of adults in their family was grade 1-11 (8.9%), the odds of vision difficulty was lower in children whose parents had a professional school or doctoral degree in our univariable (OR=0.15, 95%CI=[0.06, 0.36], $p<0.01$) and multivariable (OR=0.30, 95%CI=[0.11, 0.84], $p=0.02$) analyses.

CONCLUSIONS

- Multiple sociodemographic factors are associated with visual difficulty in children.
- In working towards achieving equity in vision health in the United States, it is imperative that disparities mediated by sociodemographic factors are addressed through public health policies.

Table 1. Unadjusted and adjusted logistic regression results.

	Vision Difficulty			
	Unadjusted Odds Ratio	95% CI	Adjusted Odds Ratio[a]	95% CI
Age				
2-4 years	Reference		Reference	
5-8 years	**3.48**	**(1.88, 6.42)**	**4.29**	**(2.26, 8.15)**
9-12 years	**4.48**	**(2.54, 7.91)**	**6.22**	**(3.42, 11.31)**
13-15 years	**5.72**	**(3.26, 10.03)**	**7.22**	**(4.03, 12.96)**
16-17 years	**4.59**	**(2.46, 8.57)**	**6.06**	**(3.17, 11.58)**
Region				
Northeast	Reference		Reference	
Midwest	**1.77**	**(1.04, 3.03)**	1.70	(0.94, 3.06)
South	**1.70**	**(1.03, 2.79)**	1.54	(0.88, 2.68)
West	**1.83**	**(1.21, 3.00)**	1.67	(0.95, 2.97)
Race				
White	Reference		Reference	
Hispanic	**1.48**	**(1.08, 2.03)**	1.02	(0.66, 1.58)
Black/African American	**1.95**	**(1.30, 2.92)**	1.34	(0.82, 2.20)
Asian	1.31	(0.73, 2.38)	N/A[a]	
American Indian/Alaskan	1.95	(0.83, 4.57)	1.77	(0.76, 4.09)
Other	1.17	(0.62, 2.21)	N/A[a]	
Health Insurance Hierarchy				
Private	Reference		Reference	
Medicaid and other public	**2.17**	**(1.68, 2.80)**	**1.52**	**(1.09, 2.12)**
Other coverage	1.71	(0.81, 3.61)	1.53	(0.73, 3.21)
Uninsured	**1.90**	**(1.02, 3.53)**	1.40	(0.79, 2.50)
Needed Medical Care but Did Not Get Due to Cost in the Past 12 months				
No	Reference		Reference	
Yes	**3.25**	**(1.54, 6.88)**	**2.60**	**(1.17, 5.80)**
Lifetime of Lacking Basic Needs				
No	Reference		Reference	
Yes	**2.78**	**(1.47, 5.26)**	1.28	(0.68, 2.44)
Highest Level of Education of the Adults Living in the Home				
Grade 1-11	Reference		Reference	
12th grade, no diploma	1.31	(0.48, 3.60)	N/A[a]	
High school graduate	**0.51**	**(0.29, 0.91)**	0.63	(0.32, 1.22)
Some college, no degree	**0.45**	**(0.25, 0.82)**	**0.48**	**(0.24, 0.95)**
Bachelor's degree (Example: BA, AB, BS, BBA)	**0.43**	**(0.25, 0.74)**	0.74	(0.39, 1.41)
Master's degree (Example: MA, MS, MEng, MEd, MBA)	**0.29**	**(0.16, 0.52)**	0.60	(0.29, 1.24)
Professional School or Doctoral degree (Example: MD, DDS, DVM, JD, PhD, EdD)	**0.15**	**(0.06, 0.36)**	**0.30**	**(0.11, 0.84)**
Marital Status of First Residential Parent				
Married	Reference		Reference	
Living with a partner together as an unmarried couple	**1.54**	**(1.00, 2.36)**	1.27	(0.79, 2.03)
Neither	**1.72**	**(1.26, 2.36)**	1.25	(0.88, 1.78)
Food Security				
Food secure	Reference		Reference	
Poor food security	**2.28**	**(1.57, 3.31)**	1.42	(0.92, 2.18)

[a]6,963 of 7,373 (94.4%) participants were included in our multivariable analysis.
[b]p>0.20 in univariable analysis.

Attitudes of Canadian Ophthalmology Residents on Rural and Indigenous Ophthalmology Education

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INTRODUCTION

- **Rural communities** comprise twenty percent of the Canadian population but are served by only **eight percent** of physicians practicing in Canada[1,2], with Indigenous communities often residing in these regions.[3]
- Rural communities have poorer health outcomes[4,5], and accessing eye care is challenging for patients.[6]
- In 2012, there were no practicing ophthalmologists in 29 percent of the 148 census areas in Canada.[7] There is an increased prevalence of eye disease in rural and Indigenous populations.[6,7, 8, 9]
- **Medical education** plays a vital role in helping students and residents to understand and appreciate the unique needs of rural and Indigenous communities.

Objective: Investigate the attitudes of Canadian ophthalmology residents towards rural and Indigenous ophthalmology practice, and their education, to better understand whether residents are receiving adequate education in these topics.

METHODS

Survey study: A 25-statement survey assessing 4 major themes on rural and Indigenous ophthalmology was distributed to all 186 current Canadian ophthalmology residents.

Data Collection

- **Attitude theme:** Beliefs towards rural and Indigenous communities and healthcare
- **Comfort theme:** Feelings of ease with practicing rural and Indigenous ophthalmology
- **Knowledge Theme**: Resident's knowledge on these topics
- **Educational Perspective:** Residents' feelings towards the quality of their training for these populations

Data Analysis

- Median scores for responses to the survey were recorded for each survey statement and for each survey theme
- Intragroup comparisons between junior (Jr. – PGY 1, 2, and 3) and senior (Sr. – PGY 4 and 5) years

RESULTS

Table 1: Survey responses by residency year. 53 Ophthalmology residents responded (28.4%). The respondents were inclusive of all resident years, with the most responses from PGY 2 and PGY 3 residents. The study population was 52.3% male and 84.1% English speaking.

Residency Year	Number of Respondents
PGY 1	9 (20.5%)
PGY 2	12 (27.3%)
PGY 3	11 (25.0%)
PGY 4	5 (11.4%)
PGY 5	7 (15.9%)

Table 2: Ophthalmology residents' attitudes toward Rural and Indigenous Ophthalmology and patients in terms of medians and interquartile ranges (IQR) for degree of agreement with each question: junior resident vs. senior residents

	Junior Residents (n = 32.0)	Senior Residents (n=21.0)	P Value (Mann-Whitney U Test)	P Value (T-test)
Rural Attitudes	**9.33 (5.0-10.0)**	**9.33 (5.0-10.0)**		
The lack of adequate ophthalmological care for rural communities is a major problem in the Canadian healthcare system.	9.0 (5.0-9.0)	9.0 (5.0-10.0)	P = 0.76	P = 0.73
Rural Comfort	**4.67 (1.0-10.0)**	**4.67 (1.0-10.0)**		
I feel knowledgeable and comfortable providing ophthalmological care for a rural patient in a low resource, rural setting.	5.0 (1.0 – 10.0)	5.0 (1.0-8.0)	P = 0.06	P = 0.06
Rural Knowledge	**4.67 (1.0-10.0)**	**5.0 (1.0-10.0)**		
Describe the challenges associated with rural ophthalmology in rural Canada?	5.0 (1.0-9.0)	6.0 (1.0-9.0)	P = 0.52	P = 0.43
Indigenous Attitudes	**9.67 (5.0-10.0)**	**9.67 (6.0-10.0)**		
The lack of adequate ophthalmological care for Indigenous peoples is a major problem in the Canadian healthcare system.	9.0 (5.0-10.0)	9.0 (6.0-10.0)	P = 0.34	P = 0.61
Indigenous Comfort	**5.0 (1.0-10.0)**	**4.67 (1.0-10.0)**		
I am comfortable with the amount of practice I have had with Indigenous ophthalmology patients.	4.0 (1.0-10.0)	3.0 (1.0-10.0)	P = 0.08	P = 0.10
Indigenous Knowledge	**4.0 (1.0-10.0)**	**4.0 (1.0-10.0)**		
Develop an understanding of the additional resources/services that may be available for Indigenous peoples when receiving care?	3.0 (1.0-9.0)	3.0 (1.0-9.0)	P = 0.09	P = 0.09
Rural and Indigenous Knowledge	**4.5 (1.0-10.0)**	**4.0 (1.0-8.0)**		
Describe the relationship between ophthalmologists and allied health care providers in rural and Indigenous communities?	4.5 (1.0-10.0)	4.0 (1.0-8.0)	P = 0.27	P = 0.25
Education	**8.0 (4.0-10.0)**	**8.5 (4.0-10.0)**		
I feel that residents need more teaching and training in rural ophthalmology.	8.0 (4.0-10.0)	9.0 (4.0-10.0)	P =0.85	P = 0.82
I feel that residents need more teaching and training in Indigenous ophthalmology.	8.0 (4.0-10.0)	8.0 (4.0-10.0)	P = 0.83	P = 1.00

Rural Analysis

In the rural "Attitudes" (junior: median = 9.33; senior: median = 9.33), "Comfort" (junior: median = 4.67; senior: median = 4.67), and "Knowledge" (junior: median = 4.67; senior: median = 5.0) sections, no significant differences between junior and senior residents were observed ($p > 0.05$).

Indigenous Analysis

In the Indigenous "Attitudes" section (junior: median = 9.67; senior: median = 9.67), only one question showed statistical significance on T-test ($p < 0.05$), but not on Mann-Whitney U test. In the Indigenous "Comfort" section (junior: median = 5.0; senior: median = 4.67), one question demonstrated significance on both tests. The Indigenous "Knowledge" section had no statistically significant results (all questions: $p > 0.05$).

Education

Both junior and senior residents strongly supported increased education in rural and Indigenous ophthalmology (median = 8.0 and 8.5, respectively). There was no significant difference between the groups.

DISCUSSION

The results from this study show that ophthalmology residents in Canada have positive attitudes towards rural and Indigenous patients and their ophthalmology care.

While ophthalmology residents have positive attitudes towards rural and Indigenous care, according to this study, they unfortunately lack comfort and knowledge with regards to providing care to these populations.

Our study shows that ophthalmology residents in Canada show a desire for further training in rural and Indigenous ophthalmology.

Future research should focus on the evaluation of current programs to determine the amount of training that is currently offered in these areas and what gaps need to be filled.

Limitations

- The survey is not a validated tool, was created based on our research question as well as well-established tool previously used to assess resident attitudes on specific topics.[10]
- Participation in the survey may have been subject to selection bias

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Disparities in Vision-related Functional Impairments Among Adults in the United States

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INTRODUCTION

- Vision loss is a substantial cause of disability in activities of daily living (ADL) and instrumental activities of daily living (IADL)[1].
- Vision impairment is associated with decreased health-related quality of life[2,3], decreased life satisfaction[4], poor mental health[5], and increased mortality[6,7]. There are limited studies investigating the sociodemographic and healthcare access factors associated with **vision-related functional impairments (VFI).**

AIM

- The associations between VFI with sociodemographic factors and healthcare access have not been thoroughly investigated at a population level.
- In this study, we uncover the relationship between self-reported VFI with race, income, education, healthcare access, and other sociodemographic factors in a large, nationally representative sample of the United States civilian, non-institutionalized population aged 18 and older.

METHOD

- Data from the 2007 National Health Interview Survey (NHIS) was used.
- The NHIS is a continuous health care survey of noninstitutionalized residents of the United States.
- Vision-related functional impairment was categorized through participant self-report to questions detailing impairment of daily functions.
- The association between VFI and our identified sociodemographic and healthcare factors was analyzed via univariable and multivariable regression analyses.
- The following factors were considered as exposure variables: categorized under five broad domains of SDH:

Domain	Variable
Health Care Access and Quality	Having usual place for healthcare
	Having delayed medical care due to cost
Economic Stability	Income
	Employment
	Insurance
Education Access	Education level
Environment	Region of residence
Social & Community Context	Age
	Gender
	Sexual orientation
	Race
	Parental status
	Marital status
	Citizenship

Table 1. Variables analyzed with Vision-related functional impairment from the 2017 National Health Interview Survey

RESULTS

- Overall, **26,711** participants were included.
- 45.24% were male, 54.76% were female.
- 10.20% were 18-25 years of age, 15.62% were 26-35, 20.70% were 50-64, 24.06% were 65-84, and 3.34% were 85+.
- There were greater odds of VFI amongst **females** (OR = 1.28, 95% CI = 1.20-1.37, p<0.001) and participants with **less than a high school** degree compared to those with an advanced degree (OR = 1.66, 95%CI = 1.49-1.85, p<0.001).
- Amongst economic and healthcare access factors, a greater odds of VFI was associated **with public health insurance versus private coverage** (OR = 1.90, 95% CI = 1.74-2.07, p<0.001), having **delayed medical care due to costs** (OR = 1.91, 95% CI = 1.72-2.12, p<0.001), and being **unemployed** (OR = 2.34, 95% CI = 2.16-2.52, p<0.001).
- Participants whose **incomes were lower than the poverty threshold** (OR = 1.63, 95% CI = 1.38-1.93, p<0.001) had a higher odds of VFI than those with income >5x poverty threshold.

Female Sex
OR = 1.28, CI = 1.20-1.37

Education
Some College: OR = 1.12, CI = 1.01-1.25
High School: OR = 1.20, CI = 0.99-1.22
Less than HS: OR = 1.02, CI = 1.02-1.33

Delayed Medical Care Due to Cost
OR = 1.91, CI = 1.72-2.12

Unemployment
OR = 1.39, CI = 1.26-1.53

Age
26-35: OR = 1.08, CI = 0.87-1.36
36-49: OR = 2.44, CI = 1.97-3.03
50-64: OR = 4.30, CI = 3.50-5.30
65-84: OR = 4.02, CI = 3.22-5.02
85+: OR = 5.35, CI = 4.06-7.05

Race
Hispanic: OR = 0.91, CI = 0.78-1.06
Black: OR = 0.90, CI = 0.78-1.03
Asian: OR = 0.69, CI = 0.56-0.84
Other Race: OR = 1.21, CI = 0.86-1.72

	Univariable Analysis				Multivariable Analysis			
Category	**Unadjusted Odds Ratio**	**95% CI**		**p-value**	**Adjusted Odds Ratio**	**95% CI**		**p-value**
Age[1] (Years)								
18-25	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
26-35	0.91	0.75	1.11	3.66	1.08	0.87	1.36	0.48
36-49	**1.94**	**1.61**	**2.34**	**<0.001**	**2.44**	**1.97**	**3.03**	**<0.001**
50-64	**3.84**	**3.25**	**4.55**	**<0.001**	**4.30**	**3.50**	**5.30**	**<0.001**
65-84	**4.54**	**3.28**	**5.40**	**<0.001**	**4.02**	**3.22**	**5.02**	**<0.001**
85+	**6.54**	**5.22**	**8.19**	**<0.001**	**5.35**	**4.06**	**7.05**	**<0.001**
Sex[2]								
Male	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Female	**1.28**	**1.20**	**1.37**	**<0.001**	**1.16**	**1.07**	**1.26**	**<0.001**
Citizenship[3]								
Yes	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
No	**0.72**	**0.62**	**0. 85**	**<0.001**	0.94	0.77	1.14	0.51
Sexual Orientation[4]								
Straight	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Not straight	1.16	0.98	1.38	0.09	**1.46**	**1.20**	**1.78**	**<0.001**
Race[5]								
Non-Hispanic White	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Hispanic	**0.80**	**0.71**	**0.91**	**0.001**	0.91	0.78	1.06	021
Non-Hispanic Black	0.82	1.05	1.098	0.25	0.90	0.78	1.03	0.11
Non-Hispanic Asian	**0.59**	**0. 50**	**0.70**	**<0.001**	**0.69**	**0.56**	**0.84**	**<0.001**
Non- Hispanic All Other Race	1.27	0.94	1.72	0.12	1.21	0.86	1.72	0.26
Educailton[6]								
Advanced degree	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Some college	**1.17**	**1.06**	**1.29**	**0.002**	**1.12**	**1.01**	**1.25**	**0.04**
High school equivalent	**1.34**	**1.21**	**1.47**	<0.001	1.10	0.99	1.22	0.09
Less than high school degree	**1.66**	**1.49**	**1.85**	**<0.001**	**1.17**	**1.02**	**1.33**	**0.02**
Income[8]								
>5x poverty threshold	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
3-5x poverty threshold	**1.25**	**1.12**	**1.40**	**<0.001**	**1.22**	**1.09**	**1.37**	**0.001**
1-3x poverty threshold	**1.47**	**1.34**	**1.61**	**<0.001**	**1.34**	**1.20**	**1.50**	**<0.001**
<1x poverty threshold	**1.63**	**1.38**	**1.93**	**<0.001**	**1.54**	**1.32**	**1.80**	**<0.001**

	Univariable Analysis				Multivariable Analysis			
Employment Status[7]								
Employed or recently employed	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
No recent employment	**2.34**	**2.16**	**2.52**	**<0.001**	**1.39**	**1.26**	**1.53**	**<0.001**
Marital Status[9]								
Married	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Cohabitating, unmarried couple	**0.79**	**0.68**	**0.92**	**0.002**	1.13	0.95	1.33	0.16
Single	**0.65**	**0.58**	**0.72**	**<0.001**	1.04	0.90	1.18	0.60
Divorced, separated, widowed	**1.81**	**1.68**	**1.96**	**<0.001**	**1.10**	**1.00**	**1.21**	**0.03**
Parental Status[9]								
Parent/caregiver	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Not parent/caregiver of minor children	**1.72**	**1.58**	**1.87**	**<0.001**	**1.12**	**1.00**	**1.25**	**0.04**
Health Status[11]								
Good	**Ref**	**Ref**	**Ref**					
Fair	**2.96**	**2.68**	**3.26**	**<0.001**				
Poor	**5.29**	**4.43**	**6.33**	**<0.001**				
Disability[12]								
No	**Ref**	**Ref**	**Ref**					
Yes	**4.51**	**4.18**	**4.86**	**<0.001**				
Insurance[13]								
Private	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Public	**1.90**	**1.74**	**2.07**	**<0.001**	**1.19**	**1.07**	**1.32**	**0.001**
Other Coverage	**1.93**	**1.68**	**2.21**	**<0.001**	**1.16**	**1.00**	**1.37**	**0.05**
Uninsured	1.12	0.99	1.26	0.06	1.08	0.93	1.26	0.33
Region[14]								
Northeast	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Midwest	**1.30**	**1.11**	**1.52**	**0.001**	**1.31**	**1.11**	**1.55**	**0.001**
South	**1.30**	**1.12**	**1.50**	**<0.001**	**1.28**	**1.10**	**1.50**	**0.001**
West	1.14	0.97	1.34	0.101	**1.21**	**1.02**	**1.45**	**0.03**
Usual place for healthcare[15]								
Yes	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
No	**0.67**	**0.60**	**0.76**	**<0.001**	0.88	0.76	1.02	0.09
Delayed medical care due to cost[16]								
No	**Ref**	**Ref**	**Ref**		**Ref**	**Ref**	**Ref**	
Yes	**1.91**	**1.72**	**2.12**	**<0.001**	**1.86**	**1.65**	**2.10**	**<0.001**

Table 3. Univariable and multivariable logistic regression analysis of differences in vision related functional impairment (VFI) diagnosis based on sociodemographic factors of participants in the 2017 National Health Interview Survey*

95% CI=95% confidence interval. *All odds ratios and 95% confidence intervals are presented relative to the reference (Ref) group. For univariable analysis: [1,2,5,7,10,12,14]n=26,711; [3]n=26,665; [4]n=25,741; [6]n=26,622; [8]n=26,671; [9]n=26,659;[11]n=26,703; [13]n=26,618; [15]n=26,529; [16]n=26,701. For multivariable analysis, n =25,473 for all categories

CONCLUSION

- This study demonstrates robust associations between patient reported VFI with sociodemographic factors as well as aspects of health care access.
- VFI are independently associated with age, Asian race, income, employment status, insurance status, region of residence, and having delayed medical care due to cost.
- Targeted efforts should be aimed to address these sociodemographic and healthcare access disparities to improve vision-related impairments. Specifically, the modifiable factors which accompany these impairments should be a priority in health policy decision making.
- Future studies, which are longitudinal in design, and involve follow-up of patients' responses to ensure accuracy, more objective identification of VFI, and an assessment of severity of VFI would be valuable.
- Identification of the type of relationships between VFI and our outlined factors would also be beneficial in addressing the modifiable pathways to reduce disparities in the community.

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Quality of Hydroxychloroquine Retinopathy Screening at a Canadian Teaching Hospital

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Université de Montréal

CHUM

INTRODUCTION

Based on the latest 2016 AAO guidelines, patients taking hydroxychloroquine (HCQ) should be screened at initiation of treatment, with annual visits beginning after 5 years of drug therapy.[1] Presence of any of the following major risk factors greatly increases risk of retinopathy and therefore warrants reevaluation of the screening algorithm: dosage >5mg/kg/day, renal disease, tamoxifen use, and preexisting retinal disease.[2-5]

To our knowledge there is no current literature evaluating the quality of HCQ retinopathy screening in Canada.

AIM

To assess the quality of risk factor documentation by ophthalmologists in a Canadian teaching hospital, using the 2016 AAO guidelines as a reference.

METHOD

Retrospective chart review of patients who had a first appointment for HCQ retinopathy screening between 2016 and 2019 (pre-COVID):

- Performed a 20% random undersampling from N=673 patients for a total of N=134 patients.
- Excluded patients with other pathologies affecting the screening
- Developed a simplified three-tier grading model: ideal, adequate, and inadequate screening (table 1).

Table 1. The tri-level scoring system used to grade the electronic health records notes

Categories	Ideal		Adequate		Inadequate
	Explanation	Example	Explanation	Example	Explanation
Daily dose	Documents weight + daily dose OR calculates dose in mg/kg/day	"Patient weights 75 kg, takes 200 mg HCQ daily" OR "Patient takes HCQ at a dose of 2.6 mg/kg/day"	Documents daily dose without documenting weight or dose in mg/kg/day	"Patient takes HCQ 200 mg per day"	Does not document medication dose
Duration of use	Documents cumulative years of usage OR documents the start year	"Patient has been taking HCQ for 15 years" OR "Patient started taking HCQ in 2016"	Does not document duration of use clearly (number of years not stated or cannot be calculated)	"Patient started taking HCQ a long time ago"	No documentation of duration of use
Renal disease	Clearly documents the presence or absence of retinal disease	"No renal disease" OR "Patient is known for CKD and has low eGFR"	Documents past medical history but does not mention renal disease as a pertinent negative	"No past medical history"	Does not document past medical history
Concomitant use of tamoxifen (in women)	Documents the use or absence of use of tamoxifen	"Patient takes tamoxifen" OR "No tamoxifen use"	Documents the list of medications (but does not document tamoxifen use)	Medication list present in the chart OR "Patient does not take any medications"	No documentation of any medication use or absence of use

RESULTS

- Charts reviewed: N=134. 15 patients excluded based on coexisting ocular conditions affecting follow-up or incomplete medical records (table 2);
- Daily dose documentation was evenly distributed between the three levels (figure 1);
- Duration of use was the best documented with 75% being ideal (figure 1);
- Renal disease was rarely documented in an ideal manner (figure 1);
- Tamoxifen use was never documented ideally (figure 1);
- Renal disease and tamoxifen use documentation accounted for 64% of all inadequate documentation. With daily dose, this number climbs to 90% (figure 2);
- Root causes of these cases of poor documentation can be classified across multiple levels: organization, EHR, ophthalmologist, and referring MD (figure 3).

Figure 1. Summary of risk factors documentation during initial examination.

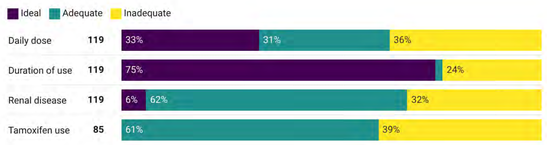

Figure 2. Pareto Analysis

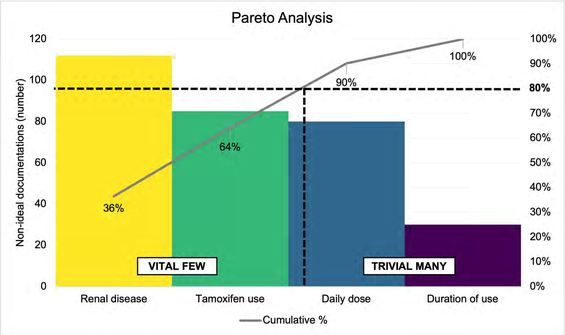

Figure 3. Ishikawa diagram

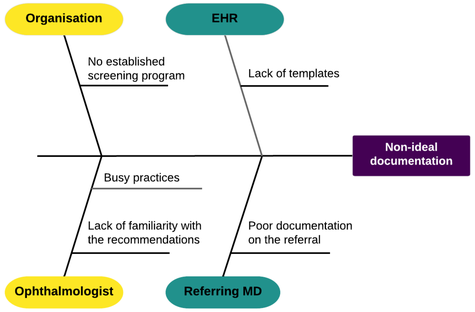

Table 2. Summary of the population demographic information, indications for HCQ treatment, time from issuance of consultation to ophthalmologic examination and follow-up duration

Age, years	
Mean	52.7
Standard deviation	15.9
Range	18 – 85
Sex, n	
Female	85/119 (71.4%)
Male	34/119 (28.6%)
Ethnicity, n	
Non-Asian	110/119 (92.4%)
Asian	9/119 (7.6%)
Indication for treatment, n (n=107)	
Rheumatoid arthritis	44/107 (41.1%)
Systemic lupus erythematous	26/107 (24.3%)
Sjogren's syndrome	8/107 (7.5%)
Undifferentiated inflammatory arthritis	7/107 (6.5%)
Other causes	22/107 (20.6%)
Time from consultation to ophthalmic examination, days (n=104)	
Median	185.5
Interquartile range	100.5
Range	1 – 796
Less than 365 days	94/104 (90.4%)
Follow-up duration, days (n=109)	
Median	603
Interquartile range	1040
Range	0 – 2058

CONCLUSION

- Risk factor awareness is essential for screening since their presence often represents an indication for starting to screen earlier. Documentation of these risk factors was variable in our institution;
- By simply improving documentation of renal disease and tamoxifen use, most cases of poor documentation can be solved;
- Actionable solutions can be taken to target the root causes at all levels of the process.

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CONTACT INFORMATION

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Evaluating the Ophthalmology Residency Program in Mongolia: A Cross-sectional Survey

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INTRODUCTION

Mongolia is a geographically vast country with a population of 3.4 million people, a third of which live in rural areas[1]. Like Canada, rural medicine is fundamental to providing equitable health care across the country. The capital city, Ulaanbaatar (UB), is the only city in Mongolia where ophthalmology training is available.

AIM

1. Assess the state of the ophthalmology residency training in Mongolia
2. Evaluate the effectiveness of international interventions
3. Offer actionable tactics to improve ophthalmic care in Mongolia.

METHOD

- A cross-sectional online survey (Qualtrics, Provo, UT) was distributed amongst ophthalmology residents in Mongolia from October to December 2022, via the cohort's mailing list.
- The survey included four subsections: **demographics**, **residency experience**, **wet lab surgical experience**, and **career outlook**.

RESULTS

Residency Experience:

- The residents reported working an average of 51 hours/week, seeing an average of 21 patients each day.
- 12 residents reported involvement in oculoplastic, 10 in pterygium, 9 in cataracts, and 7 in ruptured globe trauma surgeries.
- 50% (8/16) of residents indicated that they experienced harassment from their superiors at some point in their training.

Table 1. Demographics of survey respondents (n=19)

Gender, n (%)	
Female	16 (84.2)
Male	3 (15.8)
Age in years, mean [range]	26.8 [23-31]
Geographic Origin, n (%)	
UB	13 (68.4)
Outside UB	6 (32.6)

Wet Lab Surgical Experience:

- All residents reported using the wet lab to practice cataract, glaucoma, and corneal procedures and found it helpful in their training (100%).
- *"Excellent practice, helpful in reducing stress and tremor with early experiences in surgery"*.
- 65% of the residents found the supplies to be sufficient, while 35% indicated a need for more eye models to practice on as well instruments for eyelid surgery.

Career Outlook:

- 44% intend to work in the public system and 33% plan to practice privately.
- Most residents (67%) aim to practice in UB, however, 89% of residents expressed interest in participating in outreach missions in rural Mongolia.
- 67% preferred a surgery-based practice while 28% plan to have a solely medical practice.
- 89% residents indicated interest in pursuing a fellowship upon residency completion.

CONCLUSION

1. Incorporation of a **surgical wet lab** into the Mongolian residency training was highly beneficial and well-received by residents.
2. Given the indicated interest in completing fellowships (89%), we highly recommend facilitation of educational mobility for additional **training in international centers**. This may also encourage more trainees to pursue **surgery-based practices** (currently only 67%).
3. Since **outreach missions** are the cornerstone of ophthalmic care in rural Mongolia, these opportunities should be integrated into residency training and incentives may be considered to encourage rural practice amongst trainees.
4. Considerable rates of harassment reported by residents will be highlighted to the department and reassessed in the following surveys. We aim to repeat this survey to evaluate the impacts of local and international interventions longitudinally.

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ACKNOWLEDGEMENTS

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Global Health Education for Ophthalmology Residents in Canada: Perspectives and Opportunities

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Université de Montréal

INTRODUCTION

- Over 596 million people worldwide are affected by visual impairment, 90% of which are due to preventable or treatable causes.[1]
- Global eye health is essential for achieving sustainable development goals. [1].
- There is a growing interest in developing global health education and training opportunities within ophthalmology residency programs.[2]

AIM

✓Explore the interest of Canadian ophthalmology residents in engaging in global health initiatives during their residency and in their future practice.

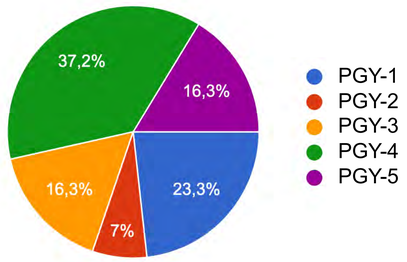
✓Assess the availability and scope of global health training opportunities for ophthalmology residents.

✓Evaluate residents' perspectives on the benefits and limitations of global health training within their residency program.

METHOD

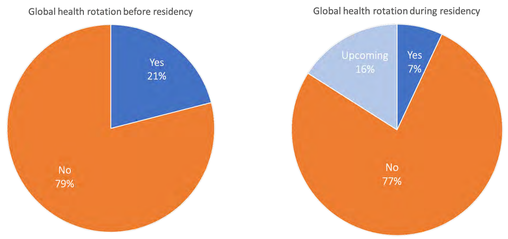
- A survey with multiple-choice and short-answer questions was distributed to all ophthalmology residents in Canada in July 2023 via email through the Canadian Ophthalmological Society (COS) resident list.
- Of 190 residents, 43 completed the survey, resulting in a response rate of 22.6%.

Year of residency of participants who completed the survey



RESULTS

Figure 1: Prevalence of residents who completed a global health rotation before and/or during their residency



- Among the residents who completed a global health rotation, 9.1% reported being accompanied by Faculty members from their department.

Figure 2: Organization of global health rotations

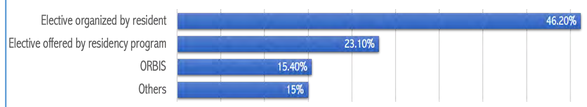


Figure 3: Activities of interest during a global health rotation

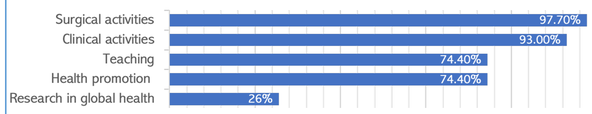


Figure 4: Residents' interest level for global health in ophthalmology

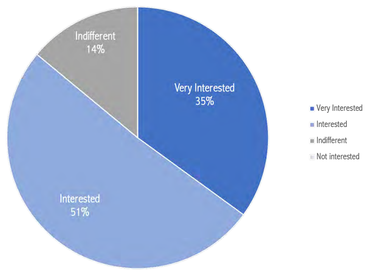
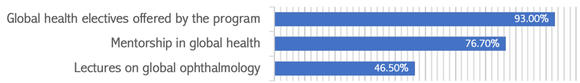


Figure 5: Activities of interest in global health education within residency programs



RESULTS

Figure 6: Residents' perspectives on the benefits of global health training

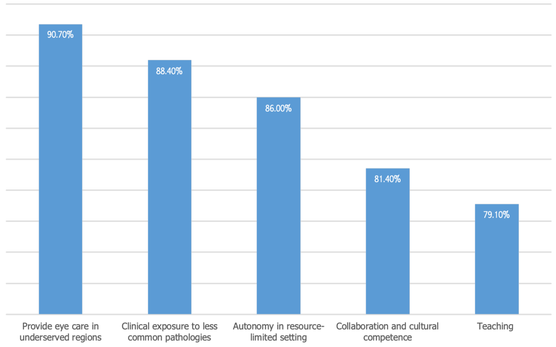


Figure 7: Training year of interest for completing a global health rotation

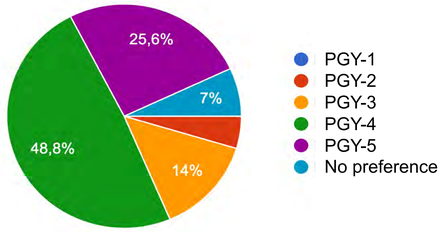


Figure 8: Obstacles and difficulties encountered by residents wishing to engage in global health

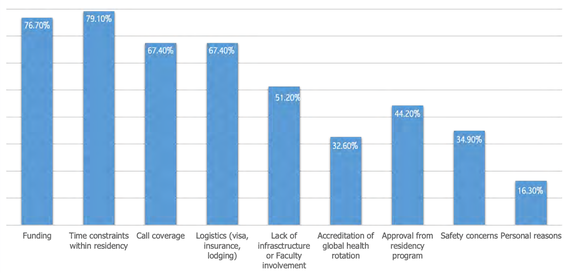


Figure 9: Types de funding available to residents

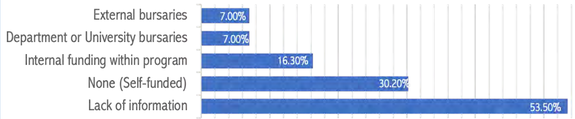
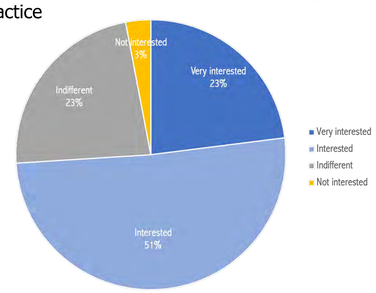


Figure 10: Residents' level of interest to engage in global health in their future practice



- 85% of ophthalmology residents demonstrate an interest in global health.
- More than 20% of ophthalmology residents have completed or plan to complete a global health rotation during their residency.
- The majority of current global health rotations are organized by students and are self-funded.
- More than 90% of residents are interested to participate in a global health rotation organized by their program.
- The major obstacles identified by residents are funding and time constraints outside the program.
- 75% of residents are interested to deepen their education in global health through a mentorship program.
- 75% of residents are interested in being involved in global health in their future practice.

CONCLUSION

- Ophthalmology residents in Canada show a strong interest to engage in global health during their training and future practice.
- This study reinforces the role of global health education during residency in contributing to the development of skills aimed at promoting sustainable development in global health.
- The creation of a national mentorship program represents an interesting opportunity for global health training.

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Newcomers to the North: Barriers to Eyecare for New Immigrants to Northern Ontario

COS 2024

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INTRODUCTION

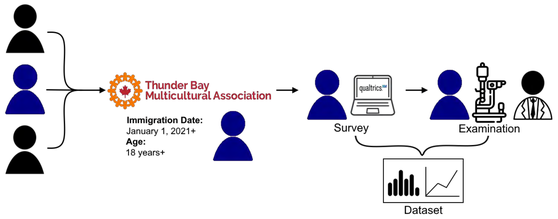
- Immigration to Northern Ontario has increased in recent years, through programs such as the Rural and Northern Immigration Pilot[1]
- Northern Ontario has significant barriers to healthcare including geographic distances, lack of resources, socioeconomic factors, and others[2]
- Marginalized populations in Canada are reported to have unique barriers to eyecare, including urban Syrian refugees[3], people experiencing homelessness[4], Indigenous peoples[5], and others
- We investigated the barriers to eyecare and baseline eye health of new immigrants to Northern Ontario
- We hope to advocate for screening eye exams for new immigrants to Canada, as was proposed by Pottie and colleagues in their 2011 report[6]

AIM

- Identify barriers to eye care for new immigrants to Northern Ontario
- Evaluate the baseline prevalence of eye diseases among new immigrants to Northern Ontario through standardized eye examinations

METHODS

- Participants were referred through the Thunder Bay Multicultural Association (TBMA), a third-party organization
- Inclusion criteria required participants to have immigrated to Canada on or after January 1, 2021, and to be at least 18 years of age
- Participants were scheduled into several clinics with one of the study's ophthalmologists (Dr. Francis, Dr. Dhurjon, Dr. Gupta)
- At each appointment, participants completed a 15-20 minute survey and received a comprehensive eye examination from an ophthalmologist
- Data from the eye examinations and survey was stored and analysed in Microsoft Excel
- Fisher Exact tests were used for statistical analysis



RESULTS

Sample Demographics

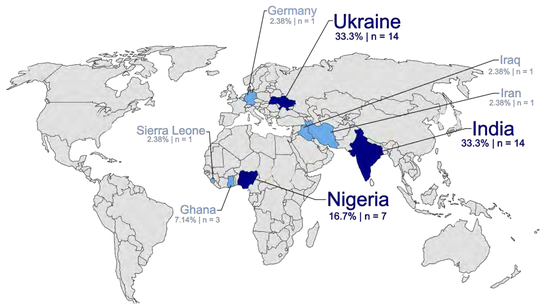
Sample Size:

n = 42

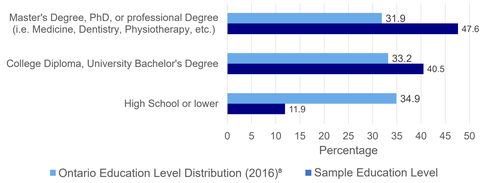
Gender:

52% Male 48% Female

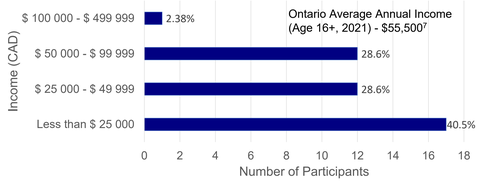
Countries of Origin:



Education Level:



Annual Income:



Median Age:

30 years (Q1: 26 | Q3: 39)

First Language:

90.5% spoke English as a second language

Household Size:

Mean number of adults was 2.095 (95% CI: 0.622)
Mean number of children was 0.714 (95% CI: 0.38)

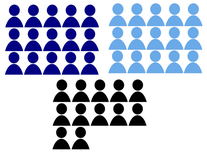
Baseline Eye Health

Mean Uncorrected Visual Acuity (LogMAR):

0.405 (95% CI: 0.164)

0.3 (95% CI: 0.10853)

Diagnoses, Follow Up and Treatment:

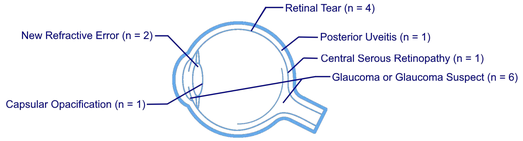


35.7% received new diagnoses on exam

35.7% required follow up by an ophthalmologist

28.6% required treatment or new glasses

Newly Diagnosed Ocular Pathologies:



Barriers to Eyecare

Eye Exam History:

47.6% had a previous eye exam outside of Canada

14.3% had a previous eye exam in Canada

Level of Concern with Eye Health:

76.2% of participants expressed concern with their eye health

Interest in Free Eye Exams:

88.1% of participants expressed interest in free eye exams

Median Time Since last Eye Exam:

1.43 Years (Q1: 0.818 | Q3: 2.366)

50% of participants commented on specific barriers to eyecare

Major Barriers:

Financial
- Lack of insurance
- High cost of glasses and exams

Time Constraints
- Long wait times for eye specialists
- Difficulty finding time to seek care

Systemic Barriers
- Lack of knowledge of the healthcare system
- Cumbersome process of seeking care
- Cultural differences between healthcare in Canada and home country

Statistical Correlations:

- Age, gender, country of origin, income level, education level, having a previous eye exam, and history of eye disease were tested against the following endpoints: 1) new diagnosis, 2) requiring follow up, and 3) requiring treatment
- Post-graduate education level was significantly correlated with requiring follow up by an ophthalmologist ($p < 0.05$)
- None of the other variables above had significant correlation with the listed endpoints

CONCLUSION

- Limitations:
  - Small sample size
  - Sampling bias due to recruitment limitations
- Most new immigrants screened for eye exams reported concerns about their ocular health and barriers to eye examination
- Several participants were found to have a new ocular diagnosis, many of which required further intervention.
- Screening eye examinations upon arrival into Canada may improve long term eye health, particularly amongst newcomers to the North.

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- Uday Dave, Wael Mohammed, Tanya Miller - FORSEE Canada
- Augustina Ampofo – William Osler Health System Research Ethics Board

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Non-mydriatic Fundus Photography for the Evaluation of Patients with Vision Loss in Canadian Emergency Settings

COS 2024

Trillium Health Partners

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INTRODUCTION

- Fundoscopy is an essential component of the initial emergency department (ED) evaluation of patients with vision loss
- Fundoscopic findings may alter patient disposition from the ED
- Fundoscopy is challenging for non-ophthalmologists and is inadequately performed in the ED
- For emergency medicine physicians, non-mydriatic ocular fundus photography is superior to other forms of ophthalmoscopy in sensitivity, specificity, and inter-examination agreement

AIM

To evaluate the use of non-mydriatic photography as a triage and telemedicine tool for the evaluation of patients with vision loss in a Canadian emergency setting

METHODS

At the time of emergency consultation, non-mydriatic fundus images of both eyes were obtained by a non-ophthalmologist using a handheld, non-mydriatic fundus camera **(Image 1)** prior to pupil dilation.

Fundus images obtained from both eyes of participants by a non-ophthalmologist n-=36

↓

Patient chart reviewed for documentation of fundoscopy

↓

Ophthalmologist reviewed images for fundus abnormalities after clinical encounter

METHODS

Image Review: **Phase 1**

The Ophthalmologist reviewer was asked to:

(1) Select the best photo obtained for each eye and rate image quality on a Likert scale (below)

1: Critical features (optic nerve, macula) cannot be distinguished
2: Only some of either the macula or optic nerve visible
3: Some details of both macular and optic nerve visible
4: Almost all critical features visible
5: All details of critical features visible (Image 2)

(2) Comment on the presence of fundus abnormalities

(3) Provide an opinion on whether the fundus image would have changed patient disposition if available at initial ED exam

Image Review: **Phase 2**

In the second phase of the study, the same fundus images will be shared with the referring ED physician, who will be asked the same three questions.

Image 1: Volk Optical Pictor Plus™ Fundus Camera (camera used)

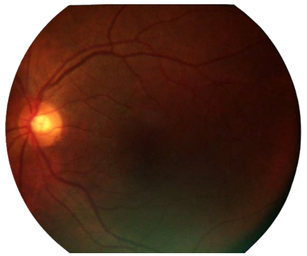
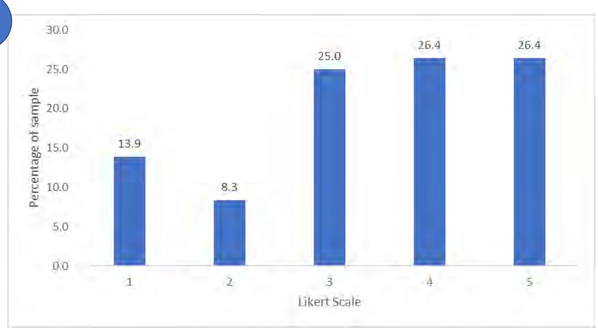


Image 2: 5: All details of critical features visible

RESULTS

- **Figure 1:** 86.1% (62/72) of images were deemed to have acceptable quality (Likert scale >= 2)
- 16.7% (6/36) of patients had a visible fundus abnormality noted on photography that was not seen at the time of the initial ED exam. In each case, ED consultation with Ophthalmology was not sought, and outpatient consultation with Ophthalmology was arranged.
- Fundus abnormalities included:
  - Macula-off retinal detachment **(Figure 2)**
  - Optic disc pallor
  - Macular scaring
  - Macular hemorrhage (**Figure 3)**
  - Dot-blot hemorrhage
- Factors limiting image quality included :
  - Media opacity (i.e. vitreous hemorrhage, cataract)
  - Pupillary miosis
  - Photosensitivity
  - Eyelid/periorbital abnormalities (i.e. edema)

1



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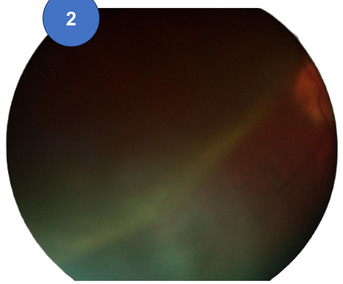

Figure 2: Macula-off retinal detachment

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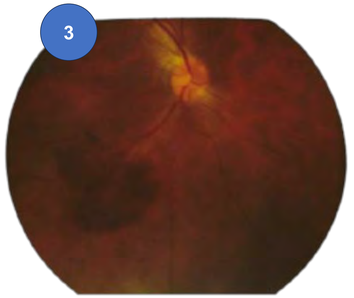

Figure 3: Macular hemorrhage

CONCLUSIONS

- Fundoscopy is infrequently performed in the Canadian emergency setting for patients presenting with vision disturbances
- Our interim results indicate that non-mydriatic ocular fundus photography is a cost-effective, reproducible method of fundus examination, even for non-expert examiners
- Preliminary results suggest that in-person or remote viewing of non-mydriatric fundus images can inform more accurate triage decisions for patients presenting with visual loss, either by indicating the need for expedited care or by providing reassurance that Ophthalmology consultation can occur less urgently

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Tele-Ophthalmology: COVID-19 & Barriers to Care

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Background

- Telehealth, often used interchangeably with 'telemedicine', is broadly defined as healthcare services provided virtually using audio and video technology (Gajarawala and Pelkowski 2021)
- Tele-ophthalmology is particularly applicable given the field's reliance on interpreting ophthalmic images for screenings and diagnoses (Yuen et al. 2022).
- Ophthalmologists have specifically employed telehealth in the treatment of several ocular conditions, including diabetic retinopathy, age-related macular degeneration, and glaucoma (Yuen et al. 2022)
- Efficient use of tele-ophthalmology services can also significantly reduce wait times and overall appointments in ophthalmology, helping minimize strain on eye-care providers (Caffery et al. 2016)
- The outbreak of the COVID-19 pandemic in early 2020 posed new challenges that telehealth was particularly suited to address, presenting a major opportunity for wider adoption of tele-ophthalmology

Objective

- To evaluate the impact of COVID-19 on tele-ophthalmology utilization in Canada and identify barriers in virtual ophthalmic care access.

Method

- A primary literature search was undertaken using the PubMed (Medline), Embase, and Scopus databases. Keywords and MeSH terms such as "tele-ophthalmology", "telehealth", and "ophthalmology" were combined with "COVID-19" or "access". Pertinent articles through October 2023 were evaluated with 30 included in this review

Results: Tele-Ophthalmology in Canada

- Although capable of providing cost-effective care to urban and rural populations, tele-ophthalmology was rarely utilized by practitioners prior to COVID-19
- In a mixed-methods survey distributed to Canadian ophthalmologists, just 6% of respondents reported utilizing telehealth before the pandemic (Mercer et. al 2021)
- At the same time, 0.10% of ophthalmology assessments in Ontario were conducted virtually in 2019 (Jin et al. 2022)
- Nonetheless, the tele-ophthalmology programs implemented in Canada have been successful
- Arora et al. (2013) delineate the positive impact of a culturally-sensitive model of healthcare delivery on the use of tele-ophthalmology in a rural Cree community
- Cao et al. (2022) underline the effectiveness of tele-ophthalmic screening for an inner-city, ethnically diverse, and socioeconomically disadvantaged population

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Results: COVID-19 & Tele-Ophthalmology

- Naturally, COVID-19 presented opportunities for an increased use of telehealth
- In a cross-sectional study, Jin et al. (2022) found that tele-ophthalmology use in Ontario peaked (55%) in March 2020 just two-weeks after the establishment of a new virtual fee code
- Similar increases in tele-ophthalmology's utilization were also found in the United States (Mosenia et al. 2022; Sethi et al. 2021)
- Among responding ophthalmologists, 80% reported using virtual care during the pandemic, and 45% indicated that tele-ophthalmology would constitute a modest-to-large part of their future practice (Mercer et al. 2021)
- Ultimately, Mercer et al. (2021) stress the importance of development in professional culture, funding and regulation as well as the necessity for further clinical research and device development to continue the heightened adoption of tele-ophthalmology post-pandemic

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Financial Disclosures

None of the authors pertinent to this presentation.

Results: Barriers to Care

- However, although designed to improve the delivery of care, access to tele-ophthalmology is not yet universal for all individuals.
- Although Jin et al. (2022) did not find any difference in tele-opthalmology's utilization between lower and higher income neighbourhoods in Ontario, other Canadian studies—not specific to tele-ophthalmology—have found that ethnicity and socio-economic status can act as barriers in accessing telehealth services (Franciosi & Quon 2021)
- In a retrospective, cross-sectional study conducted in Massachusetts, United States, Aziz et al. (2021) discovered that marginalized groups—including those who identify as Black, lacked a post-secondary educational background, and whose primary language was not English—face challenges in accessing tele-ophthalmology.

Table 1: Barriers to Tele-Ophthalmology Access (Aziz et al 2021)

Absence of suitable internet and electronic services
Limited health and technology literacy

Conclusion

- Although COVID-19 resulted in an increase in tele-ophthalmology use across North America, studies in Canada have yet to explore if there has been a lasting change post-pandemic
- In Canada, further research is necessary to evaluate which vulnerable groups still struggle to access virtual ophthalmic care and how these barriers can be removed

Utilization of Eye-Care Providers by Ontario Residents in 2019: A Population-based Study

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COS 2024

UNIVERSITY OF TORONTO

INTRODUCTION

Eye-care services in Canada are provided by ophthalmologists, optometrists, primary care providers (PCPs, including family physicians, pediatricians, and nurse practitioners), and emergency physicians.

The frequency of utilization for each eye-care provider remains unclear. Using Ontario population-based physician billing data as an example, we address this knowledge gap.

PURPOSE

To determine the number of eye-visits to ophthalmologists, optometrists, PCPs, and emergency physicians in Ontario in 2019.

METHODS

This was a cross-sectional study using 2019 physician billing data from the Ontario Health Insurance Plan and the International Classification of Diseases, Ninth Revision (ICD-9) codes.

The number of eye-visits and the number of distinct eye patients per 100 individuals in Ontario was calculated.

Results were stratified by:

- Age-group
- Urban/rural residency
- Visit type (emergency/non-emergency, determined by whether the visit occurred in an emergency room or not)
- Physician specialty

Results were reported using descriptive statistics.

RESULTS

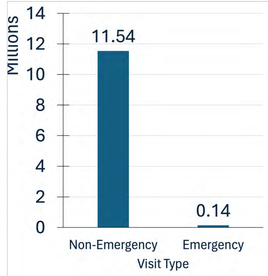

Figure 1.A. Total Number of Eye-Related Visits, by Visit Type

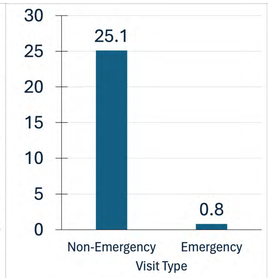

Figure 1.B. Number of Distinct Eye Patients Per 100, by Visit Type

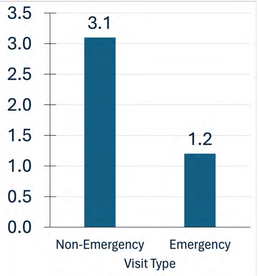

Figure 1.C. Total Number of Eye-Related Visits Made Per Patient, by Visit Type

Overall, in the year 2019, there were 11.54 million non-emergency visits and 139,023 emergency visits funded by the Ontario government (Figure 1.A.). Excluding revisits, the number of distinct eye-related patients per 100 population was 25.1 for non-emergency and 0.8 for emergency cases (Figure 1.B.). On average, each patient had 3.1 visits for non-emergency cases and 1.2 visits for emergency cases (Figure 1.C.).

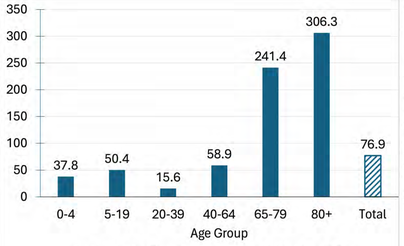

Figure 2.A. **Non-Emergency** Visits Per 100 People, by Age Group

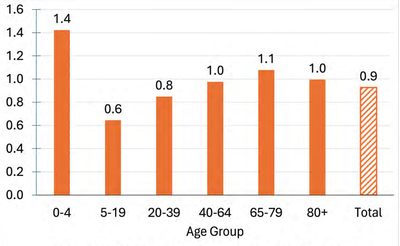

Figure 2.B. **Emergency** Visits Per 100 People, by Age Group

Per 100 population, the annual number of eye-visits by the entire population was 76.9 for non-emergency cases (Figure 2.A.) and 0.9 for emergency cases (Figure 2.B.). When stratified by age group, individuals aged 65-79 and 80+ made 241.4 and 306.5 non-emergency eye-visits per 100 people, respectively (Figure 2.A.). Individuals aged 0-4 made slightly more emergency eye visits per 100 people compared to other age groups (Figure 2.B.).

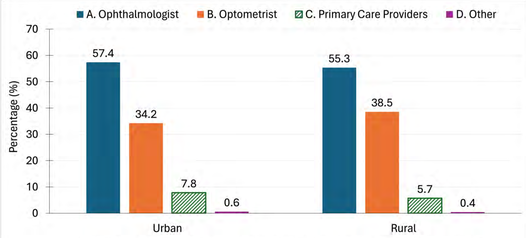

Figure 3.A. Percentage of **Non-Emergency** Visits Provided by Physician Speciality and Urban/Rural Residency

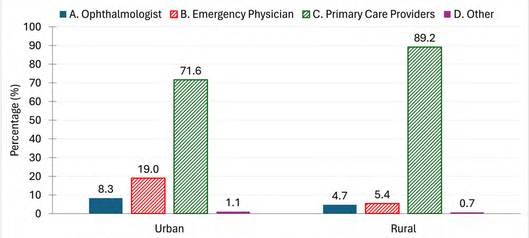

Figure 3.B. Percentage of **Emergency** Visits Provided by Physician Speciality and Urban/Rural Residency

*By urban and rural residence, for **non-emergency visits** (Figure 3.A.), more rural patients (38.5%) received care from optometrists compared to urban patients (34.2%). Ophthalmologist care was slightly less prevalent in rural (55.3%) compared to urban (57.4%) patients. PCP care was slightly less prevalent in rural (5.71%) compared to urban (7.83%). For **emergency visits** (Figure 3.B.), ophthalmologist care received by rural patients (4.7%) was substantially less common compared to urban (8.3%) patients. In both rural and urban, emergency eye-visits were predominantly managed by PCPs with special training in emergency medicine (71.6% urban and 89.2% rural).*

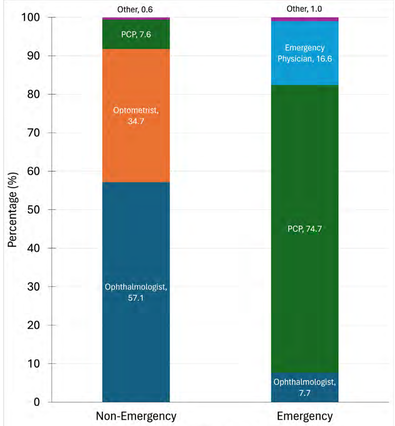

Figure 4. Distribution of Eye-Care Providers for Non-Emergency and Emergency Visits

*By eye care providers, for **non-emergency visits**, 57.1% of the care was provided by ophthalmologists (representing 6.6 million visits or 14,133 visits per ophthalmologist), 34.7% by optometrists (representing 4.0 million visits or 1,525 visits per optometrist) and 7.6% by PCPs (Figure 4). **Regarding emergency visits**, 7.7% of care was provided by ophthalmologists, 74.7% by PCPs with special training in emergency medicine, and 16.6% by emergency physicians (Figure 4).*

Table 1. Top Eye-Care Provider by Age Group

Age Group	Primary Eye-Care Provider	% of Care Provided
0-4	Optometrists	48%
5-19	Optometrists	80%
20-39	Ophthalmologists	45%
40-64	Ophthalmologists	63%
65-79	Ophthalmologists	64%
80+	Ophthalmologists	74%

Table 2. Top Diagnoses by Age Group

Age Group	Top Non-Emergency Diagnosis	Top Emergency Diagnosis
0-4	Refractive Errors, Conjunctivitis	Corneal Foreign Body, Conjunctivitis
5-19	Refractive Errors, Amblyopia	Corneal Foreign Body, Other disorders of eye
20-39	Conjunctivitis, Other disorders of eye	Other disorders of eye, Corneal Foreign Body
40-64	Glaucoma, Diabetic Retinopathy	Other disorders of eye, Corneal Foreign Body
65-79	Cataracts, Glaucoma	Other disorders of eye, Corneal Foreign Body
80+	Hypertensive Retinopathy, Glaucoma	Other disorders of eye, Corneal Foreign Body

Top diagnosis is listed as the first condition in the list
"Other disorders of the eye" is in reference to ICD-9 diagnostic code 379

CONCLUSION

In 2019, about 1 in 4 individuals received non-emergency eye care utilizing Ontario's universal public healthcare system, while 1 in 100 obtained emergency eye care. Common diagnoses were refractive errors and conjunctivitis for Ontarians under 20, and glaucoma and retinal diseases for adults. Optometrists were more frequently visited by rural patients for non-emergency cases. For emergency cases, both urban and rural patients predominantly relied on PCPs with special training in emergency medicine.

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Aqueous Humour Cytokine Levels in Fuchs Endothelial Corneal Dystrophy

COS 2024

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INTRODUCTION

- Fuchs endothelial corneal dystrophy (FECD) is characterized by progressive corneal endothelium dysfunction and apoptosis of corneal endothelial cells and development of guttae.
- Although the pathogenesis of FECD is incompletely understood, genetic, endocrine, and environmental factors have been implicated in disease progression.
- Few reports have assessed the intraocular cytokine levels of patients afflicted with this disease.

AIM

This study aims to characterize the expression of pro- and anti-inflammatory factors in the aqueous humour of patients with FECD.

METHOD

- Patients with a diagnosis of either FECD with or without cataract, or cataract only requiring surgical intervention were prospectively enrolled in this study.
- There were 3 study groups: FECD phakic eyes that underwent combined Descemet's membrane endothelial keratoplasty (DMEK) and cataract extraction with insertion of intraocular lens (CE IOL) or Descemet stripping only (DSO) and CE IOL (group FP), pseudophakic eyes that underwent DMEK only (group FPs) and CE IOL control group (group cc).
- The primary outcome of this study is to investigate differential expression of aqueous cytokine in patients with FECD.
- An anterior chamber paracentesis was performed before surgery and aqueous humour was collected for analysis.
- Using multiplex bead array assays (MILLIPLEX®), the following 48 cytokines were assessed: sCD40L, EGF, Eotaxin, FGF-2, Flt-3 ligand, Fractalkine, G-CSF, GM-CSF, GROα IFNα2, IFNγ, IL-1α, IL-1β, IL-1ra, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12 (p40), IL-12 (p70), IL-13, IL-15, IL-17A, IL-17E/IL-25, IL-17F, IL-18, IL-22, IL-27, IP-10, MCP-1, MCP-3, M-CSF, MDC (CCL22) MIG MIP-1α, MIP-1β, PDGF-AA, PDGF-AB/BB RANTES TGFα, TNFα, TNFβ, VEGF-A.
- Kruskal-Wallis and Dunn's multiple comparison tests were used to compare cytokine expression levels in each group.

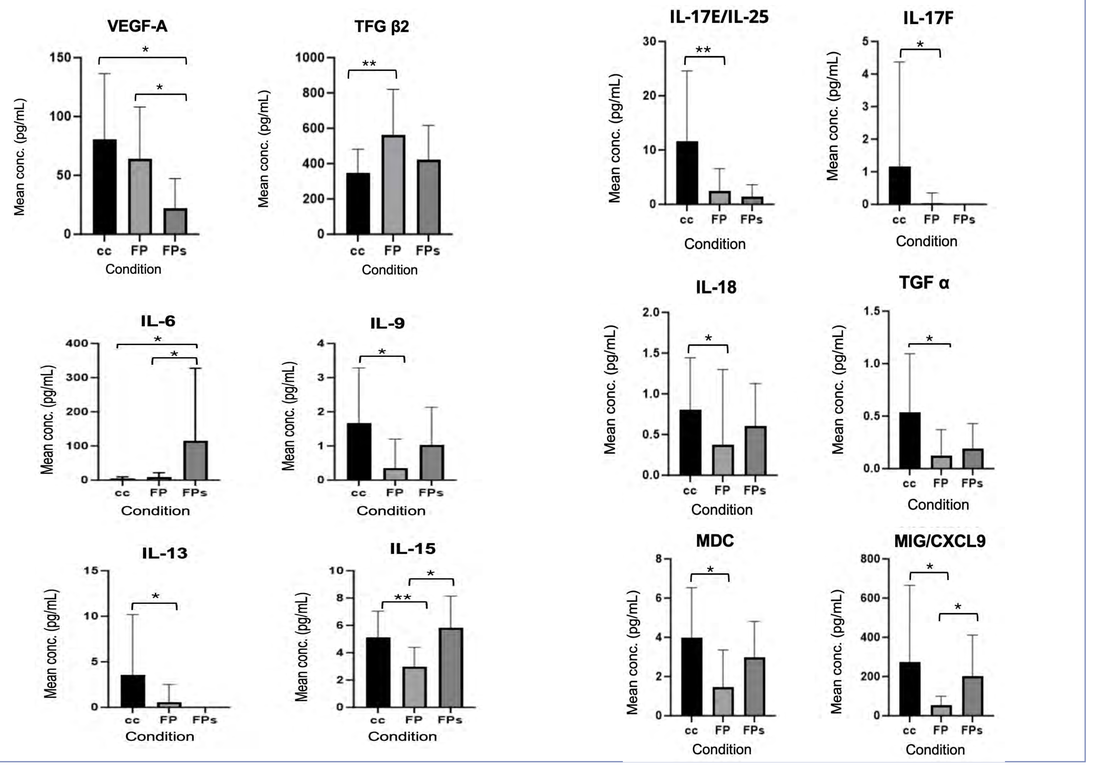
RESULTS

Table 1: Baseline Demographics

	Cataract control group (N = 18 patients)	Phakic FECD group (N = 32 patients)	Pseudophakic FECD group (N = 13 patients)
Mean age (years)	73.6	72.7	68.7
Female (%)	56	92	72
Male (%)	44	8	28

Table 2: Baseline Clinical Characteristics

	Cataract control group (N = 36 eyes)	Phakic FECD group (N = 40 eyes)	Pseudophakic FECD group (N = 13 eyes)
Surgical intervention	CE IOL (100%)	Combined DMEK and CE IOL (85%) Combined DSO and CE IOL (15%)	DMEK (100%)
Baseline VA (logMAR)	0.303	0.361	0.439
Baseline IOP (mmHg)	13.75	14.89	15.09
Baseline CCT	-	606	664
Presence of Corneal edema (%)	0%	33%	54%



CONCLUSION

- The aqueous humour of phakic FECD eyes has a distinct immunological profile when compared to eyes undergoing cataracts.
- TGFβ2 is upregulated in phakic FECD eyes when compared to cataract controls. However, TGFα is downregulated in phakic FECD eyes when compared to cataract controls.
- VEGF-A, IL-9, IL-13, IL-15, IL-17A and IL-17E/IL-25, IL-18, MDC, MIG/CXCL9 are all downregulated in phakic FECD eyes when compared to cataract controls.

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Association Of Pre-residency Publications With Research Productivity In Residency, Fellowship, And Academic Career Choice Among Canadian Ophthalmologists

COS 2024

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2Section of Ophthalmology, Department of Surgery, University of Calgary, Calgary, AB, Canada.
3Department of Ophthalmology, Schulich School of Medicine & Dentistry, Western University, London, ON, Canada.

INTRODUCTION

- Research productivity during medical school may predict academic potential in residency and later.[1]
- Pre-residency research output is associated with pursuing an academic career in several specialities but remains unexplored in the Canadian Ophthalmology landscape.[2]

AIM

This study aims to assess whether the research output of **medical students** who matched into a Canadian Ophthalmology residency program influences their subsequent **research productivity** during residency, decision to pursue a fellowship, or engagement in academic practice.

METHODS

Retrospective database study in May 2023

↓

Residents from all 15 Canadian Ophthalmology residency programs between 2004 and 2015

↓

Resident names, dates of training, residency program, gender, fellowship, practice setting

↓

Publication count, type of publication, and H-index extracted from Scopus

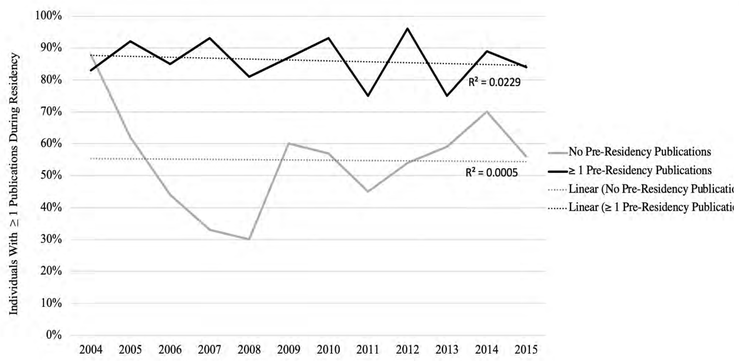
↓

Descriptive statistics, Fischer's exact test, Welch's test (or Mann-Whitney U test), regression models (binary logistics regression, negative binomial model)

RESULTS

- 369 first year ophthalmology residents from all 15 Canadian ophthalmology residency programs
  - Ontario: 132 trainees
  - West Canada: 81 trainees
  - East Canada: 156 trainees
  - Cohort 2004 – 2009: 157 trainees
  - Cohort 2010 – 2015: 212 trainees
- 187 trainees with pre-residency publications had significantly higher research productivity during residency compared to 182 without pre-residency publications, with a mean of 5.17 ± 5.97 vs. 1.60 ± 2.38 ($p < 0.001$) publications on any topic
- Significant positive correlation between research publications before and during residency ($r(367) = 0.50$, $p < 001$)
- Of those with pre-residency articles, 87% (162/187) published ≥1 article during residency, whereas only 54% (98/182, $p < 0.001$) of those without pre-residency articles did so

Figure 1. Comparison of Canadian ophthalmologists with ≥1 publication(s) during residency, separated according to pre-residency publication status (0 versus ≥1) and according to cohort year.

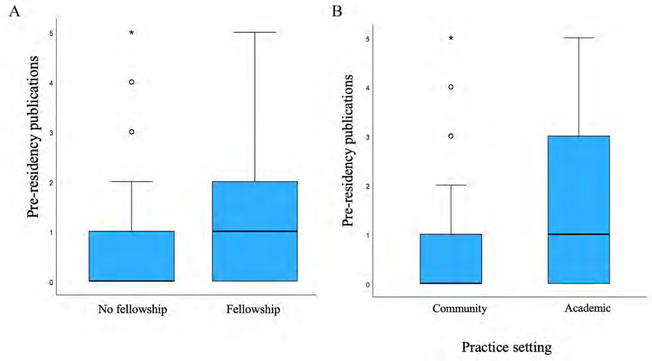


Characteristic	Residency Publication Count	
	RR, (95% CI)	p-value
Sex (female)	0.61, 0.46 – 0.80	0.23
Pre-residency publication count	**1.17, 1.09 – 1.27**	**<0.001**
Pre-residency H-index	0.99, 0.87 – 1.12	0.86
Match Year		
2004 – 2009	reference	
2010 – 2015	**1.57, 1.22 – 2.01**	**<0.001**
Residency Program		
West Canada	0.85, 0.61 – 1.17	0.23
East Canada	**0.55, 0.42 – 0.73**	**<0.001**
Ontario	reference	

There was a positive association between pre-residency research output and research output during residency.

Research productivity was increased in cohort 2010 – 2015 compared to 2004 – 2009 and was lower in Eastern Canada compared to Ontario.

Figure 2. Pre-residency publication productivity comparisons between residents based on (A) fellowship status, and (B) practice setting.



	Odds Ratio, 95% CI	
Predictors	Fellowship	Academic Practice
Sex (female)	1.03, 0.67 – 1.61	0.97, 0.61 – 1.54
≥ 1 pre-residency publication	**2.9, 1.74 – 4.83****	**1.85, 1.07 – 3.20***
Pre-residency H-index	1.03, 0.88 – 1.21	**1.25, 1.04 – 1.51***
Match Year		
2004 – 2009	reference	
2010 – 2015	**0.55, 0.35 – 0.85***	**0.36, 0.23 – 0.57****
Residency Program		
West Canada	0.82, 0.46 – 1.55	1.03, 0.56 – 1.89
East Canada	0.71, 0.43 – 1.19	0.81, 0.48 – 1.40
Ontario	reference	reference

** denotes to significance of $p < 0.001$, * denotes significance of $p < 0.05$
CI = confidence interval

CONCLUSIONS

Pre-residency research output is a significant predictor of research productivity during residency and subsequent career choices, suggesting that pre-residency publishing reflects a propensity towards an academic trajectory.

Residents who published 1 or more articles before entering residency were almost 3 times more likely to pursue fellowship training.

Residents who published 1 or more articles before entering residency were almost twice as likely to practice in an academic setting.

Resident publication count moderates this association, underscoring the role of the residency program environment in fostering research productivity. Addressing barriers like mentorship, funding, and curriculum may be key to incentivizing trainees to pursue academic medicine.

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ACKNOWLEDGEMENTS

The authors thank all the administrative staff and individuals that have helped with obtaining the list of residents.

Differences in complications between staged and combined DMEK and cataract surgery

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COS 2024

VECTOR EYE CENTRE

INTRODUCTION

- Patients with cataracts and Fuchs endothelial corneal dystrophy (FECD) undergo cataract surgery and Descemet's membrane endothelial keratoplasty (DMEK).
- These two surgeries can be combined or staged.
- The current body of research does not definitively establish the superiority of one method over another in terms of clinical outcomes and complications (1,2).

AIM

This retrospective case series aims to compare the clinical outcomes associated with staged and combined DMEK and cataract surgeries performed by a surgeon at a single centre.

METHOD

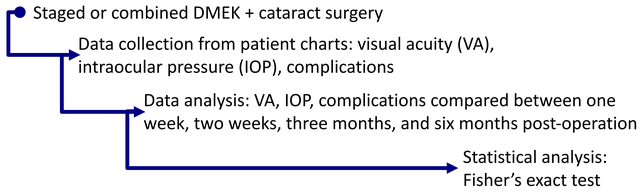

Figure 1. *A flow diagram depicting the methods of the study.*

- Staged procedures: 20 eyes (19 pseudophakic, one phakic) in 14 patients between May 2017-January 2023.
- Combined procedures: 24 eyes in 17 patients between January 2018-February 2023.
- Complications include high IOP (≥22 mmHg) and incomplete graft adherence requiring rebubbling.

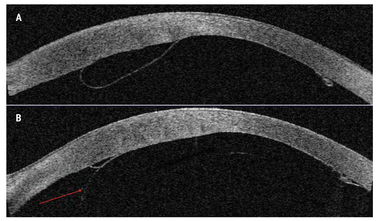

Figure 2. *A) Incomplete adherence of graft. B) Rebubbling: reattachment of graft after bubble injection (red arrow) (3).*

RESULTS

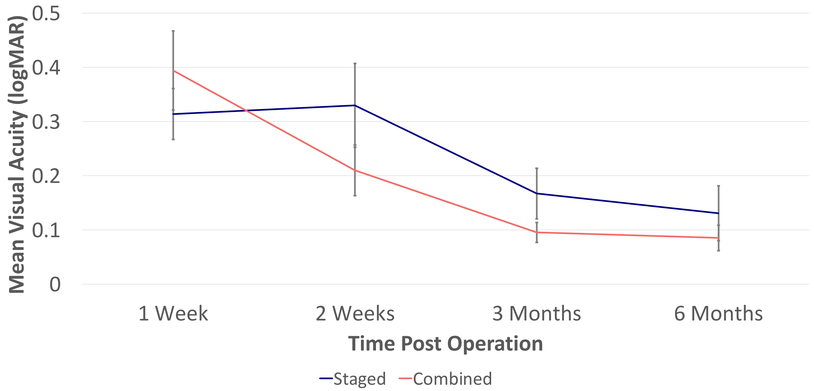

Figure 2. *Mean VA (logMAR) at one week, two weeks, three months, and six months post operation. Lower logMAR indicates higher visual acuity. Error bars signify standard error of the mean.*

There was no statistically significant difference in VA at one week (p=0.36), two weeks (p=0.19), three months (p=0.17), or six months (p=0.43) post-operation.

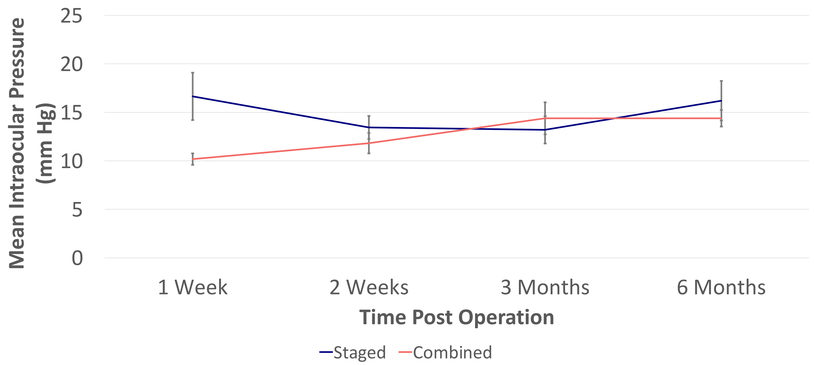

Figure 3. *Mean IOP (mm Hg) at one week, two weeks, three months, and six months post operation. Error bars signify standard error of the mean.*

Combined DMEK and cataract surgery had lower IOP one week post-operation (p=0.02). However, there was no statistically significant difference in IOP at two weeks (p=0.32), three months (p=0.59), or six months (p=0.42) post-operation.

RESULTS CONT.

Table 1. *Complications reported by each of 48 procedures. Certain eyes had more than one complication each.*

	Staged (n=20)	Combined (n=24)	Fisher's Exact
Number of eyes with high IOP (≥22 mmHg)	7 (35%)	6 (25.0%)	0.522
Rebubble for adherence completion	8 (40%)	4 (16.7%)	0.1024
Graft failure needing secondary DSAEK	4 (20%)	3 (12.5%)	0.6839
Inflammation (redness, tearing, irritation, light sensitivity)	2 (10%)	4 (16.7%)	0.6731
Allergic response	1 (5%)	0	0.4545
Temporal edema	1 (5%)	1 (4.16%)	1
Glares	0	1 (4.16%)	1
Floaters	0	1 (4.16%)	1
No reported complications	6 (30%)	11 (45.8%)	0.3585
Eyes with at least 1 complication	13 (65%)	13 (54.2%)	0.8061

The most prevalent complications were high IOP (≥22 mmHg) and incomplete adherence requiring rebubbling. There was no statistically significant difference between any single complication (p>0.05) or for overall number of complications (p=0.81).

CONCLUSION

- Combined and staged DMEK and cataract procedures demonstrated:
  - Statistically similar clinical outcomes in VA, IOP (beyond the first week), and complications post-op.
- Surgical choice can consider factors beyond VA, IOP, and complications, such as surgical time, accessibility, risks, and cost benefits to improve patient-centered care.
- Future research should employ extensive randomized controlled trials to ascertain the relative superiority or comparability of staged and combined surgeries.

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Longitudinal Assessment of Intraocular Foreign Body Injuries: Observations from a Canadian Medical Center Over 20 Years

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Ψ These authors have contributed equally to this work
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BACKGROUND

Although the incidence of intraocular foreign bodies (IOFB) in the general population is low, they make up a significant proportion of open-globe injuries (OGI) globally and may lead to various types of eye intraocular pathologies. Studies have shown that most IOFB injuries affect young males and are sustained in a workplace setting. Several studies have discussed the demographics, management approaches, and clinical outcomes of IOFB injuries. However, no Western Canadian IOFB studies have investigated these variables and factors. Therefore, this retrospective case series aims to further understand IOFB injuries within Southern Alberta.

PURPOSE

To understand the demographics, diagnostic imaging, management, outcomes, and nature of IOFB injuries within a Southern Alberta regional context.

METHODS

Study Design: Retrospective chart review of patients who received care from a single surgeon between 2002 to 2022. Data collected included demographics, IOFB characterization, assessments, treatments, related injuries/complications, as well as the initial and final best corrected visual acuity (BCVA).

Outcome Measures

- Demographics & Characterization
- Assessment & Treatment
- Associated Injuries & Complications
- Initial & Final BCVA

OUTCOMES

Baseline Demographics

Variable		Result
Number of Cases	Patients (Eyes)	31 (32)
Age	Median (Range)	32 (14 - 71)
Sex	Male/Female	30/1
Follow-up Duration (days)	Median (Range)	388 (4 - 6413)
Work Related Injury	Yes	15 (46.9%)
(per Eye)	No	17 (53.1%)

Table 1 - Baseline patient characteristics in the study population

This study evaluated 32 eyes from 31 patients, with a median follow-up of 388 days. The median age on injury was 32 years, with 31 (97%) of eyes belonging to male patients.

IOFB Characterization

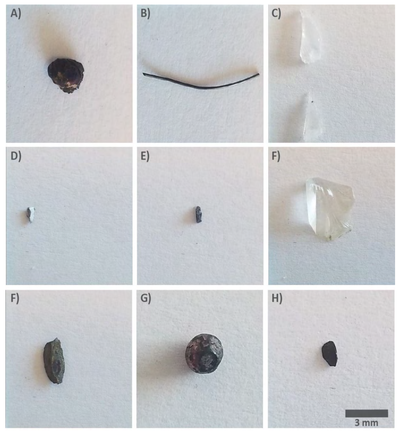


Figure 1 – Sample photographs of Intraocular Foreign Bodies extracted from the eyes of patients included in this study

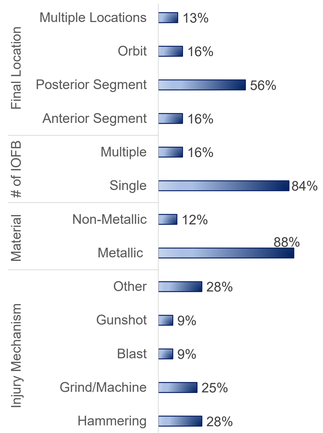


Figure 2 – IOFB characterization and mechanism of injury

The IOFB sizes ranged from 1-12 mm, with a median size of 3 mm. Of the total 32 IOFB cases, 28 (88%) were metallic and 15 (47%) resulted from work-related injuries. Among these cases, 27 eyes (84%) had a single IOFB, while 5 (16%) IOFBs perforated through the globe. The most common mechanisms of injury were hammer and grind/machine injuries, which accounted for a combined 17 out of 32 (53%) cases.

IOFB Assessment & Imaging

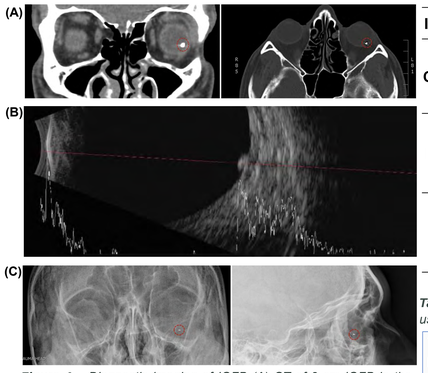


Figure 4 – Diagnostic imaging of IOFB (A) CT of 3 cm IOFB in the temporal macula of the retina (B) B-scan of a 1.5 mm IOFB in the Inferotemporal Retina (C) X-ray of 3 mm IOFB in the temporal macula. IOFB is intraocular foreign body; CT is computerized tomography; B-scan is bright scan ultrasonography.

Imaging	Pros	Cons
CT Scan	• Most sensitive imaging • No globe manipulation	• Cost and access • Ionizing radiation
B-Scan	• Low cost • No ionizing radiation	• Operator dependent • Higher risk with OGI
X-ray	• Accessible w/o training • Screening test	• Occult IOFB detection • Non-metallic IOFB detection

Table 2 – Comparison primary Imaging modalities using as initial diagnostic images for study sample

The most common initial imaging modality for patients presenting with an IOFB was CT in 19 (61%) patients and B-scan in 8 (26%) patients. Two (6.5%) x-ray screenings were done for open globe injuries to reduce radiation exposure. Clinical diagnosis was made in two (6.5%) cases where IOFBs were obvious or urgent surgery was needed.

Associated Injuries & Common Complications

Associated Injuries / Complications	Total Frequency
Lens Injury / Traumatic Cataract	27
Vitreous Hemorrhage	15
Corneal Injury/Inflammation	14
Iris Injury/Inflammation	12
Hyphema	11
Retinal Tear	10
Retinal Detachment	10
Epiretinal Membrane	9
Secondary Glaucoma	3
Endophthalmitis	2
Enucleation	2
Lateral rectus muscle Injury	2
Siderosis	1
Antibiotic drug toxicity	1

Table 3 – Frequency of complications and associated injuries in eyes presenting with an intraocular foreign body.

The two most common complications observed were traumatic cataract in 27 (84%) eyes and vitreous hemorrhage in 15 (47%) eyes. Both immediate and delayed uncommon complications were observed, including siderosis and proliferative vitreoretinopathy in one (3%) eye each, and endophthalmitis, enucleation, and rectus muscle injury in two eyes each (6%). All nine epiretinal membranes and four retinal detachments formed more than a month following the injury.

Best Corrected Visual Acuity

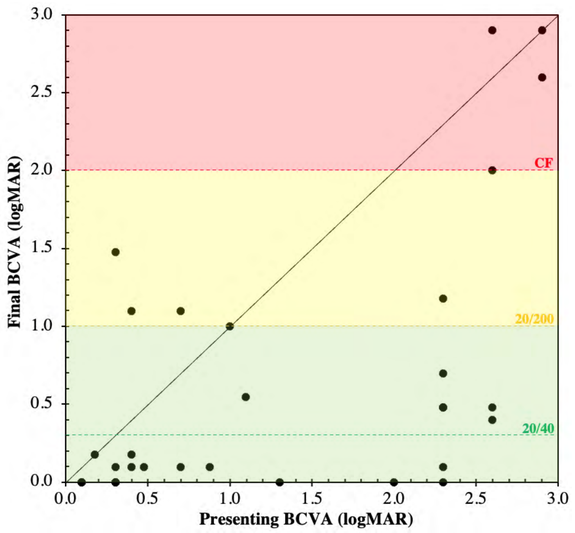
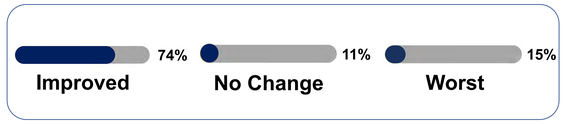


Figure 4 – Scatter plot of the BCVA for each respective eye. The points on the diagonal line represent cases where there was no change in BCVA, while points above the line represent a decrease in BCVA, and points below the line represent an improvement in BCVA.



At final follow-up, BCVA was ≥20/40 in 17 eyes (53%), compared to only 7 eyes (22%) at presentation. Patients who presented with BCVA ≥20/200 were more likely to achieve final BCVA ≥20/40 (p=0.027). The IOFB was removed in 28 eyes (88%), of which 21 (75%) were extracted within 24 hours of injury. The IOFB was retained in 3 eyes (9%), and one eye (3%) required acute enucleation.

DISCUSSION & CONCLUSIONS

- **Demographics** – The average age, higher proportion of male patients, and greater incidence of metallic IOFBs observed in this study are consistent with findings from other large cohort studies conducted in the United States and China. Although work-related injuries are often the primary cause of IOFBs in studies from these countries, this study found that only 46.9% of the injuries were work-related. Additionally, while weapon-related injuries accounted for 19% of IOFB cases in the US, this study recorded only three accidental gunshot injuries, which comprised 9.4% of the cases.
- **Imaging** – According to the literature, CT scans are the most sensitive imaging modality and are preferred in emergency settings due to their availability and convenience. MRI and B-scan imaging are appropriate additional tests, but in Canada, limited accessibility to MRI and the risk of harm associated with metal IOFBs make it impractical. To reduce radiation exposure, B-scan is a reasonable initial test, especially for closed-globe and non-metal IOFB cases. X-rays can be used as screening tests for metal IOFBs but may require follow-up images if no IOFB is identified in the context of a strong clinical history.
- **Surgical approach and strategy** – Involved performing surgery under general anesthesia, repairing the penetrating site, addressing both the anterior and posterior segments, and extracting the IOFB.
- **Complications** – Similar to studies reported in the literature, vitreous hemorrhage and traumatic cataract were some of the most common complications observed. In our study, complications were captured throughout the entire follow-up period of patients. We observed 9 eyes (28%) had developed ERM, all of which occurred more than a month after the initial trauma. This complication may not be captured in other studies where only the initial presenting injuries and complications are noted.
- **Significance** – This study provides valuable insight into the diagnosis, treatment, and outcomes of IOFB injuries in Southern Alberta. Clinical measures were stratified by timeframes, with the late-presenting complications highlighting the importance of extended follow-up for timely intervention. The study participants had a lower incidence of work-related injuries, indicating a strong workplace safety culture and emphasizing the need for protective eyewear in extracurricular settings.

REFERENCES

Morphologic Features and Implications of Regulated versus Dysregulated Rhegmatogenous Retinal Detachment Using Swept-Source Optical Coherence Tomography

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BACKGROUND & PURPOSE

- **Dysregulated Rhegmatogenous Retinal Detachment (RRD)**

Acute, progressive, extensive RRD

The influx of liquified vitreous from the retinal break overwhelms the RPE pump's capacity, leading to disruption of the subretinal homeostatic mechanism that controls outer retinal hydration

- **Regulated RRD**

Localized, slow, or non-progressive

The RPE pump can maintain relative control of the subretinal space

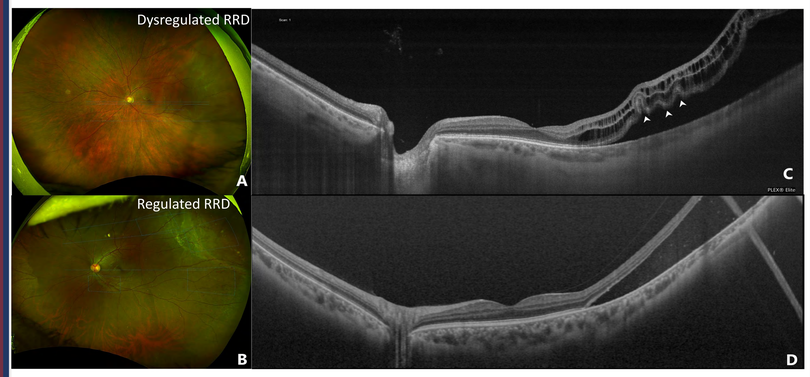
Purpose: To describe the differences in baseline morphological features with SS-OCT between RRDs with RPE-photoreceptor dysregulation vs regulated cases

Regulated RRD | **Dysregulated RRD**

MATERIAL & METHODS

METHODS:

- **Prospective cohort of consecutive primary RRDs,** August 2020-August 2023.
- PLEX Elite 9000 SS-OCT and Ultra-Widefield Optos Silverstone at baseline and 3 months postoperatively.



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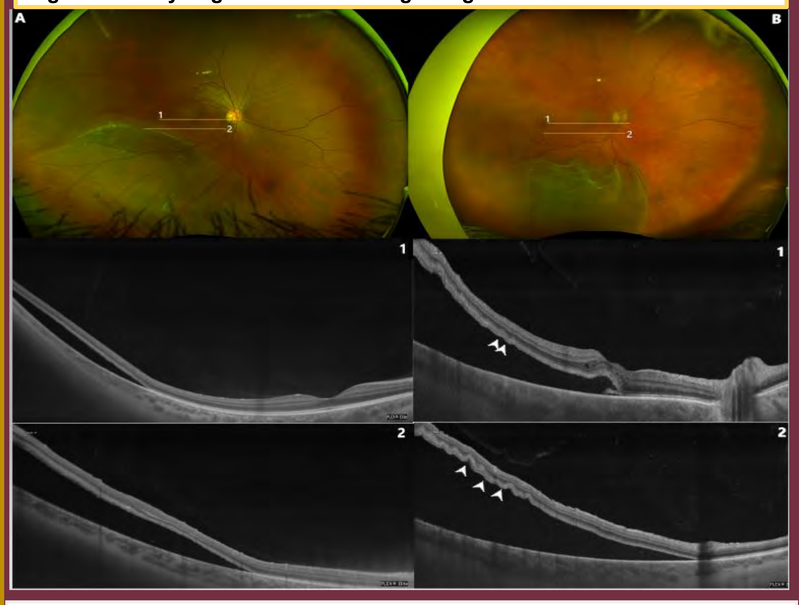
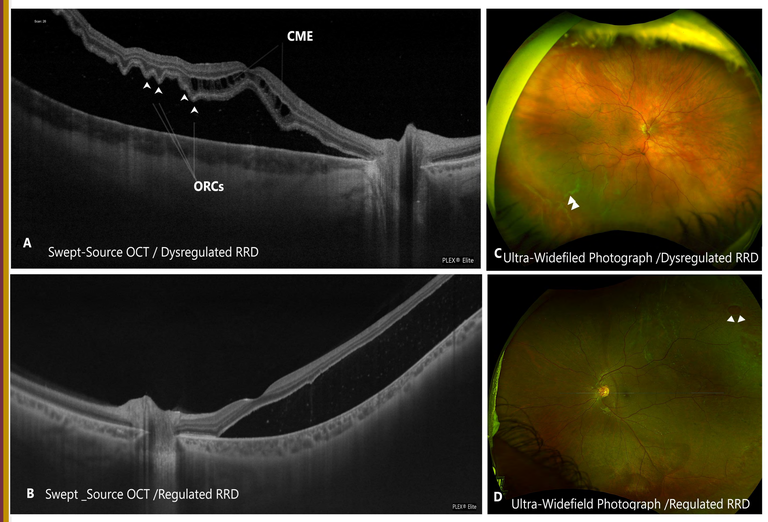
Regulated vs dysregulated inferior rhegmatogenous retinal detachment



- Ultra-widefield color fundus photo demonstrating inferior fovea on RRD, subclinical, shallow (regulated RRD) –A and bullous (dysregulated) inferior fovea involving RRD.
- Swept-source optical coherence tomography (SS-OCT) scans locations with corresponding images (A1,2) demonstrating the absence of outer retinal corrugations, despite the vertical thickening of the photoreceptor layer . SS-OCT scans in the corresponding locations demonstrated thickening of photoreceptors and early outer retinal corrugations (ORCs) B1 and B2 high-frequency ORCs,(white arrowheads)

Clinical and morphological differences in dysregulated vs regulated RRD



RESULTS

Variable	Regulated RRD	Dysregulated RRD	P Value
Age	43.9(SD18.4)	62.9(SD12.7)	<0.001
Lens (Phakic)	84.6%(22/26)	53.1%(41/95)	0.001
Horseshoe retinal Tear	0 % (0/18)	87.3% (48/55)	<0.001
Small/atrophic holes	100%(18/18)	46% (7/15)	<0.001
OCT Features			
Outer Retinal Corrugations(ORC)	3.8%(1.26)	84.4%(81/96)	<0.001
Height of Foveal Detachment	365.29(SD 300.3)	894.3(SD 664.1)	0.01
Cystoid Macular Edema (CME)	50% (8/16)	87.2(85/94)	<0.001
Bacillary Layer Detachment and Macular Hole	0%(0/18)	13.8%(13/94)	0.1
Ellipsoid Zone Thickness	68.4 (SD 50)	77.0 (SD 34.2)	0.2
Hyperreflective Dots	61.5%(16/26)	3.8 (42/96)	0.1
Subretinal Material	46.2%(12/26)	5.2%(5/96)	<0.001
Stages of RRD	Stage 1: 0 % (0/16) Stage 2: 31.3% (5/16) Stage 3A : 0% (0/16) Stage 3B: 6.3% 1/16 Stage 4:0.0 % (0/16) Stage 5: 62.5 % (10/16)	Stage 1: 0%(0/94) Stage 2: 14.9 %(14/94) Stage 3A: 15.9% (15/94) Stage3B: 38.3%(36/94) Stage 4 : 23.4% (22/94) Stage 5: 7.4% (7/94)	<0.001
Foveal photoreceptors	Intact 31.2%(5/16) Patchy loss 50% (8/16) Total loss 18.8% (3/16)	Intact 69.7%(53/76) Patchy loss 25%(19/76) Total loss 5.3% (4/76)	<0.001
Treatment Modality			0.001
Pneumatic Retinopexy (PnR)	50% (13/26)	68.8%, (66/96)	
Pars Plana Vitrectomy (PPV)	3.8% (1/26)	26.0% (25/96)	
Scleral Buckle(SB)	19.2% (5/26)	2.1% (2/96)	
SB+PPV	11.5% (3/26)	2.1%(2/96)	
Suprachoroidal Viscopexy		1.0 %(1/96)	
Laser Retinopexy	3.8% (1/26)		
Observation	7.7%(2/26) 3.8% (1/26)	0% (0/96) 0%(0/96)	
Postoperative Outer Retinal Folds	0% (0/10)	12.9%(11/85)	0.5
Subfoveal residual fluid	40%(4/10)	21.1%(18/85)	0.08

SUMMARY/CONCLUSION

- This is the first study to assess the morphologic differences between regulated and dysregulated RRDs using SS-OCT.
- ORCs = compensatory response to IPM hydration/lateral expansion due to continuous influx of hypo-osmolar liquified vitreous into the subretinal space in dysregulated RRD.
- We found a significant difference between the mean height of detachment, presence of CME and ORCs, morphologic stage of RRD, and type of causative break.
- These differences may have implications for optimal treatment strategy

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COS 2024

Safety and efficacy of transconjunctival ab-externo XEN45 stent implantation

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University of Saskatchewan Department of Ophthalmology

INTRODUCTION

The XEN45 gel stent[1] is a prominent Minimally Invasive Glaucoma Surgery (MIGS) device, with favourable outcomes reported.[2]

The XEN stent is traditionally placed using an Ab Interno approach; however, both open- and trans-conjunctival Ab-Externo approaches exist.

Limited data is reported for transconjunctival Ab-Externo XEN placement.

AIM

Report the safety and efficacy outcomes of 109 XEN stents placed transconjunctival Ab-Externo.

METHODS

Design: Single-centre, single-surgeon retrospective cohort study. Primary outcomes assessed at 12 months

109 eyes of 104 patients performed between September 2020 and October 2022

Definition of Success (World Glaucoma Association)[3]

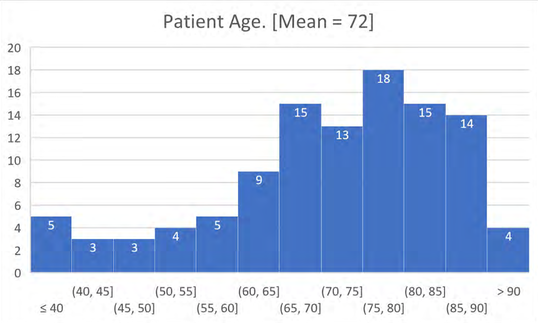
a) Complete Success: IOP ≤ 18 AND ≥20% IOP reduction from baseline at 12 months without glaucoma medications

b) Qualified Success: IOP ≤18 mm Hg and ≥20% reduction from baseline with glaucoma medications

c) Failure: reoperation for glaucoma, loss of light perception, or an IOP >18 mm Hg or <20% reduction from baseline with or without medications

RESULTS

Figures 1 & 2: *Patient Age and Glaucoma classification (n = 109 eyes)*



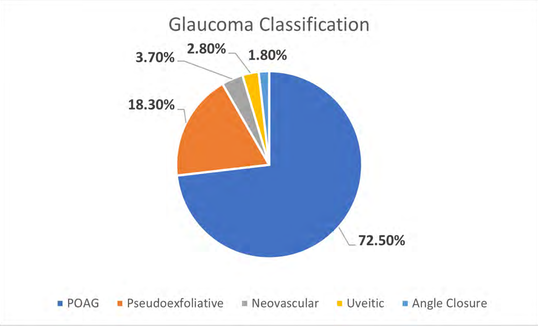


Figure 3: *Primary Outcome at 12 months follow up*

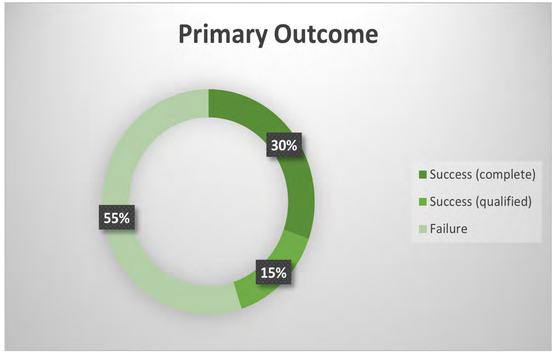


Figure 5: *Complications Encountered during 12 month follow up*

Complication	Description	Frequency	Percent
Xen-Related	Exposure or breakage of device	5	4.5%
Choroidal	Effusion/Detachment	5	4.5%
Infectious	Keratitis, Endophthalmitis	2	1.8%
Other	Corneal ulcer, retinal detachment	2	1.8%

Figure 4: *Primary Outcome compared to contemporary authors*

Study	%IOP reduction	Mean Medication @ 12 months	Success Definition	Success
Current Study	54.0%	0.8	WGA	45%
Tan et al. (2018)[5]	41.8%	0.7	IOP <21 & >20% reduction from baseline	87%
Gilman (2019)[6]	26.8%	0.6	Success [IOP<18 with or without 20% reduction	51%
Mansouri (2018)[7]	29.8%	0.4	IOP≤16 with no concomitant antiglaucoma medications at 12 months42%	42%
Podbielski (2022)[8]	27.9%	0.9	WGA	48%

CONCLUSION

The transconjunctival ab externo approach to XEN implantation significantly reduced IOP and medication use at 1-year and displayed an excellent safety profile. Our results suggest that the transconjunctival ab externo approach may be a reasonable alternative to the ab interno and open conjunctival ab externo approaches to XEN implantation.

Inter-study comparison was challenging due to low utilization of the World Glaucoma association guidelines. Our experience agrees with the work of Mathew et al which report low (45.6%) utilization of WGA guidelines.[4]

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The effect of ginkgo biloba extract on macula and peripapillary perfusion examined using optical coherence tomography angiography

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INTRODUCTION

Ginkgo biloba extract (GBE) has been reported to improve ocular blood flow measured by Doppler ultrasound.[1]

OCT-A can provide quantifiable information about retina microvasculature in patients with glaucoma.[2]

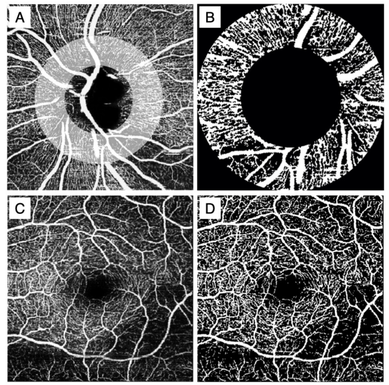
OBJECTIVE

Pilot study to evaluate the effect of GBE on OCT-A macula and peripapillary retina perfusion density among patients with early to moderate (> -10 dB MD) primary open-angle glaucoma.

METHODS

GBE group: patients with early to moderate open-angle glaucoma
Controls: matched by age, glaucoma severity, and treatments
Intervention: GBE 120 mg PO BID for four months
Main Outcome: perfusion density of superficial vascular complex at macula and peripapillary region
Analysis: OCT-A scans of macula and peripapillary retina

- 2D projection slabs of superficial vascular complex
- Student's t-test to compare perfusion density



Sample analysis for a subject from the GBE group.
(A) OCT-A of superficial vascular complex. Peripapillary region defined by 700 µm annulus (light grey);

(B) Binarized peripapillary region with perfusion density defined as proportion of pixels with flow (white) to total number of pixels;

(C) Macular region of OCT-A;

(D) Binarized macular region for analysis.

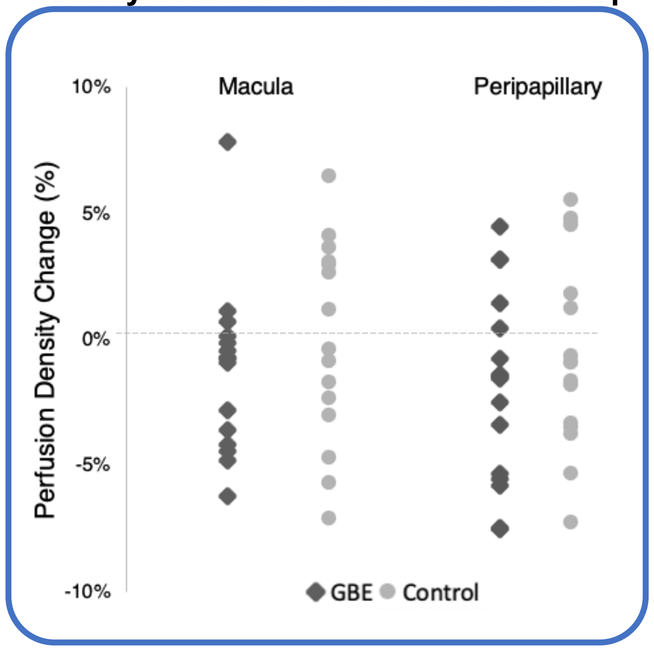
RESULTS

Subject demographics

	GBE	Control
Age (years)*	67 (48-77)	67 (55-80)
Sex		
Female	8	8
Male	9	9
BCVA (LogMar)**	0.08	0.07
Mean Deviation (dB)**	-3.45	-4.21
Follow-up (days)**	128.07	148.3
IOP (mmHg)*	16 (9-21)	14 (8-20)
Glaucoma Therapy		
Medication alone	7	3
Medication and SLT	4	5
SLT alone	6	9
Diabetes	1	0
Hypertension	1	0

*Values shown are median (range). **Values shown are mean.

Distribution of change in perfusion density between baseline and follow-up



Perfusion density in macula and peripapillary regions

	Macula				Peripapillary			
	Baseline	Follow-up	p	Change	Baseline	Follow-up	p	Change
GBE*	0.32 (0.04)	0.30 (0.04)	0.17	-4.00%	0.44 (0.05)	0.42 (0.04)	**0.02**	-5.02%
Control	0.29 (0.03)	0.30 (0.04)	0.64	1.68%	0.44 (0.04)	0.44 (0.04)	0.93	-0.19%
P	0.09	0.59			0.80	0.16		

Change = % difference in means between baseline and 4-month follow-up. *Values shown are mean (standard deviation).

DISCUSSION

Our findings of a 5% decrease in OCT-A perfusion density following GBE supplementation in glaucoma patients is unlikely to be clinically significant. Inter-visit variability reported in glaucoma ranges from 2.3-4.1% on optic nerve head scans, and 3.2-7.9% on macular scans.[3]

Variability in OCT-A interpretation has also been attributed to a learning effect over time from both operators and subjects.[4] It is also possible that OCT-A is not sensitive enough to detect changes in perfusion due to GBE or similar interventions.

CONCLUSION

Four months of GBE supplementation did not appear to cause clinically significant improvement in macula or peripapillary perfusion in patients with early to moderate primary open-angle glaucoma.

ACKNOWLEDGEMENTS

Thank you to the research staff of the Department of Ophthalmology and Visual Sciences at Dalhousie University.

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Medical Education|Éducation médicale

Adjunctive Use of Mitomycin C (MMC) for Revision Dacryocystorhinostomy (DCR): A Systematic Review and Meta-Analysis

COS 2024

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INTRODUCTION

Epiphora resulting from nasolacrimal obstruction (NLDO) can be managed through dacryocystorhinostomy (DCR) surgery, which boasts a success rate exceeding 90%. Two main approaches exist: endoscopic (EN-DCR) and external (EX-DCR). Challenges in DCR include common canaliculus obstruction, granulation tissue formation, and anastomosis closure leading to surgical failure. Revision DCR success rates are lower due to scar tissue formation. Mitomycin C (MMC) has shown promise in inhibiting fibrous tissue growth and improving outcomes in ocular procedures. Despite MMC's benefits in primary DCR, its application in revision cases lacks comprehensive evidence. This study is the first to systematically review MMC's clinical effectiveness specifically in revision DCR cases.

AIM

Evaluate the comparative effectiveness of incorporating MMC as an adjunctive therapy in revision DCR procedures.

METHOD

- The systematic review and meta-analysis were meticulously conducted in adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, ensuring comprehensive and transparent reporting of the research methodology and findings.
- An extensive electronic search strategy was employed to identify relevant comparative studies comparing the use of MMC versus non-MMC approaches in revision DCR procedures. This rigorous approach aimed to capture all available evidence on the topic.
- The primary outcome of interest focused on assessing the success rate of revision DCR procedures when MMC was used as an adjunct compared to cases where MMC was not utilized. Additionally, secondary outcome measures, including complications and operative time, were carefully evaluated to comprehensively assess the impact of MMC adjunctive therapy on various aspects of surgical management and patient outcomes.
- The analysis of the collected data was performed using fixed-effect modeling, a statistical approach commonly utilized in meta-analyses to estimate the combined effect size across multiple studies while accounting for potential heterogeneity among them. This methodological choice ensures robust and reliable synthesis of the available evidence, enhancing the validity and generalizability of the study findings.

RESULTS

- Six studies reviewed, encompassing 239 procedures
- Statistically significant difference observed between MMC and non-MMC groups in success rate for revision external DCR (OR = 3.00, P = 0.001)
- MMC adjunct associated with improved success rates in revision external DCR
- Only two adverse complications documented with MMC use
- Both complications identified as epithelial corneal defects related to delayed wound healing

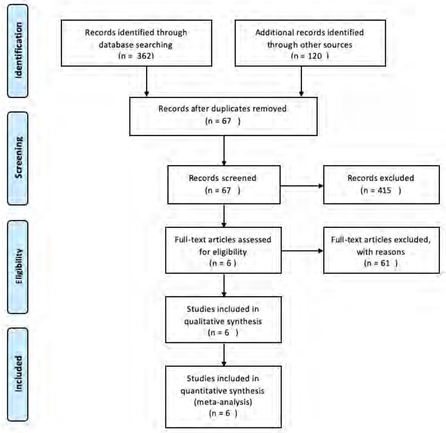

Figure 1: Prisma Flow Diagram. The PRISMA diagram details the search and selection processes applied during the overview. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Study (Year)	Journal, Country	Study Design	Age (years) [mean ± SD]	Sex (M:F)	Total Sample (MMC:Non-MMC)	MMC Concent-ration	Approach	Follow-up (months)
Zilelioglu et al. (1998)[5]	British Journal of Ophthalmology, Turkey	RCT	38.5 years	8:9	17 (8:9) procedures of 17 patients	0.5 mg/mL	EN-DCR	18.2 months
Penttila et al. (2011)[6]	American Journal of Rhinology & Allergy, Finland	RCT	MMC: 65 ±11 Non-MMC: 70 ±10	3:27	30 (15:15) procedures of 26 patients	0.4 mg/mL	EN-DCR	6 months
Ozkiriz et al. (2012)[7]	The Journal of Craniofacial Surgery, Turkey	RCT	37.2 ± 10.2	21:15	36 (18:18) procedures of 36 patients	0.5 mg/mL	EN-DCR	11.5 months
Ragab et al. (2012)[8]	Otolaryngology–Head and Neck Surgery, Egypt	RCT	40.3±9.3	NR	76 (38:38) procedures of 76 patients	0.5 mg/mL	EN-DCR	6 months
Nipa et al. (2022)[9]	Indian Journal of Clinical and Experimental Ophthalmology, Bangladesh	Prospective Cohort	MMC: 40.3 ± 9.3 Non-MMC: 41.5 ± 10.3	13:17	30 (15:15) procedures of 30 patients	NR	EX-DCR	6 months
Poonam et al. (2023)[10]	International Journal of Pharmaceutical and Clinical Research, India	Prospective Cohort	MMC: 40.3 ± 9.3 Non-MMC: 41.5 ± 10.3	22:28	50 (25:25) procedures of 50 patients	NR	EX-DCR	6 months

Table 1. Baseline characteristics of the included studies.

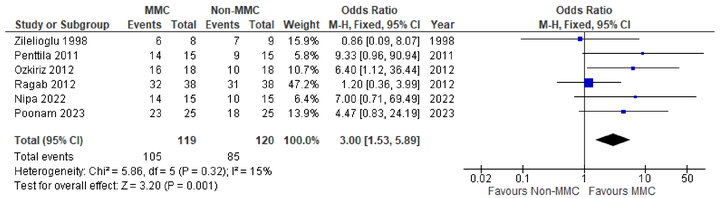

Figure 2: Forest plot for the odds ratio of Mitomycin C (MMC) adjunctive use for revision external dacryocystorhinostomy (DCR) – success rate. The adjuvant MMC group had a statistically significant higher odds ratio of success compared to the non-MMC group.

CONCLUSION

The systematic review and meta-analysis conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines comprehensively synthesized findings from six studies involving 239 procedures, focusing on the efficacy of MMC as an adjunctive therapy in revision DCR procedures. The results indicate that MMC demonstrates promising utility in preventing the reclosure of the DCR stoma, thereby contributing to improved success rates in revision DCR surgeries. However, the current evidence base underscores the need for further randomized studies with larger sample sizes to robustly validate and strengthen the evidence supporting the effectiveness of MMC in this specific clinical context.

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CONTACT INFORMATION

COS 2024

ChatGPT-4 in Ophthalmology: An Updated Evaluation of Performance, Readability, and Informative Sources

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INTRODUCTION

Previous evidence indicates encouraging yet limited performance of the ChatGPT-3.5.5 and 4.0 large language models (LLM) for completing ophthalmology examinations. The advent of Microsoft Bing Chat and ChatGPT-4 integration has conferred the capability of accessing online data past 2021.

AIM

We investigated the performance and the citation feature of this new artificial intelligence (AI) architecture on a large multiple-choice question (MCQ) bank derived from the Academy's Basic and Clinical Science Collection (BCSC).

METHOD

In August 2023, ChatGPT-3.5.5 and Bing Chat were evaluated against 913 MCQs from books within the BCSC collection. For each response, the subspecialty, performance, Simple Measure of Gobbledygook readability score, and cited online content were collected. Where appropriate, chi-square tests with phi correlation or Wilcox rank sum tests with rho correlation were used. Multiple comparison testing proceeded via the Tukey Honestly Significant Difference test. The primary outcomes were the comparative performance between models, and qualitatively, the resources referenced by Bing Chat. Secondary outcomes included comparisons of these LMMs by response readability, question type (explicit or situational), and BCSC sub-topic.

RESULTS

Across 913 questions, ChatGPT-3.5 scored 59.69% [95%CI 56.45, 62.94] while Bing Chat was proficient in 73.60% [95%CI 70.69, 76.52], both of which performed significantly better in explicit than clinical reasoning questions. Overall, both models performed best on the general medicine sub-topic than other ophthalmology subsections. Bing Chat referenced 927 online entities and provided at-least one citation to 836 of the 913 questions, though there was no significant association between citations and likelihood of correct response. The most-cited resources were eyewiki.aao.org, aao.org, wikipedia.org, and ncbi.nlm.nih.gov. Responses from Bing Chat had significantly better readability than from ChatGPT-3.5, averaging a reading level of grade 11.4 [95%CI 7.14, 15.7] versus 12.4 [95%CI 8.77, 16.1], respectively (p-value <0.0001, ρ = 0.25).

Table 1: Performance of ChatGPT-3.5 and Bing Chat, stratified by sub-topic.

ChatGPT-3.5				Bing Chat			
Section	**Mean**	**Lower 95%CI**	**Upper 95% CI**	**Section**	**Mean**	**Lower 95%CI**	**Upper 95% CI**
General Medicine	81.94%	72.88%	91.01%	General Medicine	87.50%	79.70%	95.30%
Ophthalmic Pathology & Intraocular Tumors	72.00%	59.30%	84.70%	Ophthalmology Fundamentals	86.11%	77.96%	94.26%
Refractive Surgery	70.91%	58.66%	83.16%	Ophthalmic Pathology & Intraocular Tumors	82.00%	71.13%	92.87%
Ophthalmology Fundamentals	66.67%	55.56%	77.78%	Inflammation Uveitis	80.00%	70.08%	89.92%
Glaucoma	64.00%	44.80%	83.20%	Lens, Cataract	80.00%	65.39%	94.61%
Neuro Ophthalmology	64.00%	52.91%	75.09%	Refractive Surgery	80.00%	69.21%	90.79%
External Diseases and Cornea	60.27%	48.82%	71.73%	Pediatric Ophthalmology	76.60%	67.86%	85.33%
Pediatric Ophthalmology	57.45%	47.25%	67.65%	Glaucoma	76.00%	58.92%	93.08%
Retina, Vitreous	57.29%	47.19%	67.39%	External Diseases and Cornea	73.97%	63.70%	84.24%
Inflammation Uveitis	55.38%	43.05%	67.72%	Retina, Vitreous	72.92%	63.85%	81.99%
Optics	47.92%	39.59%	56.24%	Orbit, Eyelids, Lacrimal	70.97%	59.44%	82.50%
Orbit, Eyelids, Lacrimal	46.77%	34.10%	59.45%	Neuro Ophthalmology	69.33%	58.68%	79.98%
Lens, Cataract	40.00%	22.11%	57.89%	Optics	52.08%	43.76%	60.41%

CONCLUSION

The online access, improved readability, and citation feature of Bing Chat confers additionally utility for ophthalmology learners. Attention to its cited sources is recommended during response interpretation. Whether future iterations of ChatGPT or Bing Chat provide better performance on MCQs, or other question types, deserves further investigation.

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None

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ERGONOMICS IN OPHTHALMOLOGY: WORKING STRONGER, FASTER, AND HAPPIER

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Introduction

- Ophthalmologists are at high risk for career-interrupting and career-ending work-related musculoskeletal disorders (WMSDs) due to suboptimal ergonomics in clinical and operating room settings[1-6]
- WMSDs have significant implications for individual ophthalmologists, patients, and healthcare systems:[1-6]
  - WMSDs are associated with physician burnout, mental health challenges, and reduced quality of life
  - WMSDs are a short-term and long-term cause of disability leave, practice restriction, and early retirement, exacerbating human resource challenges
  - WMSDs and poor ergonomics can adversely affect patient safety, quality of care, and health outcomes

Objective

To synthesize all English-language evidence on ergonomic challenges and WMSDs in ophthalmology to:

1. Present ergonomic challenges in ophthalmology
2. Report on risk factors and protective factors related to WMSDs
3. Discuss the impact of poor ergonomics on ophthalmologists, patients, and health care systems
4. Outline strategies for ergonomic optimization in ophthalmology and adoption of ergonomic best practices

Methods

- In this scoping review, a sensitive search query mapping to the terms "ophthalmology," "optometry," "ergonomics," and "musculoskeletal disorders" was used to search Embase, MEDLINE, Scopus, CINAHL, Web of Science, and CENTRAL from inception to June 2023
- All primary research articles, secondary research articles, and conference abstracts that discussed at least one ergonomics-related outcome in ophthalmologists were included. Article screening was performed in duplicate. The following data were extracted:
  - Source information, demographic characteristics, and clinical setting for all studies
  - In epidemiologic studies: prevalence, degree, risk factors for, treatment pursued, and psychosocial effects of WMSDs
  - In interventional studies: description and rationale for intervention, main primary and secondary ergonomic outcomes
  - In secondary research articles: ergonomic challenges for ophthalmologists and methods of optimizing ergonomics
- Descriptive and thematic analyses were conducted

Results

- Included 94 publications from 3596 unique records screened:
  - 32 epidemiologic studies, including 3 abstracts
  - 37 interventional studies, including 7 abstracts
  - 25 reviews or commentaries, including 2 abstracts

COMMON ERGONOMIC PROBLEMS IN OPHTHALMIC PRACTICE

- Non-neutral postures while using the slit lamp, performing indirect ophthalmoscopy, and operating with microscopes and loupes
- Poor postures include leaning forward, extending head forward, rounding and elevating shoulders, excessively flexing or extending elbows and wrists, and exerting strain on hips and ankles due to suboptimal foot pedal placement

PREVALENCE OF WMSDS IN OPHTHALMOLOGISTS

- Weighted average prevalence of WMSDs among ophthalmologists (18 studies) was 62.9% ± 14.9%
- Most common locations for WMSDs were the back (up to 79.6%), neck (up to 69.1%), and shoulders (up to 42.2%)
- Almost half of ophthalmologists experienced WMSD symptoms at least once weekly

IMPACT OF POOR ERGONOMICS

- 1.8-7.6% underwent surgery
- 15-71.8% had loss of productivity
- 3.1-83.3% reported modification of surgical practice
- 0.8-9.2% reported cessation of surgical work
- 9.2-13.4% had early retirement

RISK AND PROTECTIVE FACTORS for WMSD DEVELOPMENT

- 20 studies investigated risk factors. Female sex, higher clinical and surgical workload, higher job stress, previous history of MSDs, and failure to adopt ergonomic best practices were consistently associated with WMSD prevalence
- 6 studies investigated protective factors. Regular exercise and ergonomically optimized workspaces and equipment were associated with improvement in WMSD symptoms

FUTURE RESEARCH DIRECTIONS

- Almost all epidemiologic studies have been cross-sectional surveys and almost all interventional studies have been small and non-controlled investigations of 3D heads-up systems (3D-HUS)
- Longitudinal, well-powered studies are needed to elucidate WSMD epidemiology. Large, randomized investigations are required to ascertain the efficacy and safety of 3D-HUS
- More focus on diverse, equitable equipment design is needed, which will require collaboration with industry stakeholders
- Future research should include objective measurements of MSK symptoms, & provider-, patient-, and system-level outcomes, including health economics

Results

ERGONOMIC OPTIMIZATION STRATEGIES AND INNOVATIONS

- Best ergonomic practices for all ophthalmologists include:
  - Maintain neutral postures
  - Adjust environment to accommodate yourself
  - Invest in lightweight equipment that is proportional to your body
  - Use padded support for back and elbows
  - Take regular breaks and microbreaks throughout the day; reduce time spent in static and awkward postures
  - Engage in flexibility and strength-training exercises
  - Seek help from institutional supports and ergonomic professionals proactively rather than reactively
- 21 studies investigated 3D-HUS; most found it provided significantly better ergonomics without sacrificing efficacy, efficiency, and patient safety; other advantages included reduced surgeon fatigue & improved functions for teaching and visualization for the surgical team
- Other interventions that have shown benefit include digitally enabled intraoperative optical coherence tomography, posture trainers, and ergonomically modified devices (e.g. lightweight surgical loupes, slit lamps with inclined ocular adaptors, stools with back and arm support)
- Curricular reform in postgraduate and continuing medical education is required to ensure widespread adoption of best ergonomic practices

Discussion

- WMSDs are highly prevalent in ophthalmologists and their ramifications extend well beyond individual physicians, incurring significant costs to patients and healthcare systems that will worsen alongside increasing workforce shortages
- Using conservative, evidence-based estimates that 44% of ophthalmologists experience 10% productivity loss due to WMSDs, ~4.4% of patients cannot be seen; extrapolating to the US population, the opportunity cost would be 4.2 million patient encounters/year, equating to more than 224 patients/year per ophthalmologist
  - Likely underestimate as we have yet to consider sick days, medical or surgical errors, and modification and cessation of surgical practice
- Several ergonomic strategies can help not only to mitigate WMSD risk but also empower ophthalmologists to work stronger, faster, and happier over an extended period of career longevity[1-6]

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Exploring the therapeutic and adverse ocular effects of cannabinoids

COS 2024

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INTRODUCTION

Cannabis is currently the most used drug worldwide, with an estimated 219 million users in 2021. The growing movement towards the decriminalization and legalization of cannabis necessitates a comprehensive understanding of its physiological effects. In the last decade, there has been a 23% increase in global users: a growth rate more rapid than both opiates and cocaine. As of 2023, cannabis is legal in several countries, and 23 states in the United States. There has been a resurgence of interest in the uses of cannabinoids, the chemical compound in cannabis, to treat several medical conditions in the last few decades. Research into cannabinoids' applications to treat ocular conditions have revealed potential applications in the treatment of blepharospasm and glaucoma. Moreover, several adverse ocular effects of cannabinoids and cannabis have been reported in contemporary literature.

PURPOSE

Given the recent legalization of cannabis in Canada and its growing clinical and non-clinical uses, this review aims to provide a comprehensive overview of therapeutic applications and adverse ocular effects.

METHODS

- We conducted a literature search of Ovid MEDLINE, Ovid Embase, and Scopus from inception to June 25, 2023.
- The search strategy was developed with an academic librarian using both controlled vocabulary (i.e., MeSH and Emtree terms) and free-text terms.
- We further reviewed reference lists of published reviews identified through our search strategy to ensure comprehensive coverage of relevant studies
- Laboratory and animal studies were considered to supplement observational and experimental studies on human participants
- Included studies discussed ocular side effects, toxicity, or adverse eye reactions of cannabis. Studies not published in English or French were excluded.

RESULTS

Table 1. Studies on the effects of cannabis on the eyelids

Study	Topic of relevance	Design	Population	Cannabinoid and route of administration
Adamowicz et al., 2017	Eyelid tremor	Cross-sectional study	39 humans	UR-144 (unspecified)
Hartman et al., 2017	Eyelid tremor	Cross-sectional study	302 humans	Cannabis (unspecified)
Louis et al., 2014	Eyelid tremor	Cross-sectional study	18 humans	XLR-11 and/or UR-144 (unspecified)
Porath et al., 2019	Eyelid tremor	Cross-sectional study	1,512 humans	Cannabis (unspecified)
Zawar et al., 2021	Eyelid tremor	Case report	2 patients with Jeavons Syndrome	CBD (oral)
Consroe et al., 1986	Blepharospasms	Interventional Study	5 patients with dystonic movement disorders	CBD (oral)
Fox et al., 2002	Blepharospasms	Randomized-control trial	15 patients with primary dystonia	Nabilone (oral)
Gauter et al., 2004	Blepharospasms	Case report	1 patient with BEB	Dronabinol (oral)
Radke et al., 2017	Blepharospasms	Retrospective study	5 patients with BEB	Non-specific cannabis products (oral)
Zloto et al., 2022	Blepharospasms	Randomized-control trial	6 patients with BEB	Cannabis (sublingual)
Aceto et al., 1998	Ptosis	Experimental animal study	rats	Anandamide (intraperitoneal)
Aceto et al., 1996	Ptosis	Experimental animal study	rats	SR 141716A (intraperitoneal)
Beardsley et al., 1987	Ptosis	Experimental animal study	rhesus monkeys	Δ 9-THC and Δ9-11-THC (IV)
Costa et al., 2000	Ptosis	Experimental animal study	rats	Anandamide (intraperitoneal)
Hutcheson et al., 1998	Ptosis	Experimental animal study	mice	SR 141716A (intraperitoneal)
Meschler et al., 2000	Ptosis	Experimental animal study	cynomolgus monkeys	Levonantradol (intramuscular)
Young et al., 1981	Ptosis	Experimental animal study	rhesus monkeys	Nantradol and Levonantradol (IV)

Table 2. Studies on the effects of cannabis on extraocular muscle functioning

Study	Topic of relevance	Design	Population	Cannabinoid and route of administration
Adams et al., 1975	Ocular movements	Randomized-control trial	10 humans	THC (inhaled)
Baloh et al., 1979	Ocular movements	Interventional study	24 humans	Cannabis (inhaled)
Fant et al., 1998	Ocular movements	Prospective study	10 humans	Cannabis (inhaled)
Flom et al., 1976	Ocular movements	Interventional study	10 humans	Cannabis (oral or inhaled)
Huestegge et al., 2009	Ocular movements	Case-control study	40 humans	Cannabis (inhaled)
Huestegge et al., 2010	Ocular movements	Case-control study	40 humans	Cannabis (inhaled)
Kibby 2013	Ocular movements	Randomized-control trial	12 humans	THC (inhaled)
Moskowitz et al., 1976	Ocular movements	Prospective study	37 humans	Cannabis (inhaled)
Ploner et al., 2002	Ocular movements	Prospective study	12 humans	THC (oral)
Zuurman et al., 2008	Ocular movements	Randomized-control trial	12 humans	THC (inhaled)
Mohan and Sood, 1964	Strabismus	Case report	1 human	Cannabis (inhaled)
Moskowitz et al., 1972	Attention and visual perception	Prospective study	12 humans	Cannabis (inhaled)
Yoon et al., 2019	Attention and visual perception	Prospective study	53 humans	Cannabis (route unspecified)
Mikulskaya et al., 2018	Attention and visual perception	Case-control study	41 humans	Cannabis (route unspecified)
Pradeep et al., 2008	Nystagmus	Case report	1 human	Cannabis (inhaled)
Schon et al., 1999	Nystagmus	Prospective study	1 human	Cannabis (oral)
Chase 2016	Horizontal gaze nystagmus	Retrospective study	133 humans	THC (route unspecified)
DeGregorio 2021	Horizontal gaze nystagmus	Cross-sectional study	74 humans	Cannabis (inhaled)
Porath et al., 2019	Horizontal gaze nystagmus	Case report	1 human	Cannabis (inhaled)

Table 3. Studies on the effects of cannabis on the retina and retinal vasculature

Study	Topic of relevance	Design	Population	Cannabinoid and route of administration
Faure et al., 2016	Neuroretinal dysfunction	Case report	1 human	Cannabis (inhaled)
Onur et al., 2016	Neuroretinal dysfunction	Case-control study	90 humans	Synthetic cannabinoids (route unspecified)
Pérez et al., 1995	Neuroretinal dysfunction	Case-control study	30 humans	Cannabis (route unspecified)
Polli et al., 2021	Neuroretinal dysfunction	Case-control study	85 humans	Cannabis (route unspecified)
Schwitzer et al., 2016	Neuroretinal dysfunction	Case report	1 human	Cannabis (mostly inhaled)
Schwitzer et al., 2017	Neuroretinal dysfunction	Case-control study	52 humans	Cannabis (mostly inhaled)
Schwitzer et al., 2018	Neuroretinal dysfunction	Case-control study	82 humans	Cannabis (mostly inhaled)
Schwitzer et al., 2020	Neuroretinal dysfunction	Case-control study	70 humans	Cannabis (mostly inhaled)
Schwitzer et al., 2021	Neuroretinal dysfunction	Case-control study	68 humans	Cannabis (mostly inhaled)
Schwitzer et al., 2022	Neuroretinal dysfunction	Prospective study	40 humans	Cannabis (mostly inhaled)
Zhang et al., 2020	Neuroretinal dysfunction	Experimental animal study	mice	THC (intraperitoneal)
Zobor et al., 2015	Neuroretinal dysfunction	Case-control study	5 humans	Cannabis (inhaled)
Aktaş et al., 2016	Retinal vasculature	Case report	1 human	Cannabis (inhaled)
Corvi et al., 2014	Retinal vasculature	Case report	1 human	Cannabis (inhaled)
Hill et al., 2020	Retinal vasculature	Case-control study	106 humans	Cannabis (inhaled)
Hommer et al., 2020	Retinal vasculature	Randomized-control trial	24 humans	Dronabinol (oral)
Macintyre et al., 2014	Retinal vasculature	Experimental animal study	rats	Abn-CBD
Plange et al., 2007	Retinal vasculature	Cross-sectional study	8 humans	Dronabinol (oral)
Ramtohul et al., 2022	Retinal vasculature	Case report	1 human	Cannabis (inhaled)
Su et al., 2015	retinal vasculature	In vitro experimental animal study	Porcine retinal arteriole	abn-CBD (intraluminal & extraluminal)
Araújo et al., 2017	Retinal neuroprotective effects	In vitro experimental animal study	chick retinal cells	WIN 55212-2 & AM251/O-2050 or AM630
Chen et al., 2018	Retinal neuroprotective effects	In vitro experimental animal study	mouse model	SR141716A
Kalenderoglu et al., 2020	Retinal neuroprotective effects	Case-control study	156 humans	Cannabis (route unspecified)
Liu et al., 2014	Retinal neuroprotective effects	Experimental animal study	rats	Cannabinoid HU-211 (intravitreal)
Pinar-Sueiro et al., 2013	Retinal neuroprotective effects	Experimental animal study	rats	WIN 55212-2 (topical)
Spyridakos et al., 2021	Retinal neuroprotective effects	Experimental animal study	rats	WIN 55212-2 (intravitreal)
Yoles et al., 1996	Retinal neuroprotective effects	Experimental animal study	rats	Synthetic THC HU-211
Zalish et al., 2003	Retinal neuroprotective effects	Experimental animal study	rats	Synthetic THC HU-211 (intraperitoneal)
Dayi et al., 2020	Retinal layer thinning	Case-control study	53 humans	Cannabis (mostly inhaled)

Table 4. Select studies on the effects of cannabis on intraocular pressure

Study	Topic of relevance	Design	Population	Cannabinoid and route of administration
Cohen 1976	Decreased intraocular pressure	Prospective study	30 humans	THC (inhaled and oral)
Cooler and Gregg 1977	Decreased intraocular pressure	Prospective study	10 humans	THC (intravenous)
Fischer et al., 2013	Decreased intraocular pressure	Experimental animal study	dogs	THC (topical)
Jay and Green 1983	Decreased intraocular pressure	Interventional study	23 humans	THC (topical)
Merritt et al., 1980	Decreased intraocular pressure	Interventional study	18 patients with glaucoma	THC (inhaled)
Porcella et al., 2001	Decreased intraocular pressure	Interventional study	8 patients with glaucoma	WIN55212-2 (topical)
Tiedeman et al., 1981	Decreased intraocular pressure	Interventional study	16 patients with glaucoma	THC derivatives (oral)
Tomida et al., 2006	Decreased intraocular pressure	Interventional study	6 patients with OH or POAG	THC, CBD (sublingual)
Zhan et al., 2005	Decreased intraocular pressure	Case report	1 patient with glaucoma	Cannabis (inhaled)

CONCLUSION

Cannabinoids are not currently considered a first-line treatment option for any ocular conditions. Ocular teratogenic effects are few and inconclusive, and population-based studies may provide further insight into cannabis ocular teratogenicity. Cannabinoids may cause eyelid tremors and ptosis, while paradoxically demonstrating therapeutic potential as a second-line agent for treatment-refractory blepharospasm. Given present studies' limited sample size, this effect should be further explored in larger cohorts. Several animal studies have demonstrated cannabinoids' anti-inflammatory and regenerative effects on the cornea. Meanwhile, dry eye symptoms are a common side-effect of cannabis use. Observational and experimental studies in humans should seek to reconcile these findings and determine the role of cannabinoids in DED treatment. Cannabinoid retinal neuroprotective effects have only been demonstrated in animal studies. Neuro-retinal dysfunction has been substantiated in cannabis smokers, with evidence of partial reversibility with cannabis smoking cessation. Case reports have alluded to retinal vasculature abnormalities with heavy cannabis smoking. Cannabis and cannabinoids may decrease intraocular pressure in the short-term. There is insufficient evidence to support the use of cannabis and cannabinoids in glaucoma treatment given the absence of long-term therapeutic benefit, neurocognitive and systemic side-effects, and the present availability of more effective therapies. Studies have documented that cannabis and cannabinoids disrupt extraocular motility, including smooth pursuit, gaze stabilization, ocular motor control, fixation time, and eye deviation. As case reports demonstrate suppressed pendular nystagmus following smoking cannabis in individuals with multiple sclerosis, future studies may wish to explore this effect further.

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Scan QR for references

Improving Accessibility in Medical Curriculum: A Needs Assessment

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Advancing eye care through innovation, education, and advocacy
L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

INTRODUCTION

- Medical students have expressed uncertainty when it comes to approaching and working with individuals who possess diverse needs and abilities.
- Patients have raised concerns about the ability of medical professionals to interact with them in an inclusive and accessible manner.

PURPOSE

To assess the inclusivity of medical education for students with disabilities, including those with vision impairments, and to present comprehensive strategies aimed at enhancing the overall quality of medical education for students to deliver care to all patients.

METHOD

- Conducted a comprehensive needs assessment at the University of British Columbia.
- This included surveying (Qualtrics survey) second and third-year medical students across four campuses.
- Assessed medical teaching from learners' perspectives.
- Evaluated curriculum content on disability and ableism.
- Identified students' skills in approaching and interacting with patients with disabilities.

RESULTS

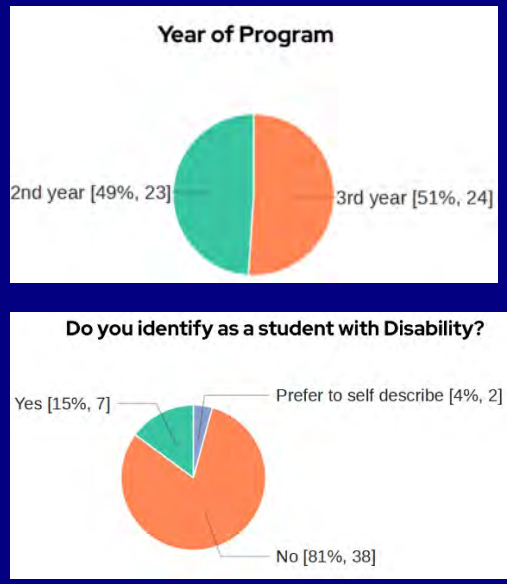

Figure 1. Participant Demographics.

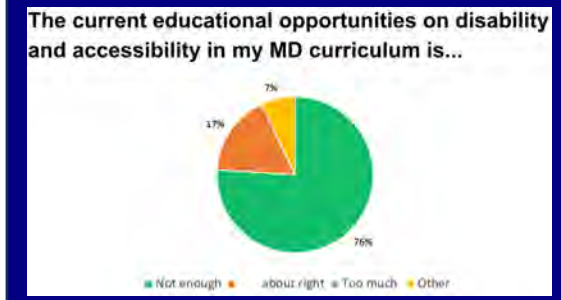

Figure 2. Participant Attitudes Towards Current Education Received.

Figure 3. Participants' Level of Experience Prior to Medical School.

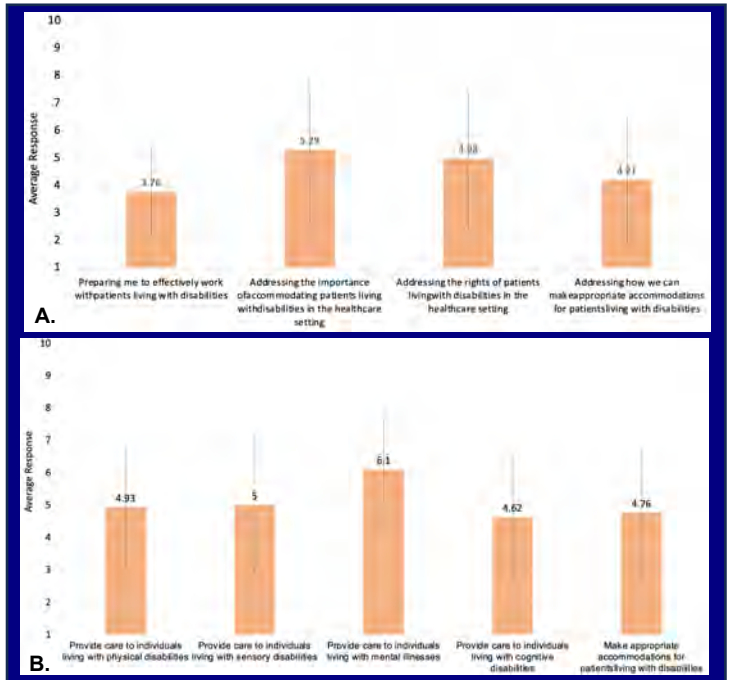

Figure 4. Participants' Level of Preparedness (A) and Confidence (B) to Provide Care to Patients with Disabilities During Medical School.

CONCLUSION AND FUTURE DIRECTIONS

- Preliminary findings emphasize the need for enhanced disability and accessibility training in medical education.
- Gaps in accessibility training during case-based learning as well curriculum teaching was identified.
- Students exhibited relatively low confidence level in working with patients with various disabilities.
- To improve student education, suggestions include working directly with more people with disabilities whether it's through clinical skills or through placements.
- More interdisciplinary sessions with allied healthcare professionals can expand the scope of medical students' knowledge.

CONTACT

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Advancing eye care through innovation, education, and advocacy

L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

Levobupivacaine versus Bupivacaine in Peribulbar Block for Ophthalmic Surgeries: A Systematic Review and Meta-analysis

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INTRODUCTION

Peribulbar anesthesia plays a crucial role in ensuring patient comfort and safety during various eye surgeries.

While **bupivacaine has long been a reliable option**, **levobupivacaine is gaining attention for potentially reducing side effects, especially cardiotoxicity and systemic hypotension**, while maintaining effective blockade.

AIM

To compare the efficacy of levobupivacaine versus bupivacaine for peribulbar block in ophthalmic surgery, aiming to inform clinicians' decisions and enhance patient care.

METHOD

- A systematic review and meta-analysis were conducted as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses **(PRISMA) guidelines**.
- Publications in **MEDLINE, EMBASE, EMCARE, CINAHL and the Cochrane Central Register of Controlled Trials (CENTRAL)** that compared levobupivacaine and bupivacaine for peribulbar block in ophthalmic surgery were screened for eligibility.
- **Inclusion Criteria:** All randomized control trials (RCTs) and observational studies comparing levobupivacaine versus bupivacaine in peribulbar block for ophthalmic surgery.
- **Exclusion Criteria:** Abstract only, conference literature, dissertation, Cases reports and single arm observational studies with no comparator, and studies not written in English.

RESULTS

8 included studies all of which are **RCTs** with a total sample size of **800 participants**

Figure 1 Prisma Flow Diagram: The PRISMA diagram details the search and selection processes applied during the

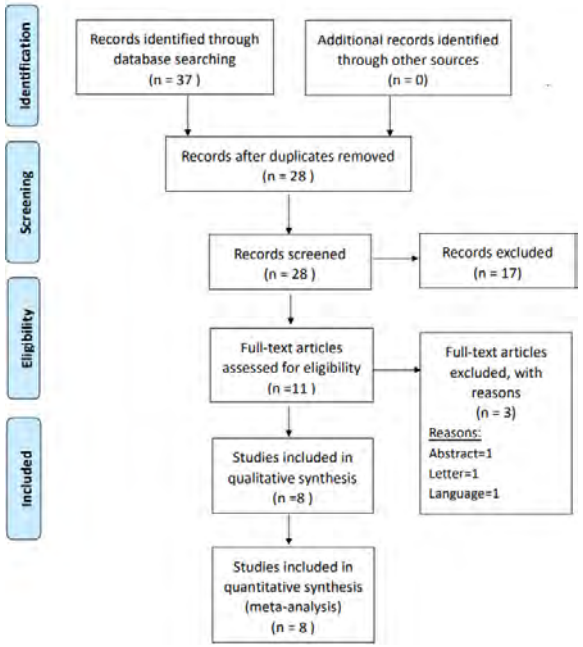


Figure 2 Forest plot for the odds ratio of levobupivacaine versus bupivacaine in a peribulbar block for ophthalmic surgeries - Akinesia Score at (a) 2 minutes (b) 10 minutes.

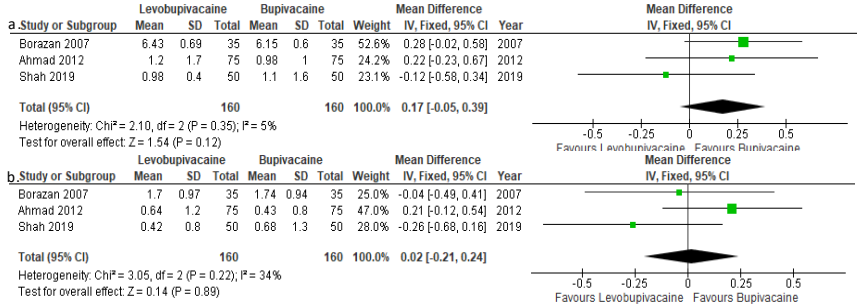


Figure 3: Forest plot for the odds ratio of levobupivacaine versus bupivacaine in a peribulbar block for ophthalmic surgeries – Time to onset (min).

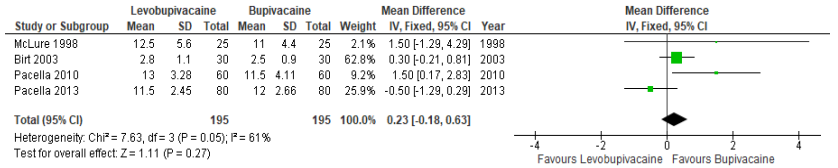
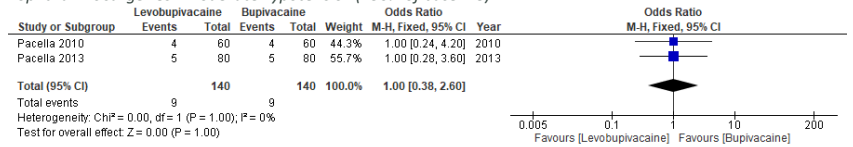


Figure 4: Forest plot for the odds ratio of levobupivacaine versus bupivacaine in a peribulbar block for ophthalmic surgeries - Moderate hypotension (<30% of baseline).



Primary Outcomes:

- **Akinesia Score**: No statistically significant difference was noted between levobupivacaine and bupivacaine groups at 2 minutes (MD = 0.17, CI = −0.05 to 0.39 , P = 0.12, I²=5%; Fig.2a) and 10 minutes post-injection (MD = 0.02, CI = −0.21 to 0.24, P = 0.89, I²=34%; Fig.2b)
- **Time to Onset of Anaesthetic Effect:** No statistically significant difference was noted between levobupivacaine and bupivacaine groups (MD = 0.23, CI = −0.18 to 0.63, P = 0.27, I²=61%; Fig.3).
- **Systemic Hypotension:** No statistically significant difference was noted between levobupivacaine and bupivacaine groups (MD = 1.00, CI = 0.38 to 2.60, P = 1.00, I²=0%;Fig.4).
- **Verbal Pain Scales:** No statistically significant difference was noted between levobupivacaine and bupivacaine groups during the block (MD = 0.04, CI = -0.15 to 0.23, P = 0.66, I²= 0%), at the end of surgery (MD = -0.01, CI = -0.17 to 0.16, P = 0.94, I²=0%) or 4 hours post-operatively (MD = -0.01, CI = -0.10 to 0.07, P = 0.73, I²= 87%).
- **Post-operative Diplopia:** No statistically significant difference was noted between levobupivacaine and bupivacaine groups (MD = 0.62, CI = 0.31 to 1.23, P = 0.17,I²=0%).

Secondary Outcomes:

- **Cost-effectiveness:** levobupivacaine is substantially more costly than bupivacaine[17].
- **Cardiac Side Effects:** reported in bupivacaine with spinal anesthesia; include ventricular arrhythmias, transient ST segment depression, and QTc prolongation[28-30].

CONCLUSION

- This study, incorporating **8 RCTs** involving **800 subjects**, indicates that levobupivacaine demonstrates **comparable efficacy and side effect profile** to bupivacaine in the context of peribulbar block for ophthalmic surgery.
- Given the higher cost of levobupivacaine compared to bupivacaine, we believe **that bupivacaine is more cost effective for patients with no cardiovascular risk factors**.
- We **advise the use of levobupivacaine for patients with cardiovascular risk factors as a precautionary measure** due to presence of reports on cardiac complications with bupivacaine.
- Future RCTs should focus on this topic should increase sample sizes and prioritize critical aspects like *onset time of adequate anesthesia for surgery* and *incidence of cardiovascular side effects.*

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CONTACT INFORMATION

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National Ophthalmology Health and Wellness Survey

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Purpose

- This study will help investigate ophthalmologists' and residents' perceptions of their wellness during the COVID-19 pandemic that can help identify the specific challenges they face, inform strategies to support their well-being, and ultimately improve the overall quality of care provided to patients.

Introduction

- The COVID-19 pandemic has had a significant impact on healthcare professionals, including ophthalmologists and residents.
- Burnout and dissatisfaction with work-life balance are already prevalent among healthcare professionals prior to the pandemic (Dyrbye et al, 2012; Shanafelt et al, 2015).
- Ophthalmologists and residents are at risk of contracting COVID-19 due to their close contact with patients, and their work is affected by changes in patient care both clinically and surgically.
- **These significant changes can lead to increased stress and burnout, negatively affecting their well-being and job performance.**
- The COVID-19 pandemic has added additional stressors to the lives of healthcare professionals, which may have further impacted their well-being (World Health Organization, 2020; Kraschnewski et al, 2020).

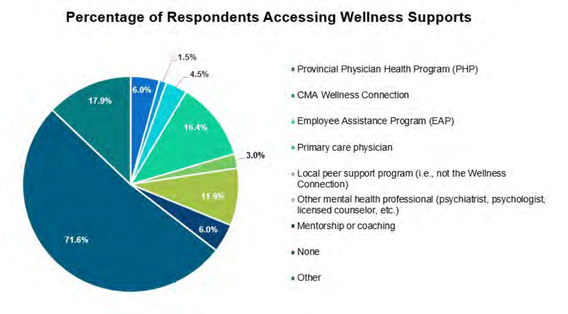
Methodology

- A survey was created in English and reviewed by a group of students, managers, and physicians.
- An electronic consent form was added at the beginning of the survey, which was hosted online and allowed for anonymous submission of answers.
- A link to the survey was forwarded to a member only Canadian Ophthalmological Society (COS) email list not publicly available.
- It was distributed through the Canadian Ophthalmological Society's email list, with a 3-month submission period and a reminder email after 2 weeks.

Figure 1: Self Reported Mental Health Insight During COVID-19

Work Setting	Self Reported Mental Health Insight During COVID-19					
	About the same	Much better	Much worse	Slightly worse	Somewhat better	Grand Total
Academic health centre	10		2	9	2	23
Community hospital	4	1		2		7
Private office or clinic	14		5	13	3	35
50% Academic, 50% Private	1			1		2
Grand Total	**29**	**1**	**7**	**25**	**5**	**67**

Figure 2: Percentage of Respondents Accessing Wellness Supports



Results

- 65 (97.0%) ophthalmologists and 2 (3.0%) fellows met the requirements for final sample inclusion.
- 30 (44.8%) females and 37 (55.2%) males responded to the survey. All respondents, except for one, identified as non-indigenous.
- 35 (52.2%) of the respondents reported their primary practice location was private practice, while only 23 (34.3%) of the respondents had primary practice in an academic center.
- 22 (32.8%) of the respondents reported being "under stress and not having as much energy in the past".
- Only 4 (6.0%) of respondents reported "feeling completely burned out".
- 54 (80.6%) of respondents reported a subjective "decline" in their mental health during the pandemic period with most of those respondents citing increasing workloads, lack of work-life integration, and challenges implementing rapidly changing policies and processes.
- Most respondents did not access wellness supports, or report accessing wellness supports such as the Provincial Physician Health Program (PHP) despite having optional access to these services.

Conclusion

- Most ophthalmologists did not report burnout during the pandemic period but were impacted by a general decline in collective mental health.
- Ophthalmologists practicing in a private practice setting had less respondents who rated their burnout as grade 4 or 5, the highest on the scale.
- This is in alignment with the Canadian Medical Association Physician Workforce Survey which was conducted in 2019 that showed that 68% of respondents were satisfied or dissatisfied with their balance of personal and professional commitments.
- **This survey provides rudimentary evidence that more can be done to make community support and services** such as the Provincial Physician Health Program (PHP) more available, as physicians who did access those services had better outcomes.

Acknowledgements

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UNIVERSITY OF CALGARY

VECTOR EYE CENTRE

Ocular Manifestations of Sweet's Syndrome

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LEADING INNOVATION FOR A HEALTHIER WORLD · CHEF DE FILE EN INNOVATION POUR UN MONDE EN SANTÉ · uOttawa Faculté de médecine Faculty of Medicine

INTRODUCTION

Sweet Syndrome (SS), or Acute febrile neutrophilic dermatosis, is an inflammatory skin disorder characterized by extensive infiltration of neutrophils into the epidermis and dermis.[1,2] While the relationship between ocular pathology and SS has been demonstrated in case reports, the ocular associations and frequencies are incompletely understood. This study aimed to systematically summarize the ocular manifestations in SS patients.

METHOD

- A comprehensive literature search was conducted in collaboration with an information specialist
- The study was conducted according to PRISMA guidelines from inception to August 31, 2023
- Ovid MEDLINE, Embase, SCOPUS, and Cochrane Central databases were used.
- The following subject terms and keywords were used: "sweet syndrome" or "sweet disease" or "gomm-button" or "acute febrile neutrophilic dermatosis".
- No language or publication date restrictions were applied.
- Studies that reported on ophthalmic symptoms or ocular manifestations were included.
- Quality of studies was evaluated using the Joanna Briggs Institute Critical Appraisal Tools.

Table 1. Distribution of ocular manifestations reported by patients

Ophthalmic Manifestation	Number of cases	% of cases
conjunctivitis	55	20.1
red eye	32	11.7
episcleritis	29	10.6
uveitis	15	5.47
scleritis	14	5.10
conjunctival injection	13	4.74
conjunctival hyperemia	12	4.37
chemosis	10	3.64
periocular erythema	9	3.28
periorbital edema	8	2.91
retinal vasculitis	5	1.82
eyelid swelling	5	1.82
retinal detachment	4	1.45
orbital cellulitis	4	1.45
periocular edema	3	1.09
peripheral ulcerative keratitis	3	1.09
eyelid lesions	3	1.09
blepharitis	3	1.09
central retinal artery occlusion	2	0.72
conjunctival pallor	2	0.72
iritis	2	0.72
endophthalmitis	2	0.72
corneal edema	2	0.72
limbal nodules	2	0.72
proptosis	2	0.72
xanthelasma	2	0.72
sclera hyperemia	1	0.36
necrotizing scleritis	1	0.36
conjunctival nodules	1	0.36
blepharoconjunctivitis	1	0.36
conjunctival erosion	1	0.36
conjunctival erythema	1	0.36
subconjunctival scarring	1	0.36
periocular swelling	1	0.36
vitritis	1	0.36
rretinitis	1	0.36
macular edema	1	0.36
cataract	1	0.36
posterior vitreous detachment	1	0.36
hyposphagma of conjunctiva	1	0.36
periorbital rash	1	0.36
periorbital erythema	1	0.36
limbic ulcerative keratitis	1	0.36
superior limbic keratoconjunctivitis	1	0.36
glaucoma	1	0.36
inflammatory glaucoma	1	0.36
limbal edema	1	0.36
papillitis	1	0.36
orbital compressive mass	1	0.36
periorbital cellulitis	1	0.36
orbital inflammation	1	0.36
choroidal atrophy	1	0.36
Descemet membrane folds	1	0.36
keratic precipitates	1	0.36
synechiae	1	0.36
papilloedema	1	0.36
ptosis	1	0.36
Total	274	100.0

RESULTS

- The search identified 5567 articles, 111 of which met the inclusion criteria and involved 140 patients.
- The most common ocular manifestations in SS were conjunctivitis (n=55; 20%), red eye (n=32; 12%), episcleritis (n=29; 11%), and uveitis (n=15; 5.5%).
- The most reported ophthalmic symptoms were ocular pain (n=15), blurred vision (n=11), and vision loss (n=10).
- Most reports were from Asia (n=51; 46%), followed by North America (n=37; 33%) and Europe (n=29; 26%).
- Systemic steroids were the most frequently used therapy.
- Patients experienced resolution in 15.1 days and were followed up over a mean of 14.3 months.

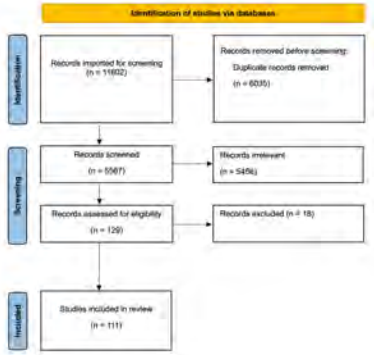

Figure 1. PRISMA diagram of selection Process

Table 2. Distribution of ocular symptoms reported by patients

Ophthalmic symptoms	Number of cases	% of cases
Ocular pain	15	29.4
Blurred vision	11	21.6
Vision loss	10	19.6
Photophobia	3	5.9
Ocular discharge	3	5.9
Diplopia	2	3.9
Epiphora	2	3.9
Eye irritation	2	3.9
Stinging and burning	2	3.9
Double vision	1	2.0

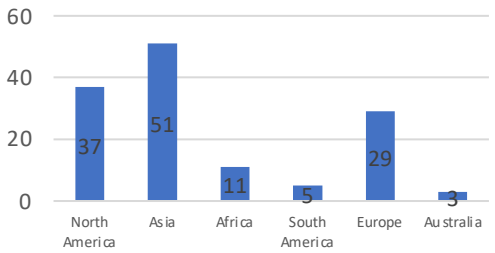

Figure 2. Distribution of studies by continent

CONCLUSION

This review synthesizes the ocular findings in SS and examines the frequency of reporting in the literature. The diagnosis of SS should be considered when patients present symptoms of ocular pain and visual decline and present with conjunctivitis and red eye. Early diagnosis and intervention can minimize the risk of chronic pain and detrimental ocular outcomes, such as blindness.

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COS 2024

Simulation-Based Ophthalmology Education For Medical Students

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NOSM UNIVERSITY

INTRODUCTION

- Ophthalmology: An **under-represented specialty** in many medical school curriculums.
- Literature shows:

a) **Lack of confidence** reported by clinicians when dealing with eye conditions.

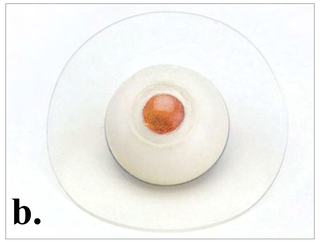
b) If undergraduate ophthalmology teaching could be made more effective, **standard of primary ocular care** would improve.

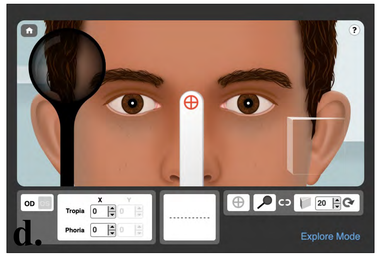
AIM

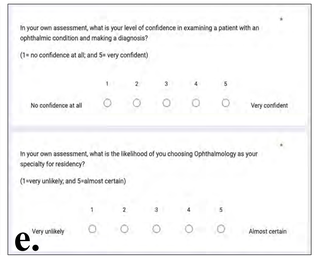
- To address the above mentioned gap in training, we used a **simulation-based education (SBE) approach** to train **medical students** in ophthalmology.

METHODS

- Two-day (eight hours in total) **simulation-based ophthalmology workshop**.
- Conducted by an **ophthalmologist**.
- Participants: **Second year NOSM U medical students**.
- **Clinical & procedural ophthalmology skills** taught: Slit lamp exams, direct & indirect ophthalmoscopy, retinoscopy, intraocular pressure & pupil assessments, ocular motility assessments, laser procedures, steps of cataract & strabismus surgery.
- **Standardised patients, simulators, & eye models** used.
- **Questionnaires** to evaluate learners' **ophthalmology experience, interest, & knowledge** before & after the workshop.
- **Feedback survey** on the **quality & usefulness** of the workshop, after the workshop.
- Pre- & post-workshop responses were compared.







From top to bottom: a. Instructors and learners at the workshop; b. Eye model for cataract surgery (simulatedocularsurgery.com); c. Eye model for strabismus surgery (wrighteyecare.com); d. Strabismus simulator (aao.org); e. Sample questions on the pre- and post-workshop questionnaires; f. Eye models for laser, for use with a slit lamp (simuleye.com)

RESULTS

- **Nine** second year NOSM U medical students participated (6 F, 3 M).
- Mean age: 27.1 years.
- Pre-workshop, learners' self-reported confidence in dealing with ophthalmology patients was **1.8/5**, & self-reported interest in pursuing an ophthalmology residency was **2.6/5**. Pre-workshop, learners scored a mean of **8.4/15** on an ophthalmology knowledge questionnaire.
- Post-workshop, their self-reported confidence was **3.4/5** (p=0.0001), interest in pursuing ophthalmology residency was **3.2/5** (p=0.022), & score on the ophthalmology questionnaire was **13/15** (p=0.0001).
- Feedback survey: All students felt the workshop was **relevant, comprehensive, easy to understand,** & that they **gained knowledge/skills that they will be able to apply to their future clinical practice**.
- The overall educational value of the workshop was rated **4.9/5**.
- Reviews received included adjectives such as "**great**", "**excellent**", & "**enjoyable**".
- All students recommended that **SBE activities should be included in the medical school curriculum**.

	Pre-workshop	Post-workshop	p value
Learner confidence	**1.8/5**	**3.4/5**	**0.0001**
Learner interest	**2.6/5**	**3.2/5**	**0.022**
Learner knowledge	**8.4/15**	**13/15**	**0.0001**

CONCLUSIONS

- SBE provides learners with an opportunity to **obtain practical & hands-on experience** to improve skills.
- It can **improve learner knowledge & confidence**.
- It can **increase learner interest in ophthalmology**.
- SBE has the potential to **produce well-trained clinicians** & **improve primary ocular care**.

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Neuro-ophthalmology | Neuro-ophtalmologie

Advancing eye care through **innovation, education, and advocacy**

L'avancement des soins oculaires grâce à **l'innovation, la formation et la représentation**

Acquired Myelinated Retinal Nerve Fiber Layer in a Child with Neurofibromatosis Type 1-Related Optic Pathway Glioma

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INTRODUCTION & PURPOSE

- Myelinated retinal nerve fiber layer (RNFL) is a rare structural anomaly characterized as a gray-white lesion with feathered, well-demarcated borders obscuring the retinal vasculature
- Myelinated RNFL is most commonly congenital but acquired cases have been rarely reported
- **Purpose:** Describe a rare case of a patient with neurofibromatosis type 1 and bilateral optic nerve glioma who presented with a unilateral acquired myelinated RNFL and stable visual function

METHODS

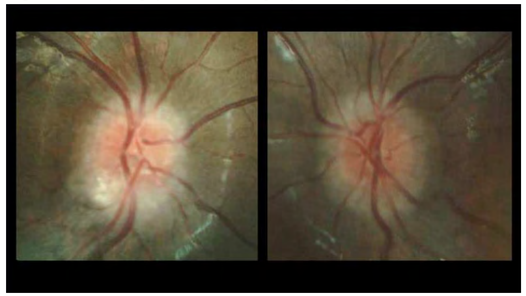
Study Design: Case report and literature review

Methods: The patient's medical chart was reviewed. A literature review was performed to identify cases of acquired myelinated RNFL in pediatric patients with concurrent optic pathway glioma

CASE PRESENTATION

- A 5-year old female patient with a diagnosis of neurofibromatosis type 1 was seen for ophthalmic examination following first seizure presentation
- Visual acuity was 20/25 OU and a single Lisch nodule was present in the right eye
- Dilated fundoscopic exam revealed optic disc edema bilaterally (Figure 1)

Figure 1. Fundus photographs of the left and right eye showing bilateral optic disc edema.



CASE PRESENTATION

- Magnetic Resonance Imaging (MRI) brain and orbit showed enlargement of the right (4.1 x 4.4mm) and left (3.3 x 3.3mm) proximal intra-orbital optic nerves consistent with bilateral optic nerve glioma (Figure 2a)
- No treatment was initiated as the patient showed no impairment of visual function and no evidence of optic atrophy
- The patient was followed regularly with serial eye examinations and MRIs
- The size of the optic pathway glioma remained stable on imaging, visual function remained unchanged, and the optic nerve edema gradually improved

FOLLOW UP

- On follow-up at 10-years of age, newly acquired myelinated RNFL was noted superior to the left optic nerve (Figure 3)
- Visual acuity was 20/20 OU, with normal color vision, and the visual fields were full to confrontation
- The patient was followed for a further 2 years with no change in visual function, optic nerve glioma, or myelinated RNFL
- MRI showed stable thickening of both optic nerves abutting the globes (Figure 2b)
- No change in the imaging characteristics of the optic pathway glioma or visual function was observed
- OCT at final follow up showed an elevated average RNFL in the left eye, but no evidence of atrophy on ganglion cell analysis (Figure 4)
- The myelinated RNFL in the left eye changed slightly in appearance over time but did not regress

Figure 2. MRI (axial T2) at diagnosis (a) and 5 years later (b) showed bilateral thickening of the optic nerves abutting the globes, consistent with optic pathway glioma

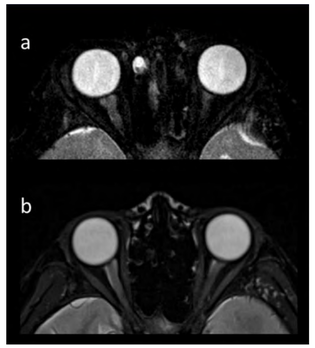


Figure 4. OCT at final follow-up showing an elevated average RNFL in the left eye (a) but no clear atrophy on ganglion cell analysis (b)

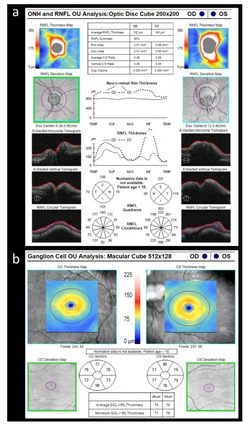
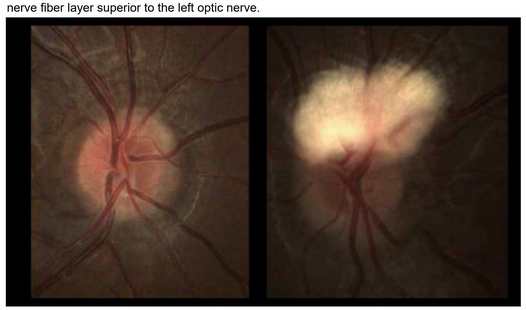


Figure 3. Fundus photographs of the left and right eye showing acquired myelinated retinal nerve fiber layer superior to the left optic nerve.



DISCUSSION

- Myelination of the retinal nerve fiber layer is present in 1% of the population with bilateral involvement in 7% of affected patients[1]
- During normal embryological development, myelination of the optic nerve originates from the lateral geniculate body extending posterior to the lamina cribrosa
- Postulated mechanisms of acquired myelinated RNFL include disruption of the physical barrier of the lamina cribrosa
- Previous cases reported of acquired myelinated RNFL in adolescents following insult to the lamina cribrosa
- Myelinated RNFL is associated with the triad of unilateral amblyopia, myopia, and strabismus known as Straatsma syndrome[2]
- Four documented cases of myelinated RNFL associated with optic pathway glioma, three in the context of neurofibromatosis type 1 and the remaining case in a patient with Klippel-Trenaunay Syndrome[3,4,5]
- In all previous case reports myelinated RNFL was preceded by an improvement in visual function
- Notably, no decline or improvement in visual acuity or visual function was observed during this time frame
- It is unclear why visual function did not change in this case, unlike previous reports

CONCLUSION

The present case represents a rare presentation of acquired myelinated RNFL preceded by optic disc edema in a patient with neurofibromatosis type 1 and bilateral optic nerve glioma. Unlike previous reports, no decline or improvement in visual acuity was observed during this time frame..

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Determinants of Pulse Steroid Therapy Acceptance Among Patients Presenting with Optic Neuritis

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Advancing eye care through innovation, education, and advocacy
L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

INTRODUCTION

- Treatment strategies, particularly the efficacy of corticosteroids, have been a focal point of investigation in optic neuritis (ON).[1,2]
- Evidence suggests the need for a tailored treatment approach based on individual patient profiles.

AIM

To investigate the determinants influencing patients' decisions to accept or decline pulse steroid therapy for ON and to determine the percentage of patients with ON who consent to receive such treatment.

METHOD

- Patients presenting to British Columbia's neuro-ophthalmology team with typical demyelinating optic neuritis were included in this study.
- Exclusion criteria included patients with prior diagnosis of multiple sclerosis.
- To date, 50 patients have been included in this study.
- Patient demographics, baseline visual acuity and color vision, comorbidities, and occupation were collected and correlated with whether they agreed to corticosteroid treatment.
- Comparative statistics was done via GraphPad Prism and SPSS with a significance level of $p<0.05$.

RESULTS

Table 1. Participant Demographics

	N = 50
Median Age (95% CI)	33.5 (±10.8)
Number of females (%)	36 (72%)
Median days between onset of symptoms and presentation	6.5 (±8.8)
Agreed to PO Corticosteroid (%)	18 (36)
Agreed to IV Corticosteroid (%)	18 (36)

Table 2. Participant Medical History

Past medical history (n, %)	
Ocular History	7 (14)
Migraines	3 (6)
Autoimmune disease	2 (4)
Diabetes	2 (4)
Depression/anxiety	2 (4)
Blood disorders	1 (2)
Hypothyroidism	1 (2)
Asthma	1 (2)

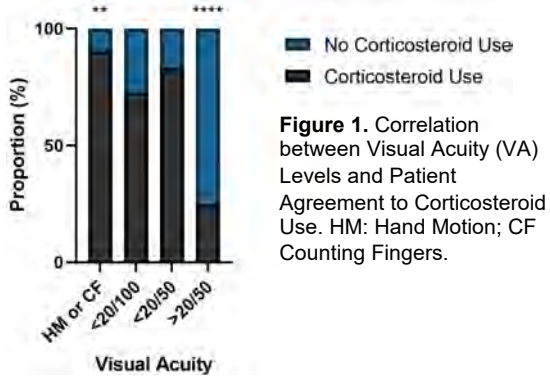

Figure 1. Correlation between Visual Acuity (VA) Levels and Patient Agreement to Corticosteroid Use. HM: Hand Motion; CF Counting Fingers.

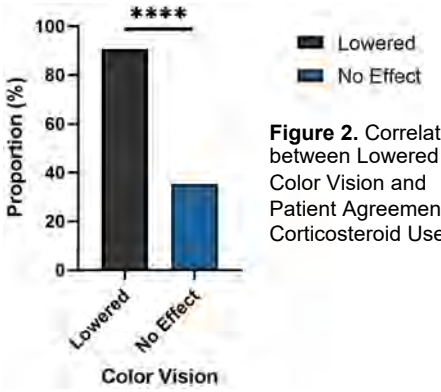

Figure 2. Correlation between Lowered Color Vision and Patient Agreement to Corticosteroid Use.

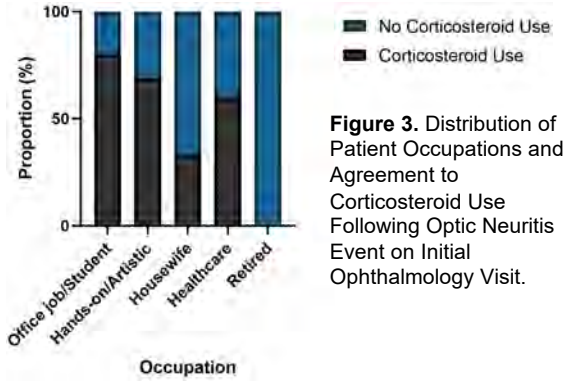

Figure 3. Distribution of Patient Occupations and Agreement to Corticosteroid Use Following Optic Neuritis Event on Initial Ophthalmology Visit.

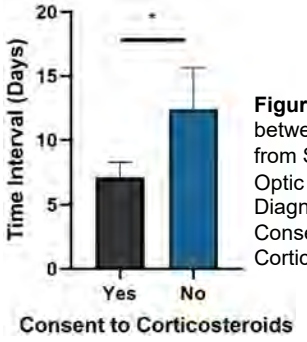

Figure 4. Relationship between Time Interval from Symptom Onset to Optic Neuritis Diagnosis and Patient Consent to Corticosteroid Use.

CONCLUSIONS

- Patients with optic neuritis showing significantly reduced visual acuity and lowered color vision were more inclined to consent to corticosteroid treatment.
- No correlation was found between patients' employment categories and their willingness to consent to corticosteroid therapy.
- Early visits to an ophthalmologist following the onset of optic neuritis symptoms were associated with a higher likelihood of consenting to corticosteroid use.

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Macular Retinal Ganglion Cell Thickness After Stroke Affecting and Not Affecting Visual Pathway

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INTRODUCTION

Stroke is a disruption of blood flow to the brain which can lead to irreversible axonal degeneration. This process starts within 5 to 30 minutes after the traumatic event[1] and leads to both anterograde (towards the post-synaptic end) and retrograde (away from the post-synaptic end) neuronal degeneration[2]. Both types of degeneration have been shown to occur simultaneously in the visual pathway within days of occipital insult[3]. Axons of retinal ganglion cells (RGCs) give rise to the retinal nerve fiber layer (RNFL). Studies of unilateral occipital lobe insults have shown thinning of the RNFL on Optical Coherence Tomography (OCT).
Spectral Domain OCT (SD-OCT) measures thickness of retinal sub-layers which can assess the integrity of neuronal and cellular axons within the visual pathway[5].
We compared GCL thickness hemiretinas patients with a history of stroke.

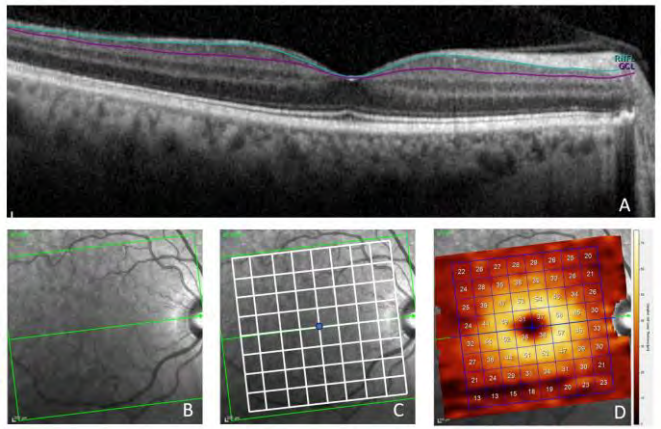

Figure 1: (A) GCL measurements (outlined between blue and purple lines) were extracted from the SD-OCT B-scans oriented to the horizontal raphe as depicted in (B). (C) The SD-OCT 8x8 grid superimposed and centered on the horizontal raphe depicts the 64 areas over which GCL measurements are calculated (D).

METHODS

46 subjects (15 males) with average age 69.2 ± 6.5 years (range 56.6-84.2 years) with a history of stroke were included in the study. All subjects underwent brain MRI and retinal imaging. MRI with diffusion tensor imaging tactography was performed and reviewed by a neurologist to determine if the lesion affected the post-chiasmal visual pathway. Retinal images were obtained with SD-OCT (Heidelberg Spectralis®, Heidelberg Engineering Co., Heidelberg, Germany) A macular (posterior pole) image was acquired, the GCL layer was auto-segmented by the software (HEYEX version 6.3.4.0) and an 8x8 grid of the macula which respects the midline was generated and electronically exported (Figure 1). Data from the central 6x6 grid from the left and right halves of each macula were combined to calculate a right and left hemi-macular GCL thickness (Figure 2). Box-plots and ANOVA were used to compare the hemi-macular GCL thicknesses of subjects with hemispheres with no stroke, stroke that affected the visual pathway, and stroke that did not affect the visual pathway. Exclusion criteria included any evidence of any retinal disorder that can affect ganglion cell layer thickness such as exudative maculopathies, glaucoma, and other optic neuropathies or any difficulty to undergo MRI imaging.

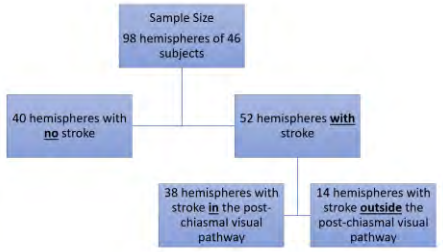

Figure 3: Study Sample.

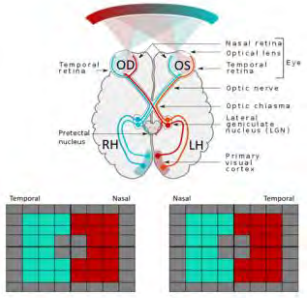

Figure 2: Points from the posterior pole grid and its correspondence to the cerebral hemispheres. Right hemi-macula GCL thickness (green) and left hemi-macula GCL thickness (red) from OCT as it corresponds with the right hemisphere and left hemispheres, receptively. Red points correspond to left hemisphere. RH= right hemisphere, LH= left hemisphere, OD = right eye, OS= left eye.

RESULTS

Box-whisker plots showed no significant difference in mean GCL thickness amongst the three groups (p-value = 0.9664393) (Figure 4).

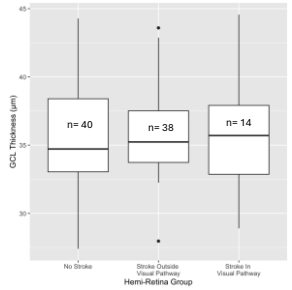

Figure 4: Box-whisker plot of mean GCL thickness in hemispheres with no stroke, stroke in the visual pathway, and stroke outside the visual pathway.

CONCLUSION

There was no difference in mean GCL thickness in the hemi-maculas with no stroke, stroke affecting in visual pathway, and stroke outside the visual pathway.
There are several possibilities that may explain this. First,
Further investigations will evaluate the change in GCL thickness over time and adjusting for size, location, and time since of stroke.

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Patterns of Extraocular Muscle Enlargement in Graves' Disease and Acromegaly

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Schulich MEDICINE & DENTISTRY

INTRODUCTION

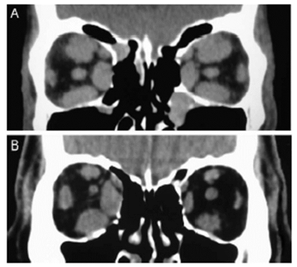
- Graves' orbitopathy (GO) is the most common cause of extraocular muscle (EOM) enlargement[1].
- Measurement of EOM on CT scans can aid in diagnosis of GO, but other conditions may also cause EOM enlargement including acromegaly[2].
- EOM hypertrophy in GO has been described to preferentially affect certain muscles, causing the greatest enlargement of the inferior rectus, followed by the medial rectus, superior rectus, lateral rectus, and lastly oblique muscles – sometimes referred to as IMSLO pattern[3,4].
- This pattern of EOM enlargement is reportedly distinct from patterns in other rarer pathologies which cause EOM changes.

AIM

- This study aims to characterize the diagnostic value of EOM size by comparing the pattern of EOM enlargement in GO to acromegaly patients and controls.

METHOD

- Retrospective analysis of 16 Graves patients, 17 acromegaly patients, and 18 controls at St. Joseph's Hospital in London, Ontario.
- CT orbits/head were analyzed for maximum diameter and maximum area of each EOM and compared between groups using students' T-test.
- Proptosis measurements for each patient were performed using a previously validated protocol[5].
- A fisher transformation and z-test of the Pearson correlation for each group were used to assess group differences.
- Correlation between proptosis and EOM sizes was performed using Pearson correlation.



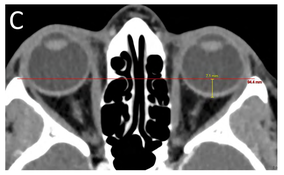


Figure 1. CT scans of Graves patients, demonstrating A) bilateral EOM enlargement B) Unilateral EOM enlargement, and C) measurement of proptosis[4]

RESULTS

EOM diameter:

- Significant differences for each EOM were found between GO and controls, and acromegaly and controls. No EOM showed significant differences between Graves' and acromegaly.
- In GO, contrary to the IMSLO pattern, the inferior, medial, and superior rectus muscles were enlarged to a similar degree, whereas only the lateral rectus was enlarged to a lesser degree (Table 1).
- In acromegaly, the inferior, medial, and superior rectus muscles were enlarged to a similar degree, whereas the lateral rectus was enlarged to a greater degree (Table 1).

Proptosis:

- Radiographically measured proptosis is greater in both GO and acromegaly compared to controls, with no significant difference between GO and acromegaly (Figure 4).

Table 1. Mean maximum diameter of extraocular muscles of the eye with larger EOM in controls, Graves', and acromegaly patients.

	Graves'		Acromegaly		Control
	EOM diameter (mm ± SD)	Enlargement vs Control (%)	EOM diameter (mm ± SD)	Enlargement vs Control (%)	
Inferior Rectus	5.32 ± 2.19	**41.5**	4.90 ± 0.64	**30.3**	3.76 ± 0.45
Medial Rectus	5.38 ± 2.34	**41.8**	5.03 ± 0.79	**31.7**	3.82 ± 0.35
Superior Rectus	5.62 ± 2.29	**51.5**	4.96 ± 0.88	**33.7**	3.71 ± 0.60
Lateral Rectus	4.30 ± 1.77	**32.3**	4.73 ± 0.70	**45.5**	3.25 ± 0.44

Figure 2. Comparison of EOM maximum diameters of the worse affected eye of Graves', control, and acromegaly groups. (* = p<0.05, ** = p<0.01)

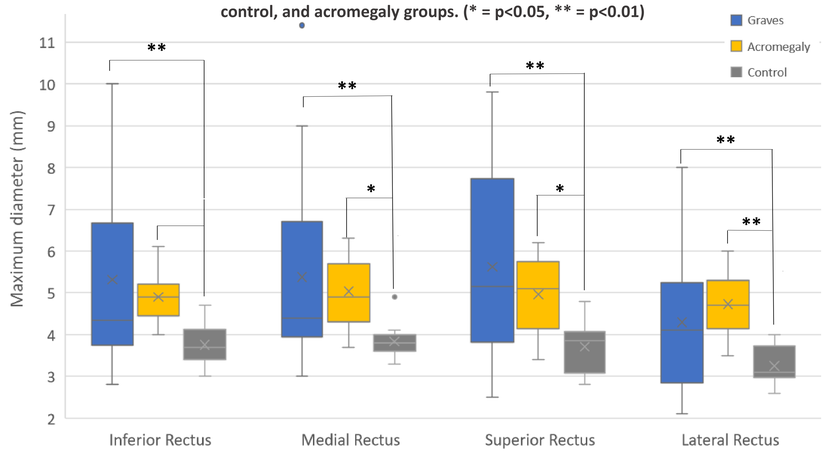


Table 2. Relative differences between mean maximum diameter of EOM's between control and Graves' or acromegaly groups. *relative to Control, †relative to Graves'

Comparison	Inferior Rectus		Medial Rectus		Superior Rectus		Lateral Rectus	
	Relative Difference (mm)	p-value	Relative Difference (mm)	p-value	Relative Difference (mm)	p-value	Relative Difference (mm)	p-value
Graves' vs. Controls	1.56	**0.003***	1.56	**0.001***	1.91	**<0.001***	1.05	**0.020***
Acromegaly vs. Controls	1.14	**0.034 ***	1.21	**0.023***	1.25	**0.032***	1.48	**<0.001***
Graves' vs. Acromegaly	0.42	0.629†	0.51	0.471†	0.65	0.391†	-0.41	0.541†

Figure 3. Comparison of percentage of Eyes with Significantly Enlarged Extraocular Muscles in Graves and Acromegaly

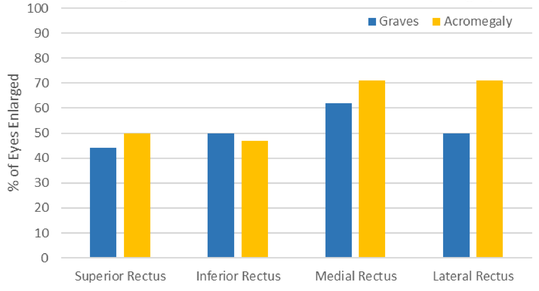
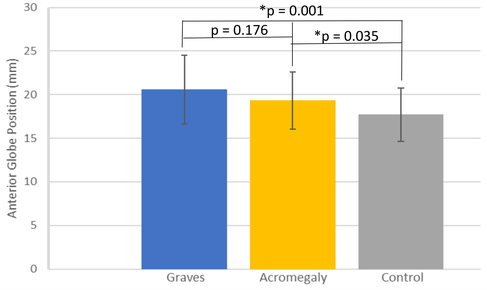


Figure 4. Comparison of proptosis between Graves, acromegaly, and controls



CONCLUSION

- The classic dogma of an IMSLO pattern of EOM enlargement in GO was not reflected in our findings.
- Further studies are needed to determine if the IMSLO pattern is accurate.
- EOM enlargement appears to be similar in magnitude in GO as in acromegaly patients.
- Proptosis may be more common in acromegaly than previously reported. Larger sample sizes are required to determine if there is a difference between GO and acromegaly, and if proptosis is primarily due to EOM enlargement or other factors, such as fat hypertrophy.

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Severe bilateral ophthalmoplegia and ptosis as a first presentation of NMOSD: A case report

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Objective

To highlight the following:

- **less typical brainstem syndromes seen in Neuromyelitis optica spectrum disorder (NMOSD)**
- **the importance of recognizing ascending and descending fibers that may be affected in a more diffuse brainstem lesion,**
- **the salient imaging pattern that can be seen in NMOSD.**

Introduction

- NMOSD is an autoimmune astrocytopathy that mainly affects middle-aged women with a female:male ratio of 9:1.
- Optic neuritis (ON) and transverse myelitis (TM) are the predominant presenting features, with 85% of patients presenting with either one or both as a first sign of the disease.
- Brainstem, cerebral, and diencephalic events can occur, including narcolepsy and osmotic demyelination.
- Less commonly involved brainstem nuclei may present with under-recognized symptoms that delay diagnosis and treatment, leading to a poorer treatment response and greater residual disability.
- **Awareness of less common presentations can aid in timely NMOSD recognition and intervention.**

Methodology

- A 38-year-old female of Filipino descent presented with a two-week history of progressive bilateral ptosis, ophthalmoparesis, ageusia, and tinnitus.
- The patient also reported a severely pruritic area on her right back in the T4 dermatome.
- The patient had no relevant family history and was otherwise healthy.
- She was admitted to the Neurology inpatient service for further evaluation and management.

Results

- Initial examination showed symmetric, miotic, but reactive pupils bilaterally and profound bilateral ptosis with near-complete ophthalmoparesis.
- Enhanced MRI brain, orbits, and cervicothoracic spine revealed a large periaqueductal ependymal lesion extending from the midbrain to the cerebellopontine angle, as well as a marbled lesion in the corpus callosum.
- A working diagnosis of NMOSD was made, and the patient was treated with high-dose intravenous methylprednisolone and plasmapheresis.
- AQP-4 antibody testing came back positive at a high titer, confirming the diagnosis of NMOSD.
- The patient had a moderate response to initial treatment and started on rituximab infusions for maintenance therapy.
- At the 2-month follow-up appointment, the patient showed significant improvement in her ocular symptoms, with resolution of ptosis and only mild binocular diplopia in certain directions of gaze.

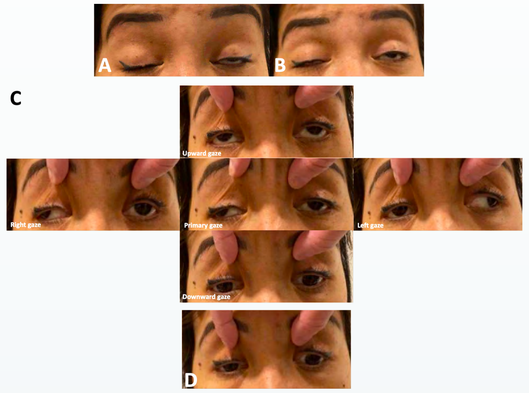

Figure 1: Eye movements at presentation to hospital A. eyes open at rest, B. eyes open voluntarily, C. primary gaze and cardinal eye positions, D. convergence

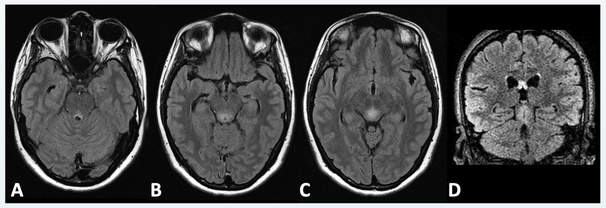

Figure 2: T2 FLAIR MR brain showing a periaqueductal hyperintense lesion spanning from pons to the midbrain, axial (A-C) and coronal (D)

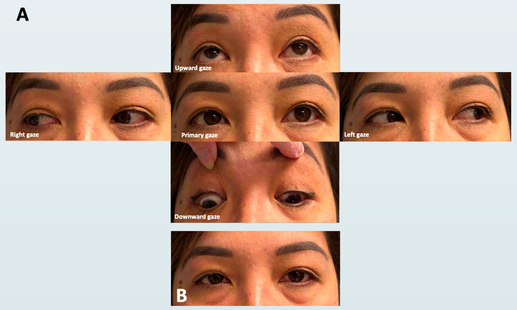

Figure 3: Eye movements after plasmapheresis A. primary gaze and cardinal eye positions, B. convergence.

Conclusion

1. NMOSD can present with atypical brainstem syndromes, making localization and differential diagnosis challenging.
2. Periaqueductal lesions on MRI have a high association with NMOSD and can aid in diagnosis.
3. AQP-4 antibody testing is highly sensitive and specific and can confirm the diagnosis of NMOSD in atypical cases.
4. Delay in diagnosis and treatment of NMOSD can result in greater fixed disability.
5. Healthcare providers should recognize the full range of NMOSD phenotypes to ensure appropriate investigations and rapid treatment.

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L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

Utility of ChatGPT for Automated Creation of Patient Education Handouts: An Application in Neuro-Ophthalmology

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INTRODUCTION

Patient education in ophthalmology poses a challenge for physicians due to time and resource limitations. ChatGPT (OpenAI, San Francisco) may assist with automating production of patient handouts on common neuro-ophthalmic diseases.[1-5]

AIM

The primary outcome was whether ChatGPT generated educational materials that were sufficiently accurate, as measured by our scoring tool, requiring only minor edits by a fellowship-trained neuro-ophthalmologist. The secondary outcome of this work was whether the language used in the handouts were accessible to a lay readership, as measured by a validated readability scoring tool.

METHOD

We queried ChatGPT-3.5 to generate 51 patient education handouts across 17 conditions. We devised the "Quality of Generated Language Outputs for Patients" (QGLOP) tool to assess handouts on the domains of accuracy/comprehensiveness, bias, currency, and tone, each scored out of 4 for a total of 16. A fellowship-trained neuro-ophthalmologist scored each passage. Handout readability was assessed using the Simple Measure of Gobbledygook (SMOG), which estimates years of education required to understand a text.[6]

RESULTS

The **mean QGLOP score was 11.9** [95% CI 8.98, 14.8] out of 16 points, indicating a **performance of 74.4%** [95%CI 56.1%, 92.5%]. By domain, the QGLOP scores across responses were 2.43 [95%CI 1.21, 3.65] for accuracy; 3 [95%CI 1.3, 4.7] for bias; 3.43 [95%CI 1.92, 4.94] for currency; and 3.02 [95%CI 2.74, 3.30] for tone. Across all 17 studied conditions, the top three best total scored ailments were giant cell arteritis with vision loss (13.3 [95%CI 12.2, 14.5]), idiopathic intracranial hypertension (13 [95%CI 9, 17]), and sixth nerve palsy (13 [95%CI 13, 13]). Comparatively, the bottom three scoring ailments were downbeat nystagmus (11 [95%CI 7, 15]), Horner's syndrome (10.3 [95%CI 8.02, 12.6]), and Adie's tonic pupil (9.67 [95%CI 5.5, 13.8]). The mean SMOG across responses as 10.9 [95%CI 9.36, 12.4] years of education required to adequately comprehend the created text.

The mean QGLOP score suggest that a fellowship-trained ophthalmologist may have at-least a moderate level of satisfaction with the write-up quality conferred by ChatGPT. This still requires a final review and editing before dissemination. Comparatively, the rarer 5% of responses collectively on either extreme would require very mild or extensive revision. As well, the mean SMOG score exceeded the accepted upper limits of grade 8 reading level for health-related patient handouts.[7]

Table 1: Quality rating scores stratified by condition of interest.

Condition	Mean	Lower Bound of 9% Confidence Interval	Upper Bound of 9% Confidence Interval
Giant Cell Arteritis with vision loss	13.33	12.18	14.49
Idiopathic intracranial hypertension	13	9	17
Sixth nerve palsy	13	13	13
Optic Neuritis	12.67	9.61	15.72
Pituitary adenoma with vision loss	12.67	10.36	14.98
Dorsal midbrain syndrome	12.33	10.02	14.64
Homonymous Hemianopia	12.33	10.02	14.64
NAION	12	10	14
Third nerve palsy	12	10	14
Internuclear ophthalmoplegia	11.67	10.51	12.82
Leber's Hereditary Optic Neuropathy	11.67	7.50	15.83
Thyroid eye disease	11.67	10.51	12.82
Fourth nerve palsy	11.33	8.28	14.39
Optic nerve sheath meningioma	11.33	10.18	12.49
Downbeat nystagmus	11	7	15
Horner's Syndrome	10.33	8.02	12.64
Adie's tonic pupil	9.67	5.50	13.83

CONCLUSION

In its current iteration, ChatGPT should be used as an efficiency tool to generate an initial draft for the neuro-ophthalmologist, who may then refine the accuracy and readability for a lay readership.

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None

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Ocular Regenerative Medicine | Médecine oculaire régénérative

Adeno-Associated Virus (AAV) Mediated Expression of Bcl-xL Attenuates Apoptosis in Human Corneal Endothelial Cells

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INTRODUCTION

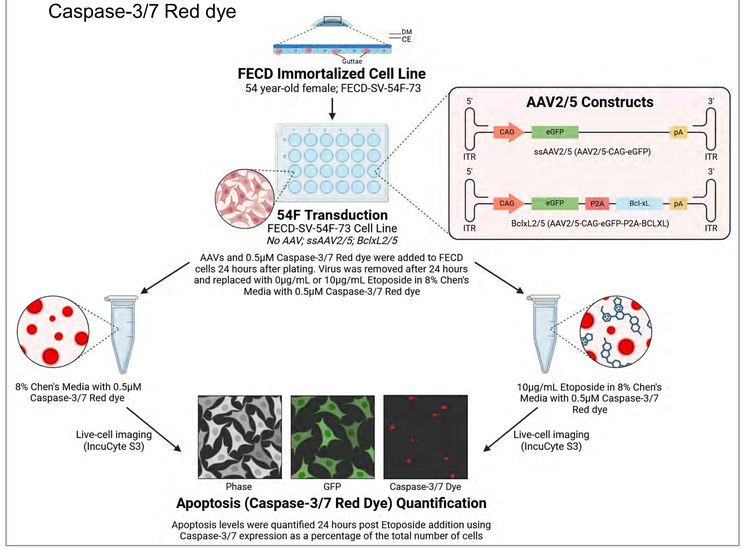
- Corneal transplantation is the standard-of-care treatment for severe corneal endothelial cell (CEC) loss and is limited by the availability and suitability of donor corneas
- AAVs induce a mild immune response, remain primarily episomal after transduction, avoid random integration into the host genome, and are already in human clinical trials for the treatment of ocular diseases[1]
- Limited studies have explored using AAVs to deliver the anti-apoptotic gene Bcl-xL to human corneal endothelial cells[2]

AIM

- Investigate AAV-mediated expression of Bcl-xL and its impact on attenuation of CEC apoptosis in Fuchs endothelial corneal dystrophy (FECD)

METHODS

- Normal and FECD CECs were transduced *in-vitro* with anti-apoptotic AAV BclxL2/5 (AAV2/5-CAG-eGFP-P2A-BCLXL) or control ssAAV2/5 (AAV2/5-CAG-eGFP) using an MOI of 200,000 and 10µg/mL Etoposide
- Apoptosis and GFP expression was visualized in real-time using Incucyte Caspase-3/7 Red dye and the Incucyte S3 Live-Cell Analysis System
- Apoptosis was quantified as the percentage of total cells expressing Caspase-3/7 Red dye



RESULTS

- Anti-apoptotic BclxL2/5 showed transduction rates of 70.47% ± 8.28 in FECD-SV-54F-73 cells
- Control ssAAV2/5 showed similar transduction levels of 65.86% ± 3.54 in FECD-SV-54F-73 cells
- FECD cells transduced with BclxL2/5 show significantly lower levels of etoposide-induced cell death (23.96% ± 11.54) compared to control ssAAV2/5 (70.43% ± 14.35; p=0.000) and no AAV (71.68% ± 18.70; p=0.000)

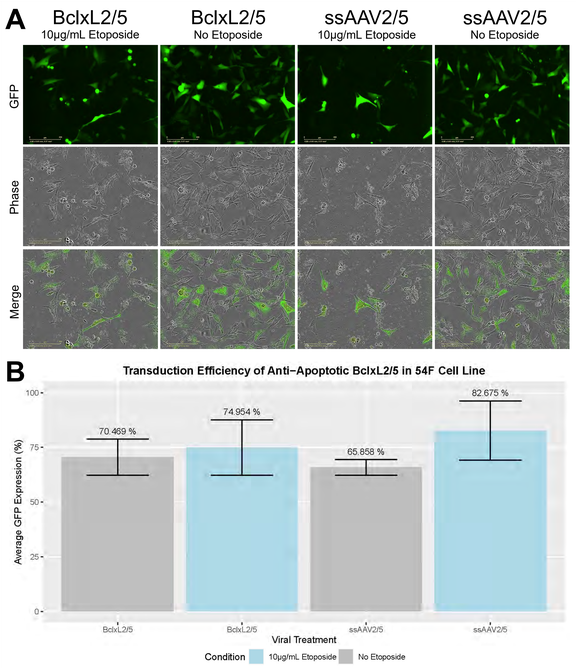


Figure 1. BclxL2/5 can transduce FECD cells with high efficiency. Average levels of GFP expression in FECD-SV-54F-73 cells transduced with anti-apoptotic BclxL2/5 (AAV2/5-CAG-eGFP-P2A-BCLXL) and control ssAAV2/5 (AAV2/5-CAG-eGFP). **A)** Transduction efficiency of anti-apoptotic BclxL2/5 and control ssAAV2/5 in FECD-SV-54F-73 cells. Average transduction efficiency was quantified as the number of GFP expressing cells as a percentage of total cells. **B)** Both AAVs showed similarly high *in-vitro* transduction efficiency, with BclxL2/5 showing an average transduction efficiency of 70.47% ± 8.28 and 74.94% ± 12.67 in untreated and etoposide-treated wells (p = 0.437), respectively. Similarly, ssAAV2/5 showed an average transduction of 65.86% ± 3.54 and 82.68% ± 13.55 in untreated and treated cells (p=0.345). All experiments were done using n = 3.

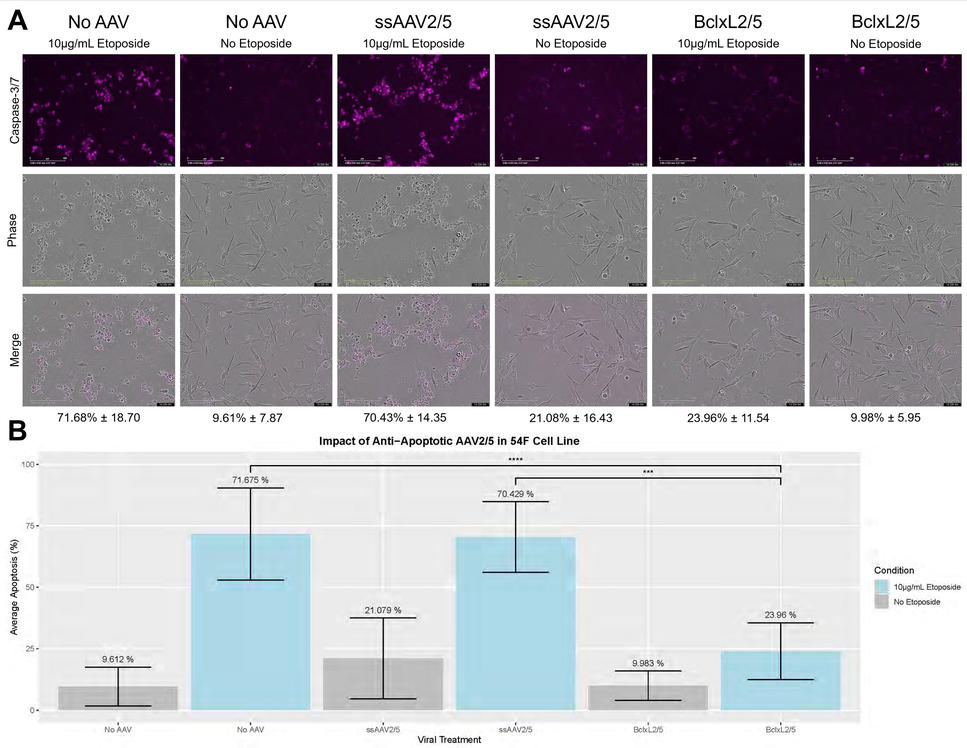


Figure 2. BclxL2/5 protects against etoposide-induced cell death in FECD cells. Average levels of etoposide-induced and background apoptosis in FECD-SV-54F-73 cells transduced with anti-apoptotic BclxL2/5 (AAV2/5-CAG-eGFP-P2A-BCLXL), control ssAAV2/5 (AAV2/5-CAG-eGFP) or no AAV. **A)** Apoptosis was quantified by the percentage of total cells expressing Caspase-3/7. **B)** AAV-mediated expression of Bcl-xL (AAV2/5-CAG-eGFP-P2A-BCLXL) resulted in significantly lower levels of etoposide-induced apoptosis (23.96% ± 11.54) compared to control AAV (AAV2/5-CAG-eGFP; 70.43% ± 14.35; p=0.000) and non-transduced FECD CECs (71.68% ± 18.70; p=0.000). In untreated FECD CECs, AAV-mediated expression of Bcl-xL resulted in lower levels of apoptosis (9.98% ± 5.95) compared to control AAV (21.08% ± 16.43; p=0.264), and non-transduced FECD CECs (9.61% ± 7.87; p=0.999). All experiments were done using n = 3.

CONCLUSION

- Anti-apoptotic BclxL2/5 can transduce normal and FECD cells with high efficiency
- BclxL2/5 was able to protect against etoposide-induced cell death
- Future studies could explore using BclxL2/5 to extend the corneal transplantation window past 14 days following donor death to increase the number of donor corneas available for transplantation

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A Meta-Analysis of Intravitreal Ranibizumab Versus Laser Therapy for the Treatment of Retinopathy of Prematurity

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INTRODUCTION

- Retinopathy of prematurity (ROP) is the most common cause of preventable blindness in preterm infants and is estimated to cause visual impairment in over 30,000 children worldwide
- ROP is characterized by abnormal neovascularization of the retina in premature infants. The traditional treatment for retinopathy of prematurity (ROP) has been laser photocoagulation (LPC); however, intravitreal anti-VEGF agents such as bevacizumab (IVB), ranibizumab (IVR) and aflibercept (IVA) have also been used recently
- IVB is more commonly used for ROP, however, IVR is increasingly emerging as a treatment option

OBJECTIVE

- To evaluate efficacy and safety of IVR compared to LPC for ROP

METHODS

- MEDLINE, EMBASE and Cochrane CENTRAL were searched up to August 2023 to select articles comparing efficacy and safety outcomes in children who received IVR versus LPC for ROP
- Studies were included if they reported on the following outcomes with at least 6 months of follow-up:

Primary Outcomes:

- ROP disease regression

Secondary Outcomes:

- Likelihood of additional treatment
- Time from treatment to recurrence or retreatment
- Refractive outcomes and adverse events (e.g., retinal detachment, cataract, macular ectopia/drag, vitreous hemorrhage, retinal hemorrhage or endophthalmitis)

- A random-effects meta-analysis was performed
- The Grading of Recommendations, Assessment, Development and Evaluations (GRADE) tool was used to assess the certainty of evidence for all analyzed studies

RESULTS

2361 Articles Identified → **74 Full-Text Reviews** → **13 Studies Included** | **1007 Infants** | **1947 Eyes** → **IVR:** 793 eyes, **IVA:** 872 eyes

Mean Gestational Age (GA) +STDEV	27.7 weeks ± 1.4 wks
IVR: 27.4 + 1.6 wks LPC: 27.7 + 1.2 wks	

Mean Birth Weight (BW) +STDEV	1056.0 ± 165.2 g
IVR: 1028.5 ± 177.6 g LPC: 1067.3 ± 149.9 g	

ROP Zone (n= 1526 eyes)	
Zone	%
I	26%
II	74%

ROP Stage (n=799 eyes)	
Stage	% study arms
1	2%
2	13%
3	85%

LPC: 810nm diode laser
IVR: ranibizumab (Lucentis®)
- 0.25 mg (6 studies)
- 0.3 mg (1 study)
- 0.2 and 0.1 mg (2 studies)
- Dose N/A (1 study)

Median Follow-Up 20.7 months (Range 11-76 months)

Mean PMA @ treatment: 37.1 ± 2.1 wks

Outcome	Intervention	Relative Effect: RR or WMD (95% CI)	Number of eyes	Certainty (GRADE)
Initial ROP Regression	Ranibizumab vs. Laser	RR= 0.96 [0.83, 1.10], p=0.52	1815	⊕⊕⊕⊖ Moderate
Likelihood of Additional Treatment	Ranibizumab vs. Laser	**RR= 2.70 [1.55, 4.68], p=0.0004**	1815	⊕⊕⊕⊖ Moderate
Time from Treatment to Recurrence or Retreatment	Ranibizumab vs. Laser	**WMD= -4.29 weeks [-6.48, -2.10], p=0.0001** *(Earlier recurrence with laser)*	1201	⊕⊕⊕⊖ Moderate

- No significant difference in initial regression between IVR and LPC
- Infants who received IVR had a higher risk of recurrence and required additional treatment compared to infants who received LPC
- Recurrence occurred earlier with LPC compared to IVR

Outcome	Intervention	Relative Effect: RR or WMD (95% CI)	Number of eyes	Certainty (GRADE)
Spherical Equivalent	Ranibizumab vs. Laser	**WMD= - 0.93 D [-1.54, -0.32], p<0.003** *(More myopia with laser)*	664	⊕⊕⊕⊖ Low-Moderate
Adverse Events				
- Most common: RD	Ranibizumab vs. Laser	RR= 0.68 [0.24, 1.93], p=0.47	813[N]	⊕⊕⊕⊖ Moderate
- 2nd most common: MDR		RR= 0.54 [0.16, 1.88], p=0.33	520[N]	⊕⊕⊖⊖ Low
- 3rd most common: VH		RR= 0.80 [0.06, 11.55], p=0.87	127[N]	⊕⊕⊖⊖ Low

[N]: number of eyes in studies where any complications were reported. RD: retinal detachment. MDR: macular drag/ectopia. VH: vitreous hemorrhage.

- Less myopia in infants who received IVR compared to infants who underwent LPC
- No risk difference was found for RD, MDR and VH

CONCLUSION

- Infants who received IVR had a higher risk of requiring additional re-treatment compared to infants who received LPC, despite similar initial disease regression (GRADE: moderate)
- Although less frequent, recurrence occurred earlier with LPC compared to IVR (GRADE: low-moderate).
- Eyes that received IVR were less myopic but were at similar risk for ocular complications (GRADE: low-moderate).

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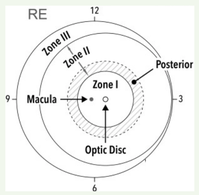
Photo: Clare Gilbert, Iris Medical Instruments. "Retinopathy of prematurity." by Community Eye Health - licensed under CC BY-NC 2.0.



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Comparison of Respiratory Outcomes in Children Treated with Laser Vs Bevacizumab for Severe Retinopathy of Prematurity (ROP)

COS 2024

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INTRODUCTION

- Intravitreal bevacizumab injection (IVB) is an accepted treatment for type 1 ROP mainly zone I disease.[1,2]
- Bevacizumab gets absorbed into the systemic circulation & results in lower VEGF levels for at least 8 weeks post injection.[3]
- VEGF is critical for lung development.[4]
- Effects on the lungs of premature children treated with IVB are not well studied.[5,6]

AIM

- To assess whether respiratory function in older children is affected by modality of treatment for severe ROP comparing intravitreal bevacizumab (IVB) to laser photocoagulation.

Hypothesis:

- After adjusting for prematurity, IVB does not have an overall effect on respiratory outcomes when compared to infants treated with laser.

METHOD

Study design:

- Prospective cross-sectional comparative study.

Inclusion criteria:

- Children treated for severe ROP between 2009-2015.
- Treatment with single injection of bevacizumab 0.625mg or laser.
- Minimum age of 6 years at testing.

Exclusion criteria:

- Significant congenital or acquired respiratory anomalies.
- Treatment with IVB for compassionate reasons or combined treatment of IVB and laser.

Primary outcome measure:

- Pulmonary function assessed by spirometry & presented by forced expiratory volume in one second (FEV1)

Secondary outcome measures:

- Resting respiratory rate (RR) and oxygen saturation (O2%)

ACKNOWLEDGEMENTS

This study was supported by the Ophthalmology Research Fund at the Ophthalmology & Vision Sciences Department, The Hospital for Sick Children, Toronto, ON, Canada

CONTACT INFORMATION

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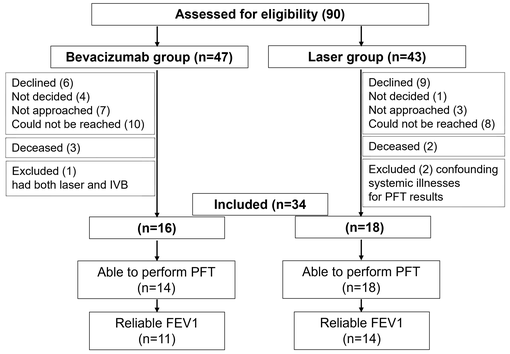
RESULTS

Recruitment Flow Chart



Demographics

#Infants	IVB 16	Laser 18	
	Mean (SD) (range)	mean (SD) (range)	*p=*
Birth weight (g),	746 (103) (570-914)	817 (295) (433-1530)	0.35
GA (w),	25.2 (1.1) (23.7-27.5)	26.3 (2.0) (23.6-32)	***0.046***
PMA at ROP Rx (w),	37.0 (2.6) (33.6-42.0)	38.7 (3.4) (33.1-46.7)	***0.023***
Age at respiratory function test, (y)	9.5 (1.2) (7.8-11.9)	11.1 (2.02) (7.9-13.9)	***0.008***

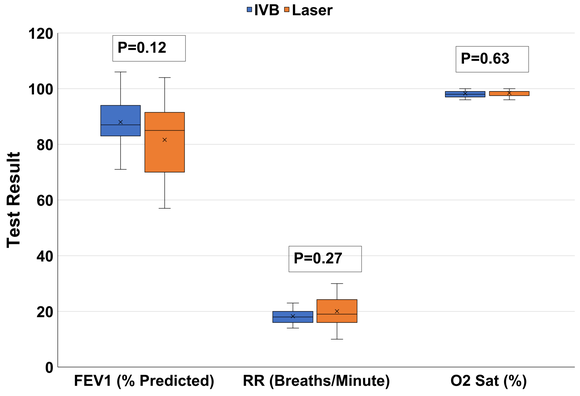
Neonatal Characteristics

	IVB (N=16)	Laser (N=12)	*P=*
Pre-treatment			
SGA, n (%)	2 (13%)	4 (33%)	0.35
Multiple gestations, n (%)	4 (25%)	3 (25%)	1.00
BPD at 36 weeks PMA, n (%)	12 (75%)	9 (82%)	1.00
Invasive mechanical ventilation, n (%)	16 (100%)	12 (100%)	N/A
CPAP, n (%)	16 (100%)	10 (83%)	0.17
Low-flow oxygen, n (%)	16 (100%)	12 (100%)	N/A
Total duration of mechanical ventilation,			
mean (SD) days	39.5 (15.8)	34.5 (29.3)	0.60
median (IQR)	40.5 (31, 47.5)	28 (8, 60)	0.44
Total duration of CPAP, days			
mean (SD)	20.9 (13.2)	24.1 (21.1)	0.63
median (IQR)	20 (12.5,26.5)	22 (3,40)	0.8
Total duration of low-flow oxygen, days			
mean (SD)	90.1 (31.0)	85.1 (65.3)	0.81
median (IQR)	91.5 (60, 115.5)	115 (12, 143)	0.8
Post-treatment (>1 week after)			
Total length of stay, days			
mean (SD)	113.8 (30.8)	115.3 (57.5)	0.93
median (IQR)	125.5 (104.5,135)	121 (85.5,156.5)	0.98

- SGA; small for gestational age, BPD; bronchopulmonary dysplasia, CPAP; continuous positive airway pressure, N/A; Not applicable

Respiratory Outcomes

- None of the children had significant respiratory illness or were oxygen dependent.
- No statistically significant differences in all respiratory parameters under study between the two groups.



ROP Characteristics

- All infants treated with IVB had type 1 ROP compared to 80% in the laser group, p=0.016.
- 38% of infants treated with IVB had an injection in one eye only compared to 6% in the laser group, p=0.035.

DISCUSSION

- The bevacizumab treated children were more premature, treated earlier and younger at the study visit.
- Neonatal characteristics pre and post treatment were similar between the IVB and laser treated children.
- There were no significant differences in FEV1, respiratory rate or oxygen saturation among the two groups.
- Limitation of the study:
  - Small sample size
  - No structural lung assessment (lung imaging) which could be earlier markers of disease.
  - Higher rate of unilateral treatment in IVB group

CONCLUSIONS

- This study showed similar respiratory status in children treated with IVB when compared to laser at the age of 8-14 years.
- These results suggest that low lung function parameters are linked to premature birth rather than treatment modality.
- This information adds to our knowledge regarding systemic safety of intravitreal injection of anti-VEGFs for the treatment of ROP.
- Ongoing monitoring of systemic outcomes in premature infants treated with IVB provides important additional information to direct future research.

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Optic Nerve Hypoplasia in CSS: A Case Series

COS 2024

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Introduction

Coffin-Siris syndrome (CSS) is a rare genetic condition associated with gene mutations coding for proteins in the Bromocriptine activating factor (BAF) chromatin-remodeling complex. Associated ophthalmological anomalies include ptosis, strabismus, childhood glaucoma and rarely optic nerve hypoplasia (ARID1B gene only). We present 3 patients with different CSS gene mutations who all exhibited optic nerve hypoplasia.

Aim & Method

To present optic nerve hypoplasia (ON) in three CSS patients.

Cases

	CSS2- ARID1A	CSS4-SMARCA4	CSS9-SOX11
Visual Acuity	OD: 20/50 -2 OS: 20/60 +5	OD: 20/60 OS: 20/60	OD: 20/25-3 OS: 20/40+2
Extraocular abnormalities	Duane syndrome OS	Nystagmus	None
Posterior segment	**Hypoplastic ON OU; vascular tortuosity OD**	**Hypoplastic ON OU, vascular tortuosity OS**	**Hypoplastic ON OU, macular striae**
OCT findings	Not available	Not available	**Macular schisis OS**
DD/DM* ratio	OD: 0.324 OS: 0.254	OD: 0.248 OS: 0.237	OD: 0.259 OS: 0.167
MRI brain	Shortened corpus callosum	Partial ectopia of posterior pituitary gland, dysmorphic corpus callosum	Thin pituitary infundibulum, hypoplasia of inferior vermis

*DD: Disc diameter, DM: Disc to macula distance

Type of CSS (gene mutation)	Reported ophthalmological findings
All except CSS5 (SMARCE1)	Ptosis, strabismus
CSS1 (ARID1B)	nystagmus, optic nerve hypoplasia (survey report only)
CSS6 (ARID2)	amblyopia, exotropia
CSS1 (ARID1B), CSS2 (ARID1A), CSS 9 (SOX11)	Childhood glaucoma

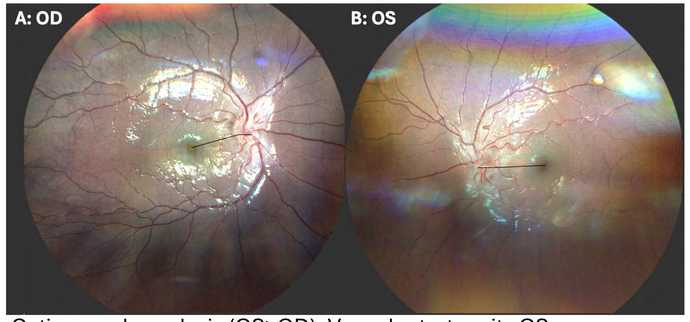
Type of CSS (gene mutation)	Reported cranial abnormalities
All except CSS9 (SOX11)	Agenesis of corpus callosum
All except CSS5 (SMARCE1)	Microcephaly
CSS2 (ARID1A), CSS3 (SMARCB1), CSS4(SMARCA4), CSS3(SMARCE1)	Cerebellar hypoplasia

Case 1: CSS 2/ARID1A

Optic nerve hypoplasia (OS>OD) with surrounding pigmentary changes and retinal vascular tortuosity OD. "Double Ring" sign OD.

Dysmorphic and short corpus callosum (red arrow)

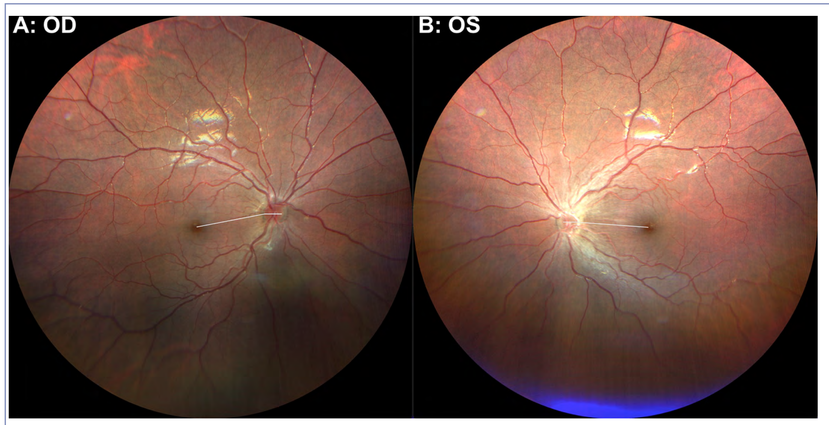
Case 2: CSS 4/SMARCA4



Optic nerve hypoplasia (OS>OD). Vascular tortuosity OS.

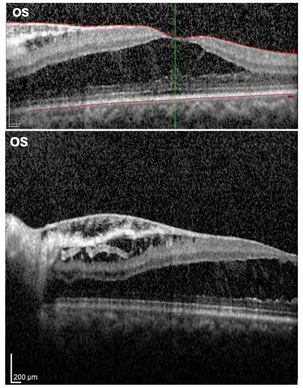
Partial ectopia of posterior pituitary gland (red arrow) with dysmorphic corpus callosum (blue arrow)

Case 3: CSS 9/SOX11



Optic nerve hypoplasia (OS>OD) with "double ring" sign OU. Retinal striae along peripapillary macular bundle OS.

Thin pituitary infundibulum (short arrow), nodular thickening of the median eminence (long arrow) in addition to hypoplasia of the inferior vermis



Optical coherence tomography of left eye showing macular schisis.

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Conclusion

To our knowledge, these are likely to be the first cases to demonstrate the presence of optic nerve hypoplasia across multiple gene mutations in CSS patients. Additionally, we demonstrate midline brain abnormalities among our three patients. Mice studies have previously demonstrated CSS gene mutations lead to various brain midline defects. **Optic nerve hypoplasia and brain midline abnormalities in CSS may be more prevalent than previously reported. Ophthalmologist should pay particular attention to the optic nerve configuration in CSS patients and should have a low threshold for ordering MRI brain and obtaining endocrinology consult.**

Contact Information

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Retina | Rétine

A Machine Learning Algorithm for the Detection of Drusen on OCT

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COS 2024

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BACKGROUND

Drusen (singular: druse) are deposits between the RPE and Bruch's membrane. Drusen are a hallmark of age-related macular degeneration (AMD), with greater size and number of drusen correlating with increased risk progression to late AMD[1].

AIM To create a machine learning algorithm for the automated detection and quantification of drusen on optical coherence tomography (OCT)

METHODS

- 1552 OCT images from patients with dry AMD were annotated
- Training was conducted on 70% (892), with 15% (233) each reserved for validation and testing
- A model built upon a Feature Pyramid Network (FPN) with a ResNet34 backbone was utilized
- Data augmentation methods including random rotation and flipping were used to increase model robustness
- Model performance was evaluated using precision, recall, accuracy, loss, and intersection over union (IoU)

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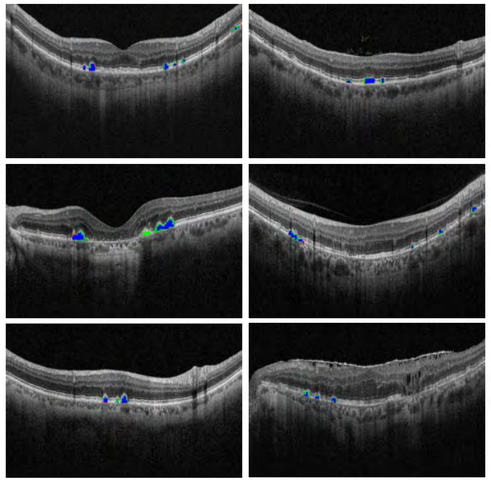
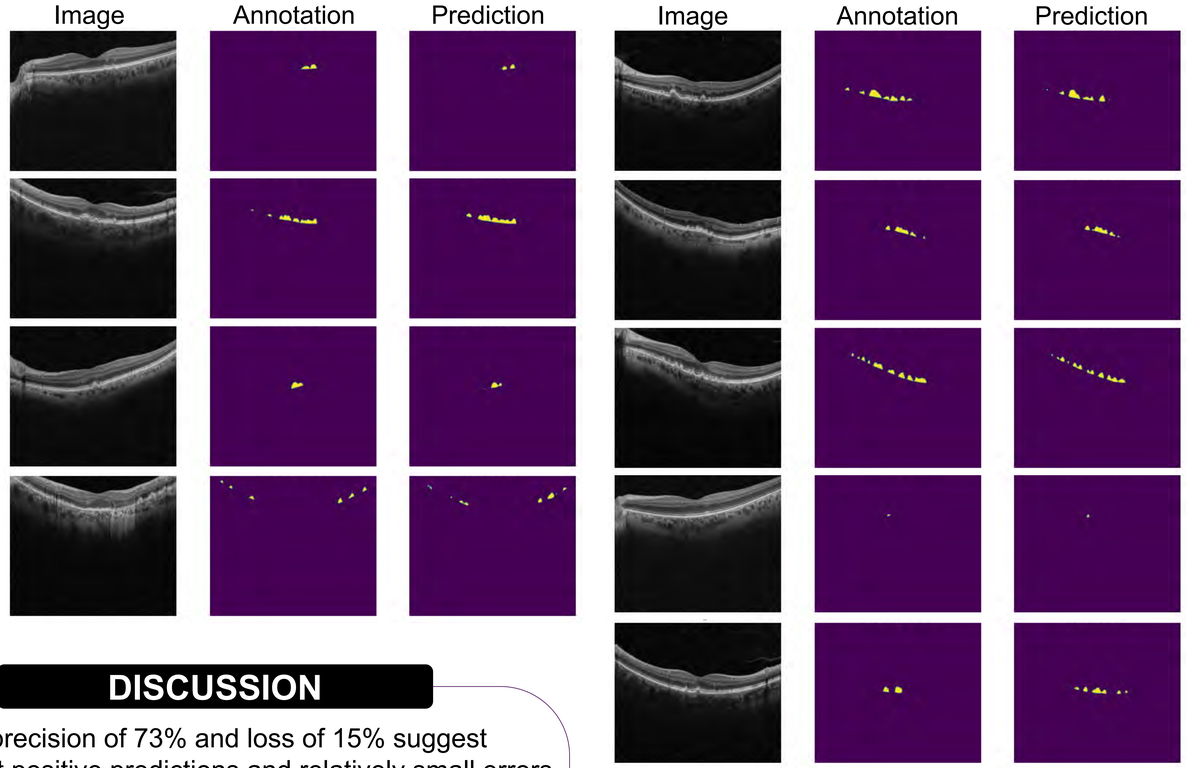
RESULTS

		Predicted		
		0	1	
Actual	0	TN 881859	FP 796	Sensitivity 89.4%
	1	FN 230	TP 1849	Specificity 99.9%

	Validation	Test
Precision	71.8%	73.4%
Accuracy	99.9%	99.9%
Recall	89.8%	89.4%
Loss	15.3%	15.3%
IoU	61.7%	64.4%

Model Prediction Annotation Intersection





DISCUSSION

- Model precision of 73% and loss of 15% suggest relevant positive predictions and relatively small errors
- A recall (sensitivity) of 89% is promising. Given the intended application of the model, it is important to have few false negatives
- Specificity and accuracy of 99.9% are impressive, but can be misleading given the large background area
- IoU measures the overlap between predictions and ground truth (annotation) areas over the union of these areas. It is moderate at 64%, in part from imperfect matching of drusen shape

FUTURE DIRECTIONS

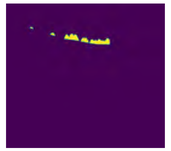
- Tweak model to improve precision
- Use to quantify drusen after nanosecond laser treatment
- External validation on prospective validation cohort
- Develop an open-source tool for clinical translation

		Predicted		
		0	1	
Actual	0	TN 881859	FP 796	Sensitivity 89.4%
	1	FN 230	TP 1849	Specificity 99.9%

	Validation	Test
Precision	71.8%	73.4%
Accuracy	99.9%	99.9%
Recall	89.8%	87.8%
Loss	15.3%	15.3%
IoU	61.7%	64.4%

TP (validation_tp): 1849
TN (validation_tn): 881859
FP (validation_fp): 796
FN (validation_fn): 230

False positive rate: 796/ 796+ 881859 =
False negative rate: 230/(230+1849) = 1
Sensitivity: 1849/(1849+230) = 88.9%
Specificity: 881859/(881859+796) = 99.9
Accuracy: (1849+881859)/ (1849+ 88185



Validate metric	DataLoader 0
validation_dataset_iou	0.6429740190505981
validation_fn	230.43777465820312
validation_fp	796.3905639648438
validation_mean_accuracy	0.9988394379615784
validation_mean_loss	0.1370137333869934
validation_mean_precision	0.742097020149231
validation_mean_recall	0.8936097025871277
validation_per_image_iou	0.6805325746536255
validation_tn	881859.9375
validation_tp	1849.2318115234375

		Predicted	
		0	1
Actual	0	TN	FP
	1	FN	TP

$$Precision = \frac{TP}{TP + FP}$$

$$Recall = \frac{TP}{TP + FN}$$

		True Value			
	Total Population 24	Improved Patients	Unimproved Patients	ACC 95.83%	
Predicted Value	Improved Patients	6	0	PPV 100.00%	FDR 0.00%
	Unimproved Patients	1	17	FOR 5.56%	NPV 94.44%
		TPR 85.71%	FPR 0.00%	F1 Score 92.31%	
		FNR 14.29%	TNR 100.00%		

Advancing ocular oncology care through teleophthalmology: A patient-centric perspective

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Introduction

- Ocular oncology in Canada: There are 3.35 ophthalmologists per 100,000 Canadians, of which only 1.5% of ophthalmologists specialize in ocular oncology.
- Ocular oncology requires an innovative solution to enhance patient care.
- Patient satisfaction is critical for predicting overall quality of life.
- Teleophthalmology utilizes digital technologies for remote assessments and care delivery.

Objectives

1. Measure patient satisfaction with a teleophthalmology program for ocular oncology.
2. Test differences in satisfaction between specific subgroups of patients.

Methods

- Survey of patients' experiences with teleophthalmology.
  - Telehealth Satisfaction Scale (TeSS)
  - 5 questions specific to the teleophthalmology program
- Verbal and online surveys.
- Patients who received teleophthalmology care from an ocular oncology clinic.
- Data was collected from March 2 to December 20, 2022.
- Descriptive statistics and comparative analyses.

Teleophthalmology program

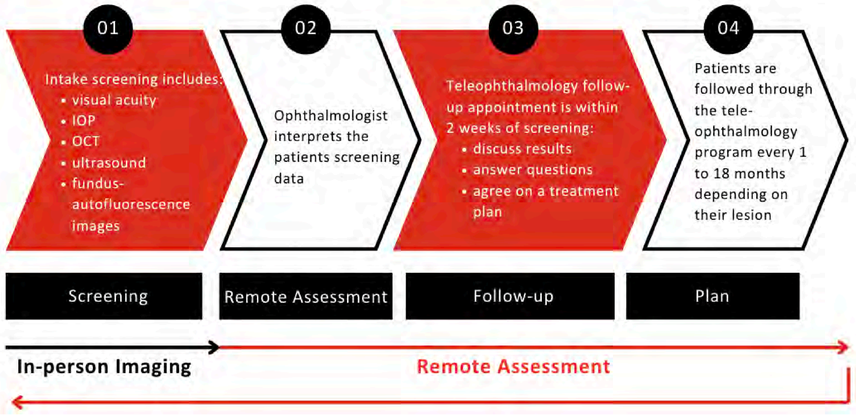
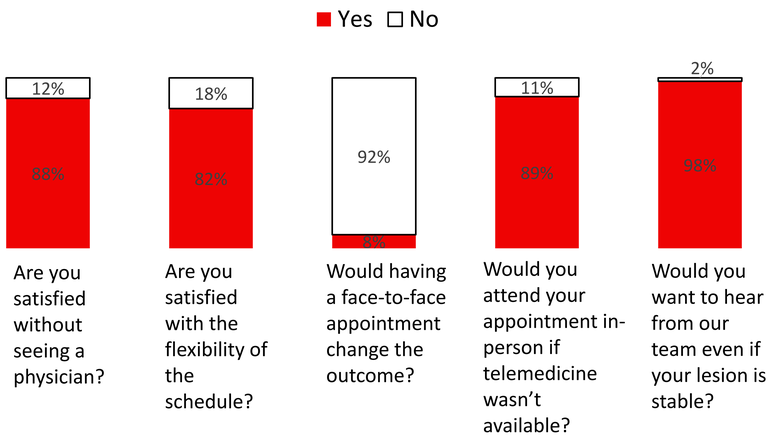


Figure 1. TeSS survey results

Response Item	Score n (%)				
	Poor	Fair	Good	Excellent	N/A
Q1. Voice Quality	0 (0%)	1 (1%)	36 (40%)	53 (58%)	1 (1%)
Q2. Personal Comfort	1 (1%)	3 (3%)	35 (39%)	52 (57%)	0 (0%)
Q3. Answers to Questions	0 (0%)	0 (0%)	22 (24%)	63 (69%)	6 (7%)
Q4. Time Spent	0 (0%)	2 (2%)	21 (23%)	68 (75%)	0 (0%)
Q5. Explanations	1 (1%)	0 (0%)	22 (24%)	64 (70%)	4 (4%)
Q6. Skillfulness	1 (1%)	2 (2%)	18 (20%)	70 (77%)	0 (0%)
Q7. Courtesy	0 (0%)	2 (2%)	19 (21%)	70 (77%)	0 (0%)
Q8. Privacy	0 (0%)	1 (1%)	28 (31%)	60 (66%)	2 (2%)

Figure 2. Added Patient Satisfaction Questions



Results

- 95 patients were contacted (96% response rate).
- 70% of participants (n = 64) had a diagnosed choroidal nevus, second most common was CHRPE (11.0%; n = 10).
- TeSS score = 29 out of a possible 32 (Table 1; 90.6%; SD = 3.35).
- No significant differences were observed based on age categories (under 65 and over), urban or rural residence, or the number of telemedicine appointments.
- Table 2 displays specific feedback of the teleophthalmology program.

Discussion

- Teleophthalmology has a positive impact on patient satisfaction, convenience, and desire for continued communication.
- Teleophthalmology implementation can reduce waitlists by cutting access barriers and streamlining screening/diagnosis.
- This project highlights telemedicine's integral role in optimizing care and ensuring consistent experiences across subgroups.
- A limitation is that disease progression was not measured.

Conclusion

- Ocular oncology patients reported a high level of satisfaction while engaging in teleophthalmology.

Clinical Relevance

- Addressing challenges in ocular oncology specialization, managing waitlists effectively, and prioritizing patient satisfaction is crucial for clinicians in this highly sub-specialized field.
- The use of teleophthalmology not only addresses these aspects but also contributes to ensuring consistent care experiences across different patient groups.

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Anatomic and Functional Outcomes of Lamellar Macular Hole Surgery: Predictive Factors and Associated Complications

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BACKGROUND:

Lamellar macular hole (LMH) is characterized by a partial-thickness defect in the inner layers of the fovea.

LMHs can be classified as:

- Epiretinal membrane foveoschisis (ERMF)
- "True" LMH

Given an unclear physiopathology and changes in definition over the years, no definitive consensus has been made on which cases of LMH respond best to surgery.

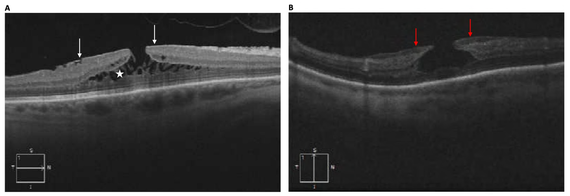


Figure 1: Types of Lamellar Macular Holes.

A: Epiretinal membrane foveoschisis (ERMF) with presence of foveoschisis (star) and a hyperreflective contractile epiretinal membrane (white arrows).

B: "True" LMH with its hat-like shape and the presence of epiretinal proliferation (red arrows) above the ganglion cell layer.

OBJECTIVES AND METHODS:

Purpose:

- Analyze the anatomic and functional outcomes of lamellar macular hole (LMH) surgery;
- Assess which LMH-related factors best predict final visual acuity;
- Document postoperative complications.

Design:

- Retrospective interventional study
- n=91
- Patients who underwent pars plana vitrectomy for unilateral LMH
- CHU de Québec
- 2014 and 2021

Primary outcomes:

- Final postoperative best-corrected visual acuity (BCVA)
- LMH closure.

A multiple linear regression model was built to identify variables associated with final BCVA.

RESULTS: Population's Characteristics

Table 1: Comparison of preoperative clinical and optical coherence tomography (OCT) findings in ERMF vs. "true" LMH

Variable	ERMF	"True" LMH	p-value
	N = 52	N = 39	
Age at surgery (years), mean ± SE	69 ± 9	74 ± 8	**0.005**
Preop period (days), median [Q1, Q3]*	97 [46, 181]	146 [69, 595]	**0.021**
BCVA (logMAR), median [Q1, Q3], Snellen	0.32 [0.21, 0.54], 20/42	0.52 [0.40, 0.74], 20/66	**0.002**
Base diameter of LMH (µm), median [Q1, Q3]*	758 [576, 1424]	1143 [762, 1298]	0.136
Apex diameter of LMH (µm), median [Q1, Q3]*	399 [304, 537]	530 [346, 702]	**0.019**
CFT of LMH (µm), median [Q1, Q3]	389 [330, 436]	308 [271, 354]	**<0.001**
Presence of ELM disruption, N (%)	6 (11.5)	11 (28.2)	**0.044**
Presence of EZ disruption, N (%)	12 (23.1)	18 (46.2)	**0.020**
Presence of IRCs, N (%)	42 (80.8)	19 (48.7)	**0.001**
Presence of PVD, N (%)*	28 (54.9)	16 (43.2)	0.280
Presence of VMT, N (%)	3 (5.8)	6 (15.4)	0.128

*: Preoperative period, 1 case missing; base diameter of LMH, 5 cases missing; apex diameter of LMH, 5 cases missing; presence of PVD, 3 cases missing.
Bold values were considered statistically significant.
AFT, average foveal thickness; BCVA, best corrected visual acuity; CFT, central foveal thickness; ELM, external limiting membrane; EZ, ellipsoid zone; IRC, intraretinal cyst; LMH, lamellar macular hole; MFT, minimal foveal thickness; PVD, posterior vitreous detachment; preop, preoperative; SE, standard error; VMT, vitreomacular traction.

RESULTS: Functional Outcomes

BCVA significantly improved from a preoperative median [Q1, Q3] of 0.42 [0.26, 0.62] (Snellen: 20/53) to 0.32 [0.14, 0.52] (Snellen: 20/42) postoperatively (p=0.036).

Table 2: Multiple linear regression model for final BCVA following surgery for LMH in 91 patients

Variable	B	95% CI	β	p-value
Age at surgery	0.005	-0.004, 0.013	0.108	0.266
Sex	0.275	0.134, 0.415	0.358	**<0.001**
Preop BCVA	0.188	-0.067, 0.443	0.144	0.146
Phaco-PPV	-0.281	-0.437, -0.125	-0.343	**<0.001**
No ILM peeling	0.226	-0.101, 0.552	0.129	0.173
Exclusive ILM peeling	0.304	0.015, 0.594	0.194	**0.040**
SF_6 tamponade	0.109	-0.037, 0.255	0.141	0.142
LMH closure	-0.048	-0.274, 0.177	-0.042	0.671
Preop CFT of LMH	-0.001	-0.002, 0.000	-0.128	0.192
Lesion type (ERMF/"true" LMH)	-0.037	-0.205, 0.131	-0.050	0.665
Preop base diameter of LMH	0.000	0.000, 0.000	-0.142	0.131
Preop presence of EZ disruption	0.144	-0.006, 0.295	0.182	0.060
Preop presence of IRCs	-0.118	-0.268, 0.032	-0.150	0.123

Bold values were considered statistically significant.
AFT, average foveal thickness; BCVA, best corrected visual acuity; B, unstandardized coefficients; β, standardized coefficients; CI, confidence interval; CFT, central foveal thickness; ERM, epiretinal membrane; ERMF, epiretinal membrane foveoschisis; EZ, ellipsoid zone; ILM, internal limiting membrane; IRC, intraretinal cyst; LMH, lamellar macular hole; PPV, pars plana vitrectomy; preop, preoperative; SF6, sulfar hexafluoride.

RESULTS: Anatomic Outcomes

LMH closure was achieved in 80 (88%) cases.

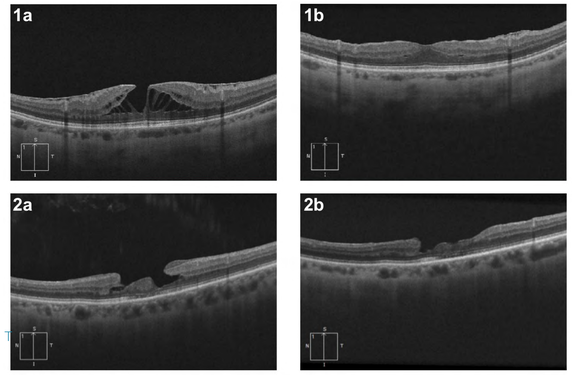
Postoperative full-thickness macular hole (FTMH) was associated with "true" LMH: all 5 patients who developed the complication were "true" LMH subjects (p=0.008).

Table 3: Comparison of patient characteristics comparing cases which led to lamellar macular hole (LMH) closure

Variable	LMH closure	LMH non-closure	p-value
	N = 80	N = 11	
Age at surgery (years), mean ± SE	71 ± 9	76 ± 8	0.096
Masculine sex, N (%)	26 (32.5)	7 (63.6)	**0.044**
"True" LMH, N (%)	30 (37.5)	9 (81.8)	**0.005**
SF_6 tamponade, N (%)	52 (65.0)	6 (54.5)	0.499
Indocyanine green staining, N (%)*	53 (67.1%)	9 (81.8%)	**0.323**
Follow-up period (months), median [Q1, Q3]	15 [6, 29]	6 [2, 16]	0.182
Preop BCVA (logMAR), median [Q1, Q3], Snellen	0.40 [0.26, 0.56], 20/50	0.70 [0.48, 0.92], 20/100	**0.003**
Preop base diameter of LMH (µm), median [Q1, Q3]*	854 [620, 1309]	1253 [785, 1432]	0.176
Preop apex diameter of LMH (µm), median [Q1, Q3]*	421 [316, 606]	632 [398, 803]	0.052
Preop CFT of LMH (µm), median [Q1, Q3]	354 [299, 413]	293 [271, 354]	**0.026**
Preop AFT of LMH (µm), median [Q1, Q3]	316 [285, 331]	305 [296, 344]	0.836
Preop MFT of LMH (µm), median [Q1, Q3]	282 [253, 304]	280 [250, 293]	0.644
Preop presence of EZ disruption, N (%)	25 (31.3)	5 (45.5)	0.347
Preop presence of VMT, N (%)	8 (10.0)	1 (9.1)	0.925

*: Apex diameter of LMH, 5 cases missing; base diameter of LMH, 5 cases missing; indocyanine green staining, 1 case missing.
Bold values were considered statistically significant.
AFT, average foveal thickness; BCVA, best corrected visual acuity; CFT, central foveal thickness; ELM, external limiting membrane; EZ, ellipsoid zone; LMH, lamellar macular hole; MFT, minimal foveal thickness; preop, preoperative; SE, standard error; SF6, sulfar hexafluoride; VMT, vitreomacular traction.

Figure 2: Optical coherence tomography features of cases of lamellar macular hole (LMH) closure and non-closure postoperatively.



CONCLUSIONS:

This is one of the largest cohorts of LMH in the literature using the most recent classification.

Results support the effectiveness of primary vitrectomy as a viable treatment option.

"True" LMH had a lower chance of closure and higher risk of full-thickness MH development postoperatively.

OCT biomarkers like "true" LMH can guide clinicians to optimize surgical outcomes and limit complications.

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DISCLOSURES:

I have NOT had a financial affiliation or otherwise with a commercial organization that may have a direct or indirect connection to the content of this presentation.

I will NOT discuss off-label use and/or investigational use of drugs or devices.

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Anatomical and Functional Outcomes of Rhegmatogenous Retinal Detachment With or Without Coexistent Macular Hole

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INTRODUCTION

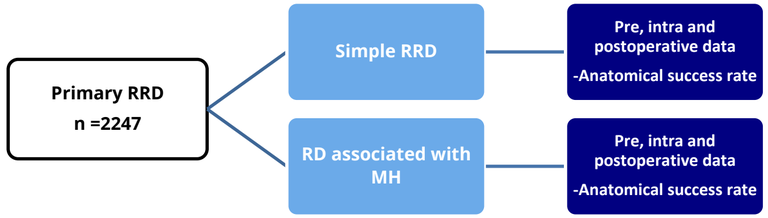
- **Macular holes (MH)** are a major cause of marked visual acuity decrease and metamorphopsia.
- In rare circumstances, MH are associated with a **retinal detachment (RD).**
- The surgical management of MH-RRD is **challenging** for retinal surgeons as the level of complexity during surgeries is higher than in MH or RRD alone.
- Few studies directly **compare** the **qualitative** and **quantitative** characteristics between MH-RRD and primary uncomplicated RRD patients.

AIM

- Analyze the anatomical and functional outcomes in MH-RRD and primary uncomplicated RRD patients, including rate of **single surgery anatomic success (SSAS)** and **final pinhole visual acuity (PHVA).**

METHOD

- **Study design:**
- → **Retrospective** study of patients operated for primary RRD by five retinal surgeons (A.D, S.B, M.C, B.C.M and E.T) at CHU de Québec – Université Laval between **2014** and **2018**.
- **Initial cohort:**
- → **2247** patients operated for primary RRD
- **Populations studied:**
- → Simple primary uncomplicated rhegmatogenous RD (sRRD)
- → RD associated with MH



- Minimum of **3 months** of follow-up.
- Patients with **other causes of RD** (traumatic RD, tractional diabetic RD, RD with preoperative PVR ≥C2, retinoschisis, retinal dialysis, and giant retinal tears) were excluded.
- Patients treated with pneumatic retinopexy or scleral buckle only as primary surgery were excluded as well as patients with **pathologic myopia**.

RESULTS

- **30**/2247 (1.3%) had RD associated with MH and met the inclusion criteria in the total cohort
- **1303**/2247 (58%) had simple RRD and met the inclusion criteria in the total cohort

Table 1. Comparison of preoperative demographic and rhegmatogenous retinal detachment (RRD) characteristics in patients with RRD and MH-RD

Characteristic	RRD n = 1303	MH-RRD n = 30	*P*
Age, *years*	63 [57, 70]	67 [59, 72]	0.13
Male sex	851 (65%)	16 (53%)	0.17
Baseline visual acuity, *logMAR*	0.6 [0.1, 2.3]	2.5 [1.2, 2.6]	**<0.001**
Myopia, >4 diopters	256/1266 (20%)	8/17 (47%)	**0.007**
Lens status			0.91
Phakic	682 (52%)	16 (53%)	
Pseudophakic	613 (47%)	14 (47%)	
Aphakic	8 (1%)	0 (0%)	
Macula status			**0.004**
On	433 (33%)	4 (13%)	
Off	738 (57%)	26 (87%)	
Split	132 (10%)	0 (0%)	
Number of clock hours	6 [6, 9]	10 [5, 12]	0.10
Number of retinal breaks	2 [1, 3]	2 [1, 4]	**0.02**

Table 2. Anatomical and functional outcomes of patients with RRD and MH-RD

Characteristic	RRD n = 1303	MH-RRD n = 30	*P*
RD recurrence	153 (12%)	3 (10%)	0.77
Visual acuity at 3 months, *logMAR*	0.30 [0.18, 0.54]	0.85 [0.60, 1.30]	**<0.001**
Final visual acuity, *logMAR*	0.18 [0.10, 0.40]	0.68 [0.40, 0.90]	**<0.001**

- In multiple logistic regression after correcting for confounding factors, MH was **not associated with RD recurrence** (OR 0.154, 95% confidence interval (CI): 0.016-1.516; p=0.11)
- MH was **associated with worse final best-corrected visual acuity** in multiple linear regression (β = 0.051; p=0.03).

CONCLUSION

- Our study shows that the surgical repair of MH-RD compared to RRD remains a **challenge** and is associated with **a worse visual prognosis**, though RD recurrences were similar.

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No conflict of interest to declare

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Anti-VEGF monotherapy versus anti-VEGF and steroid combination therapy for diabetic macular edema: a meta-analysis

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INTRODUCTION

Diabetic macular edema (DME) is the accumulation of fluid in the retinal extracellular space and is a serious complication of diabetic retinopathy (DR) that can occur at any stage of the disease.[1]

Despite anti-VEGF injections being considered the first-line treatment for DME, over 40% of patients will still have persistent DME after adequate treatment.[2]

Steroids have been found to be an effective alternative option and have gained a substantial role in the management of patients that are resistant to anti-VEGF treatment.[3]

AIM

To date, no systematic reviews or meta-analysis have analyzed the efficacy or safety of anti-VEGF monotherapy versus concurrent anti-VEGF and steroid treatment, known as combination therapy, in treatment resistant or treatment naïve populations.

The purpose of this meta-analysis is to investigate the safety and efficacy of the two different treatment modalities and to examine if a patient's previous treatment status is an important factor in their outcomes.

METHOD

A systematic literature was conducted on literature published between January 2005 to December 2022 on OVID MEDLINE, EMBASE, and Cochrane CENTRAL with only randomized controlled trials eligible for inclusion.

Included studies were classified as treatment resistant if the specific study's methods mentioned patients as being refractive or resistant to previous treatment of DME.

For study arms to be considered as combination therapy, patients had to have received overlapping anti-VEGF and steroid therapy; however, both therapies were not required to be administered in the same visit.

The inverse variance approach was used for reporting continuous data as weighted mean differences (WMD) and 95% confidence intervals (CI). The weighted variable considered was the number of eyes in the comparison. The Mantel-Haenszel method was used for dichotomous data outcomes, with the data being presented as risk ratios RR and 95% CI. A random effects model was used for all comparisons in the meta-analysis.

RESULTS

The systematic search resulted in 4466 studies that went through title and abstract screening and 64 underwent full text screening. Ultimately, 16 RCTs reporting on 1166 eyes were included as seen in Figure 1.

Monotherapy and combination therapy resulted in similar changes in BCVA at final follow up using ETDRS letters in 10 RCTs (p=0.47, Fig. 2a) and LogMAR (p=0.90, Figure 2b) in 6 RCTs.

In 11 RCTs, monotherapy was associated with a significantly smaller change in retinal thickness compared to combination therapy at final follow up (p=0.005, Figure 2c).

With respect to adverse events, monotherapy was associated with a significantly lower risk of IOP related adverse events in 13 RCTs (p=<0.001).

The risk of intraocular inflammation (p=0.67), conjunctival hemorrhage (p=0.17), and eye pain (p=0.34) were similar between groups.

The risk of cataract related adverse events was not observed to be significantly different between groups in 5 RCTs, however there were numerically less cataract related events in the monotherapy group (p=0.06).

Overall, similar results in the main analysis were observed in the treatment naïve and treatment resistant subgroup analysis.

In treatment resistant patients, the risk of cataract related adverse events was significantly lower in the monotherapy group in 2 RCTs (p=0.02)

FIGURE 1

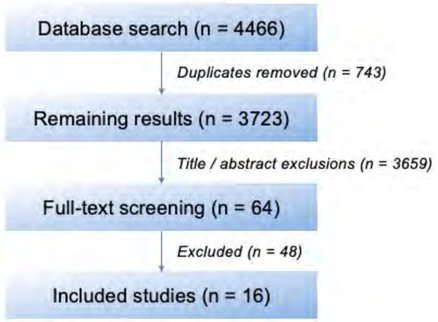
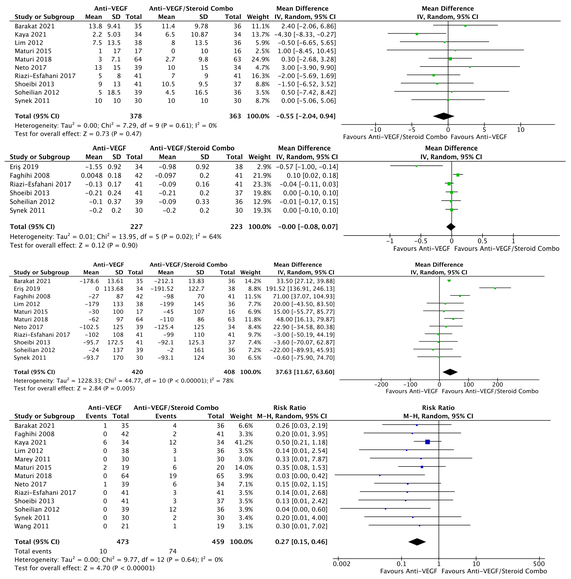


FIGURE 2



CONCLUSION

The results of the main analysis found no significant differences in change in BCVA from baseline to final follow up although there was a significantly greater change in retinal thickness.

While a correlation does exist between retinal thickness and BCVA in patients with DME, it has been reported by multiple studies to be in the range of 0.2-0.3 after treatment.[4] While OCT measures do have value in the clinical evaluation of DME, they are unable to reliably be used as a surrogate for visual acuity outcomes.[5]

There appears to be little advantage to combination therapy over monotherapy with this meta-analysis noting similar efficacy and increased risk of IOP related adverse events and potentially cataract related adverse events with combination therapy.

A relevant limitation of note is the current ambiguity in the literature regarding the definition treatment resistant patients. Future research should develop standardized criteria for treatment resistant status with re-investigation into this topic warranted at that time.

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CONFLICT OF INTEREST

Netan Choudhry is a consultant for Topcon, Optos, Bayer, Allergan, Novartis, Carl Zeiss Meditec, Ellex, and receives research equipment from Topcon, Optos, and Carl Zeiss Meditec. The remaining authors declare no conflicts of interest.

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Aqueous Humor VEGF-A Levels Detected with Millipore and R&D Multiplexing Immunoassays after Ranibizumab Treatment

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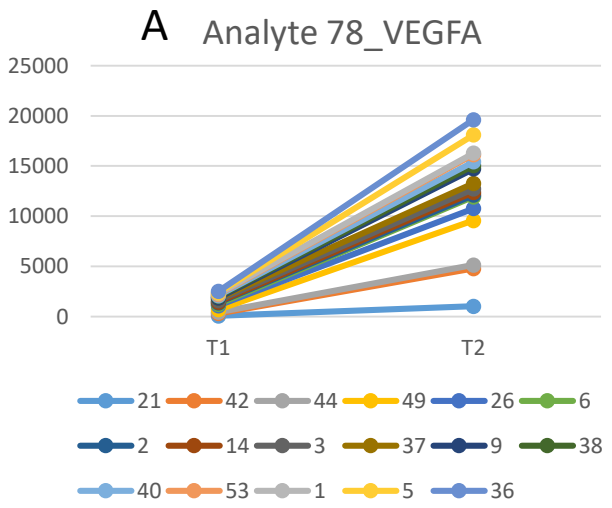
Purpose: To detect VEGF-A levels in aqueous humor (AH) of eyes with choroidal neovascularization (CNV) before and after intravitreal injection of Ranibizumab (IVL) using Millipore and R&D multiplexing immunoassays

Methods: Treatment-naïve patients with CNV, treated with IVL between March 2017 and August 2023 at St. Michael's Hospital (Toronto, Ontario) were recruited. The eyes with the history of trauma, retinal detachment, high myopia, or glaucoma were excluded. 60-80µl of AH was extracted via paracentesis from the inferotemporal limbus of study eyes pre-IVL, at baseline and during follow-up visits. Each sample was divided into two portions, one for VEGF-A detection using the R&D assay (cat#LXSAHM-03) and the other using the Millipore assay (cat#HAGP1MAG-12K). VEGF-A levels were assessed with the Magpix device incorporating Luminex's xMap multiplexing immunoassay technology. The Wilcoxon paired test was employed to compare VEGF-A levels between assays at pre- and post-IVL administration. A p-value <0.05 was considered statistically significant.

Results: 16 participants (17 eyes) were enrolled in this study, 12 were female (75%) and the average age of the cohort was 75.5 years (SD 9.6). The number of samples collected from each eye ranged from 3 to 17. At the pre-IVL baseline visit, median VEGF-A levels were measured at 134.56 pg/ml (IQR 83.56 to 161.24) by the Millipore assay and 225.39 pg/ml (IQR 109.30 to 842.19) by the R&D assay (p>0.05). At the one-month visit following the first IVL administration, the Millipore assay detected a median 718.90 pg/ml (IQR 335.49 to 1454.94) of VEGF-A, which was significantly increased when compared to the baseline (p<0.001). By contrast, the R&D assay detected a median 4.44 pg/ml (IQR 1.48 to 13.42) of VEGF-A at one month post IVL, which was significantly decreased when compared to the baseline (p<0.001). 12/16 (75%) samples measured with the R&D assay had VEGF-A levels <10 pg/ml post first IVL.

Study design: Perspective cohort study

Conclusions: Initial baseline measurements revealed comparable VEGF-A detection between the Millipore and R&D assays, indicating a similar sensitivity for free VEGF-A. Following IVL administration, the Millipore detected substantially higher VEGF-A levels compared to baseline, whereas R&D detected significantly lower VEGF-A levels compared to baseline. This discrepancy likely arises from Millipore's ability to detect VEGF-A in both its free and drug-bound states, whereas R&D is specific to free VEGF-A. Implementing both assays concurrently may provide valuable insight on the VEGF-A behavior and distribution post Ranibizumab treatment for CNV.



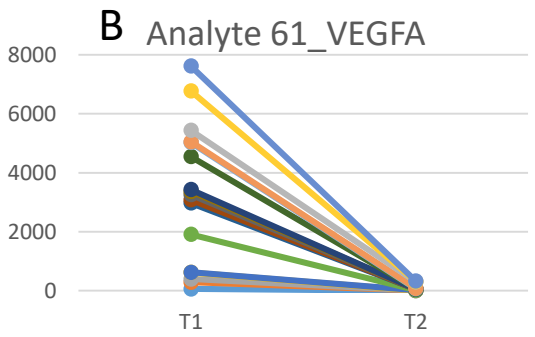


Fig A. VEFG-A levels detected with Millipore assay showed a significant increase after IVL (p<0.001).
B. VEGF-A levels detected with R&D assay showed significant decrease after IVL (p<0.001).

Area Under The Curve Visual Acuity Following Rhegmatogenous Retinal Detachment Repair with Pneumatic Retinopexy (PnR) vs Pars Plana Vitrectomy (PPV)

COS 2024

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AIM

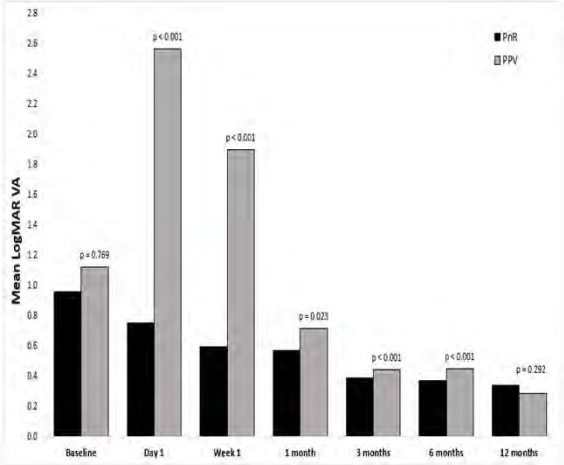
- ✓ This is a retrospective cohort study aiming at comparing postoperative visual acuity (VA) following rhegmatogenous retinal detachment (RRD) repair with pneumatic retinopexy (PnR) versus pars-plana vitrectomy (PPV) by assessing area under the curve for visual acuity.

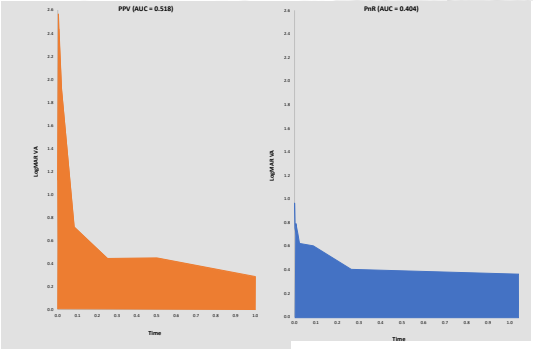
METHOD

- ✓ We recruited 1000 consecutive patients presenting to St. Michael's Hospital, Toronto, with primary rhegmatogenous retinal detachment, during the period between October 2009 to May 2023, who were assessed for their visual acuity, intraocular pressure (IOP), and fundus examination at baseline, on postoperative day 1, week 1, months 1,3,6 and 12 respectively.
- ✓ Patients with vision loss ≥ 3 months, PVR ≥ grade B, demarcation line, and previous history of vitrectomy or other retinal pathology were excluded.
- ✓ A graph was then plotted to represent the area under the curve for vision at different time points.

RESULTS

- ✓ On POD#1, patients who had PnR achieved a significantly improved LogMAR VA of 0.754 ± 0.778, versus 2.565 ± 0.662 in those who received PPV (p<0.001).
- ✓ This difference was also noted in the one-week postoperative evaluation. The PnR exhibited an enhanced LogMAR VA of 0.599 ± 0.657, while the PPV group lagged with a higher LogMAR VA of 1.901 ± 0.957,(p< 0.001).
- ✓ At 1 month postoperatively, the LogMAR VA for the PnR group was 0.570 ± 0.681, compared to 0.717 ± 0.705 for the PPV group. (P=0.023).
- ✓ At 3 months postoperatively, the LogMAR VA for the PnR group was 0.392 ± 0.474, compared to 0.443 ± 0.463 for the PPV group (p<0.001). This trend continued at the six-month mark, with the PnR group showing a LogMAR VA of 0.369 ± 0.455, while the PPV group had a LogMAR VA of 0.448 ± 0.411 (p<0.001).
- ✓ One-year follow-up patients treated with PnR had a LogMar VA of 0.344 ± 0.438 vs 0.286 ± 0.380 in those treated with PPV. P=0.2.

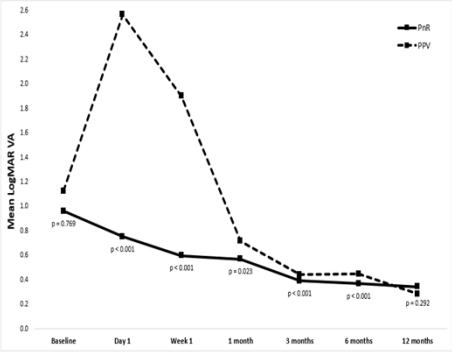




- ✓ The size of the area under the curve measured in both groups using mathematical models in Log Mar was 0.404 in the PnR group vs 0.518 in thr PPV group

CONCLUSION

- ✓ The incorporation of the area under the curve (AUC) demonstrates comprehensively the benefits of PnR vs PPV throughout the entire postoperative period, while both groups exhibited statistically non-significant differences in vision after one year of postoperative follow-up.
- ✓ This suggests that patients undergoing PnR experience a gradual improvement in vision starting from day 1 post-procedure. In contrast, patients undergoing PPV show an abrupt increase in logMAR on day 1 and week 1, with subsequent improvement observed between the first and twelfth months.



Artificial Intelligence Chatbot Knowledge on the Diagnosis and Treatment of Common Retinal Disorders

COS 2024

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UNIVERSITY OF TORONTO

Background

ChatGPT is a large language model developed by OpenAI, designed for natural language understanding and generation.

As a simplified summary, it operates by predicting and generating text based on patterns learned from a diverse range of internet text during its training.

Purpose

In this cross-sectional study, we evaluated ChatGPT's responses to diagnostic and therapeutic questions on common retinal disorders.

Methods

We prompted ChatGPT with questions regarding diabetic retinopathy (DR), retinopathy of prematurity (ROP), age-related macular degeneration (AMD), epiretinal membrane (ERM), macular hole (MH), posterior vitreous detachment (PVD), rhegmatogenous retinal detachment (RRD), retinoschisis (RS), retinitis pigmentosa (RP), retinal artery occlusion (RAO), and retinal vein occlusion (RVO).

Two retina specialists independently graded responses using a Likert scale ranging from 1 (unacceptable inaccuracies) to 5 (no inaccuracies).

Our primary endpoint was the median grade given to ChatGPT-3.5 and ChatGPT-4's responses. Our secondary endpoints were differences between the two chatbot models in mean response time, length in characters and readability scores.

Results

ChatGPT-3.5 performed worst (median grade=3/5) on questions pertaining to ROP, RS, or RVO and best (median grade=4/5) on questions pertaining to DR, AMD, ERM, PVD, RP, or RRD.

ChatGPT-4 performed worst (median grade=4/5) on questions pertaining to ROP, MH, RS, RP, or RVO and best (median grade=4.5/5) on questions pertaining to DR, AMD, ERM, PVD, RRD, or RAO.

ChatGPT-4 (81.8%) achieved a greater proportion of responses with a grade of at least 4/5 compared to ChatGPT-3.5 (54.5%; $p<0.01$). ChatGPT-4 took significantly longer to generate responses compared to ChatGPT-3.5 ($p<0.01$) and produced significantly longer responses ($p<0.01$). Evaluation using readability indices indicated that the responses of ChatGPT-4 tended to be more challenging to read than the responses of ChatGPT-3.5.

Conclusions

ChatGPT provides valuable, generally accurate responses on retinal disorders, but the current version lacks nuances with important omissions.

Both patients and health care allies should appreciate the educational potential of chatbots in ophthalmology while approaching its use in clinical practice and bioethics with caution.

Artificial Intelligence-Based Extraction of Retinal Vasculature Parameters From Fluorescein Angiography in Retinal Vein Occlusion

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COS 2024

INTRODUCTION

- Macular edema (ME) secondary to retinal vein occlusion (RVO) is a leading cause of vision loss
- Optical coherence tomography angiography is often used in RVO evaluation, yet ultra-widefield fluorescein angiography (UWFA) may offer more robust insight

AIM

Elicit associations between quantitative vascular parameters extracted from UWFA & baseline clinical characteristics of RVO patients

METHODS

- **Design:** Prospective single-centre trial in Toronto, Canada from 2017-2023
- **Inclusion Criteria:** ME secondary to RVO & central macular thickness (CMT) >310 µm
- **UWFA Analysis:** Blood-retinal barrier (BRB) permeability was quantified using the artificial intelligence-based RETICAD FA_{assist} system v5.12 (Emagix)
- **Coordinates:** Based on ETDRS grid **[Figure 1]**
- **Statistical Analysis:** Multivariable regression models on MATLAB (MathWorks) were used to elicit associations between BRB permeability and best-corrected visual acuity (BCVA), CMT, and macular volume (MV)
- **Subgroups:** Central retinal vein occlusion (CRVO) & branch retinal vein occlusion (BRVO)

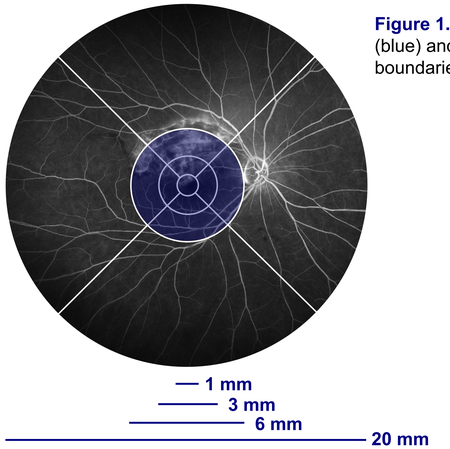

Figure 1. Central (blue) and peripheral boundaries

RESULTS

- 41 RVO eyes & 7 control eyes were included **[Table 1]**
- **RVO** eyes had a higher central & peripheral BRB permeability than *controls*
  - **Central: 0.05 (0.03) au/sec** vs. *-0.03 (0.01) au/sec* (p<0.001)
    - *Normal: -0.09 au/sec to 0 au/sec*
  - **Peripheral: 0.02 (0.01) au/sec** vs. *-0.03 (0.01) au/sec* (p<0.001)
    - *Normal: -0.11 au/sec to 0 au/sec*
- In **RVO** eyes, central BRB permeability was associated with CMT (p=0.001) & MV (p=0.013)
- In **CRVO** eyes, central BRB permeability was associated with CMT (p=0.041) & MV (p=0.019) **[Figure 2]**
- In **BRVO** eyes, central (p=0.030) & peripheral (p=0.011) BRB permeability were negatively associated with BCVA **[Figure 3]**

Table 1. Baseline Characteristics of RVO Eyes

Discrete	No. (%)
Sex	
Male	18 (43.9)
Female	23 (56.1)
Eye Laterality	
OD	25 (61.0)
OS	16 (39.0)
Race	
Caucasian	25 (61.0)
Asian	13 (31.7)
Hispanic	2 (4.9)
Not Reported	1 (2.4)
RVO Type	
CRVO	21 (51.2)
BRVO	20 (48.8)
Lens Status	
Phakic	33 (80.5)
Pseudophakic	8 (19.5)
Continuous	**Mean (SD)**
Age	67.6 (10.5)
Intraocular pressure (mmHg)	14.4 (3.0)
BCVA (ETDRS Letters)	56.5 (12.9)
CMT (µm)	445.5 (113.6)
MV (mm^3)	11.4 (3.2)

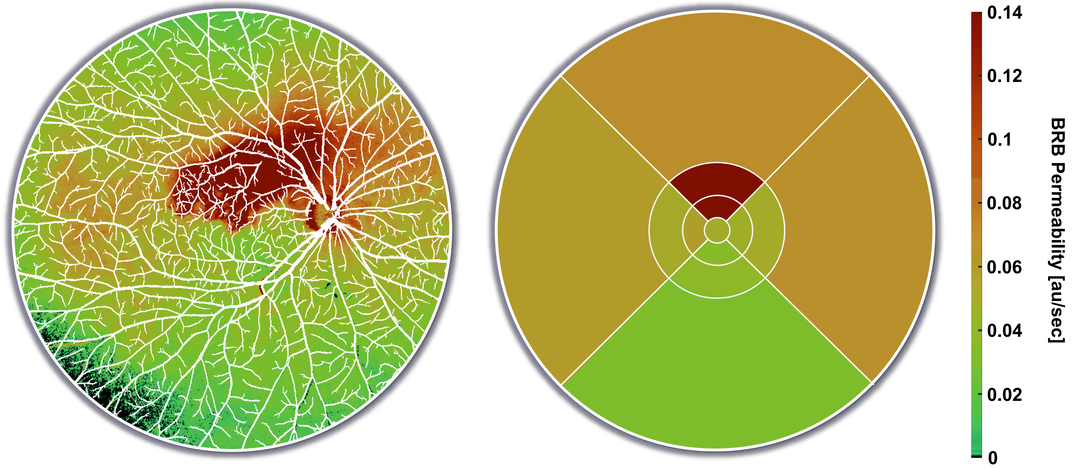

Figure 2. CRVO eye with high central BRB permeability (0.08 au/sec), CMT (508 µm) & MV (13.9 mm^3)

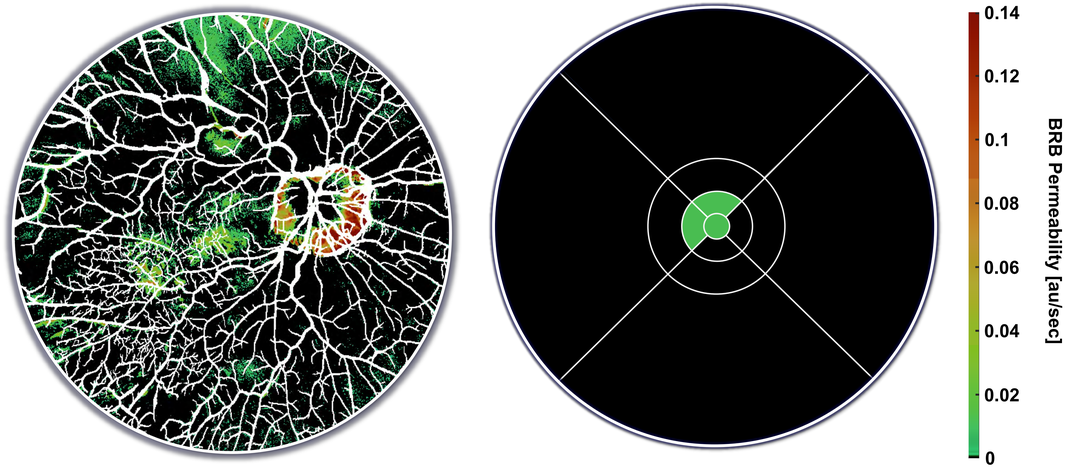

Figure 3. BRVO eye with low central (-0.01 au/sec) & peripheral (-0.02 au/sec) BRB permeability, but high BCVA (72 Letters)

CONCLUSION

- Quantitative baseline BRB permeability may serve as a clinically relevant biomarker in RVO
- Future studies should explore longitudinal associations between UWFA parameters & clinical outcomes in RVO

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Association of Artificial Intelligence-Based Quantitative Fluorescein Angiography Measurements with Clinical Parameters in Patients with Diabetic Macular Edema

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COS 2024

INTRODUCTION

- Diabetic macular edema (DME) is a leading cause of vision loss globally and a major complication of diabetes mellitus
- Quantification of retinal vascular parameters based on ultra-widefield fluorescein angiography may provide further insight into the severity and management of DME

AIM

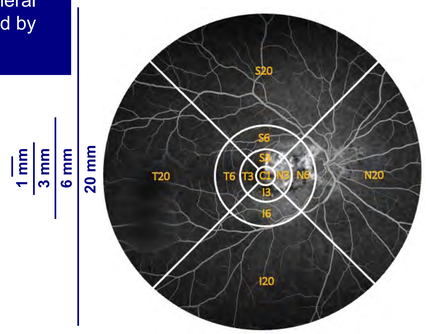
- To investigate the associations between baseline clinical characteristics of patients with DME and quantitative UWFA parameters.

METHODS

- **Design:** Prospective single-centre trial in Toronto, Canada from 2017-2023
- **Inclusion Criteria:** Diabetes mellitus type 1 & 2 with diagnosis of DME & central macular thickness (CMT) >310µm
- **UWFA Analysis:** Quantitative measures of blood-retinal barrier (BRB) permeability, CMT, and macular volume were extracted using the artificial intelligence-based RETICAD FA_{assist} system v5.12 (Emagix)
- **Coordinates:** 9 central and 4 peripheral based on ETDRS grid **[Figure 1]**
- **Statistical Analysis:** Multivariable regression models on MATLAB (MathWorks) were used to elicit associations between UWFA parameters and best-corrected visual acuity (BCVA), CMT, and macular volume (MV)

FIGURE 1

Central and peripheral boundaries marked by coordinates



RESULTS

- 56 DME eyes & 7 control eyes were included **[Table 1]**
- **DME** eyes had a higher central & peripheral BRB permeability than *controls*
- **Central: 0.11 (0.06) au/sec** vs. *-0.03 (0.01) au/sec* (p<0.001)
  - Normal range (5th-95th percentile): *-0.09 – 0.00*
- **Peripheral: 0.08 (0.03) au/sec** vs. *-0.03 (0.01) au/sec* (p<0.001)
  - Normal range (5th-95th percentile): *-0.11 – 0.00*
- **DME** eyes had a lower central & peripheral perfusion than *controls*
- **Central: 1.52 (1.52) au/sec** vs. *4.43 (1.93) au/sec* (p<0.001)
- **Peripheral: 1.45 (0.73) au/sec** vs. *5.01 (1.55) au/sec* (p=0.002)
- In **DME** eyes, central BRB permeability was negatively associated with BCVA (p=0.003) & positively with MV (p=0.025) **[Figure 2,3]**
- In **DME** eyes, peripheral BRB permeability was negatively associated with BCVA (p=0.002) & positively with MV (p=0.046)
- In **DME** eyes, central blood flow was associated with MV (p=0.048)

TABLE 1

Clinical Characteristics of Patients	Number (n=56)
Sex, n (%)	
Male	44 (78.6%)
Female	12 (21.4%)
Race, n (%)	
Caucasian	24 (42.9%)
Black	6 (10.7%)
Asian	22 (39.3%)
Not Reported	4 (7.1%)
Laterality, n (%)	
OD	28 (50.0%)
OS	28 (50.0%)
Lens Status, n (%)	
Phakic	34 (60.7%)
Pseudophakic	22 (39.3%)
DR Severity, n (%)	
Mild NPDR	25 (44.6%)
Moderate NPDR	14 (25.0%)
Severe NPDR	13 (23.2%)
PDR	4 (7.1%)
Age (Mean ± SD)	61.6 ± 11.6
Clinical Exam (Mean ± SD)	
BCVA (ETDRS)	63.4 ± 12.2
CMT (µm)	435.4 ± 109.2
IOP (mmHg)	15.0 ± 3.1
Macular Volume (mm^3)	12.3 ± 1.9

FIGURE 2

BRB permeability map generated from the UWFA sequence showing high central and moderate peripheral BRB permeability with high macular volume.

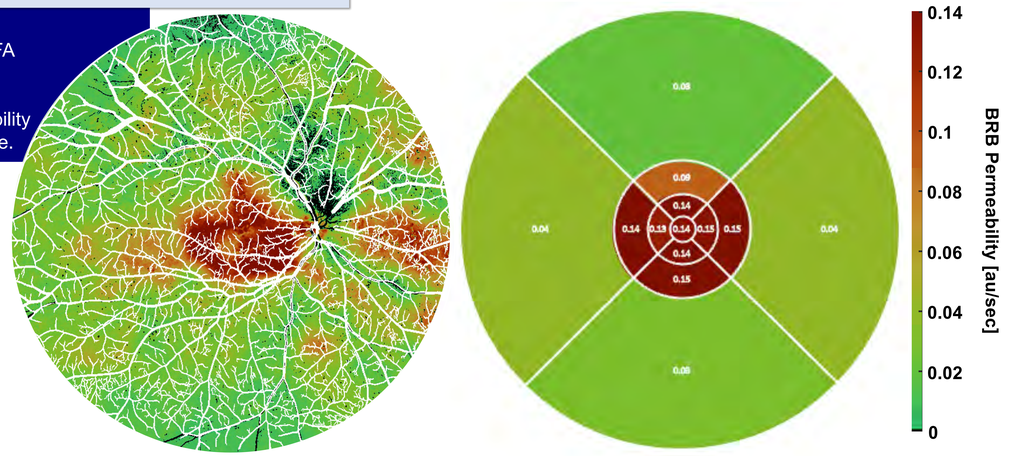
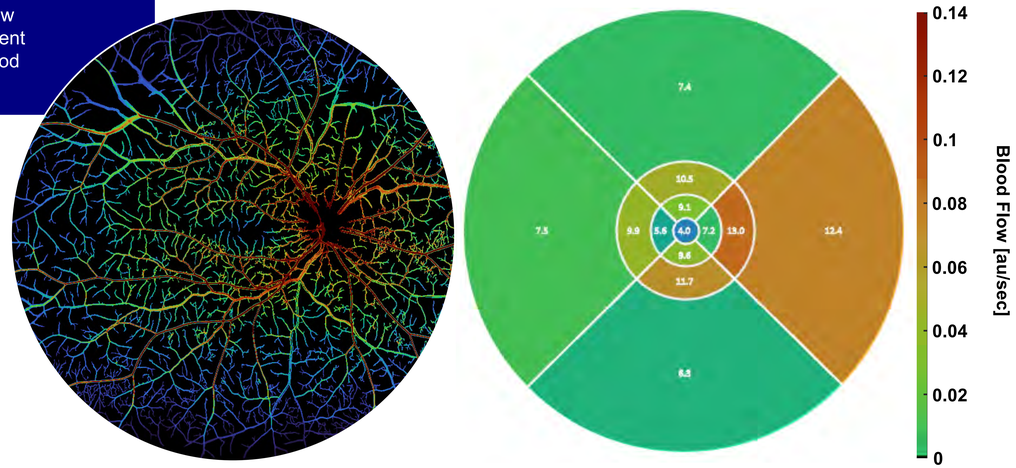


FIGURE 3

Corresponding blood flow map from the same patient showed high central blood flow.



CONCLUSION

- An increased BRB permeability was associated with a greater baseline macular volume and worse BCVA
- Future studies should explore longitudinal associations between UWFA parameters & clinical outcomes to examine associations with treatment prognosis

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Automated Segmentation of Hyperreflective Foci in DME Shows Greater Volume Reduction in Eyes Treated With Faricimab Compared to Aflibercept in the Phase 3 YOSEMITE and RHINE Clinical Trials

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COS 2024

INTRODUCTION

In diabetic macular edema (DME), hyperreflective foci (HRF) are considered to represent inflammation within the retina and may be an imaging biomarker for retinal disease progression.

Hyperrefelctive foci (HRF):

- **≤ 50 µM diameter, highly reflective dots on SD-OCT[1]**
- **Presente throughout the retina in both DME and nAMD[2,3]**
- **Reduce with anti-VEGF and steroid treatment[4-6]**
- **Presence at baseline suggested to be predictive of poor vision outcomes in patients with DME[4,7-9]**

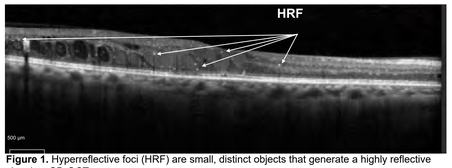

Figure 1. Hyperreflective foci (HRF) are small, distinct objects that generate a highly reflective signal on SD-OCT

AIM

To compare the effect of faricimab, a dual Ang-2/VEGF-A pathway inhibitor, versus aflibercept on resolution of retinal HRF in eyes with DME.

METHODS

- HRF were automatically segmented in whole SD-OCT volumes from the phase 3 YOSEMITE/RHINE trials up to week 48 using a deep learning-based algorithm.
- HRF were assessed within the 1.0- and 3.0-mm diameter Early Treatment Diabetic Retinopathy Study rings, which was also separated into the inner retina, defined as ILM to OPL-HFL, as shown in purple, and the outer retina, defined as OPL-HFL to RPE, as shown in green.
- The total retina was defined as ILM to RPE.

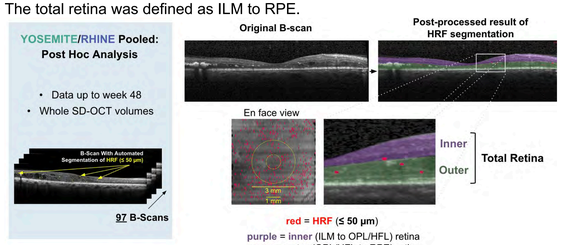

Figure 2. Example scans showing the automated prediction of HRF and retinal-layer boundaries; YOSEMITE (NCT03622580); RHINE (NCT03622593).

RESULTS

Baseline HRF Volumes in Total Retina[a] Were Associated With Markers of Disease Severity

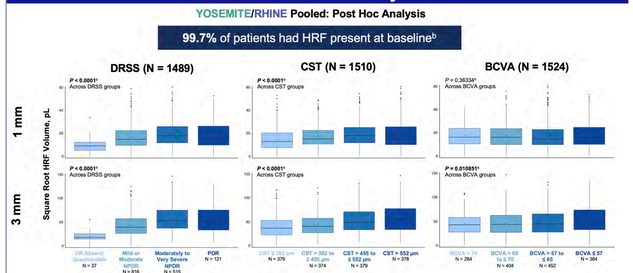

Figure 3. At baseline, HRF were present in almost all patients. When evaluating by quartiles in a treatment agnostic manner, greater baseline HRF volumes in the total retina were associated with increasing DRSS severity and CST in the 1.0 and 3.0 mm diameter. [a] ILM to RPE in the region within the 1 and 3 mm circles of the ETDRS grid. [b] Patients with HRF present (> 0) at baseline for pooled treatment groups in any one of the inner or outer, 1 mm or 3 mm rings; HRF presence is the same when calculated from volumes or counts. [c] *P* values from Kruskal-Wallis tests are nominal and not adjusted for multiplicity; no formal statistical conclusion should be made based on the *P* values.

Greater Reductions in HRF Counts in the Inner Retina[a] With Faricimab vs. Aflibercept

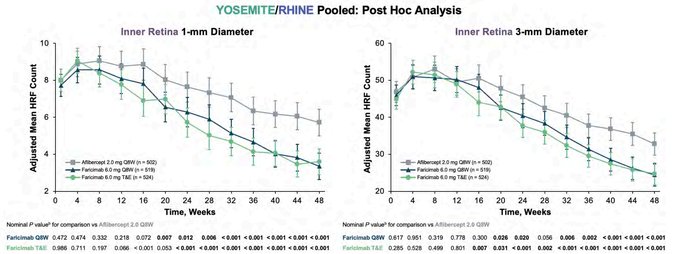

Figure 4. Over time to week 48, mean HRF counts were more greatly reduced with faricimab Q8W and T&E compared with aflibercept in the inner retina, 1- and 3-mm diameters based on the *P* values. [a] ILM to OPL-HFL. [b] *P* values are nominal and not adjusted for multiplicity; no formal statistical conclusion should be made based on the *P* values.

Faricimab Reduced HRF Volumes in the Inner[a] and Outer[b] Retina, Whereas Aflibercept's Effects Were Localized in the Outer Retina

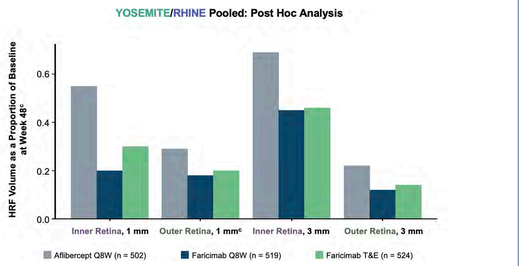

Figure 5. The relative amount of HRF remaining where faricimab reduced HRF volumes in both the inner and outer retina, whereas HRF volume reductions with aflibercept were predominantly localized to the outer retina; [a] ILM to OPL-HFL. [b] OPL-HFL to RPE. [c] Based on the median ([d]or Q3 if median zero) at week 48 relative to baseline. [d] The upper quartile is presented for this parameter as the median values are zero in the faricimab arms. Each bar represents the ratio of the median (or Q3) HRF volume at week 48 to baseline for the relevant treatment group and location.

Faricimab Showed Faster Time to Absence of HRF Count[a] at 2 Consecutive Visits in the Inner[b] and Outer[c] Retina Than Aflibercept

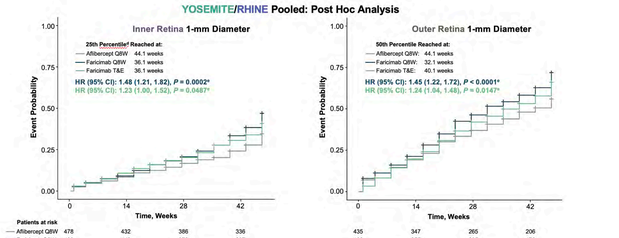

Figure 6. Time to absence of HRF count at 2 consecutive visits was achieved faster with faricimab Q8W and T&E compared with aflibercept Q8W in the inner and outer retina, 1-mm diameter. [a] Absence of HRF count was defined as the first time of HRF count = 0 for 2 consecutive visits. Patients who had such an event on or before the baseline visit were excluded from the corresponding analysis. Summaries of time to absence of HRF count are Kaplan-Meier estimates. Times represent the planned visit day. [b] OPL-HFL to RPE. [c] ILM to OPL-HFL. [d] *P* values are nominal and not adjusted for multiplicity; no formal statistical conclusion should be made based on the *P* values.

Greater Reduction in HRF Volumes in the Inner Retina[a] With Faricimab vs. Aflibercept

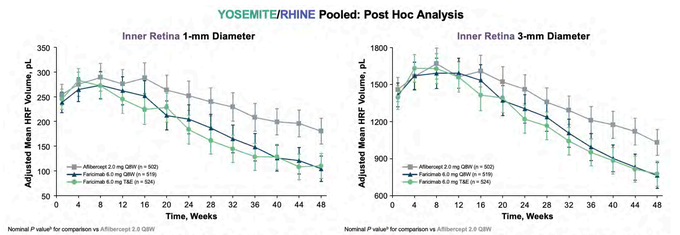

Figure 7. Consistent with the HRF counts, mean HRF volumes in the inner retina, 1- and 3-mm diameters, were more greatly reduced with faricimab Q8W and T&E vs aflibercept over time to week 48. [a] ILM to OPL-HFL. [b] *P* values are nominal and not adjusted for multiplicity; no formal statistical conclusion should be made based on the *P* values.

Case: Reduction of HRF From Baseline to Week 48 With Faricimab

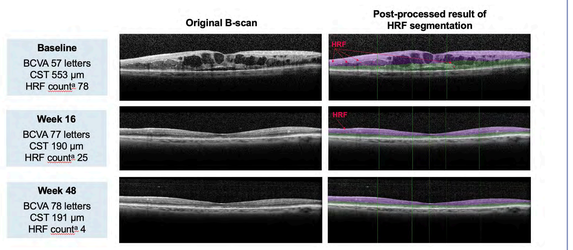

Figure 8. Case images are from a 77-year-old female who received faricimab T&E. No serious ocular adverse drug reactions were observed/reported in the treated eye.

CONCLUSIONS

Volumetric assessment of HRF in YOSEMITE/RHINE demonstrated:

- Association of HRF volumes with DRSS and CST at baseline, suggesting that HRF are linked to disease severity
- Greater retinal HRF volume and count reductions in faricimab versus aflibercept-treated eyes at week 48
- Faster time to absence of HRF count in faricimab versus aflibercept-treated eyes

These findings support the therapeutic potential of dual Ang-2/VEGF-A inhibition with faricimab for patients with DME

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DISCLOSURES

Financial Disclosures
VC: Consultant: Alcon, Bayer, Novartis, Roche; Grant Support: Bayer, Novartis, Roche; RPS: Research Grant: Aerie, Apellis, Graybug; Consultant: Alcon, Bausch + Lomb, Genentech, Inc., Gyroscope, Novartis, Regeneron; UC: Consultant: Apellis, Boehringer Ingelheim, Iveric Bio, Roche; Data Safety Monitoring Committee: Adverum, Oxurion : AM, EvS, KP, IB, ILJ, YC, CG, SF: Employee: F. Hoffmann-La Roche Ltd.. KG: Employee: Roche Products Ltd.; JRW: Employee: Genentech, Inc.

Study and Product Disclosures
•Faricimab is approved for the treatment of neovascular age-related macular degeneration and diabetic macular edema in multiple countries worldwide and is not currently approved for use outside these indications
•This study includes research conducted on human subjects
•Institutional Review Board approval was obtained prior to study initiation
•Funding was provided by F. Hoffmann-La Roche Ltd. for the study and third-party writing assistance, which was provided by Ellen M. Ross, PhD, of Envision Pharma Group

Presented at the Canadian Ophthalmological Society Meeting May 30 - June 2, 2024

Baseline Characteristics and 3-Month Data From Patients Receiving Faricimab for nAMD or DME in the Real-World VOYAGER Study

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On Behalf of the VOYAGER Study Steering Committee

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Purpose

To report the results of the first interim analysis (from baseline to 3 months) of the VOYAGER study, which includes patients enrolled in the US, Canada, and Japan

Conclusions

- VOYAGER is a noninterventional, prospective, multinational, multicenter study of faricimab
  - Planned enrollment is at least 5000 patients with nAMD or DME across 28 countries
- Here, we presented the results from the first interim analysis (baseline up to 3 months) including data from the US, Canada, and Japan
  - Most patients (98%) had received prior anti-VEGF or faricimab treatment
  - From baseline to month 3 of VOYAGER:
    - Mean VA improved in nAMD (from 59 to 65 letters) and DME (from 70 to 72 letters) switch patients initiating faricimab treatment
    - Patients who switched from anti-VEGF to faricimab experienced rapid CST reductions
    - No new safety concerns were identified[a]
  - T&E was the preferred treatment option for nAMD (83%) and DME (61%)
  - 39% and 61% of physicians responded that they tolerated fluid in nAMD and DME, respectively
- Data collected in VOYAGER will assess long-term outcomes of faricimab and support an in-depth understanding of factors affecting treatment outcomes to inform faricimab use in the real world

[a] Data on file.

Presented at the Canadian Opthalmological Society, May 30th - June 2nd, 2024

Introduction

- Vision gains achieved with anti-VEGFs in clinical practice often fall short of those achieved in clinical trials[1]
- Potential reasons for this disparity include:
  - Inadequate treatment frequency[2]
  - Inability to replicate clinical trial protocols[3]
  - Greater diversity in real-world populations[4]
  - Variable interpretation of disease activity[5] and implementation of treatment approaches[6]
- The VOYAGER study will collect real-world long-term data on patients treated with faricimab to:
  - Explore long-term effectiveness and safety in the real-world setting
  - Gain insights into real-world treatment patterns and factors driving clinician treatment decisions
  - Provide a novel Investigator Interface that will allow health care providers to gain a complete picture of individual response to optimize individual treatment
  - Gather imaging data to validate key anatomic features that influence visual outcomes
- These data will support an in-depth understanding of factors affecting treatment outcomes to inform faricimab use in the real world

Methods

- The VOYAGER study is an observational, prospective, multinational, multicenter study that includes patients who are currently receiving or initiating treatment with faricimab for nAMD and DME in routine clinical practice
  - Recruitment commenced in November 2022 and will continue until late 2027 allowing for up to 5-years of follow-up
- For this interim analysis (baseline to month 3)
  - Prior anti-VEGF or faricimab treatment and patient demographic data were collected at baseline
  - Key ocular assessments, including VA and fundus images (including optical coherence topography), were collected according to routine local clinical practice
  - Investigator tolerance to fluid and preferred treatment regimen data were collected by self report at baseline

Financial Disclosures

MS: Speaker, Roche/Genentech, Inc. **VS:** Consultant: Alimera, Apellis, EyePoint, Genentech, Inc., Graybug, Iveric Bio, Novartis; Contracted Research: Alimera, Allergan, Chengdu Kanghong, EyePoint, Genentech, Inc., Gyroscope, Ionis, Iveric Bio, NGM, Novartis, Opthea, Outlook, Oxurion, RecensMedical, Regeneron, Regenxbio, Roche, SalutarisMD, SamChungDang, Santen; Speaker: Alimera, Apellis, Genentech, Inc.; **CB:** Consultant: Alimera Sciences, Bayer, Boehringer Ingelheim, Janssen, Novartis, Roche; **MB:** Employee and Shareholder: F. Hoffmann-La Roche Ltd.; **VChaikitmongkol:** Consultant: Bayer, Novartis, Roche; Grant Support: Bayer, Roche; **VChaudhary:** Consultant: Alcon, Bayer, Novartis, Roche; Grant Support: Bayer, Novartis; **GCC:** Employee: Genentech, Inc.; **RPF:** Consultant: Alimera, Apellis, Bayer, Boehringer Ingelheim, Chiesi, OD-OS, Opthea, ProQR, Roche/Genentech, Inc., Santen; Grant Support: Biogen, CenterVue, Novartis; Speaker: Alimera, Apellis, Bayer, Novartis; **RG-P:** Consultant: Boehringer Ingelheim, Novartis, Ora, Roche, ZEISS; Grant Support: Bloss Group, Celltrion, Ionis, Iveric Bio, Novartis, NTC, Roche; Speaker: Allergan, Heidelberg Engineering, Novartis, Ora, Roche, ZEISS; **FG, SS:** Employee: F. Hoffmann-La Roche Ltd.; **AHCK:** Consultant: Alcon, Allergan/AbbVie, Apellis, Bayer, Boehringer Mannheim, Heidelberg Engineering, Novartis, Santen, Topcon, ZEISS; **SI:** Speaker: Bayer, Chugai Pharmeceutical Co., Ltd, Novartis, Santen, Senju; Patents: Chugai Pharmeceutical Co., Ltd, Nidek, Seed, Senju; **ML-A:** Consultant: Allergan, Bayer, Novartis, Roche; **MP:** Consultant: Allergan, Bayer, Novartis, Roche/Genentech, Inc.; **JDLP:** Grant Support: F. Hoffmann-La Roche Ltd.; **SS-V**: Consultant: AlphaRet, Apellis, bioeq, Katairo, Kubota Vision, Novartis, Oxurion, Pixium Vision, Roche, SparingVision; Grant Support: Apellis, Bayer, Heidelberg Engineering, Novartis, Roche, ZEISS; Owner: STZ GRADE Reading Center; **EHS:** Consultant: Allergan/AbbVie, Bayer, Novartis, Roche, Teva; **RG:** Consultant: Apellis, Bayer, Novartis, Roche/Genentech, Inc.

Study and Product Disclosures

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Abbreviations

CST, central subfield thickness; DME, diabetic macular edema; eCRF, electronic case report form; EMR, electronic medical record; ETDRS, Early Treatment Diabetic Retinopathy Study; nAMD, neovascular age-related macular degeneration; PRN, pro re nata; SD, standard deviation; T&E, treat-and-extend; VA, visual acuity; VEGF, vascular endothelial growth factor.

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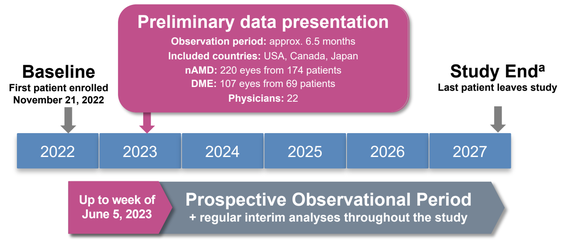
Study Design and Results

1. VOYAGER (NCT05476926): A Noninterventional, Prospective, Multinational, Multicenter Study

At least 5000 patients
- ☑ Adult patients being treated with faricimab for nAMD or DME
- ☒ Participation in an interventional ophthalmology trial within 28 days prior to enrollment

28 countries
Across **Europe**, the **Middle East, Africa, North** and **South America,** and **Asia Pacific**



Data collected as per routine clinical practice for a maximum of 5 years from first patient enrollment until end of study via eCRFs, EMRs (if applicable), and imaging data uploaded directly to the data platform

[a] Study end: date on which the last entry of the last patient is recorded in the database.

2. Patient Baseline Demographic Characteristics

Characteristic	Faricimab for nAMD (N = 174)[a]	Faricimab for DME (N = 69)[a]
Age, years, mean (SD)	79.7 (7.9)	65.3 (12.2)
Female, n (%)	95 (54.6)	27 (39.1)
Current country of residence, n (%)		
Canada	17 (9.8)	12 (17.4)
Japan	1 (0.6)	5 (7.2)
US	156 (89.7)	52 (75.4)
Race, n (%)		
American Indian or Alaska Native	0	1 (1.5)
Asian	3 (1.7)	6 (8.8)
Black or African American	0	3 (4.4)
White	160 (93.0)	54 (79.4)
Other	1 (0.6)	1 (1.5)
Missing	2	1
Ethnicity, n (%)		
Hispanic or Latino	2 (1.2)	2 (2.9)
Not Hispanic or Latino	144 (83.7)	58 (85.3)
Unknown/not reported/missing	28	9

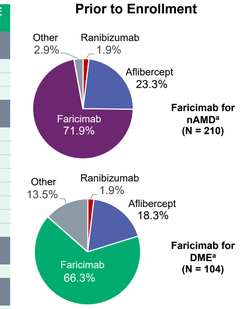
[a] N value reflects patient numbers; patients with ≥ 1 eye being treated are counted once. The data points are still subject to data cleaning and data collection (missing values), and the results may change when the final analysis is performed.

3. Most Patient Eyes Had Received Prior Anti-VEGF or Faricimab Treatment, With > 65% of Patient Eyes Initiating Faricimab Treatment Prior to Enrollment

Prior Treatment With Anti-VEGF or Faricimab

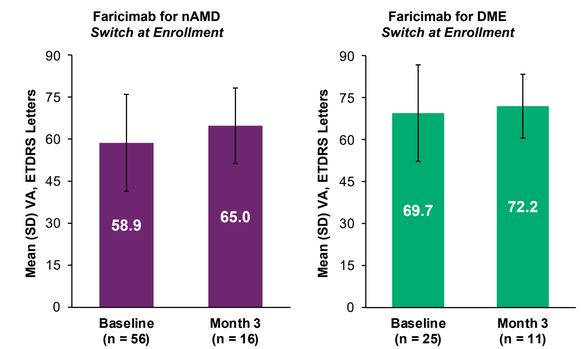
	Faricimab for nAMD (N = 220)[a]	Faricimab for DME (N = 107)[a]
Eyes that received anti-VEGF or faricimab prior to enrollment, n (%)		
Yes	210 (97.7)	104 (98.1)
No	5 (2.3)	2 (1.9)
Missing	5	1
Total number of anti-VEGF or faricimab injections per eye prior to enrollment, n (%)		
0	5	2
1–5	20 (9.5)	16 (15.4)
6–10	32 (15.2)	17 (16.3)
11–15	22 (10.5)	10 (9.6)
16–20	19 (9.0)	9 (8.7)
21–25	15 (7.1)	9 (8.7)
> 25	102 (48.6)	43 (41.3)
Missing	5	1
Duration of prior anti-VEGF or faricimab treatment, months[b]		
Mean (SD)	46.4 (39.66)	41.3 (32.64)
Time from last anti-VEGF or faricimab treatment prior to enrollment, months[c]		
Mean (SD)	2.0 (3.8)	2.5 (6.1)

Last Treatment Received Prior to Enrollment



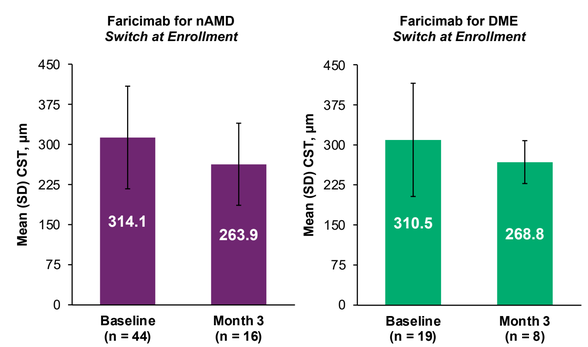
[a] Treated eyes were considered separately and were included in their respective cohort by treatment and disease state. [b] Duration of prior anti-VEGF treatment (months) = (Date of last treatment prior to enrollment – Date of first anti-VEGF treatment + 1) / 30.4375. [c] Time from last anti-VEGF or faricimab treatment prior to enrollment (months) = (Date of informed consent – Date of last treatment prior to enrollment + 1) / 30.4375. The data points are still subject to data cleaning and data collection (missing values), and the results may change when the final analysis is performed.

4. VA Increased in nAMD and DME Switch Patients Who Initiated Faricimab at Enrollment From Baseline to Month 3



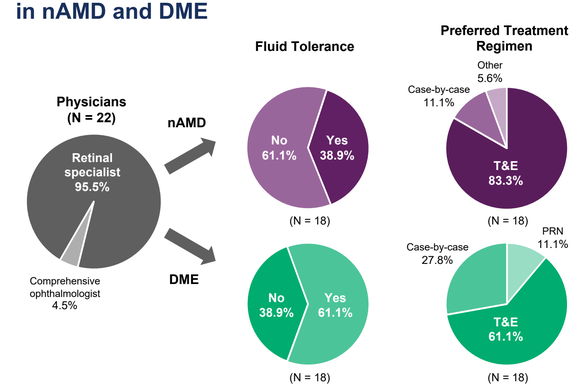
VA, collected as measured per local practice, was converted to approximate ETDRS score automatically in the eCRF.[7] Switch at enrollment reflects patients who were switched from anti-VEGF (ranibizumab, aflibercept, brolucizumab, other) to faricimab at enrollment into VOYAGER. N values reflect the number of patient eyes that data were collected from at the analysis time points. For post-baseline VA measurements, patient eyes with VA measurements outside the analysis time window were not considered. The data points are still subject to data cleaning and data collection (missing values), and the results may change when the final analysis is performed.

5. Rapid Fluid Reductions in nAMD and DME Switch Patients Who Initiated Faricimab at Enrollment From Baseline to Month 3



CST was collected as measured in local practice. Switch at enrollment reflects patients who were switched from anti-VEGF (ranibizumab, aflibercept, brolucizumab, other) to faricimab at enrollment into VOYAGER. N values reflect the number of patient eyes that data were collected from at the analysis time points. For post-baseline CST measurements, patient eyes with a CST measurements outside the analysis time window were not considered. The data points are still subject to data cleaning and data collection (missing values), and the results may change when the final analysis is performed.

6. VOYAGER Investigators Variably Tolerated Fluid and Consistently Preferred a T&E Treatment Regimen in nAMD and DME



Data were collected at the baseline visit. Tolerance to fluid refers to if a physician will allow a limit of retinal fluid before considering additional medication doses. The data points are still subject to data cleaning and data collection (missing values), and the results may change when the final analysis is performed.

Bilateral Purtscher-like retinopathy secondary to COVID-19 infection

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Background

- Purtscher retinopathy is an occlusive microvasculopathy related to trauma[1]
- In the absence of trauma, the condition is referred to as "Purtscher-like retinopathy" and has been described in conditions such as acute pancreatitis, fat embolism syndrome, renal failure, and childbirth[1]
- Both conditions present with sudden unilateral or bilateral vision loss and nerve fiber layer infarcts, optic disk swelling, retinal hemorrhages, and pathognomonic Purtscher flecken (discrete areas of retinal whitening between the arterioles and venules) on fundus exam.
- The retinopathy typically spontaneously resolves within one to three months[1]

Purpose

- To report a case of Purtscher-like retinopathy in an adult female secondary to COVID-19 infection

Methods

- Retrospective case report
- The patient's clinical records were reviewed, including history, examinations, imaging, and investigations.
- A thorough literature review was conducted

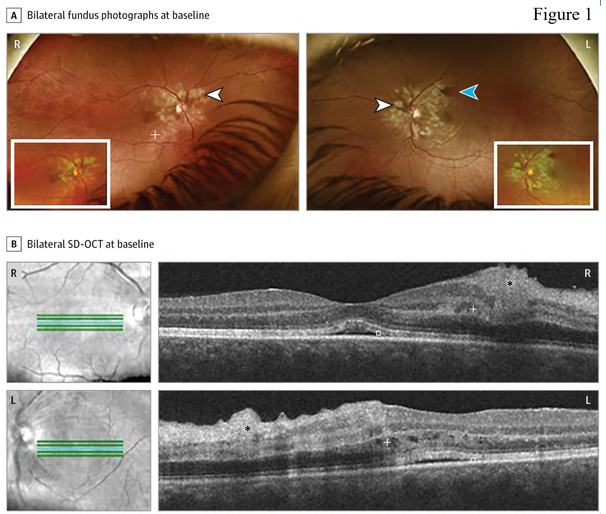
Case Report

History of Presenting Illness: A 37-year-old female presented with sudden-onset blurred vision in both eyes four days after testing positive for COVID-19.
She reported mild symptoms of COVID-19 infection that did not require hospitalization, such as malaise, headaches, fever, loss of taste and smell. Infection was confirmed with a series of three positive rapid antigen tests for SARS-CoV-2. Prior to infection, she had received two doses of the mRNA-based Pfizer-BioNTech vaccine.
Her past ocular history was remarkable for a bilateral YAG peripheral iridotomy for high hyperopia.

Exam at Initial Presentation: BCVA was 20/150 OD and 20/80 OS. Her IOP was 17 mmHg OD and 15 mmHg OS. Anterior segment exam showed a relative afferent pupillary defect on the left. Dilated fundus examination revealed nerve fiber layer infarcts (plus sign), intraretinal hemorrhages (blue arrow), and Purtscher flecken (white arrow) bilaterally (Fig. 1A).

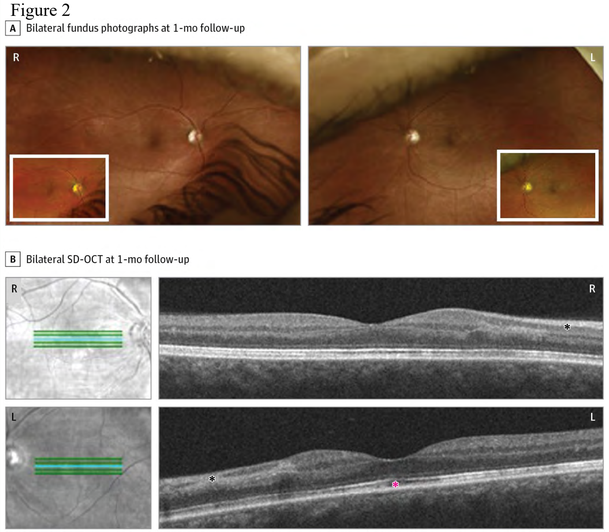
Spectral domain optical coherence tomography (SD-OCT) revealed thickening and hyperreflectivity of the nerve fiber layer (asterisk) and areas of subretinal fluid (square) and intraretinal edema (plus sign) bilaterally (Fig. 1B).

Figure 1



Management: Based on the clinical findings, the patient was diagnosed with Purtscher-like retinopathy and was counselled on the self-limiting nature of the condition.

Figure 2



Exam at 1-Month Follow-up: One month later, BCVA improved to 20/30 OD and 20/50 OS with pinhole improvement to 20/30. Fundus examination showed considerable improvement to the nerve fiber layer infarcts, intraretinal hemorrhages, and Purtscher flecken bilaterally (Fig. 2A).

SD-OCT revealed considerable improvement to the nerve fiber layer thickening (black asterisk) and intraretinal edema, with a persistent small amount of subretinal fluid (pink asterisk) (Fig. 2B).

Discussion

- Pathogenesis of Purtscher-like retinopathy remains debated
- A complement-mediated hypothesis exists that complement formation induces the formation of leukocyte aggregates that lead to transient arteriolar occlusion[1]
- COVID-19 is associated with thromboinflammation, endothelial injury, and complement activation[1]
- Typically treated with observation alone, but cases have been reported using high-dose steroids, papaverine hydrochloride, and hyperbaric oxygen, but have not shown superiority to observation[1]
- Similar cases described in COVID-19 patients requiring hospitalization and intubation and in cases of mild symptoms like our patient.[2 3 4]
- Although the temporal relationship of this finding with the COVID-19 infection suggests a cause-and-effect relationship, one cannot determine with certainty that the findings were due to COVID-19, or some other confounding event

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Carbon Footprint of Pars Plana Vitrectomy, Pneumatic Retinopexy and Scleral Buckle for Rhegmatogenous Retinal Detachment Repair

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Advancing eye care through innovation, education, and advocacy
L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

Alberta Retina Consultants

EYE INSTITUTE OF ALBERTA

UNIVERSITY OF ALBERTA FACULTY OF MEDICINE & DENTISTRY

INTRODUCTION

- Global warming is a major threat to human health
- Health care systems are substantial producers of greenhouse gas (GHG) emissions globally
- Ophthalmology is a high-volume surgical speciality, and we must find ways to reduce our carbon footprint

AIM

- To quantify the environmental impact of a pars plana vitrectomy (PPV), pneumatic retinopexy (PR), and scleral buckle (SB) for repair of a rhegmatogenous retinal detachment (RRD)

METHODS

- Single centre, **lifecycle assessment** of PPV, PR and SB

Cradle to grave analysis

Procurement (Single use equipment) → Energy consumption + Gas tamponade → Waste Disposal

LCA Calculator
The sustainable design tool

RESULTS AND DISCUSSION

- The total GHG emissions produced by a PPV, PR and SB was 51.10 kg CO_2 eq, 2.09 kg CO_2 eq, and 12.57 kg CO_2 eq, respectively
- Emissions related to the manufacturing process of disposable equipment were major contributors of GHGs in all procedures, but was proportionally greater in PR and SB
- Sulfur hexafluoride (SF_6) use accounted for 45% and 22% of the total PPV and PR related emissions, respectively
- We estimate that approximately 25000 RRDs meet criteria for repair via PR, and if these are repaired via PPV or SB instead, it would result in a difference of 1226 metric tons CO_2 eq and 262 metric tons CO_2 eq, respectively
- These differences are equivalent to the GHGs produced by driving 3,000,000 miles and 670,000 miles in an average gasoline powered car, respectively

Figure 1. Image of disposable equipment and instruments after rhegmatogenous retinal detachment repair by pars plana vitrectomy.

Figure 2. Image of disposable equipment and instruments after rhegmatogenous retinal detachment repair by scleral buckle.

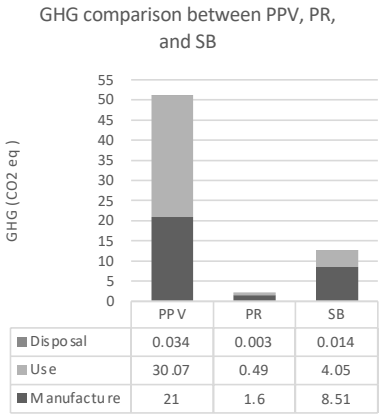

Figure 2. Comparison of greenhouse gas (GHG) emissions in carbon-dioxide equivalents (CO_2 eq) produced from pars plana vitrectomy (PPV), pneumatic retinopexy (PR), and scleral buckle (SB)

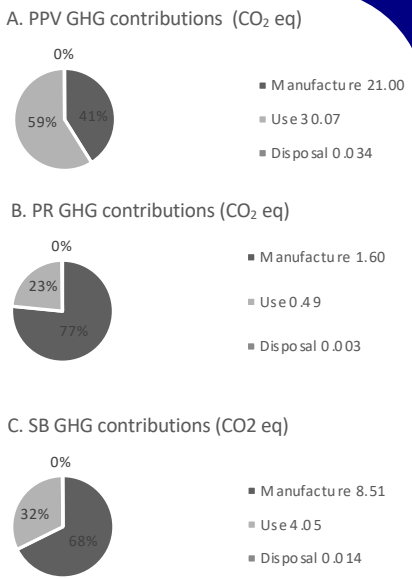

Figure 4. Contribution of greenhouse gas emissions (GHG) in carbon-dioxide equivalents (CO_2 eq) from instrument manufacturing, use of equipment and disposal for pars plana vitrectomy (PPV) (A), pneumatic retinopexy (PR) (B), and scleral buckle (SB) (C).

CONCLUSIONS

- This study highlights the steps in the lifecycle of each procedure that can be targeted to mitigate GHG emissions
- Sustainable product development could be an area of focus for further environmental optimization
- Re-evaluating gas preparation and choice of tamponade may be worth future consideration

CONCLUSIONS

- There is a substantial difference in GHG emissions between PPV, PR, and SB
- Patient-centred factors and best patient outcomes should always be the primary focal point. In situations where there is clinical equipoise, the broader environmental impact of our work should be among surgical considerations

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COS 2024

ChatGPT and Retinal Disease: A Cross-Sectional Study on AI Comprehension of Clinical Guidelines

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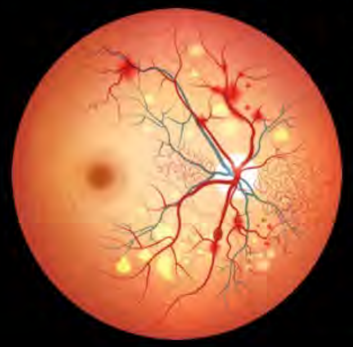
Introduction



Retinal Disease

- Requires astute clinical management for optimal results
- Encompasses a vast spectrum of vision-threatening disorders, including:
  1. Non-proliferative diabetic retinopathy (**NPDR**)
  2. Proliferative diabetic retinopathy (**PDR**)
  3. Dry age-related macular degeneration (**AMD**)
  4. Wet **AMD**
  5. Posterior vitreous detachment (**PVD**)
  6. Vitreomacular traction (**VMT**)
  7. Epiretinal membrane (**ERM**)
  8. Full-thickness macular hole (**FTMH**)
  9. Retinal vein occlusion (**RVO**)
  10. Retinal artery occlusion (**RAO**)
  11. Retinal tear (**RT**)
  12. Retinal detachment (**RDs**)

The Potential of AI

- Recent surge in AI capabilities for diverse tasks
- **GPT-4 by OpenAI:** *Can it answer intricate medical questions?*
- **Objective:** Assess GPT-4's aptitude in answering questions related to 12 domains of retinal diseases
- **Benchmark:** American Academy of Ophthalmology (AAO) Preferred Practice Pattern (PPP) Guidelines
- **Assessors:** Retinal Specialists

Methods

Study Design

- **Observational, cross-sectional investigation**
- **Question Development**
  - **Identified 12 domains** of retinal diseases
  - Developed **~10 clinically relevant questions** per domain
  - Questions related to **pathophysiology, diagnosis, & management**
  - Direct alignment with **AAO PPP guidelines**
- **Standardized Prompt Engineering**
  - *"Act as an experienced ophthalmologist, answer using the most up-to-date medical guidelines for retinal specialists…"*

Scoring Mechanism

- 3 independent retinal specialists
- Response scored from 1 to 5
  - *Based on accuracy, quality, and guideline alignment*
- Raters recorded comments on AI errors

Readability Metrics

- For every AI-generated response:
  - Flesch Reading Ease Score
  - Flesch-Kincaid Reading Grade level
- Measures reading difficulty and educational level required

Data Synthesis & Analysis

- **Inter-rater reliability** using **percent agreement measure**
- **Statistical Tests:**
  - Shapiro-Wilk test for data normality
  - Kruskal-Wallis test + Dunn's post-hoc for pair-wise analyses
  - Bonferroni correction for multiple comparisons
- **Statistical significance:** p-value of <0.05

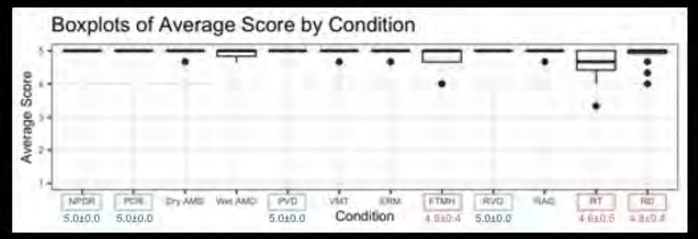
Results

Overview

- Responses to **130 questions over 12 domains** of retinal disease
- **Overall average score:** 4.91 (SD ±0.25), Median: 5.00 (IQR 5.00 – 5.00)

Inter-Rater Reliability

- **Overall agreement:** 83.9%
- **Lowest agreement** in RT (40.0%), RD (75.0%), and FTMH (63.6%).



Comparative Performance

- Significant variability across retinal disease domains
  - Kruskal-Wallis p-value<0.01
- **Post-hoc analyses using Dunn's test**
  - Significantly **worse performance** in the **Retinal Tear (RT) domain**
- **Lowest Rated Response:**
  - *"How does the severity and location of a retinal tear impact the recommended treatment?"*
- Misrepresented standard approach & misunderstood proper use & indication for certain techniques
  - (e.g. laser retinopexy or laser barricade)

Discussion

4.9/5.0
Overall Score
High alignment with AAO PPP guidelines

83.9%
Overall Inter-rater reliability
Consistent agreement among specialists

Exceptional scores in medical retina disease
(e.g. NPDR, PDR, PVD, RVO)
Likely reflective of standardized treatment protocols

Lower scores/agreement in surgical retina diseases
(e.g. RT, RD, FTMH)
Inherent complexity & variability of management
Frequency & subjectivity of relevant training data

Readability Metrics

- Average Flesch score suggests **college to graduate-level comprehension**
  - Complexity reflects scientific & medical nature of prompts
- Adaptive Communication
  - ***Can prompts drive responses for lower reading levels without sacrificing accuracy?***

Conclusion

ChatGPT Evaluation

- Robust evaluation for common retina diseases
- Significant potential in guideline-concordant responses, especially for medical retinal diseases

Challenges

- Performance variability in surgical retina
- Complexity/individualized treatment decisions

Role of Human Expertise

- Essential human role emphasized, particularly in complex surgical scenarios

Future of AI in Healthcare

- Promising AI integration ahead with potential to enhance guideline adherence

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Clinical findings amongst immigrants from China and African-Caribbean countries attending a new linguistic and culturally tailored tele-diabetic retinopathy screening program in Ottawa, Canada

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Introduction

- Tele-ophthalmology has been shown to be an effective tool to improve rates of diabetic retinopathy (DR) screening.
- Previous work has identified that immigrants to Canada with diabetes have lower rates of DR screening due to challenges such as lack of insurance coverage and language barriers
- Few studies or programs have assessed the potential of tele-DR screening in this at-risk population.

Methods

A linguistic and culturally tailored tele-DR screening program at the Centretown Community Health Centre (CHC) in Ottawa

Inclusion criteria:
- Immigrants from China or African/Caribbean countries

Underwent ocular exam

Demographic info (ethnicity etc)

Exam using the Topcon Maestro 2 OCT and fundus camera

Results

Table 1. Demographics of cohort

	African patients (n=21)	Chinese patients (n=7)
Gender (male)	11, 52%	4, 57%
Mild diabetic retinopathy	5, 24%	3, 43%
Dry age-related macular degeneration	2, 10%	2, 29%
Macular edema	2, 10%	0, 0%

Table 2. Recommendations given to patients (%)

	All patients (n=29)
Repeat screening in 1 year	43%
In-person optometrist exam in 1 year	32%
Non urgent retina referral	14%
Non urgent ophthalmology referral (1-6 months)	11%
Urgent ophthalmology referral	3%

Figure 1. The DR screening program at the Centretown Community Health Centre (CHC) in Ottawa

Conclusions

- This study demonstrates the establishment of a linguistic and culturally tailored tele-DR screening program that addresses barriers to attendance amongst to immigrants who might not otherwise have their eyes screened.
- Consistent with other programs, while most patients did not have DR, a small percentage had DR requiring treatment and enabled the identification of several other ocular pathologies.
- Now established, future research can aim to expand this community-centred program and evaluate strategies for further increasing access amongst marginalized populations.

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Comparative Analysis of Automated Hand-Held and Desktop Fundus Camera Grading in a Tele-Retinal Screening Program

COS 2024

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Ophthalmology & Vision Sciences UNIVERSITY OF TORONTO

UHN Toronto General Toronto Western Princess Margaret Toronto Rehab Michener Institute

Diabetes Action Canada

South Riverdale COMMUNITY HEALTH CENTRE

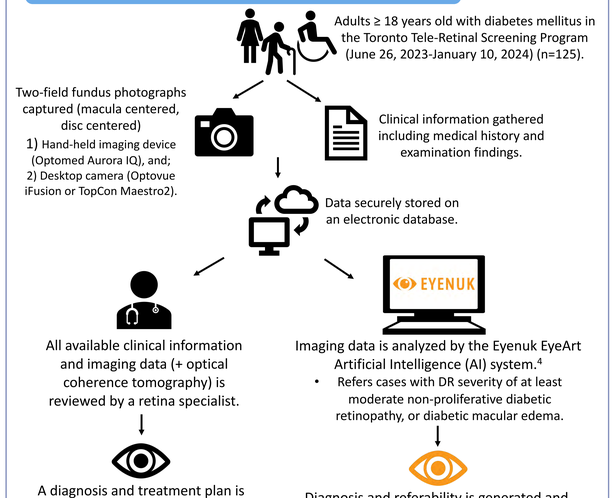
INTRODUCTION

- Diabetic retinopathy (DR) is a leading cause of preventable vision impairment and blindness.[1,2] Yet, studies have shown that 33% of patients with diabetes in Ontario are unscreened.[3]
- The Toronto Tele-Retinal Screening Program has an essential role in vision preservation in marginalized populations through free screening and access to early intervention for DR.[3]
- Artificial Intelligence (AI) and use of a hand-held and desktop fundus camera could improve DR screening access, if proven to have high sensitivity and specificity for referral to a retina specialist.

AIM

To determine the performance of the Health Canada approved EyeArt Artificial Intelligence (AI) system with a hand-held camera and desktop device for detection of diabetic retinopathy (DR) as a part of a tele-retinal screening program.

METHOD



RESULTS

Amongst the 250 eyes (125 patients) included, there was evidence of DR and DME in 24.4% (61) and 2.4% (6) of eyes, respectively **(Table 1).** Fifteen percent (95% CI: 8.9-21.5%) and 7% (95% CI: 2.7-11.7%) of patients were ungradable by AI due to poor image quality of the hand-held and the desktop cameras, respectively.

REFERABILITY TO RETINA SPECIALIST

The performance metrics for automated screening of the hand-held camera fundus photos yielded a patient referability sensitivity, specificity, PPV and NPV of 83.3% (95% CI: 76.8-89.9%), 91.0% (95% CI: 86.0-96.0%), 35.7% (95% CI: 27.3-44.1%) and 98.9% (95% CI: 97.1-100%), respectively **(Figure 1 & Table 2)**.

Comparatively, the desktop camera images demonstrated a referability sensitivity, specificity, PPV and NPV of 66.7% (95% CI: 58.4-74.9%), 91.8% (95% CI: 87.0-96.6%), 30.8% (95% CI: 22.7-38.9%), and 98.1% (95% CI: 95.6-100%), respectively **(Figure & Table 2).**

DIABETIC RETINOPATHY (DR) GRADE

AI and reader agreements for DR grading in eyes were 74.0% (95% CI: 68.6-79.4%) and 74.8% (95% CI: 69.4-80.2%) for the hand-held fundus and desktop fundus photos, respectively **(Figure 1 & 2)**.

PRESENCE OF DIABETIC MACULAR EDEMA (DME)

AI and reader agreements for presence of DME in eyes were 85.2% (95% CI: 80.8-89.6%) and 93.2% (95% CI: 90.1-96.3%) for the hand-held fundus and desktop fundus photos, respectively **(Figure 1 & 2)**.

Table 1. Baseline characteristics of sample.

	Mean ± SD
n, patients	125
Number of patients with gradable images	
Hand-held fundus camera	106, 84.8%
Desktop fundus camera	240, 96.0%
Age, years	55.2 ± 12.5
Sex (F)	47, 37.6%
Visual acuity, logMAR	0.18 ± 0.28
Intraocular pressure, mmHg	17.0 ± 3.4
Time since last dilated eye exam, years	2.3 ± 3.1
Last HbA1C level, %	7.8 ± 2.0
Time since diabetes mellitus diagnosis, years	8.1 ± 9.1
No OHIP	26, 20.8%
Non-North American ethnicity*	88, 70.4%
Non-Caucasian race†	81, 64.8%
Household income <$25,000‡	24, 19.2%
Highest level of education secondary degree or lower§	32, 25.6%

*Data unavailable for *9 (7.2%), †19 (15.2%), ‡67 (53.6%), and §28 (22.4%) patients.*

Table 2. Performance of the EyeArt Artificial Intelligence (AI) system.

	Hand-Held Fundus Camera (Optomed Aurora) + EyeArt AI (95% CI)	Desktop Fundus Camera + EyeArt AI (95% CI)
Sensitivity	83.3% (76.8-89.9%)	66.7% (58.4-74.9%)
Specificity	91.0% (86.0-96.0%)	91.8% (87.0-96.6%)
PPV	35.7% (27.3-44.1%)	30.8% (22.7-38.9%)
NPV	98.9% (97.1-100%)	98.1% (95.6-100%)

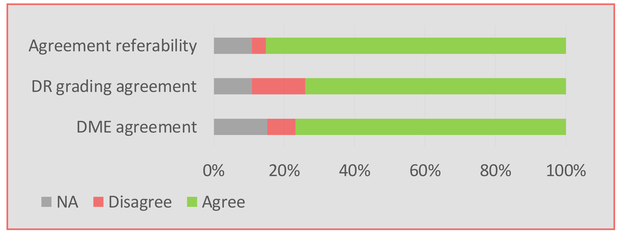


Figure 1. Agreement between EyeArt Artificial Intelligence system using **hand-held fundus camera** (Optomed Aurora IQ) photos, and retina specialist (reference standard) for: referability to a retina specialist; diabetic retinopathy (DR) grade (none, mild non-proliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR, proliferative diabetic retinopathy); and diabetic macular edema (DME).

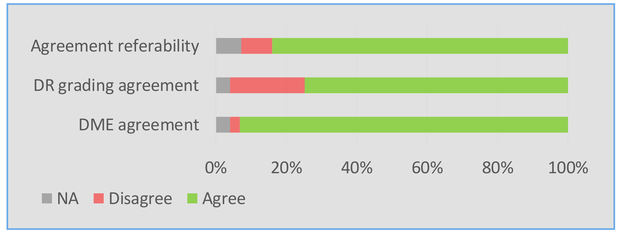


Figure 2. Agreement between EyeArt Artificial Intelligence system using **desktop fundus camera** (Optovue iFusion or TopCon Maestro2) photos and retina specialist (reference standard) for: referability to a retina specialist; diabetic retinopathy (DR) grade (none, mild non-proliferative diabetic retinopathy (NPDR), moderate NPDR, severe NPDR, proliferative diabetic retinopathy); and diabetic macular edema (DME).

CONCLUSION

- EyeArt AI automated grading of images provided high specificity and high negative predictive value for DR referral recommendations to a retina specialist. This suggests that there are few false positives, and a high proportion of patients with a negative screening result are truly healthy.
- The desktop fundus camera provided a higher proportion of gradable images for the AI, compared to the hand-held fundus camera. Despite this, both cameras provided high specificity and NPV.
- In the future, automated AI systems could:
  - **Improve triaging**, where patients receive near immediate screening results. Those that are flagged as positive could be referred quicker for an eye exam, and negative cases could undergo further review.
  - Combined with a portable hand-held fundus camera, **enhance access** to reliable DR screening for patients with low mobility or those that are bed-bound.

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Advancing eye care through innovation, education, and advocacy

L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

Comparison of Different Topical Anesthetics for Intravitreal Injections: A Randomized Crossover Clinical Trial

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INTRODUCTION

- Intravitreal injection is the injection of substances into the vitreous humor and is a first-line treatment offered to patients suffering from various retinal conditions.[1]
- It's use is growing rapidly and is already the most commonly performed ophthalmic procedure.[2]

AIM

Aims:

To evaluate the potential adjunctive effect of pledget anesthetic to topical proparacaine eyedrops alone in patients undergoing IVI

Hypothesis:

Pledget of proparacaine enhances anesthesia compared to topical proparacaine alone and provides additional pain relief during IVIs

METHOD

- Patients were randomized in a 1:1 ratio to receive either 0.5% proparacaine soaked pledget, or placebo with pledget soaked with normal saline
- Both arms received 2 drops of 0.5% proparacaine before the application of the pledget
- At the subsequent visit for intravitreal injection, the patients were crossed over to receive the alternative intervention
- Following the intravitreal injection, the subjects would record their pain level on a visual analog scale immediately, 10 minutes and 20 minutes post injection

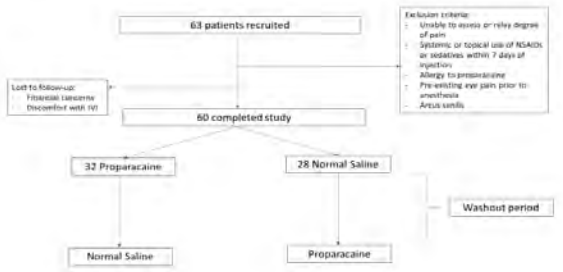

Figure 1. Recruitment schedule

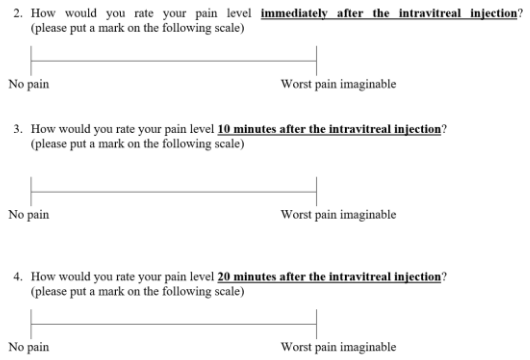

Figure 2. Visual analog scale

RESULTS

- 60 patients completed the study.
- The mean age was 72 and patients had undergone a mean of 8.79 IVI with 8 treatment naïve patients
- Pain intensity as assessed on the visual analogue scale was lower for the droplet group compared to the pledget group immediately (2.24cm vs. 2.60cm), 10-minutes (1.57cm vs. 2.03cm) and 20-minutes (1.08cm vs 1.60cm) after injection, however this was not statistically significant (p=0.48, p=0.43, p=0.24 respectively). (figure 4)
- For treatment naïve patients, the pain score was higher for the topical group 2.97cm compared to the pledget group 2.12cm immediately after injection, although this was not statistically significant P=0.3.

Characteristics	Number of patients
Age (mean ± SD): 72 ± 9.2	
Sex	
Male	43
Female	17
Indication	
AMD	38
DME	13
CRVO	1
BRVO	6
Macular telangiectasia	1
Average number of previous injections	8.8 ± 11
Number of treatment naive patients	8

Figure 3. Patient demographics

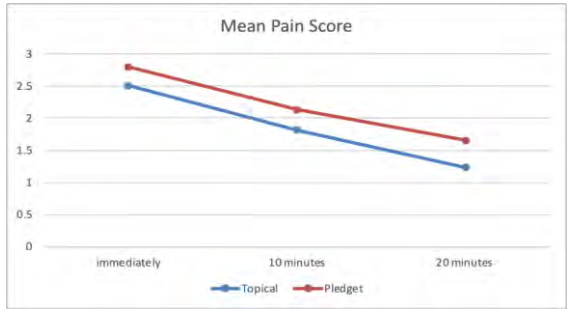

Figure 4. Pain score trend over time

CONCLUSION

Topical proparacaine applied in a pledget form does not enhance anesthesia compared to a droplet form for IVI.

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Determining the relationship between serum oxylipin levels and retinal thickness in Alzheimer's disease: An exploratory analysis

COS 2024

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INTRODUCTION

Retinal thinning as seen on ocular coherence tomography (OCT) is known to occur in Alzheimer's disease (AD) mild cognitive impairment (MCI), and other dementias, and AD pathology is reflected in the retina by amyloid beta deposits [1]. Although the retina is affected in cerebral neurodegenerative diseases, the mechanisms by which this occurs are not clear. A mechanism increasingly being investigated in brain and retinal degenerative and microvascular pathologies is the role of oxylipins, which are oxidized derivatives of polyunsaturated fatty acids (PUFAs) that are known to mediate vascular and inflammatory pathways [2]. Animal studies and post-mortem eyes have shown evidence of oxylipin dysregulation, in particular oxylipins metabolized by soluble epoxide hydrolase (sEH), contributing to wet age-related macular degeneration, diabetic retinopathy, and glaucoma pathology, and in the brain their levels are altered in AD, MCI, and cerebrovascular disease [3-15]. Whether circulating oxylipin levels in disease neurodegenerative affect the retina warrants further investigation.

AIM

To determine in an exploratory analysis whether serum oxylipin levels are associated with retinal thickness on spectral OCT (SD-OCT) in subjects with Alzheimer's disease or mild cognitive impairment (ADMCI).

METHODS

Inclusion criteria:
- ADMCI subjects in the Ontario Neurodegenerative Research Initiative
- Serum oxylipin levels & bilateral OCT (peripapillary retinal nerve fiber layer [pRNFL] and posterior pole) scans obtained at baseline

Exclusion criteria:
- Optic neuropathies/maculopathies (assessed by ophthalmologist)
- Chronic kidney disease or PUFA supplement use (can inflate oxylipin levels)

Statistical analysis:
Mean pRNFL, mean macular total retinal thickness (mTRT), and mean macular ganglion cell layer thickness (mGCL) were each **summed across both eyes for analysis**. Missing oxylipin data were imputed (using the imputeLCMD package in R) if ≤25% were missing and then log-transformed. At >25% missing, they were converted into categorical variables. Oxylipins with >85% missing were excluded. Ratios between diol and epoxide oxylipins were determined as an indicator of sEH activity.
Correlation matrices explored relationships between oxylipins and retinal layers (Pearson's correlations for continuous oxylipins, Spearman's for categorical). Oxylipins achieving significant correlations with retinal layers were tested in **linear regression models** as predictors of retinal thickness, controlling for age and sex.

RESULTS

Subjects

- 47, 45, and 44 subjects met inclusion criteria for pRNFL, mTRT, and mGCL studies, respectively.

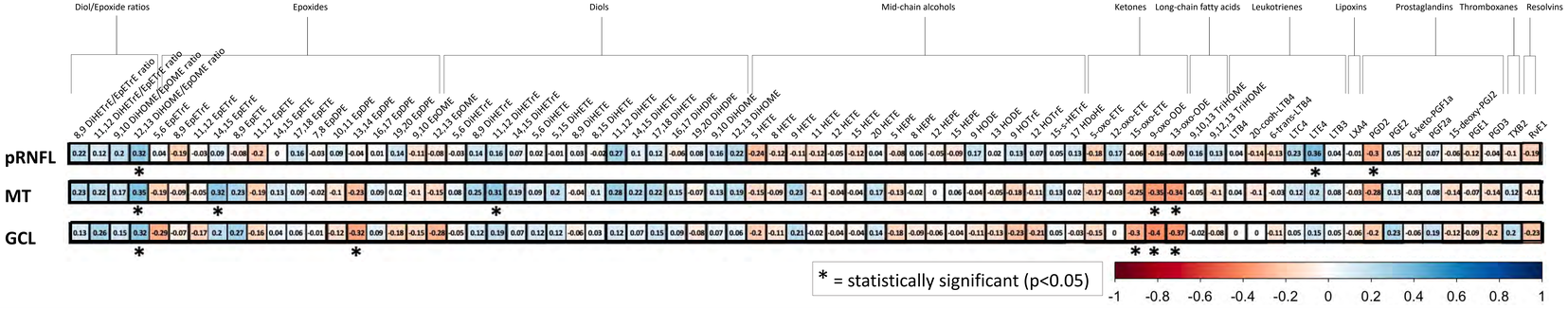
Table 1: Demographics

Subject group	pRNFL	mTRT	mGCL
# Included	47	45	44
Mean Age (SD)	71.2 (8.8)	71.0 (8.6)	70.9 (8.7)
% male	53%	51%	49%
Mean summed thickness (SD)*	186.7µm (18.4)	617.6µm (29.0)	76.3µm (6.8)

**mean retinal layer thicknesses were summed across both eyes in each participant. SD = standard deviation*

Exploratory correlation matrices between bilateral summed retinal layer thicknesses and systemic oxylipin levels

- Correlation matrices showed a pattern of **positive correlations** between retinal layer thickness and diol/epoxide ratios
- Of 71 oxylipins, 3, 5, and 5 oxylipins had significant with pRNFL, mTRT, and mGCL, respectively



Associations between oxylipins of interest and retinal thickness in ADMCI (linear regression models)

- Higher PGD2 and lower LTE4 levels predicted a thinner pRNFL (β=-0.348, p=0.010; β=0.375, p=0.008)
- Higher 13-oxo-ODE, lower 12,13-DiHOME/EpOME ratio, and lower 14,15-EpETRE levels predicted a thinner mTRT (β=-0.252, p=0.048; β=0.412, p=0.009; β=0.378, p=0.005)
- Higher 9-oxo-ODE trended toward predicting thinner mGCL and mTRT (β=-0.250, p=0.085; β=-0.234, p=0.066), and a lower 12,13-DiHOME/EpOME ratio trended toward predicting a thinner pRNFL (β=0.249, p=0.063)
- Age and sex did not significantly predict layer thickness

CONCLUSIONS

- Specific profiles of circulating oxylipins may reflect pathological changes occurring in the retina during ADMCI neurodegeneration.
- Linoleic acid ketone metabolite levels in particular (9-oxo-ODE, 13-oxo-ODE), known to have some anti-inflammatory mechanisms [16], show an inverse relationship with macular thickness in ADMCI.
- Future work can determine whether altered circulating oxylipin levels have a direct effect on the retina, given their inflammatory and neovascularization functions, or if they are reflecting the severity of direct eye-brain pathological processes.

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Does Preoperative Epiretinal Membrane OCT Staging Predict Postoperative Visual Prognosis ?

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PURPOSE

Epiretinal membrane (ERM) is a frequent retinal condition that increases in prevalence with age[1].

ERM constitutes one of the main conditions leading to vitreoretinal surgery, but should ERM peeling be indicated for all preoperative ERM stages?

In this study, we assessed the association between preoperative ERM staging and postoperative visual acuity in phakic and pseudophakic patients.

METHODS

- Retrospective cohort study
- **184** patients operated for primary or secondary ERM (**184 eyes**)
- Period: 2014 to 2021
- Center: CHU de Québec – Université Laval
- Preoperative **ERM were graded based on optical coherence tomography** (OCT) **staging** proposed by Govetto et al. (2017)[1]
- Primary outcome: **Best-corrected visual acuity** (**BCVA**) at 3 months and at the final follow-up in logarithm of the minimal angle of resolution (logMAR)
- BCVA and ERM grades were compared using Kruskal-Wallis test
- Generalized linear model was used for final BCVA

RESULTS

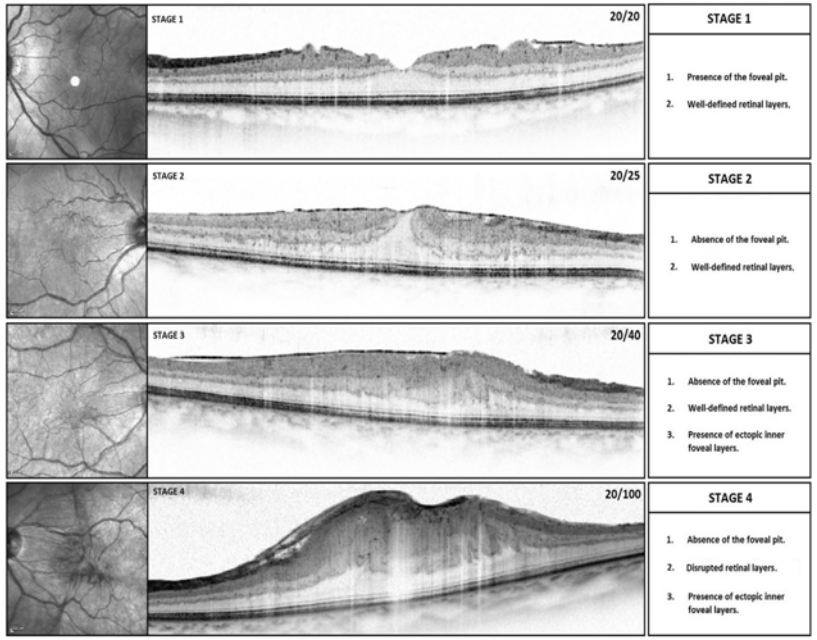

Figure 1: Proposed OCT staging scheme of ERM by Govetto et al. (2017)[1]

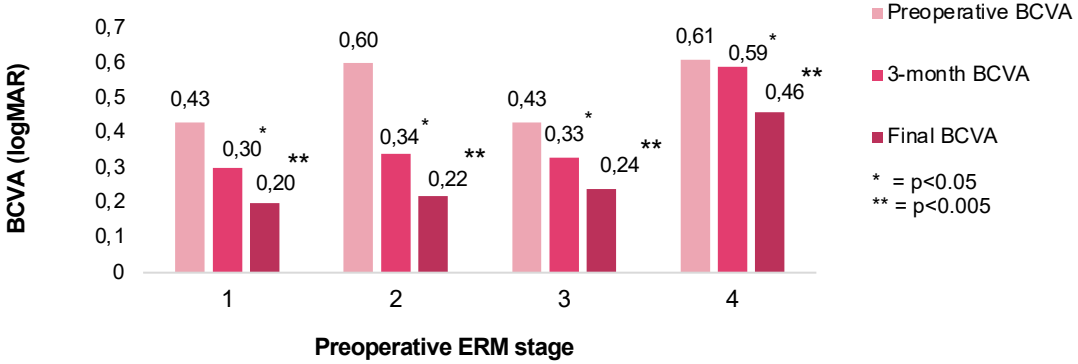

Figure 2: BCVA according to preoperative ERM stage

Table 1: Generalized linear model of final BCVA in logMAR relative to stage 4 ERM

Stage	B	95% CI	p
1	-0.32	[-0.63, -0.01]	0.04
2	-0.40	[−0.67, 0.13]	0.004
3	-0.47	[-0.72,-0.21]	<0.001

N.B. Final model adjusted for age, preoperative BCVA and ERM grade, lens status, tamponade used, and total follow-up duration. B = unstandardized coefficients; CI = confidence interval

CONCLUSION

- 3-month BCVA and final BCVA significantly different by ERM grades, particularly with stage 4 ERM
- Preoperative ERM staging seems to be an important predictor of visual potential
- OCT staging system proposed by Govetto et al. (2017) may become an interesting additional clinical tool for ERM management

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Disclosure : None

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Efficacy and Clinical Outcomes of Suprachoroidal Triamcinolone Acetonide in Diabetic Macular Edema Patients: A Systematic Review and Meta-Analysis

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INTRODUCTION

Diabetic Macular Edema (DME) poses a significant challenge in ophthalmology due to its prevalence and potential for vision loss. Among the treatment modalities, Suprachoroidal Triamcinolone Acetonide (SCTA) has emerged as a promising intervention. However, a comprehensive synthesis of existing evidence regarding its efficacy remains elusive. This systematic review and meta-analysis aims to fill this gap by providing a rigorous evaluation of SCTA's efficacy in managing DME, thereby paving the way for informed clinical decision-making.

AIM

To evaluate the efficacy of SCTA in patients with DME.

METHOD

- Systematic Review and Meta-Analysis: Conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological rigor and transparency.
- Comprehensive Data Search: A thorough search of electronic databases was performed to identify relevant studies for inclusion in the analysis, ensuring a comprehensive coverage of available literature.
- Data Pooling and Analysis: Data from selected studies were meticulously pooled to facilitate a robust analysis, allowing for the synthesis of findings across multiple studies.
- Primary Outcomes Measurement: Central Macular Thickness (CMT) and Best Corrected Visual Acuity (BCVA) were measured at baseline, Month 1, and Month 3 to track changes over time and assess treatment efficacy.
- Secondary Outcomes Assessment: Intraocular Pressure (IOP) was assessed at the same time points to provide a holistic evaluation of treatment outcomes beyond structural changes.
- Statistical Analysis: The random-effects model was utilized to calculate pooled mean values along with 95% confidence intervals (CIs), ensuring a robust and reliable statistical approach to data synthesis and interpretation.

RESULTS

- Eleven studies were included, comprising a total sample size of 411 eyes.
- In patients with DME receiving SCTA, CMT significantly improved over the study period (**Figure 1**).
  - Baseline: Pooled mean CMT was 555.647 µm (95% CI: 397.014 – 714.280, P = 0.000)
  - Month 1: Pooled mean CMT was 299.305 µm (95% CI: 273.710 – 324.900, P = 0.000)
  - Month 3: Pooled mean CMT was 315.794 µm (95% CI: 266.960 – 364.629, P = 0.000)
- BCVA consistently improved across time points (**Figure 2**):
  - Baseline: 0.774 (P = 0.000)
  - Month 1: 0.540 (P = 0.000)
  - Month 3: 0.521 (P = 0.000)
- Intraocular Pressure (IOP) exhibited a significant reduction **(Figure 3)**:
  - Baseline: 13.575 mmHg (P = 0.000)
  - Month 1: 13.946 mmHg (P = 0.000)
  - Month 3: 13.726 mmHg (P = 0.000)

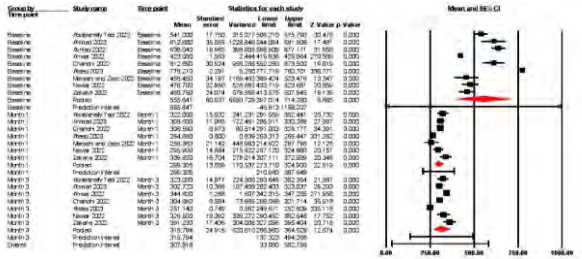

Figure 1: Forest plot of the pooled estimate of the mean of Central Macular Thickness (CMT) in Diabetic Macular Edema (DME) Patients Receiving Suprachoroidal Triamcinolone Acetonide (SCTA).

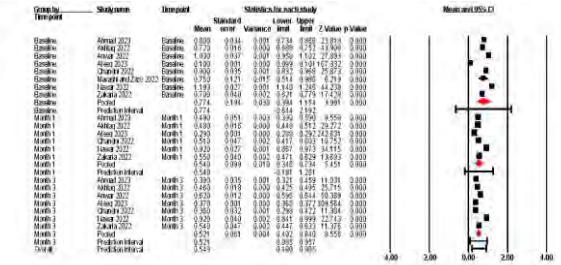

Figure 2: Forest plot of the pooled estimate of the mean of Best Corrected Visual Acuity (BCVA) in Diabetic Macular Edema (DME) Patients Receiving Suprachoroidal Triamcinolone Acetonide (SCTA).

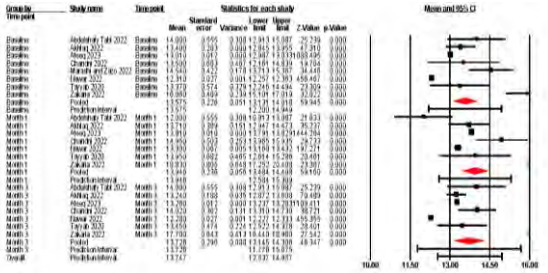

Figure 3: Forest plot of the pooled estimate of the mean of Intraocular Pressure (IOP) in Diabetic Macular Edema (DME) Patients Receiving Suprachoroidal Triamcinolone Acetonide (SCTA).

CONCLUSION

Suprachoroidal Triamcinolone Acetonide intervention in DME patients demonstrated significant improvements in CMT, BCVA and IOP. These findings suggest that SCTA is an effective treatment option for DME patients, offering favorable clinical outcomes in terms of both structural and visual parameters.

REFERENCES

CONTACT INFORMATION

Efficacy, Durability, and Safety of Faricimab in Diabetic Macular Edema (DME): 1-Year Results From China Subpopulation of Phase 3 RHINE Trial

COS 2024

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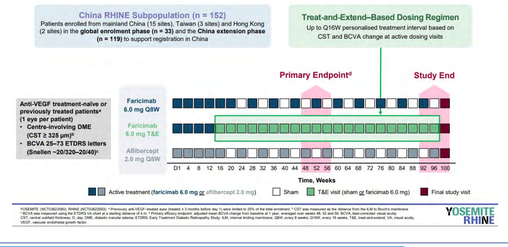
INTRODUCTION

- The global RHINE trial demonstrated that dual angiopoietin-2/vascular endothelial growth factor (VEGF)-A pathway inhibition with faricimab provides durable efficacy beyond current anti-VEGF therapies for DME[1].
- The China RHINE subpopulation included patients from mainland China, Hong Kong and Taiwan enrolled during the global (33 patients) and China extension phases (119 patients).

YOSEMITE and RHINE Trial Design



AIM

The China subpopulation analysis of the RHINE trial was undertaken to compare the efficacy, durability, and safety of faricimab in patients with DME from mainland China, Hong Kong, and Taiwan versus the global population.

METHOD

- The RHINE trial (NCT03622593) was a randomized, double-masked, active comparator–controlled, phase 3 trial of intravitreal faricimab in treatment-naïve and previously anti-VEGF–treated patients with center-involving DME.
- Patients were randomized 1:1:1 to faricimab 6.0 mg every 8 weeks (Q8W) after 6 initial doses every 4 weeks (Q4W); faricimab 6.0 mg per personalized treat-and-extend-based regimen (T&E) after 4 initial Q4W doses; or aflibercept 2.0 mg Q8W after 5 initial Q4W doses. The T&E regimen (Q4W up to every 16 weeks [Q16W]) used prespecified best-corrected visual acuity (BCVA) / central subfield thickness (CST) criteria to adjust dosing.
- The primary efficacy endpoint was BCVA change from baseline at 1 year, averaged over weeks 48/52/56. Other efficacy and safety endpoints assessed through week 56 are reported.

Presented at the Canadian Ophthalmological Society Meeting May 30th – June 2nd, 2024

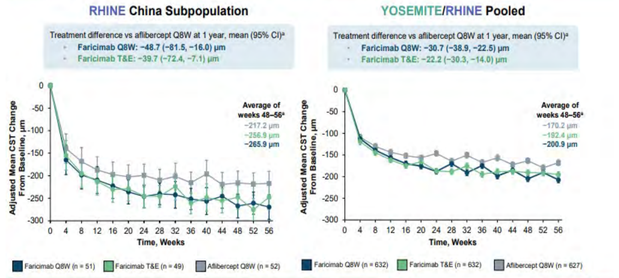
RESULTS

Baseline Patient Characteristics Were Generally Well Balanced Across Arms in the China Subpopulation; Generally Consistent With the Global Population

Characteristic	RHINE China Subpopulation			YOSEMITE/RHINE Pooled		
	Faricimab Q8W n = 51	Faricimab T&E n = 49	Aflibercept Q8W n = 52	Faricimab Q8W n = 632	Faricimab T&E n = 632	Aflibercept Q8W n = 627
Age, years, mean [SD][a]	56.1 [9.5]	57.7 [9.5]	62.1 [8.8]	62.1 [9.8]	62.2 [10.1]	62.3 [9.8]
Female, n (%)	21 (41.2)	24 (49.0)	21 (40.4)	251 (39.7)	236 (37.3)	263 (41.9)
BCVA, ETDRS letters, mean [SD]	59.0 [12.7]	57.7 [13.1]	57.8 [11.1]	61.9 [10.0]	62.2 [9.8]	62.1 [9.5]
CST, µm, mean [SD][b]	493.0 [132.9]	518.8 [155.8]	550.7 [148.1]	479.2 [128.4]	478.5 [129.0]	480.9 [130.2]
Previously anti-VEGF treated, n (%)	6 (11.8)	5 (10.2)	6 (11.5)	140 (22.2)	132 (20.9)	137 (21.9)
Baseline DR severity status, n (%)						
DR questionable, mild to moderate NPDR (ETDRS-DRSS level 14, 15, 20, 35, 43)	18 (35.3)	18 (36.7)	27 (51.9)	357 (56.5)	365 (57.8)	362 (57.7)
Moderately severe and severe NPDR (ETDRS-DRSS level 47, 53)	21 (41.2)	22 (44.9)	20 (38.5)	222 (35.1)	198 (31.3)	208 (33.2)
PDR (ETDRS-DRSS level 61, 65, 71/75)	10 (19.6)	7 (14.3)	4 (7.7)	42 (6.6)	58 (9.2)	38 (6.1)
Cannot grade (ETDRS-DRSS level 90)	2 (3.9)	2 (4.1)	1 (1.9)	6 (0.9)	10 (1.6)	12 (1.9)

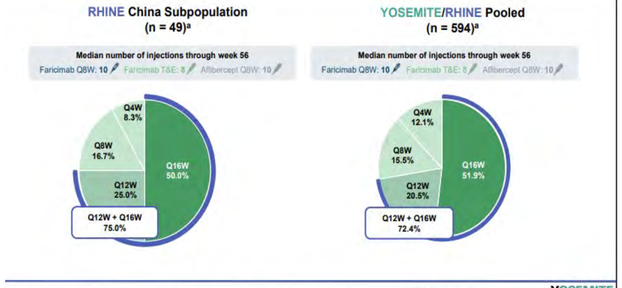
Results are presented for the ITT population. [a]Age at randomization. [b]CST was measured as the distance from the ILM to Bruch's membrane.
BCVA, best-corrected visual acuity; CST, central subfield thickness; DR, diabetic retinopathy; DRSS, Diabetic Retinopathy Severity Scale; ETDRS, Early Treatment Diabetic Retinopathy Study; ILM, internal limiting membrane; ITT, intent-to-treat; NPDR, non-proliferative diabetic retinopathy; PDR, proliferative diabetic retinopathy; Q8W, every 8 weeks; SD, standard deviation; T&E, treat-and-extend; VEGF, vascular endothelial growth factor.

Numerically Greater CST Reductions Were Achieved With Faricimab in the China Subpopulation; Consistent With the Global Population



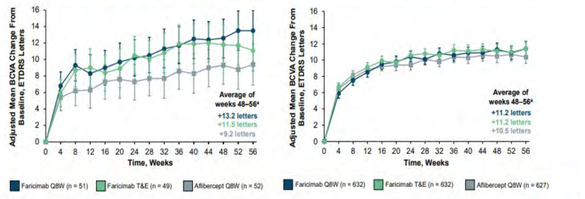
[a]Adjusted mean change from baseline at 1 year, averaged over weeks 48, 52 and 56. Results are based on a mixed model for repeated measures analysis, adjusted for treatment group, visit, visit-by-treatment group interaction, baseline CST (continuous), baseline BCVA score (< 64 letters vs. ≥ 64 letters), prior intravitreal anti-VEGF therapy (yes vs. no), region (United States and Canada, Asia and rest of the world; applicable to YOSEMITE/RHINE pooled data) and study (YOSEMITE vs RHINE; applicable to YOSEMITE/RHINE pooled data). 95% CI error bars are shown. BCVA, best-corrected visual acuity; CI, confidence interval; CST, central subfield thickness; Q8W, every 8 weeks; T&E, treat-and-extend; VEGF, vascular endothelial growth factor.

75% of Patients Achieved Extended Dosing With Faricimab at Week 52 in the China Subpopulation; Consistent With the Global Population



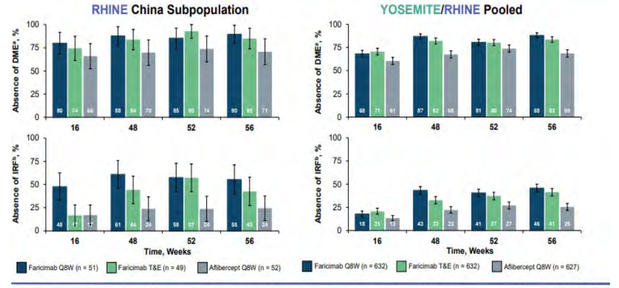
Q4W, every 4 weeks; Q8W, every 8 weeks; Q12W, every 12 weeks; Q16W, every 16 weeks; T&E, treat-and-extend. [a]Analyses included patients in the faricimab T&E arms who had not discontinued the study at the week 52 visit.

Robust Vision Gains Were Achieved With Faricimab in the China Subpopulation; Consistent With the Global Population



[a]Adjusted mean change from baseline at 1 year, averaged over weeks 48, 52 and 56. Results are based on a mixed model for repeated measures analysis, adjusted for treatment group, visit, visit-by-treatment group interaction, baseline BCVA (continuous), baseline BCVA (< 64 letters vs. ≥ 64 letters), prior intravitreal anti-VEGF therapy (yes vs. no), region (United States and Canada, Asia and rest of the world; applicable to YOSEMITE/RHINE pooled data) and study (YOSEMITE vs RHINE; applicable to YOSEMITE/RHINE pooled data). 95% CI error bars are shown. BCVA, best-corrected visual acuity; CI, confidence interval; ETDRS, Early Treatment Diabetic Retinopathy Study; Q8W, every 8 weeks; T&E, treat-and-extend; VEGF, vascular endothelial growth factor.

More Faricimab-Treated Patients Achieved Absence of DME and IRF in the China Subpopulation; Consistent With the Global Population



Unstratified results were presented for the China subpopulation and stratified results using the CMH weights were presented for the pooled population. [a]Absence of DME was defined as CST < 325 µm, measured as the distance from the ILM to Bruch's membrane. [b]IRF was measured in the central 1-mm diameter of the ETDRS grid. Estimates of 95% CI below 0% or above 100% are imputed as 0% or 100%, respectively. No formal statistical testing is planned for China subpopulation. 95% CI error bars are shown. CI, confidence interval; CMH, Cochran-Mantel-Haenszel; CST, central subfield thickness; DME, diabetic macular edema; ETDRS, Early Treatment Diabetic Retinopathy Study; ILM, internal limiting membrane; IRF, intraretinal fluid; T&E, treat-and-extend; Q8W, every 8 weeks.

Faricimab and Aflibercept Had Comparable Safety Outcomes in the China Subpopulation; Consistent With the Global Population

Selected AEs Through Week 56	RHINE China Subpopulation			YOSEMITE/RHINE Pooled		
	Faricimab Q8W n = 51	Faricimab T&E n = 49	Aflibercept Q8W n = 52	Faricimab Q8W n = 630	Faricimab T&E n = 632	Aflibercept Q8W n = 625
Total number of AEs[a]	166	148	181	2169	1891	1852
Total number of SAEs[a]	17	13	17	272	193	191
Patients with any ocular AE, n (%)[b]	19 (37.3)	21 (42.9)	21 (40.4)	235 (37.3)	225 (35.6)	215 (34.4)
Patients with any ocular SAE, n (%)[b]	2 (3.9)	3 (6.1)	2 (3.8)	15 (2.4)	19 (3.0)	8 (1.3)
Patients with any ocular AE of special interest, n (%)[b,c]	2 (3.9)	3 (6.1)	2 (3.8)	15 (2.4)	17 (2.7)	6 (1.0)
Patients with any IOI event, n (%)[b,d]	2 (3.9)	0	0	8 (1.3)	9 (1.4)	4 (0.6)
Patients with any endophthalmitis event, n (%)[b]	0	0	0	2 (0.3)	2 (0.3)	1 (0.2)
Patients with any retinal vasculitis event, n (%)[b]	0	0	0	0	0	0
Patients with any retinal occlusive event, n (%)[b]	0	0	0	1 (0.2)	2 (0.3)	2 (0.3)

Results are presented for the safety-evaluable population. [a]Total number of AEs and SAEs includes non-ocular events and ocular events in the study or fellow eye. [b]Events in the study eye only are presented in all safety outputs. [c]Ocular AEs of special interest were defined as events associated with severe IOI, events requiring surgical or medical intervention to prevent permanent loss of sight, or events that cause a visual acuity loss of ≥ 30 letters for > 1 hour. [d]Included little and zeidler, all moderate in severity.
AE, adverse event; IOI, intraocular inflammation; Q8W, every 8 weeks; SAE, serious adverse event; T&E, treat-and-extend.

CONCLUSION

Faricimab in the RHINE China subpopulation demonstrated:

- Robust vision gains
- Greater CST reductions vs aflibercept
- Reduced DME and IRF in more patients vs aflibercept

- 75% of T&E patients achieved ≥ Q12W dosing
- Comparable efficacy between faricimab T&E and aflibercept with fewer injections

- Comparable safety profile to aflibercept

The efficacy and safety findings were generally consistent with those of the global population

DISCLOSURES

Financial Disclosures

- WCL: Consultant: Alcon, Bayer Healthcare, Roche, Apellis, Novartis
- XS: Consultant: Alcon, Allergan, Bayer Healthcare, Carl Zeiss Meditec, Inc., Innovent Biologics, Inc., Kanghong Biotech Inc., Novartis, Roche
- XL, QJ, XL: None
- OI, YT, JW: Employee: Genentech, Inc.
- RL, WL, LZ: Employee: Roche China
- AK: Employee: Roche Products Ltd.

Study and Product Disclosures

- Faricimab is approved for the treatment of retinal vein occlusion in the USA, and neovascular age-related macular degeneration and diabetic macular edema in multiple countries worldwide. Faricimab is not currently approved for use outside these indications.
- This study includes research conducted on human subjects.
- Institutional Review Board approval was obtained prior to study initiation.
- Funding was provided by F. Hoffmann-La Roche Ltd. for the study and third-party writing assistance, which was provided by Trishan Gajanand, PhD, of Envision Pharma Group

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Evaluation of Pars Plana Vitrectomy with and without Supplemental Scleral Buckle for the Repair of Rhegmatogenous Detachment due to Inferior Retinal Breaks: A Systematic Review

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Introduction

- Pars plana vitrectomy (PPV) is effective for treatment of rhegmatogenous retinal detachment (RRD) secondary to inferior retinal breaks (IRBs)
- The use of a supplemental 360° encircling scleral buckle (SB) band supports the vitreous base and may improve the success of vitrectomy surgery
- **Here, we perform a systematic review of the literature to assess the efficacy of scleral buckle (SB) with PPV, compared to PPV alone in eyes with RRD due to IRB**

Methods

- MEDLINE, Cochrane Library, and EMBASE were systematically searched from 2000-2022
- Inclusion criteria: randomized clinical trials (RCTs) and observational studies comparing PPV versus PPV/ SB for patients with RRD secondary to IRB
- Primary outcome: final BCVA (logMAR)
- Secondary outcomes: single surgery anatomic success (SSAS), final anatomic success (FAS), and complications
- Results were reported using descriptive statistics

Results

- Four studies collectively examining 696 eyes were included in this review
- Three studies demonstrated that there was no significant difference between PPV and PPV/SB for final BCVA
- One study reported better BCVA with added SB
- When stratifying by lens status, SSAS with PPV/SB was greater relative to PPV in phakic eyes, while there was no difference between surgical approaches in pseudophakic eyes **(p=0.046)**

Conclusions

- **Across a limited set of studies, PPV and PPV/SB were associated with similar functional outcomes and risk profile**
- There were no significant differences in the risk of complications between treatment groups.
- **SSAS may be improved with PPV/ SB in phakic eyes with RRD due to IRB**

Disclosures

MMP: Financial support (to institution) – PSI Foundation, Fighting Blindness Canada. PJK: Advisory board – Novartis, Alcon, Bayer, Roche, Novelty Nobility; Financial support (to institution) – Bayer, Roche, Novartis; Financial support – Novartis, Bayer; Equity owner – ArcticDx. RHM: Advisory board- Bayer, Novartis, Allergan, Roche; Financial Support (to institution)- Bayer, Novartis

Ophthalmology & Vision Sciences
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Evaluation of the Diagnosys ColorFlash Device

COS 2024

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The Ottawa Hospital Vision Research Centre

INTRODUCTION

- The ColorFlash is a new stimulator for full-field ERG testing.
- Compared to the standard of care, the ColorDome, it can be used handheld as well as in a tabletop stand, making it ideal for pediatric patients, patients in wheelchairs, and operating room testing.

ColorDome *ColorFlash*

AIMS

- The objectives of phase 1 of this study were to perform ERG testing using the ColorFlash on control subjects and build a normative database of findings and to evaluate the effect of dilation on the ColorFlash.
- The objectives of phase 2 are to perform ERG testing using the ColorFlash on patients with a range of diseases affecting visual function and to evaluate the reliability of the ColorFlash in comparison to the standard of care, the ColorDome.

METHODS

- The inclusion criteria for the control group were BCVA of 20/25 or better and a normal dilated eye exam.
- The inclusion criteria for the patient group was a pre-existing ocular disorder.
- Exclusion criteria included poor compliance with the standard of care ERG testing protocol and previous intraocular surgery in the last 6 months.
- In phase 1, the control group underwent testing with the ColorFlash before and after dilation and the ColorDome after dilation. Outcomes were component amplitudes and implicit times. Eyes were analyzed independently.
- In phase 2, the patient group will undergo testing with the ColorFlash and the ColorDome after dilation. The sensitivity and specificity of the ColorFlash will be calculated and compared to the ColorDome.

RESULTS

- In phase 1, 38 control patients (78 eyes) were included. Patients were predominantly female (66%) with a mean age of 27.8 years (Table 1).

Table 1: Control Group Characteristics (n = 38 patients, 76 eyes)

Gender, n (%)		
Female	25	(66)
Male	13	(34)
Age, mean years (SD)	27.8	(8.4)

- Normative ranges for dilated ColorFlash testing were calculated (Table 2 and Table 3).
- In Figure 1, normative ranges are superimposed on a sample waveform illustrating their importance for interpreting ColorFlash testing.

Table 2: Normative Data for Light Adapted Protocols

Name	Amplitude (uV)	Implicit Time (ms)
Light-adapted 3.0 ERG (n = 76 eyes)		
A-wave	-26.95 +/- 9.56	13.93 +/- 0.94
B-wave	93.01 +/- 31.54	29.46 +/- 1.42
Light-adapted 30 Hz Flicker ERG (n = 76 eyes)		
Trough		13.23 +/- 3.36
Peak	79.85 +/- 25.85	25.77 +/- 1.29

Table 3: Normative Data for Dark Adapted Protocols

Name	Amplitude (uV)	Implicit Time (ms)
Dark-adapted 0.01 ERG (n = 72 eyes)		
A-wave	-13.46 +/- 25.02	37.93 +/- 6.25
B-wave	149.46 +/- 52.85	86.04 +/- 10.14
Dark-adapted 3.0 ERG (n = 66 eyes)		
A-wave	-140.19 +/- 48.55	16.02 +/- 2.80
B-wave	280.07 +/- 96.37	49.86 +/- 4.59
Dark-adapted 10 ERG (n = 66 eyes)		
A-wave	-158.97 +/- 49.37	12.80 +/- 2.52
B-wave	287.01 +/- 98.10	47.02 +/- 8.86

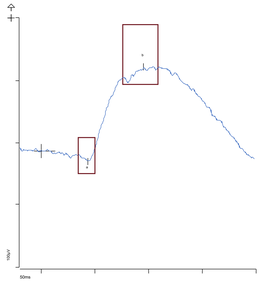
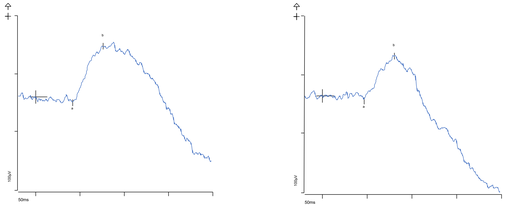


Figure 1: Patient 01 OS ColorFlash Dark-adapted 0.01 ERG with Superimposed Normative Ranges

- In general, waveform amplitudes were smaller and implicit times longer for undilated compared to dilated testing. The comparison for Dark-Adapted 0.01 ERG testing is shown in Table 4.
- In Figure 2, the differences between dilated and undilated testing are illustrated in sample waveforms.

Table 4: Dilated vs. Undilated for Dark-Adapted 0.01 ERG

		Dilated		Undilated			
	N	Mean	SD	Mean	SD	MD	P-Value
A-wave amplitude (uV)	68	-13.40	25.09	-12.58	25.99	-0.82	0.82
A-wave implicit time (ms)	68	37.83	6.33	43.84	6.05	-6.01	**0.00**
B-wave amplitude (uV)	68	149.95	53.20	127.63	59.04	22.33	**0.00**
B-wave implicit time (ms)	68	85.34	9.13	90.19	10.15	-4.83	**0.00**



Dilated *Undilated*

Figure 2: Patient 02 OD ColorFlash Dark-adapted 0.01 ERG

CONCLUSIONS

- The normative database generated by this study will allow for the interpretation of future ColorFlash results.
- Undilated testing is unreliable when interpreted using dilated normative data.
- Establishing undilated normative data would expand the utility of the ColorFlash.

FUTURE DIRECTIONS

- In phase 2, ERG testing using the ColorFlash will be performed on patients with a range of diseases affecting visual function and the reliability of the ColorFlash in comparison to the standard of care, the ColorDome will be evaluated.
- Recruitment is currently underway.

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Faricimab Reduces Macular Leakage vs Aflibercept in Patients with DME

COS 2024

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INTRODUCTION

- Increased vascular permeability is a hallmark feature of diabetic macular edema (DME).
  - In the RUBY study[1]:
    - Reduction in macular leakage correlated with improved anatomical outcomes.
    - Reduction in macular leakage area correlated with vision improvements (0.7-letter increase for every 1mm^2 decrease in macular leakage area)
  - In the PANAROMA study[2]: increased macular leakage area was associated with increased risk of developing centre-involving DME[2]
- Increasing the dosage of anti-VEGF (aflibercept) up to 4x in the PHOTON study did not further decrease macular leakage area[3].
- In preclinical mouse models, dual angiopoietin-2 (Ang-2)/vascular endothelial growth factor A (VEGF-A) inhibition was associated with greater vascular leakage reductions versus Ang-2 or VEGF-A inhibition alone, suggesting synergistic actions of Ang-2 and VEGF-A.[4]

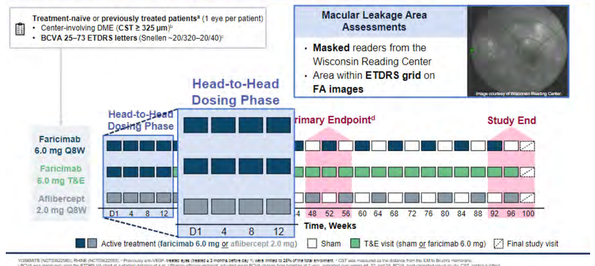
AIM

This analysis evaluated if dual Ang-2/VEGF-A inhibition with faricimab improves macular leakage over VEGF-A inhibition alone with aflibercept in patients with DME.

METHOD

YOSEMITE (NCT03622580) and RHINE (NCT03622593) were identical trials evaluating the efficacy and safety of 6.0-mg faricimab versus 2.0-mg aflibercept in patients with center-involving DME. Patients were randomized 1:1:1 to faricimab every 8 weeks (Q8W), faricimab according to a personalized treat-and-extend–based regimen (T&E), or aflibercept Q8W. This analysis included data from the first 16 weeks of the trials (matched dosing phase) in which all patients received assigned study drug Q4W. The faricimab Q8W and T&E arms were pooled as they received the same dosing regimen during this period. Outcomes included macular leakage area and the proportion of patients with minimal to no macular leakage (0–1 mm^2).

Macular Leakage Was Evaluated During the Matched Head-to-Head Dosing Phase of YOSEMITE/RHINE

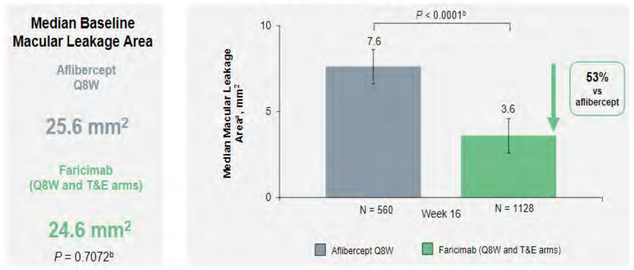


Presented at the Canadian Ophthalmological Society Meeting May 30th – June 2nd, 2024

RESULTS

Greater Reduction in Macular Leakage Area, a Biomarker of Vascular Stability, With Faricimab vs Aflibercept in the Head-to-Head Dosing Phase

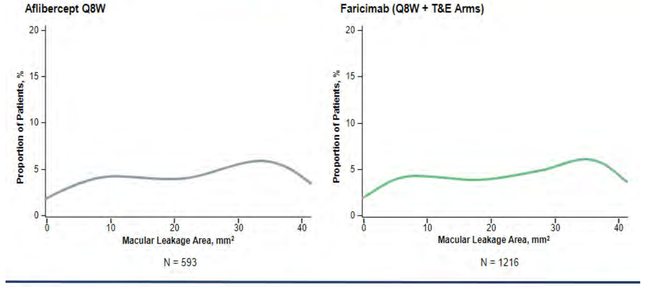
YOSEMITE/RHINE Pooled: Post Hoc Analysis



Population: patients with available macular leakage data at baseline or Week 16 according to the timeperiod of the analysis.
[a]Macular leakage area determined by fluorescein angiography. [b]The P value from Wilcoxon 2-sample rank test is nominal and not adjusted for multiplicity; no formal statistical conclusion should be made based on the P values. 95% CIs are shown.
CI, confidence interval; Q8W, every 8 weeks; T&E, treat-and-extend.

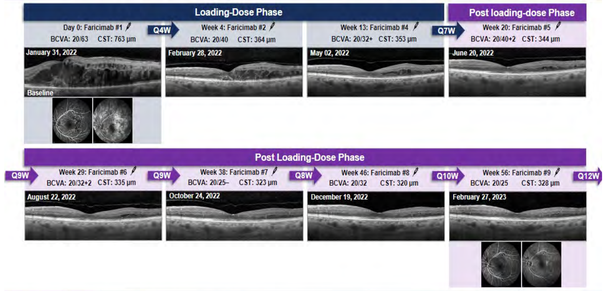
Distribution of Macular Leakage Area at Baseline

YOSEMITE/RHINE Pooled: Post Hoc Analysis



Population: patients with available macular leakage data at baseline.
Curves represent kernel density estimation of macular leakage area (mm²) determined by fluorescein angiography. Q8W, every 8 weeks; T&E, treat-and-extend.

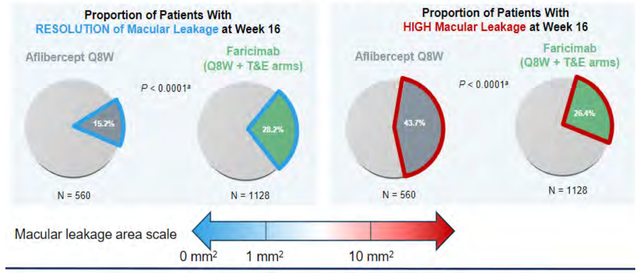
Real World Case: Faricimab Resolved Leakage and Fluid in Treatment-Naïve Patient With DME



Case provided by Dr David Eichenbaum, Retina Vitreous Associates of Florida, St. Petersburg, Florida. No serious ocular adverse drug reactions were observed/reported in the treated eye.
BCVA, best-corrected visual acuity; CST, central subfield thickness; DME, diabetic macular edema; Q8W, every 8 weeks; Q7W, every 7 weeks; Q9W, every 9 weeks; Q8W, every 8 weeks; Q10W, every 10 weeks; Q12W, every 12 weeks.

More Patients Treated With Faricimab vs Aflibercept Achieved Resolution of Macular Leakage After Head-to-Head Dosing Phase

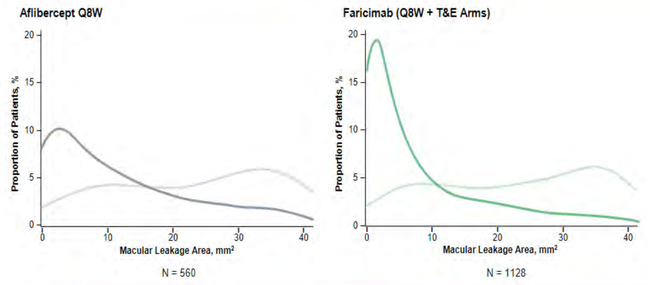
YOSEMITE/RHINE Pooled: Post Hoc Analysis



Population: patients with available macular leakage data at week 16. Proportion of patients with macular leakage ≤ 1 mm^2 at baseline: aflibercept Q2W 2.9%, faricimab Q2W and T&E arms 1.2%. Proportion of patients with macular leakage ≥ 10 mm^2 at baseline: aflibercept Q8W 69.4%, faricimab Q8W and T&E arms 78.3%. The proportion estimates were weighted using CMH method stratified by baseline BCVA score (< 64 letters vs ≥ 64 letters), prior intravitreal anti-VEGF therapy (yes vs no), region (US and Canada vs the rest of the world), and study (RHINE/RHI vs YOSEMITE/YOS). [a]The P value in 0.0001 from CMH test is nominal and not adjusted for multiplicity; no formal statistical conclusion should be made based on the P values. N values: faricimab N = 1216 at day 1, N = 1128 at week 16; aflibercept N = 563 on day 1, N = 560 at week 16. CMH, Cochran-Mantel-Haenszel; Q8W, every 8 weeks; T&E, treat-and-extend.

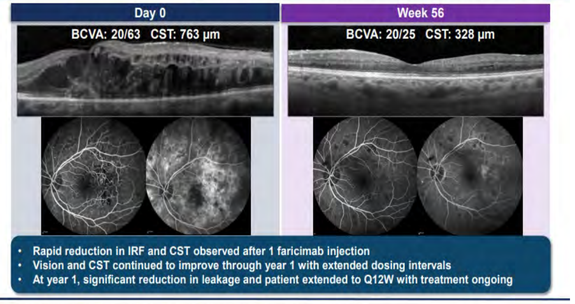
Distribution of Macular Leakage Area at Week 16

YOSEMITE/RHINE Pooled: Post Hoc Analysis



Population: patients with available macular leakage data at baseline (light lines) and week 16 (dark lines).
Curves represent kernel density estimation of macular leakage area (mm²) determined by fluorescein angiography. Q8W, every 8 weeks; T&E, treat-and-extend.

Real World Case: Faricimab Resolved Leakage and Fluid in Treatment-Naïve Patient With DME



Case provided by Dr David Eichenbaum, Retina Vitreous Associates of Florida, St. Petersburg, Florida. No serious ocular adverse drug reactions were observed/reported in the treated eye.
BCVA, best-corrected visual acuity; CST, central subfield thickness; DME, diabetic macular edema; IRF, intraretinal fluid; Q12W, every 12 weeks.

CONCLUSION

- In patients with DME, dual Ang-2/VEGF-A inhibition with faricimab resulted in a greater reduction in macular leakage and a larger proportion of patients achieving minimal to no leakage versus aflibercept.
- These findings suggest that dual Ang-2/VEGF inhibition provides greater vascular stability, which may contribute to the faster fluid resolution and extended durability observed with faricimab versus aflibercept in YOSEMITE/RHINE.

DISCLOSURES

Financial Disclosures:
NC: Consultant: Optos,Topcon, Hoffman La Roche, Bayer, AbbVue, Apellis, Alcon Laboratories, Bausch & Lomb, Viatris, Biogen, Johnson & Johnson Vision, Novartis, Regenxbio.
AK: Consultant: Alimera Sciences, Allergen (AbbVie), Biogen, Genentech (Roche), Iveric Bio, Regeneron
DE: Consultant: Alimera, Allergan, Apellis, Bausch + Lomb, Coherus, Crinetics, DORC, EyePoint, Genentech, Inc., Gyroscope, Iveric Bio, KKR, Kodiak, Novartis, Opthea, Outlook, RecensMedical, Regeneron, Regenxbio, ReVive, US Retina, Vial; Financial Support: 4DMT, Alkahest, Allgenesis, Annexon, AsclepiX, Bayer, Chengdu, EyePoint, Gemini, Genentech, Inc., Gyroscope, Ionis, Iveric Bio, Kodiak, Mylan, NGM Biopharmaceuticals, Novartis, Ocular Therapeutix, Opthea, RecensMedical, Regeneron, Regenxbio, Unity; Nonremunerative: Allergan, Apellis, Bayer, DORC, EyePoint, Genentech, Inc., Iveric Bio, Kodiak; Owner: Network Eye; Personal Financial Interest: Boston Image Reading Center, Clearside, Hemera, Network Eye, US Retina
SS: Funding/fees from AbbVie, Apellis, Bayer, Biogen, Boehringer Ingelheim, EyeBiotech, Novartis, Optos, Roche EN: Consultant: Allergan/AbbVie, Alcon, EyeBio, Genentech, Inc.
KC: Consultant: AbbVie, Adverum, Annexon, Cognition Therapeutics, Endogena, EyeBio, Genentech, Inc./Roche, Gyroscope, Heidelberg Engineering, Johnson & Johnson, Merck, NGM Bio, Novartis Pharma AG, Ocular Therapeutix, ReNeuron, Retrotope, Ribomic; (F) Alexion, Annexon, Boehringer Ingelheim, Genentech, Inc., Gyroscope, Iveric Bio, NGM Bio
RG: Consultant: Allergan, Apellis, Carl Zeiss Meditec, Genentech, Inc., Regeneron; Grant Support: Aerie, Apellis, Boehringer Ingelheim, Carl Zeiss Meditec, Genentech, Inc., Graybug, Novo Nordisk, Ocuphire, Unity; Speaker: Allergan, Genentech, Inc.; Stockholder: Emmetrope Ophthalmics AC, ZH, MA, FM: Employee: Genentech, Inc.
Y(E)S: Employee: Genentech, Inc. at time of study
TW: Employee: Roche

Study and Product Disclosures
Faricimab is approved for the treatment of neovascular age-related macular degeneration and diabetic macular edema in multiple countries worldwide and is not currently approved for use outside these indications
This study includes research conducted on human subjects
Institutional Review Board approval was obtained prior to study initiation
Funding was provided by F. Hoffmann-La Roche Ltd. for the study and third-party writing assistance, which was provided by Sophie Albon of Envision Pharma Group

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Fibrosis Characterization and Prevention in nAMD: Identification of Subretinal Triggers, Cell Types Responsible and Inhibitors Using Improved Tools

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[1]The University of Western Ontario, [2]Roche Pharma Research and Early Development, Roche Innovation Center, F. Hoffman-La Roche AG, Basel, Basel-Stadt, Switzerland, [3] Trinity College Dublin, The University of Dublin, Dublin, Ireland

COS 2024

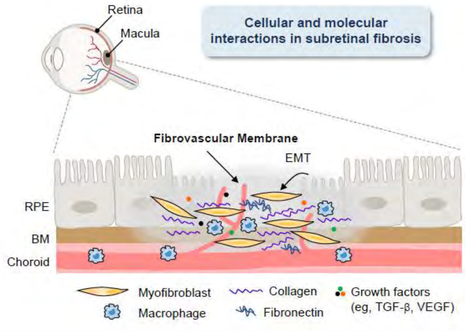
INTRODUCTION

Fibrosis: excessive deposition of ECM components (e.g. collagen, fibronectin), within and around damaged tissues.[1]

RPE dysfunction contributes to fibrosis in the retina[2-3]

Subretinal fibrosis causes irreversible vision loss in patients with nAMD; however, the pathogenesis of fibrosis in nAMD remains poorly defined.[4]

- Therefore, **a clinical need exists for novel tools to monitor subretinal fibrosis-related changes in nAMD**



AIM

Purpose: Subretinal fibrosis causes irreversible vision loss in nAMD patients. The pathogenesis of fibrosis in nAMD remains poorly defined; we aimed to characterize the fibrosis using in vivo mouse models, human model systems and patient samples.

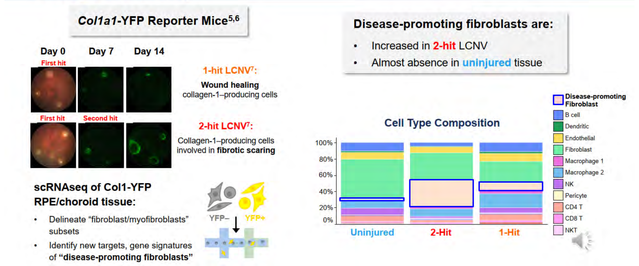
METHOD

- Inducers/inhibitors of epithelial-mesenchymal transition (EMT) were identified in a 2D high-throughput screening (HTS) assay in primary human RPE monolayers; primary human RPE spheroids were treated with fibrosis inducers/inhibitors identified in the HTS, and cytoskeleton remodeling and EMT were assessed.
- Active fibrotic lesions were imaged in vivo with fluorophore-labelled CHPs in LCNV mice.
- The antifibrotic effects of a bispecific anti-Ang-2/VEGF-A antibody were evaluated using in vivo CHP imaging in 42-day-old JR5558 mice and by assessing yellow fluorescent protein (YFP) expression in 2-hit LCNV Col-YFP reporter mice.
- To delineate subsets of collagen-producing fibroblasts, YFP+ cells were sorted from RPE/choroid of LCNV Col-YFP mice and analyzed by single-cell RNA-sequencing (scRNAseq).
- Collagen was imaged with CHPs and second-harmonic generation (SHG) microscopy in human nAMD patient tissue and LCNV mice.
- Examining spatial profiling of 21 fibrosis-associated markers on nAMD patient samples is ongoing.

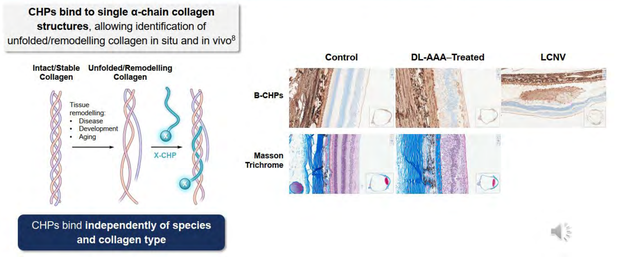
Presented at the Canadian Ophthalmological Society Meeting May 30th – June 2nd, 2024

RESULTS

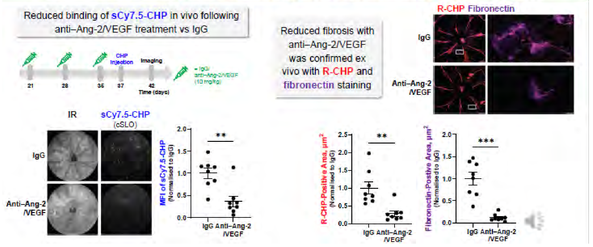
Collagen-Producing Cell Atlas in LCNV RPE/Choroid Tissue Using scRNAseq



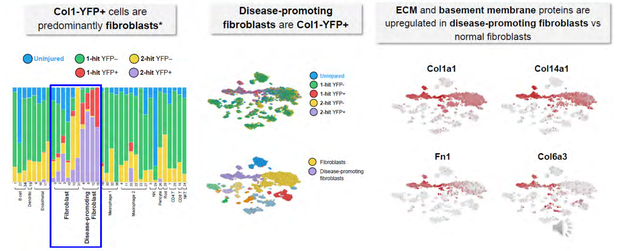
CHPs Allowed In Situ Detection of Increased Collagen Remodelling in DL-AAA–Treated and LCNV African Green Monkey Retinas



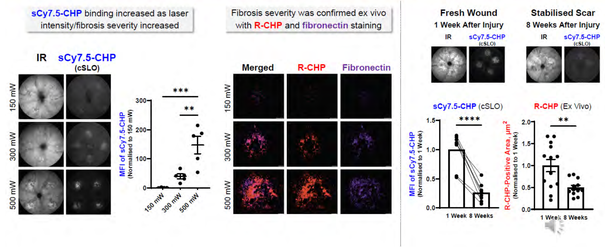
sCy7.5-CHPs Enabled Monitoring of Reduced Fibrosis Following Treatment With a Bispecific Anti–Ang-2/VEGF-A Antibody in JR5558 Mice



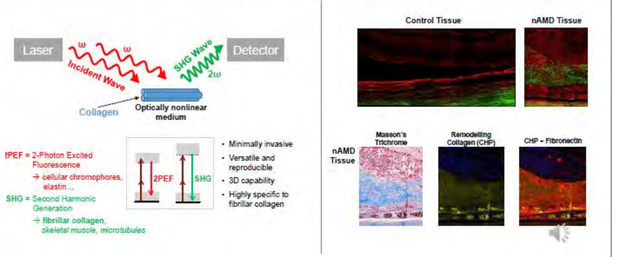
Disease-Promoting Fibroblasts are Col1-YFP+ and Show Upregulated ECM and Basement Membrane Protein Expression



In Murine LCNV, sCy7.5-CHP In Vivo Staining Correlated With Fibrosis Severity and Was Reduced in Stabilised vs Fresh Wounds



SHG Microscopy Demonstrated Collagen Scars and Fibrovascular Tissue in Patients With nAMD

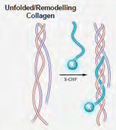


CONCLUSION

Collagen-Producing Cell Atlas in LCNV *Col1a1*-YFP Reporter Mice

- Fibroblasts were identified as key collagen producers:
  - scRNAseq revealed an increase in disease-promoting fibroblasts in 2-hit model
  - Col1-YFP+ cells are predominantly fibroblasts
  - Higher expression of ECM and basement membrane proteins in disease-promoting vs normal fibroblasts

Visualisation of Collagen Remodelling With CHPs



- CHPs detected increased collagen remodelling in NHPs, LCNV mice and nAMD patient tissue
- In JR5558 mice, in vivo CHP staining demonstrated the anti-fibrotic effects of dual Ang-2/VEGF inhibition

Together, these tools have the potential to:

1. Identify subretinal fibrosis triggers
2. Support the clinical development of nAMD therapies that prevent fibrosis by targeting pathways beyond VEGF alone

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DISCLOSURES

Financial Disclosures

- BH, Consult/Ad board Member/Paid speaking engagements for: Allergan, Novartis, Alcon Canada, Bayer, Bausch and Lomb Canada, Hoffmann-La Roche, Biogen
- PW, CR: Employee: F. Hoffman-La Roche Ltd.
- EO: Employee: F. Hoffmann-La Roche Ltd.; Former Employee: Trinity College Dublin
- SD: Consultant: F. Hoffmann-La Roche Ltd.; Employee: Trinity College Dublin

Study and Produce Disclosures

- Faricimab is approved for the treatment of neovascular age-related macular degeneration and diabetic macular edema in multiple countries worldwide and is not currently approved for use outside these indications
- Institutional Review Board approval was obtained prior to study initiation
- Animal experiments were approved and conducted in strict adherence to the Swiss federal ordinance on animal protection and welfare (reference BS-2734), as well as according to the rules of the Association for Research in Vision and Ophthalmology Statement for the Use of Animals in Ophthalmic and Vision Research guidelines, European Directive 86/609/EEC, and the Roche Ethics Committee on Animal Welfare
- Funding was provided by F. Hoffmann-La Roche Ltd. for the study and third-party writing assistance, which was provided by Ellen M. Ross, PhD, of Envision Pharma Group

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- Alan Proia and Eleonora Lad (Duke University, Durham, NC, US

Four-point Scleral-Fixation of Hydrophilic Acrylic (Akreos® AO60) Lenses in Vitrectomized Eyes: A Retrospective Analysis of Outcomes and Complications with Emphasis on Intraocular Lens Opacification

COS 2024

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INTRODUCTION

Over the recent decades, scleral-fixation techniques have continuously evolved, and surgeons have expanded the use of IOLs originally engineered for capsular implantation for off-label indications. (1,2) The Akreos® AO60 IOL (Bausch + Lomb) is a hydrophilic, acrylic, foldable, aspheric IOL that is unique in that each of its four haptics has large eyelets where nonabsorbable monofilament expanded polytetrafluoroethylene (ePTFE) sutures (Gore-tex® CV-8) can be passed, allowing a stable four-point IOL fixation. While multiple authors have reported use of a similar technique (3–8), there is a gap in the knowledge about the complications associated with this approach. This study presents an analysis of complications associated with the lens implantation procedure, placing an emphasis on IOL opacification.

AIM

To evaluate the outcomes and complications associated with four-point scleral-fixation of hydrophilic acrylic intraocular lenses (Akreos® AO60) in vitrectomized eyes.

METHOD

Study Design, Duration, and Population:

- Single-surgeon, retrospective study
- Consecutive eyes that underwent scleral-fixation of the Akreos® AO60 lens using Gore-tex® sutures (Jan 2017 – Dec 2022)
- **Inclusion**: Previously vitrectomized eyes, eyes that underwent vitrectomy on the same sitting as the IOL fixation
- **Exclusion**: Non-vitrectomized eyes, eyes that only underwent limited anterior vitrectomy prior to scleral-fixation of the Akreos® AO60 lens, eyes with an existing Akreos® AO60 implant that required repositioning or refixation
- **Surgical Technique:**

Data Collection:

- age, sex, laterality, past ophthalmic history, surgical indication, pertinent systemic history
- surgical steps, intraoperative findings/complications
- baseline and follow-up (month 1, 3, 12, last visit) best-reported visual acuity (BRVA) & IOP
- type of postoperative complications, timing, management approach, final outcome.

Statistical Analysis:

- descriptive statistics (frequencies), Fisher's exact test (risk factors and outcomes), paired t-test (pre- vs. post-op BRVA)

RESULTS

Baseline Characteristics

- 89 eyes from 86 patients
- mean follow-up duration: 544 days (range: 1-1830 days)

Intraoperative Findings and Complications

- Intraoperative issues in 8 eyes (9.0%)
- Localized choroidal hemorrhage in a 90/F on aspirin and apixaban, recent history of fall
- Retinal breaks in 7 eyes (7.9%), 6 were pseudophakic with dislocated IOLs

Postoperative Complications

- Timing:
  - <2 weeks: 54.5% (most common: vitreous hemorrhage, corneal edema, and ocular hypotony)
  - 2-6 weeks: 12.1%
  - >6 weeks: 33% (most common: IOL opacification, CME, other macular pathologies)
- Management:
  - 70.4% observed/medical management
  - 29.6% procedural intervention
- IOL opacification:
  - 10 eyes (11.2%) of 9 patients
    - 9/10 documented beyond 6 weeks after surgery
  - Management:
    - Majority were observed
    - **IOL exchange was considered in 3 eyes**
  - Associations:
    - **prolonged AC inflammation and/ or reactivation of uveitis after surgery (OR: 14.5, p = 0.05).**
    - **exposure to air or gas exchange during surgery or gas injection in the post-operative period (OR: 12.2, p = 0.006).**
    - no correlation between IOL opacification and pre-existing controlled uveitis, DM, hypertension, and glaucoma

Table 1. Post-operative Complications after Scleral-Fixation of the Akreos AO60 Lens in Vitrectomized Eyes.

Complication	N	%
Vitreous hemorrhage	12	13.48
Corneal edema	11	12.36
Ocular hypotony	10	11.24
IOL opacification	10	11.24
Ocular hypertension	8	8.99
Minor IOL decentration	8	8.99
Cystoid macular edema	8	8.99
Choroidal hemorrhage	7	7.87
Epiretinal membrane/Macular hole	6	6.74
Exposed suture	5	5.62
Hyphema	4	4.49
Retinal detachment	4	4.49
Prolonged anterior chamber inflammation	3	3.37
Conjunctival cyst/granuloma	2	2.25
UGH Syndrome	0	0.00
IOL dislocation	0	0.00
IOL fracture	0	0.00
Endophthalmitis	0	0.00

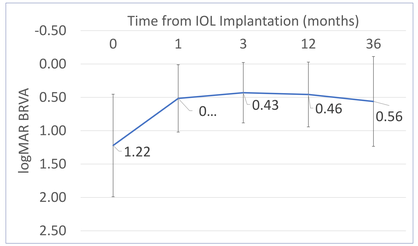

Figure 1. LogMar BRVA versus time (in months) from IOL implantation.

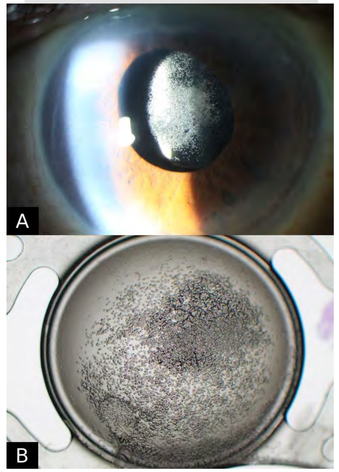

Figure 2. A. Slit lamp photograph of an opacified scleral-fixated Akreos® AO60 lens implant from Case 46. B. Gross microscopic photograph of an explanted IOL from the same eye. The patient underwent SF_6 gas-fluid exchange on the first post-operative day secondary to post-operative hyphema, vitreous hemorrhage, and choroidal hemorrhage. Vitreous and anterior chamber washout with gas exchange was performed a week later due to hemolytic glaucoma.

Table 2. Characteristics of eyes that developed intraocular lens opacification.

Case	Pertinent Past Ocular History	Surgical Indication	Intraop Air/ Gas Exposure	Post-op Air/ Gas Exposure	Other complications	Pre-op BRVA	1 mo Post-op BRVA	Days from IOL Implantation to IOL Opacification	BRVA at the time of opacification	Management	Latest BRVA	Follow-up duration (days)
12	Uveitis, prior Vx	Dislocated IOL	Air	SF6	hypotony, uveitis reactivation, slight decentration, choroidals	20/50	20/50	370	20/50	Observation	20/40	1377
13	Uveitis	Dislocated IOL	-	-	uveitis reactivation	20/50	20/50	503	20/50	Observation	20/40	1510
40	PEX syndrome, prior Vx	Aphakia post-complicated cataract surgery	Air	-	exposed suture, CME	20/100	20/50	279	20/50	Observation	20/50	897
45	RVO, prior Vx	Capsular phimosis	Air	-	none	HM	20/150	398	20/125	Observation	20/150	1576
46	RD, prior Vx	Dislocated IOL	-	SF6 x 2	ocular hypertension, hyphema, VH, choroidal hemorrhage	20/300	HM	728	20/30, blurred	IOL Explant, ACIOL Placement	20/30	1740
48	PEX syndrome	Dislocated IOL	Air	-	none	20/200	20/250	1071	20/50	Observation	20/50	1071
55	PEX syndrome, Wet AMD, prior Vx	UGH syndrome	SF6	-	hypotony	LP	20/150	788	20/300	Observation	20/600	1180
75	PEX syndrome	Dislocated IOL	Air	C3F8	ocular hypertension, RRD	20/200	20/60	261	CF, distorted	Offered IOL Explant (Declined)	CF	568
77	None	Aphakia post-complicated cataract surgery	-	C3F8	choroidals, serous RD, corneal edema	CF	20/40	118	20/30	Observation	20/30	176
86	Recent Ocular Trauma, PEX syndrome, RD	Dislocated IOL (traumatic)	-	C3F8	choroidals, VH, hyphema, ocular hypertension	CF	20/70	217	20/40, blurred	IOL Explant, ACIOL Placement	20/40	827

ACIOL: anterior chamber intraocular lens; AMD: age-related macular degeneration, BRVA: best-reported visual acuity, CME: cystoid macular edema; HM: hand motions; HPN: hypertension; LP: light perception; IOL, intraocular lens; IOP: intraocular pressure, PEX: pseudoexfoliation; RD: retinal detachment, RVO: retinal vaso-occlusion; UGH: uveitis-glaucoma-hyphema; VH: vitreous hemorrhage; Vx: vitrectomy

CONCLUSION

The majority of the complications from four-point scleral-fixation of hydrophilic acrylic intraocular lenses (Akreos® AO60) in vitrectomized eyes were mild and transient; however, a proportion required surgical intervention. **A significant risk for opacification was found in IOLs exposed to gas/air and prolonged ocular inflammation, although visual acuity was often maintained.**

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Greater Reduction in Pigment Epithelial Detachment Size With Faricimab vs Aflibercept During Head-to-Head Dosing in Patients with nAMD

COS 2024

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INTRODUCTION

- PED is associated with nAMD in 30–80% of patients[1]
- Sub-RPE fluid is more persistent than IRF and SRF in nAMD
- PED in nAMD requires more consistent anti-VEGF therapy and recurs during PRN treatment[3]

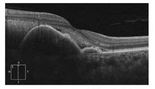

Figure 1. Patient with nAMD with new PED CNV in their left eye

AIM

- In TENAYA/LUCERNE (NCT03823287/NCT03823300), dual inhibition of angiopoietin-2 (Ang-2) and vascular endothelial growth factor receptor (VEGF)-A with faricimab resulted in greater improvement in anatomical outcomes during the head-to-head dosing period vs aflibercept, and more rapid drying of the retina with fewer injections.
- This analysis evaluates changes in pigment epithelial detachment (PED) over time in TENAYA/LUCERNE.

METHOD

- Treatment-naïve patients were randomized to faricimab 6.0 mg up to every 16 weeks (Q16W) after 4 initial Q4W doses or aflibercept 2.0 mg Q8W 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 treat-and-extend dosing regimen (personalized treatment interval per protocol).
- A post hoc analysis was performed evaluating PED baseline characteristics and anatomic changes during the head-to-head dosing period (weeks 0–12).
- PED was defined as retinal pigment epithelium elevation with width ≥350 µm. PED was graded as predominantly serous or purely serous (serous PED) or predominantly fibrovascular or fibrovascular only (fibrovascular PED).

CONCLUSION

Dual Ang-2/VEGF inhibition with faricimab was associated with greater improvements in PED outcomes vs aflibercept in the head-to-head dosing period of TENAYA/LUCERNE. These findings are consistent with the greater drying of retinal fluid seen with faricimab during the head-to-head dosing period.

DISCLOSURE

Financial Disclosures

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TYYL: Consultant: Alcon, Allergan, Bayer, Boehringer Ingelheim, Chengdu Kanghong, Iveric Bio, Novartis, Oculis, Roche. Research Support: Bayer, Novartis, Roche

AMK: Consultant: 4D Molecular Therapeutics, AbbVie, Adverum, Aerie, Aldebaran, Allergan, Apellis, Applied Genetic Technologies Corporation, Arrowhead, Aviceda, Bausch + Lomb, BroadWing Bio, Clearside Biomedical, Exegenesis Bio, EyePoint, Frontera, Genentech, Inc., Gyroscope, iLumen, Iveric Bio, Janssen, Kartos, Kato, Kodiak Sciences, Kriya, Nanoscope, Notal Vision, Novartis, Ocular Therapeutix, Oculis, OcuTerra, Olives Bio, Opthea, Oxurion, Perfuse, PolyPhotonix, Protagonist, Ray Therapeutics, RecensMedical, Regeneron, Regenxbio, RevOpsis, Roche, Stealth, Thea, Unity, Vanotech, Vial; Research Support: 4D Molecular Therapeutics, Adverum, Annexon, Apellis, Genentech, Inc., Gyroscope, Iveric Bio, Kodiak, Neurotech, NGM Bio, Novartis, Ocular Therapeutix, Oculis, OcuTerra, Opthea, Oxurion, Regenxbio, Roche, Unity; Equity: Aviceda, PolyPhotonix, RecensMedical, RevOpsis, Vial

AS, PM: Employee: F. Hoffmann-La Roche Ltd.

MY, SP: Employee: Genentech, Inc.

Study and Product Disclosures

- Faricimab is approved for the treatment of retinal vein occlusion in the USA, and neovascular age-related macular degeneration and diabetic macular edemain multiple countries worldwide. Faricimab is not currently approved for use outside these indications
- This study includes research conducted on human subjects
- Institutional Review Board approval was obtained prior to study initiation
- Funding was provided by F. Hoffmann-La Roche Ltd. for the study and third-party writing assistance, which was provided by Karen Pemberton, PhD, of Envision Pharma Group

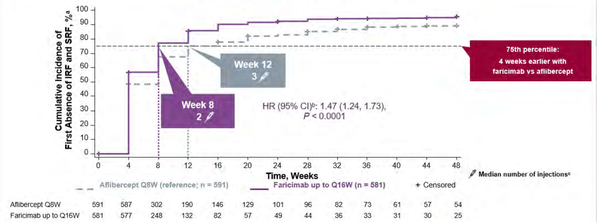
Presented at the Canadian Ophthalmological Society Meeting May 30th – June 2nd, 2024

RESULTS

Faricimab Patients Achieved First Absence of IRF and SRF Faster and With Fewer Injections vs Aflibercept

Patients With IRF and/or SRF at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis



Aflibercept Q8W	591	587	302	190	146	129	101	96	82	73	61	57	54
Faricimab up to Q16W	581	577	248	132	82	57	49	44	36	33	31	30	25

Figure 2. Time to first absence of IRF and SRF in patients with IRF and/or SRF at baseline with faricimab vs aflibercept over 48 weeks

Reduction in Maximum PED Thickness With Faricimab vs Aflibercept in the Head-to-Head Dosing Phase

Patients With Presence of PED at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis

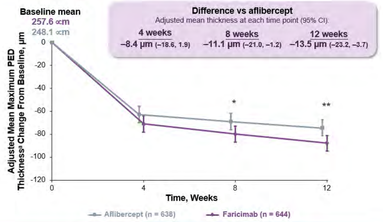


Figure 3. Maximum PED thickness in patients with presence of PED at baseline with faricimab vs aflibercept over 12 weeks

Reduction in Maximum PED Thickness With Faricimab vs Aflibercept in the Head-to-Head Dosing Phase

Patients With Presence of Fibrovascular PED at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis

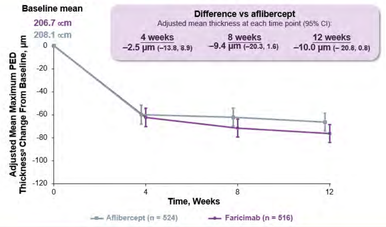


Figure 4. Maximum PED thickness in patients with presence of fibrovascular PED at baseline with faricimab vs aflibercept over 12 weeks

Reduction in Maximum PED Thickness With Faricimab vs Aflibercept in the Head-to-Head Dosing Phase

Patients With Presence of Serous PED at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis

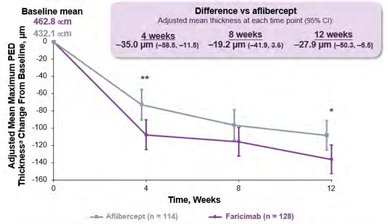
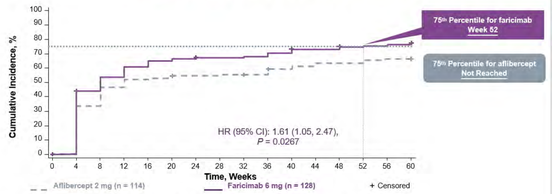


Figure 5. Maximum PED thickness in patients with presence of Serous PED at baseline with faricimab vs aflibercept over 12 weeks

Time to First Reduction of Maximum PED Thickness by 50% From Baseline

Patients With Presence of Serous PED at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis

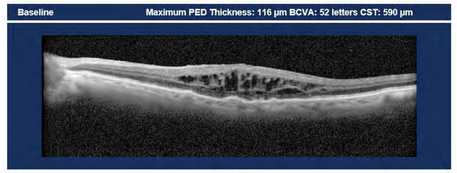


Aflibercept 2 mg	114	114	76	61	55	54	50	50	49	47	40	38	36	36	34	33
Faricimab 6 mg	128	127	70	58	49	44	42	40	40	39	36	32	32	29	28	27

Figure 6. Time to First Reduction of Maximum PED thickness by 50% in patients with presence of Serous PED at baseline with faricimab vs aflibercept over 60 weeks

Patient With Maximum PED Thickness < 125 µm at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis



	Faricimab up to Q16W N = 665	Aflibercept Q8W N = 664
Median (Q1–Q3) maximum thickness of PEDc, µm	185.0 (126.5–316.0)	176.5 (125.0–300.5)

Figure 7. Patient with Maximum PED Thickness <12 µm at baseline

Reduction in Maximum PED Thickness With Faricimab vs Aflibercept in the Head-to-Head Dosing Phase

Patients With Presence of PED ≥ 125 µm at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis

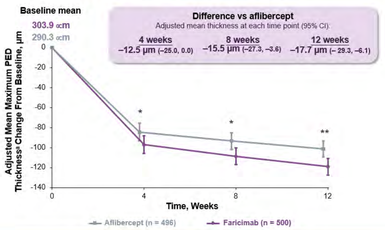
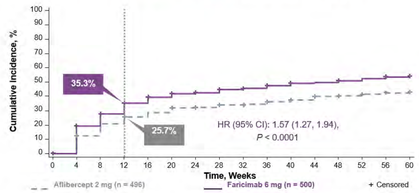


Figure 8. Maximum PED thickness in patients with presence of PED ≥ 125 µm at baseline with faricimab vs aflibercept over 12 weeks

Time to Reduction in Maximum PED Thickness by 50%

Patients With Presence of PED ≥ 125 µm at Baseline

TENAYA/LUCERNE Pooled: Post Hoc Analysis



Aflibercept 2 mg	496	493	429	387	362	348	324	322	310	301	277	267	255	253	245	231
Faricimab 6 mg	500	498	401	357	317	294	278	272	259	248	234	219	218	208	202	193

Figure 9. Time to First Reduction of Maximum PED thickness by 50% in patients with presence of PED ≥ 125 µm at baseline with faricimab vs aflibercept over 60 weeks

Faricimab Was Well Tolerated With a Safety Profile Comparable With Aflibercept Through Study End

Common AEs in Study Eye Through Study End	TENAYA/LUCERNE Pooled: Faricimab Up to Q16W n = 664	TENAYA/LUCERNE Pooled: Aflibercept Q8W n = 662
Patients with events, n (%)		
nAMD	64 (9.6%)	58 (8.8%)
Conjunctival haemorrhage	59 (8.9%)	60 (9.1%)
Cataract	58 (8.7%)	50 (7.6%)
Dry eye	29 (4.4%)	45 (6.8%)
Vitreous detachment	34 (5.1%)	33 (5.0%)
Eye pain	25 (3.8%)	29 (4.4%)
Intraocular pressure increased	27 (4.1%)	26 (3.9%)
Vitreous floaters	30 (4.5%)	17 (2.6%)
Posterior capsule opacification	18 (2.7%)	21 (3.2%)
Blepharitis	18 (2.7%)	19 (2.9%)
Punctate keratitis	14 (2.1%)	20 (3.0%)
Dry age-related macular degeneration	16 (2.4%)	14 (2.1%)
Retinal pigment epithelial tear	19 (2.9%)	10 (1.5%)
Foreign body sensation in eyes	10 (1.5%)	14 (2.1%)

RPE tears were associated with larger baseline PED heights and most frequently occurred after 1–3 anti-VEGF injections[a]

Most of the events were non-serious, mild[b], reported as not related to study drug and did not result in sustained vision loss[a]

~50% of patients with RPE tear had a fibrovascular PED at baseline. Most had an occult CNVM at baseline[a]

Figure 10. Safety profile of faricimab vs aflibercept

ABBREVIATIONS

AE, adverse event; BCVA, best-corrected visual acuity; CST, central subfield thickness; nAMD, neovascular age-related macular degeneration; PED, pigment epithelial detachment; PRN, as-needed; RF, intraretinal fluid; RPE, retinal pigment epithelium; SRF, subretinal fluid; VEGF, vascular endothelial growth factor; Q8W, every 8 weeks; Q16W, every 16 weeks

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Histological Assessment of the Fovea Reveals Areas of Mechanical Instability Susceptible to Injury in Vitreoretinal Diseases

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INTRODUCTION

Foveal abnormalities on histological sections have been routinely observed *post-mortem*.[1] Although these **"artifacts"** may not be pathological, they **may provide insight into the biomechanical properties** of the tissue.

AIM

To assess **foveal areas of disruption** that occur **within or between tissue planes** in histological sections of normal eyes, which are not thought to be related to direct trauma and could **represent areas of low mechanical stability.**

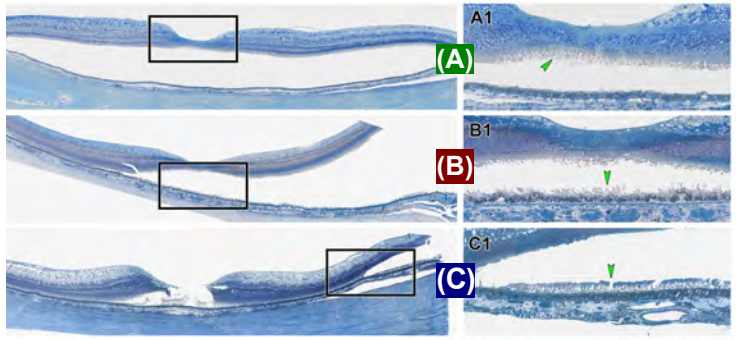
METHODS

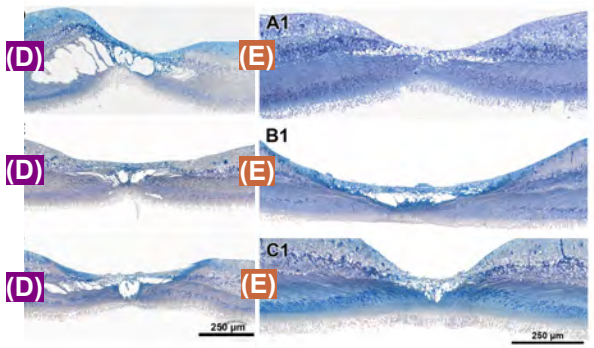
- Single-center cross-sectional study.
- Assessment of tissue disruptions in an annotated collection of high-resolution **histological sections of normal foveas of Project MACULA** (projectmacula.org).

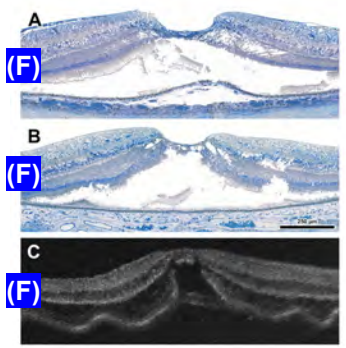
Main areas of interest:
1) RPE-photoreceptor interface
2) Inner segment myoid zone
3) Henle fiber layer and outer plexiform layer
4) Müller cell cone (MCC)

RESULTS

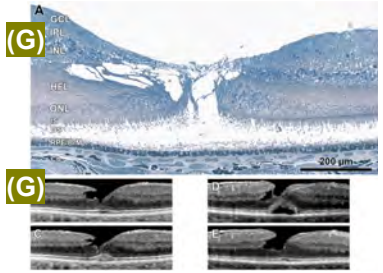
- 96% (72/75) of sections had a **retinal detachment (A).**
  - 56.9% (41/72) had a **break in the IS-OS junction (B).**
  - 15.2% (11/72) had bacillary layer detachment **(BALAD) (C).**
    - 90.9% (10/11) of BALAD were subfoveal.
- 64% (48/75) of sections had **disruptions within the HFL** at the foveal walls **(D).**
  - 91.4% (43/48) had disruption at the interface with the Müller cell cone (MCC).
- 50.6% (38/75) of sections had **cystic changes in the MCC (E).**
  - 47.3% (18/38) had MCC partially or completely disinserted from the fovea.

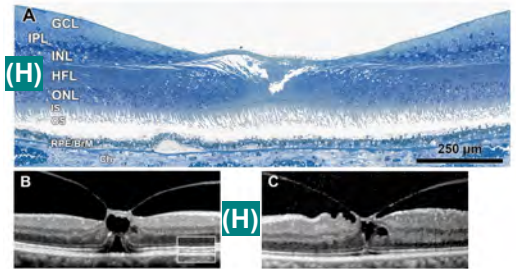


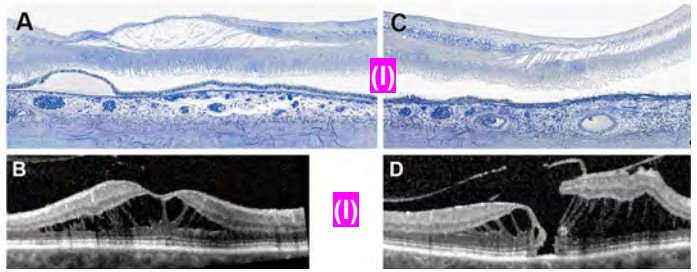




These disruptions are incredibly similar to *in vivo* OCT abnormalities observed in different pathological processes illustrated in the following figures: (F) Histologic vs clinical BALAD (rhegmatogenous detachment associated with BALAD); (G) Histologic vs clinical[2] disruption of HFL/MCC (lamellar hole); (H) Histologic vs clinical[2] dehiscence of MCC (vitreomacular traction with foveal pseudo cyst); (I) Histologic vs clinical[2] disruption within the HFL (cystoid macular edema and foveoschisis).







CONCLUSION

We hypothesize that foveal areas of low mechanical stability manifest as common artifactual disruptions in histological sections.

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Impacts of Delayed Surgical Intervention on Postoperative Visual Acuity in Patients with Rhegmatogenous Retinal Detachment

COS 2024

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UNIVERSITY OF SASKATCHEWAN

Introduction

Delays in eye care due to patient knowledge, emergent care access and early surgical intervention determine visual outcomes[1]. For Rhegmatogenous Retinal Detachment (RRD), improved awareness of symptoms, emergent referral and availability of local ophthalmologists can reduce delay[2,3,4]. This can lead to earlier surgery, which is critical for the preservation of visual acuity[1,5]. The impact of RRD and macular involvement duration on postoperative visual acuity is not well-defined, requiring an enhanced understanding of retinal detachment as a leading cause of vision loss[2,5,6,7].

Methods

A retrospective chart review was conducted on over 1000 urgent eye care presentations between January 2012-July 2023, and 96 patients with RRD were included. Primary variables consisted of pre-operative/post-operative best corrected visual acuity (BCVA) in LogMAR and macular status. Secondary variables included age, sex, city of residence, presenting symptom and type of surgery.

Letter Score	LogMAR Value	Snellen Equivalent
5	1.6	20/800
10	1.5	20/640
15	1.4	20/500
20	1.3	20/400
25	1.2	20/320
30	1.1	20/250
35	1.0	20/200
40	0.9	20/160
45	0.8	20/125
50	0.7	20/100
55	0.6	20/80
60	0.5	20/63
65	0.4	20/50
70	0.3	20/40
75	0.2	20/32
80	0.1	20/25
85	0.0	20/20
90	-0.1	20/15
95	-0.2	20/12

LogMAR = logarithm of the minimal angle of resolution

Figure 1. Letter-LogMAR-Snellen Conversions [8]

Description of Study Sample	N	Mean	SD	Median	Min	Max
Age at Surgery	96	60.1	11.2	61	18	87
Pre-Op BCVA	95	0.3	0.6	0.1	-4	2.3
Final BCVA	89	0.3	0.4	0.1	-0.02	2.12
Months from Surgery to Followup	87	12.0	8.9	10	0	47
Change between Final BCVA and Pre-op BCVA	86	0.06	0.76	-0.02	-1.9	4.22
Mean Symptom Onset-Surgery Interval	82	8.8	8.3	5.5	0	32
Mean First Visit-Surgery Interval	79	1.5	3.1	1	0	21
Mean First Retina Specialist Visit-Surgery Interval	90	0.7	1.6	0	0	10

Figure 2. Measures of Central Tendency

Results

Variables were assessed for statistically significant associations with Final BCVA and macular status using Mann Whitney U test or Kruskal-Wallis H. Duration since Symptom Onset (average 8.8 days), First Healthcare Professional Visit (1.5 days) and First Retina Specialist Visit (0.7 days) to surgery were negatively correlated with Final BCVA. For each day increase in the time from First Retina Specialist visit to Surgery, the odds of having post VA>=0.5 increases about 78% (p = 0.005) and are twice as likely to have Macula-OFF with each day (p = 0.036). For each day increase in the time from First visit to Surgery, the odds of having post VA>=0.5 increases about 20% (p = 0.042).

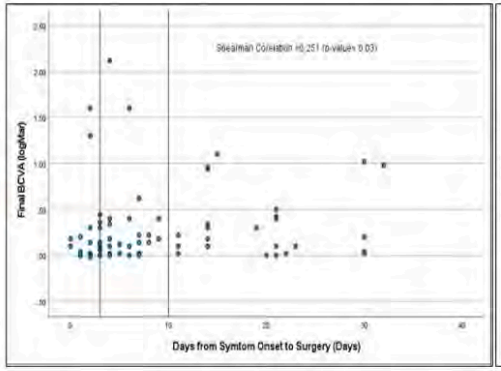

Figure 3. Scatter Plot for Symptom Onset-to-Surgery Interval (days) vs. Final BCVA (LogMAR)

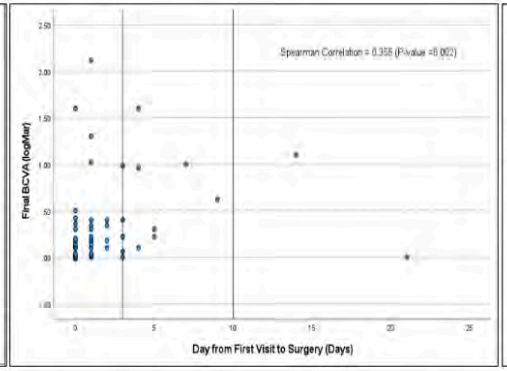

Figure 4. Scatter Plot for First Visit-to-Surgery Interval (days) vs. Final BCVA (LogMAR)

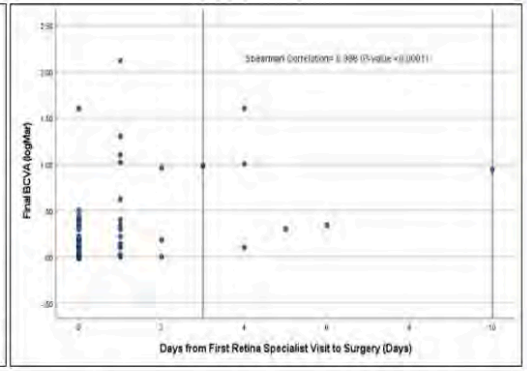

Figure 5. Scatter Plot for First Retina Specialist Visit-to-Surgery Interval (days) vs. Final BCVA (LogMAR)

Conclusions

Our study emphasizes the critical role of timely intervention in Rhegmatogenous Retinal Detachment (RRD). Delays in symptom recognition, referral to retina specialists, and surgical intervention negatively impact visual outcomes. Prolonged intervals between specialist visits and surgery are associated with reduced postoperative visual acuity and an increased risk of macular detachment. Geographic disparities also play a role in RRD outcomes, which can be assessed more thoroughly in future investigations. These findings emphasize the need for heightened patient awareness, improved access to specialized care, and policy measures to expedite RRD management and preserve visual acuity.

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Incidence of Cystoid Macular Edema Post Pars Plana Vitrectomy for Epiretinal Membrane or Macular Hole With VS Without Intraoperative Endolaser Treatment

COS 2024

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Université de Montréal

Introduction

- Cystoid macular edema (CME) often surfaces as a complication post-pars plana vitrectomy (PPV)
- In cases devoid of retinal detachment or tears, the application of endolaser primarily serves a preventative function. However, its use might increase the risk of postoperative CME.

Purpose

This study intends to determine CME incidence after elective PPV procedures, comparing cases with and without endolaser, aiming to identify any correlation between endolaser usage and CME onset.

Methods

Study design

- Retrospective, single center, single surgeon, comparative study of patients who were operated between 2018 and 2022 for macular hole or epiretinal membrane.
- Patients were categorized based on the utilization or non-utilization of endolaser during the procedure.

Main outcomes

- Incidence of postoperative CME during the entire postoperative follow-up.
- Mean duration to CME onset in months.
- Treatment responsiveness.
- Complications were also noted.

Statistical analysis :

- Independent t-test, Chi-Square test for association.

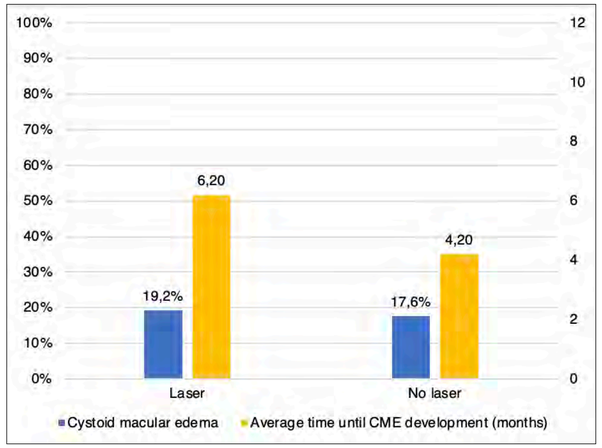
Results

	Endolaser (n=156)	Without endolaser (n=125)	*p*
	156	125	
Age (SD)	68.4 (8.1)	69.1 (9.5)	0.529
Left eye, n (%)	49.4	48.8	0.926
Male, n (%)	48.1	49.6	0.800
Concurrent phacoemulsification, n (%)	53.8	58.1	0.480
Diabetes, n (%)	5.8	4.0	0.500
Uveitis, n (%)	1.9	4.8	0.176
Venous occlusion n (%)	1.9	2.4	0.790
Age-related macular degeneration, n(%)	3.9	6.4	0.334
Preoperative cystoid macular edema, n(%)	10.3	15.2	0.220
Use of drops, n (%)			
Epinephrine drops	0	0	
Prostaglandin drops	5.9	4.8	0.691
Anti-inflammatory drops	0.7	2.4	0.237
Diagnosis			0.103
Epiretinal membrane	57.7	67.2	
Macular hole	42.3	32.8	
Follow-up (months)	20.1 (17)	22.9 (17.7)	0.174
Patients with at least 1 year of follow-up	76.9	70.4	0.215

Table 1. Demographics

COMPLICATIONS	Endoaser	Without endolaser	*p*
Steroid response	1.9%	5.6%	0.02
Rebound uveitis	0.6%	2.4%	0.22
Vitreous hemorrhage	1.9%	1.6%	0.82
Retinal detachment	0.6%	2.4%	0.052
Response to treatment			
Chronic cysts	1.9%	0 %	0.12
Recurrences	0 %	1.6%	0.11

Table 2. Postoperative complications



Graph 1: Incidence of CME with vs without endolaser treatment: Group comparison showed no significant difference in the development of CME (p=0.73) nor in the delay for CME onset (p=0.45) between patients treated with endolaser and those without.

Conclusion

- CME is a frequent postoperative issue that requires diligent monitoring and timely intervention.
- Our findings did not identify a significant correlation between endolaser application and CME. No significant difference was revealed in terms of CME incidence and postoperative complications between the two groups.
- Hence, prophylactic endolaser appears to be a risk-neutral procedure with respect to CME.

No disclosures.

International Classification System for Ocular Complications of Anti-Vascular Endothelial Growth Factor Agents in Clinical Trials

COS 2024

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INTRODUCTION

Complications associated with intravitreal anti-vascular endothelial growth factor (VEGF) therapies are inconsistently reported in the literature, thus limiting an accurate evaluation and comparison of safety between studies.[1-3]

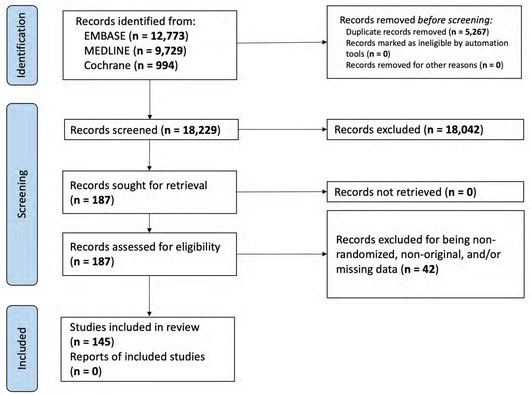
AIM

To develop a **standardized classification system** for **anti-VEGF** ocular complications using the **Delphi** consensus process.

METHODS

- **Study Design:** Cross-sectional, survey-based study utilizing the Delphi consensus methodology.[4]
- **Literature Search:** Systematic review of RCTs on intravitreal anti-VEGF agents from OVID MEDLINE, EMBASE, and Cochrane CENTRAL (2005-November 2023) to identify ocular complications.
- **Inclusion Criteria:** Studies reporting ocular adverse events from anti-VEGF agents; exclusions included non-English/original articles, abstracts, and non-research materials.
- **Screening Process:** Two-phase independent screening by two reviewers, with a third reviewer to mediate disputes.
- **Survey Development:** Complications organized by anatomic region and formatted into a binary-choice survey for retinal specialists.
- **Delphi Rounds:** Iterative scoring by an international panel of retinal specialists until consensus on complications was achieved (≥70% agreement for ≥90% of items).
- **Recruitment:** Direct invitations to retinal specialists via internationally focused retinal societies (ASRS, APVRS, BEAVRS, CRS, EURETINA, Macula Society, Retina Society).
- **Complication Specifiers:** Secondary Delphi process to identify specific descriptors for complications, using ≥70% agreement for inclusion.

RESULTS



145 Included RCTs

↓

244 Unique Complications

↓

Redundancies Removed & Similar Terms Grouped

↓

Pilot List:
127 Complications

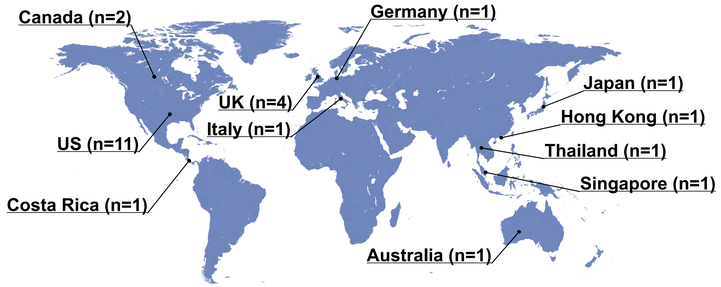
Delphi Process

127 Complications — **List of Complications**: Round 1 → Round 2 → Round 3 (*Consensus Achieved*) → **67 Complications**

75 Specifiers — **Complication Specifiers**: Round 1 → Round 2 (*Consensus Achieved*) → **47 Specifiers**

*e.g. "**uveitis**" is a **complication**, while "**bilateral** uveitis", or "**recurrent** uveitis" are different **specifiers** of the same **complication** term*

Geographic Distribution of Retinal Specialist Participants (n=25)



APVRS: n=5
ASRS: n=6
BEAVRS: n=4
CRS: n=2
EURETINA: n=2
Macula Society: n=3
Retina Society: n=3

CONCLUSION

A standardized classification system consisting of **67 ocular complications** and **47 specifiers** was established for anti-VEGF agents in clinical trials.

The use of this system in future trials may improve consistency & quality of adverse event reporting, potentially facilitating more accurate risk-benefit analyses.

Full Classification System Available

Google Sheets — SCAN ME

Microsoft Excel — SCAN ME

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Sustained Remission of Paediatric Choroidal Neovascular Membrane Secondary to Choroidal Rupture with Intravitreal Aflibercept

COS 2024

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INTRODUCTION

- **Choroidal rupture** is a rare occurrence after **blunt ocular trauma** that may lead to choroidal neovascularization (CNV)
- There is **no treatment** for choroidal rupture; however**, anti-VEGF** can antagonize CNV membrane **(CNVM)** development and progression.
- Management of **pediatric CNVM** is controversial, given the potential for **systemic anti-VEGF side-effects**.
- We report a pediatric patient treated with anti-VEGF for post-traumatic CNVM, who remained in sustained disease remission without side effects over four years.

RESULTS

- **12-year-old female** with chief complaint of blurred vision in her right eye (OD) after blunt trauma induced by a tennis ball injury.
  - **BCVA:** 20/200 OD (20/50 with pinhole correction OD)
  - **Fundus examination and OCT**: significant macular RPE disruption with choroidal rupture and a large CNVM OD
  - A single intravitreal **Aflibercept** injection (1mg; **half adult dose**) was administered and **repeated in 4 weeks**.
- Follow-up (four years)
  - **No further injections** were required since the CNVM remained inactive in all follow-up visits.
  - The patient had **no adverse effects**
  - **BCVA:** 20/30-2 OD (20/25-2 on pinhole)
  - **Fundus examination and OCT:** stable macular scar and quiescent CNVM OD, which remained dry with no further treatments

CONCLUSION

- Our young patient experienced a long-term benefit and safety after intravitreal aflibercept for their post-traumatic CNVM.
- Despite concern systemic side effects of anti-VEGF, the patient had **sustained disease remission**, improved vision, and **no adverse events**.
- Larger studies are needed to assess the generalizability of our patient's clinical course regarding anti-VEGF-use in CNVM.

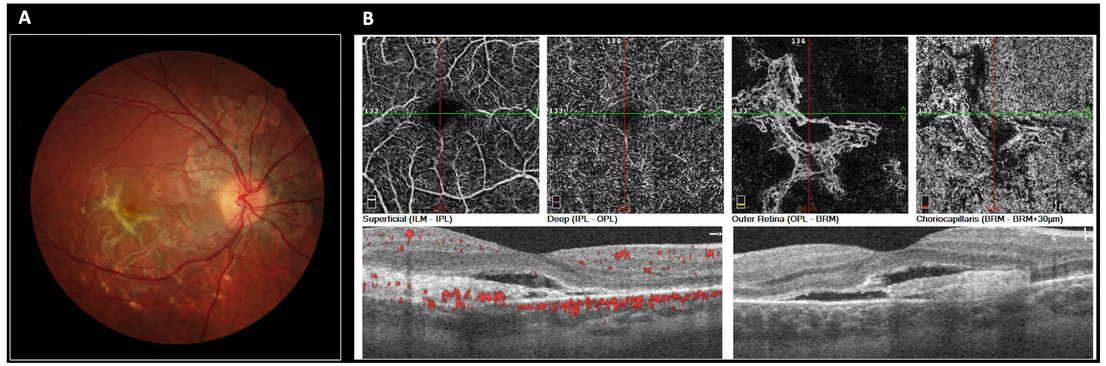

Figure 1:

- **A**: Baseline fundus photographs of the right eye, exhibiting perifoveal and peripapillary multifocal vitelliform lesions. There are also disciform macular and peripapillary scars with an associated choroidal neovascular membrane in the setting of a choroidal rupture located temporally to the macula.
- **B (top row):** Baseline ocular coherence tomography angiography of the right eye exhibits a large choroidal neovascular membrane.
- **B (bottom row):** Baseline ocular coherence tomography of the macula and peripapillary region of the right eye. This OCT reveals subretinal fluid surrounding the disciform scar noted in Figure 1A. There is notable disruption of outer retinal layers, especially the ellipsoid layer at the central fovea. There are also small cystic changes in the inner retina.

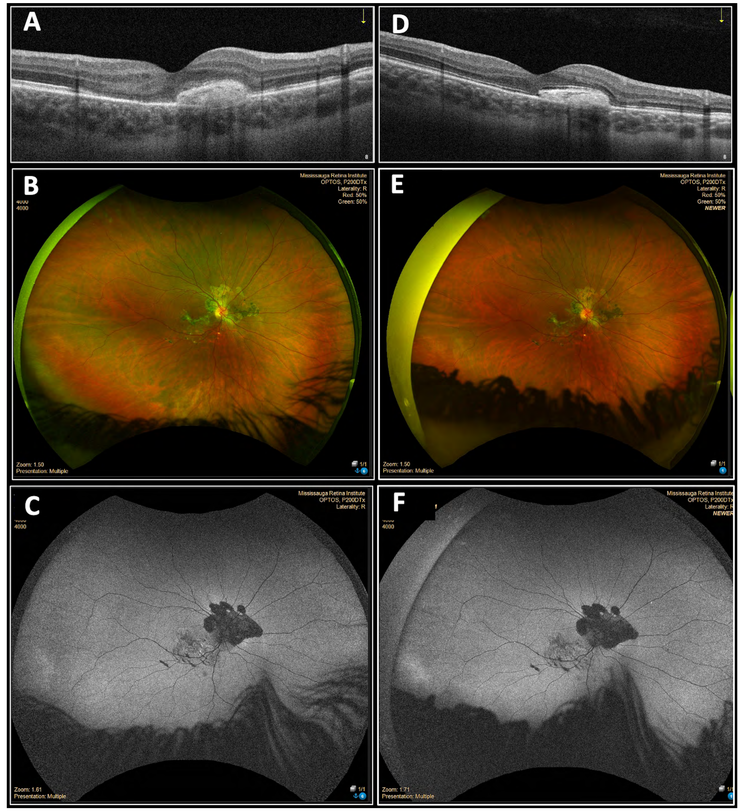

Figure 2:

- **A**: OCT month 1. Much resolved subretinal fluid since baseline, which had previously surrounded the disciform scar. Persistent disorganization of outer retinal layers with less distinct central ellipsoid layer. The smaller cystic changes of the inner retina are now resolved.
- **B-C**: Optos (B) and FAF (C) images at month 10. Regression of the perifoveal and peripapillary multifocal vitelliform lesions with residual disciform/peripapillary macular scarring. There is regression and quiescence of the CNVM, with improvement of the temporal choroidal rupture. FAF shows more extensive RPE changes nearby the disc than the macular region, likely attributed to heavier scarring around the former.
- **D:** OCT year 4. Unchanged since follow-up month one, mostly notably remaining dry without further treatment.
- **E-F**: Optos (E)and FAF (F) showed stably regressed choroidal neovascular membrane, with a residual disciform/peripapillary macular scar. The choroidal rupture remains stable. The extensive peripapillary RPE changes noted at follow-up month 10 remains and is more severe than the macular region.

COS 2024

Introducing Diabetic Retinopathy Risk Index (DiaRRI): Hb to HbA1c ratios as a novel indicator for severity of diabetic retinopathy

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CHU de Québec

INTRODUCTION

Glycosylated hemoglobin (HbA1c) is the gold standard for monitoring glycemia.

However, any conditions (such as anemia) that may affect hemoglobin or glycation may influence the HbA1c level independently of the level of glycemia.

AIM

We aim to investigate the association between hemoglobin and HbA1c for severity of diabetic retinopathy (DR) and to explore its prognostic value as a biomarker.

METHOD

- This is a prospective, cross-sectional observational study at a tertiary academic center between 2019 and 2020.
- Treatment-naïve patient with a new diagnosis of DR were included.
- Basic demographic characteristics, risk factors and clinical characteristics including fundus grading of DR, hemoglobin levels and HbA1c were noted.
- Analysis of variance (ANOVA) were performed to test the association between hemoglobin, HbA1c and hemoglobin to HbA1c ratio and severity of retinopathy.

Figure 1. Hemoglobin levels

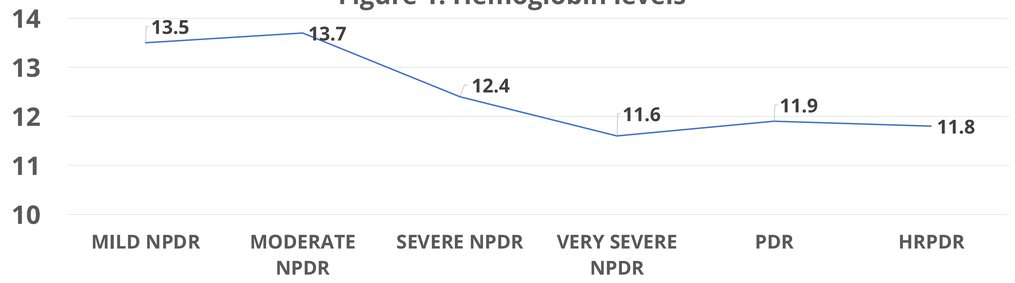


Figure 2. HbA1c levels

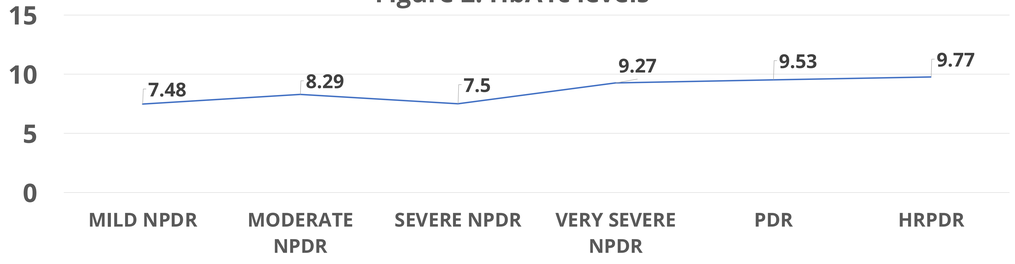
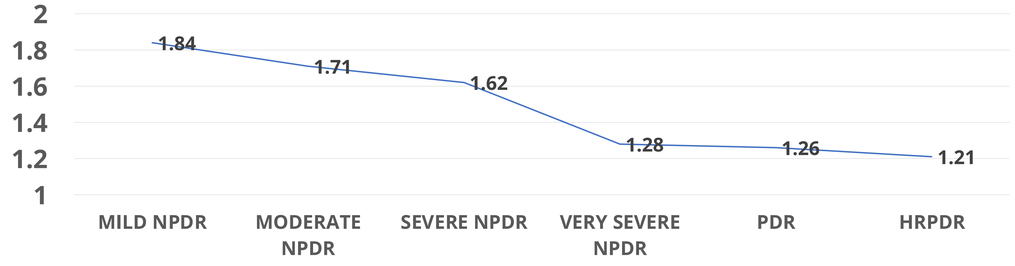


Figure 3. Hemoglobin to HbA1c ratios



RESULTS

- A total of 112 patients met the inclusion criteria.
- The mean age of the patients was 56.8 (SD ± 7.63) years with a male to female ratio of 2:1.
- Most patients (n = 100, 89.4%) had non-proliferative DR.
- Higher levels of hemoglobin >12 g/dl were found to be associated with milder forms of DR ($p < 0.05$) (Figure 1).
- Higher level of HbA1c >9% were associated with severe forms of DR ($p < 0.001$) (Figure 2).
- A Diabetic Retinopathy Risk Index (DiaRRI) was established showing that hemoglobin to HbA1c ratios > 1.7 corresponded to mild and moderate non-proliferative DR.
- Hemoglobin to HbA1c ratios <1.3 corresponded to severe non-proliferative DR, proliferative DR and high-risk proliferative DR ($p<0.001$) and was better associated with level of retinopathy than either hemoglobin or HbA1c ratios (Figure 3).

CONCLUSION

- The ratio of hemoglobin to HbA1c ratio may be superior at identifying eyes “at risk” of deterioration.
- An evaluation of Hb and HbA1c should be a part of the follow up visits of diabetic patients.
- Future studies aim to validate the DiaRRI as a prognostic tool.

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Late Sequelae of Retinopathy of Prematurity in Adulthood

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INTRODUCTION

- Retinopathy of prematurity (**ROP**) is the leading cause of visual impairment and blindness in infants.
- Many believe that ROP only affects patients during its active phase. Emerging evidence shows that ROP carries **protracted impact on one's vision.**
- To date, comprehensive data on long-term outcomes of ROP remain scarce.

OBJECTIVES

- Evaluate the long-term impact of ROP on **visual function** and **ocular structure** in **young adults**.

MATERIALS & METHODS

Groups

Ex-ROP n=8 | Preterm n=12 | Full-term n=8

Tests

- Refraction
- Color vision
- Biometry
- IOP
- Visual acuity
- Macular OCT
- Flash ERG
- Multifocal ERG

Analysis

- ANOVA with post-hoc two-tailed Student's or Welch's t-test
- Chi-square test
- Level of significance 0.05

RESULTS

Table 1. Patient demographics

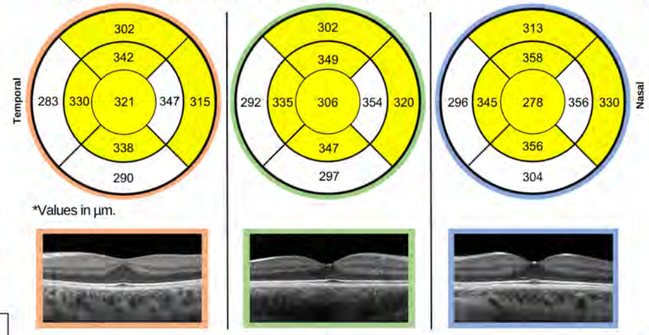
	Ex-ROP (N=8)	Preterm (N=12)	Full-term (N=8)
Age at visit mean ± SD	30.0 ± 3.4	30.7 ± 3.8	29.6 ± 4.4
Male n (%)	1 (13)	7 (58)	3 (37.5)
Female n (%)	7 (87)	5 (42)	5 (62.5)
Gestational age weeks ± SD	26.1 ± 1.0	27.8 ± 1.2	39.1 ± 1.2

Table 2. Vision parameters

	Ex-ROP (N=8)	Preterm (N=12)	Full-term (N=8)	p-value
BCVA BCVA logMAR ± SD	20/24 0.08 ± 0.22	20/20 -0.01 ± 0.10	20/20 0.01 ± 0.04	0.46
Myopia n (%)	16 (61)	14 (33)	9 (33)	< 0.01*
Hyperopia n (%)	2 (11)	0 (0)	0 (0)	0.02**
Astigmatism n (%)	10 (56)	1 (8)	0 (0)	0.07
Spherical equivalent D ± SD	-6.71 ± 2.80	-0.97 ± 1.73	-2.18 ± 2.27	< 0.01*
Cylinder D ± SD	1.70 ± 1.64	0.72 ± 0.65	0.50 ± 0.35	< 0.01*
Color vision*** n (%)	2 (13)	0 (0)	0 (0)	0.12
Stereopsis (sec) ± SD	225 ± 262	79 ±58	45 ±14	0.36
Axial length (mm) ± SD	25.2 ± 1.0	22.8 ± 1.4	24.5 ± 1.1	< 0.01*
IOP (mmHg) ± SD	13.7 ± 3.5	14.7 ± 4.1	14.4 ± 3.6	0.72

N = number of participants per group. Both eyes were assessed.
*ROP vs non-ROP. ROP vs Preterm and ROP vs Full-term comparisons also showed significant differences.
**ROP vs non-ROP. ROP vs Preterm and ROP vs Full-term did not show significant differences.
***n = number of eyes with abnormal screening. Color deficiency was screened using the Ashihara test.

Figure 1. Macular retinal thickness



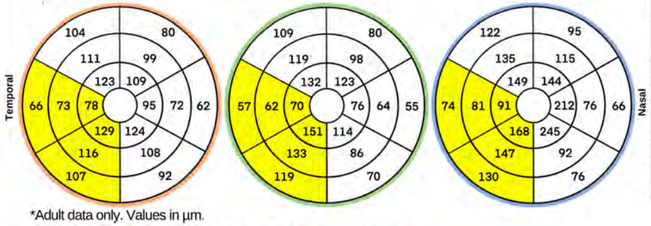
*Values in µm.

Table 2. Post-hoc t-test p-values

	ROP vs Preterm	ROP vs Term	Preterm vs Term
Fovea	0.222	< 0.001	< 0.001
Parafovea	0.590	< 0.001	< 0.001
Internal superior macula	0.111	0.001	0.019
Internal inferior macula	0.067	< 0.001	0.072
Internal temporal macula	0.224	0.002	0.021
Internal macula average	0.116	0.003	0.079
External superior macula	0.998	0.017	< 0.001
External nasal macula	0.265	0.003	0.014
External macula average	0.242	< 0.001	0.067

p-value < 0,05

Figure 2. Optic nerve RNFL thickness

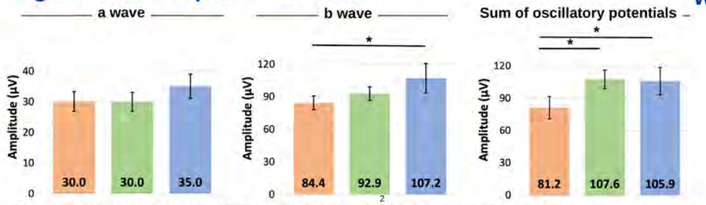


*Adult data only. Values in µm.

Table 3. Post-hoc t-test p-values

	ROP vs Preterm	ROP vs Term	Preterm vs Term
Rim 1 - Inferotemporal	0,136	0,009	0,026
Rim 1 - Temporal	0,434	0,225	0,001
Rim 1 - Global	0,808	0,015	0,002
Rim 2 - Inferotemporal	0,146	0,012	0,045
Rim 2 - Temporal	0,285	0,389	<,001
Rim 2 - Global	0,016	0,04	0,006
Rim 3 - Inferotemporal	0,114	0,022	0,055
Rim 3 - Temporal	0,294	0,326	<,001
Rim 3 - Global	0,061	0,031	<,001

Figure 3. Photopic ERG results



*Results at the peak of the photopic hill with a flash intensity of 10 cd.sec/m².

★ : p-value < 0,05
Error bars represent 95% confidence intervals.

Figure 4. Scotopic ERG results

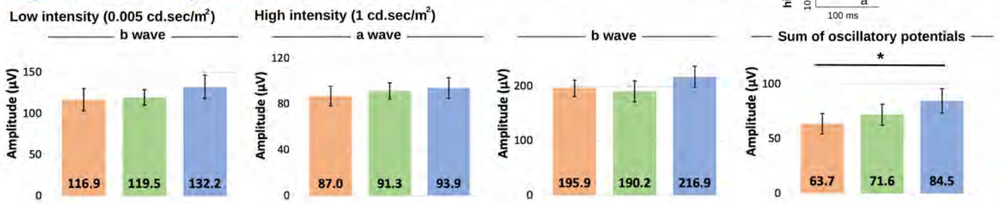
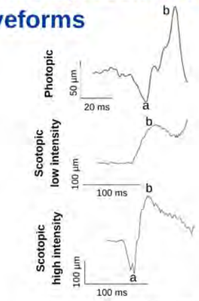
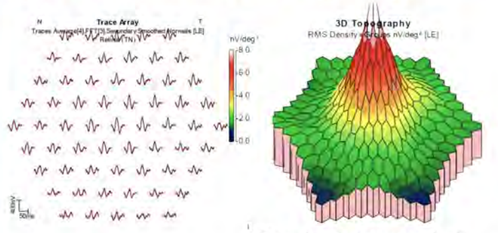


Fig. 5. Representative ERG waveforms

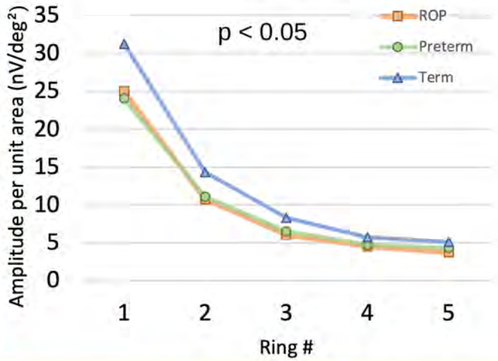


RESULTS

Figure 6. Multifocal ERG ring analysis



Rings 1 to 5 are respectively: 0-3°; 3-8°; 8-15°; 15-22°; 22-30°



CONCLUSION

- Our study indicated that a history of ROP is associated with **increased refractive error, parafoveal thickening, peripheral macular thinning, RNFL thinning,** and **diminished retinal function** in a group of young adults.
- These data support the notion that ROP is not a static disease, but a dynamic condition capable of long-standing impacts.
- Therefore, close follow-ups are warranted in patients with a history of ROP.

REFERENCES

Longitudinal Assessment of Intraocular Foreign Body Injuries: Observations from a Canadian Medical Center Over 20 Years

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Ψ These authors have contributed equally to this work
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BACKGROUND

Although the incidence of intraocular foreign bodies (IOFB) in the general population is low, they make up a significant proportion of open-globe injuries (OGI) globally and may lead to various types of eye intraocular pathologies. Studies have shown that most IOFB injuries affect young males and are sustained in a workplace setting. Several studies have discussed the demographics, management approaches, and clinical outcomes of IOFB injuries. However, no Western Canadian IOFB studies have investigated these variables and factors. Therefore, this retrospective case series aims to further understand IOFB injuries within Southern Alberta.

PURPOSE

To understand the demographics, diagnostic imaging, management, outcomes, and nature of IOFB injuries within a Southern Alberta regional context.

METHODS

Study Design: Retrospective chart review of patients who received care from a single surgeon between 2002 to 2022. Data collected included demographics, IOFB characterization, assessments, treatments, related injuries/complications, as well as the initial and final best corrected visual acuity (BCVA).

Outcome Measures

- Demographics & Characterization
- Assessment & Treatment
- Associated Injuries & Complications
- Initial & Final BCVA

OUTCOMES

Baseline Demographics

Variable		Result
Number of Cases	Patients (Eyes)	31 (32)
Age	Median (Range)	32 (14 - 71)
Sex	Male/Female	30/1
Follow-up Duration (days)	Median (Range)	388 (4 - 6413)
Work Related Injury	Yes	15 (46.9%)
(per Eye)	No	17 (53.1%)

Table 1 - Baseline patient characteristics in the study population

This study evaluated 32 eyes from 31 patients, with a median follow-up of 388 days. The median age on injury was 32 years, with 31 (97%) of eyes belonging to male patients.

IOFB Characterization

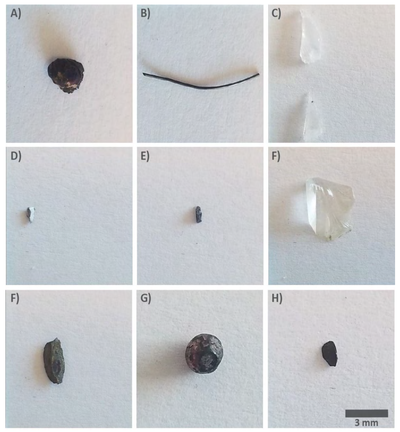


Figure 1 – Sample photographs of Intraocular Foreign Bodies extracted from the eyes of patients included in this study

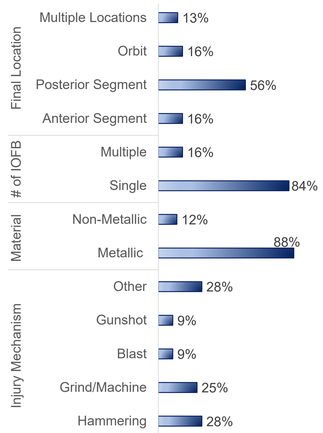


Figure 2 – IOFB characterization and mechanism of injury

The IOFB sizes ranged from 1-12 mm, with a median size of 3 mm. Of the total 32 IOFB cases, 28 (88%) were metallic and 15 (47%) resulted from work-related injuries. Among these cases, 27 eyes (84%) had a single IOFB, while 5 (16%) IOFBs perforated through the globe. The most common mechanisms of injury were hammer and grind/machine injuries, which accounted for a combined 17 out of 32 (53%) cases.

IOFB Assessment & Imaging

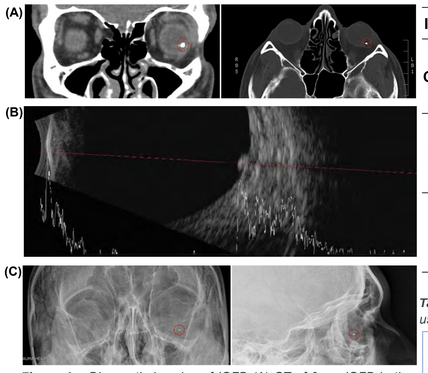


Figure 4 – Diagnostic imaging of IOFB (A) CT of 3 cm IOFB in the temporal macula of the retina (B) B-scan of a 1.5 mm IOFB in the Inferotemporal Retina (C) X-ray of 3 mm IOFB in the temporal macula. IOFB is intraocular foreign body; CT is computerized tomography; B-scan is bright scan ultrasonography.

Imaging	Pros	Cons
CT Scan	• Most sensitive imaging • No globe manipulation	• Cost and access • Ionizing radiation
B-Scan	• Low cost • No ionizing radiation	• Operator dependent • Higher risk with OGI
X-ray	• Accessible w/o training • Screening test	• Occult IOFB detection • Non-metallic IOFB detection

Table 2 – Comparison primary Imaging modalities using as initial diagnostic images for study sample

The most common initial imaging modality for patients presenting with an IOFB was CT in 19 (61%) patients and B-scan in 8 (26%) patients. Two (6.5%) x-ray screenings were done for open globe injuries to reduce radiation exposure. Clinical diagnosis was made in two (6.5%) cases where IOFBs were obvious or urgent surgery was needed.

Associated Injuries & Common Complications

Associated Injuries / Complications	Total Frequency
Lens Injury / Traumatic Cataract	27
Vitreous Hemorrhage	15
Corneal Injury/Inflammation	14
Iris Injury/Inflammation	12
Hyphema	11
Retinal Tear	10
Retinal Detachment	10
Epiretinal Membrane	9
Secondary Glaucoma	3
Endophthalmitis	2
Enucleation	2
Lateral rectus muscle Injury	2
Siderosis	1
Antibiotic drug toxicity	1

Table 3 – Frequency of complications and associated injuries in eyes presenting with an intraocular foreign body.

The two most common complications observed were traumatic cataract in 27 (84%) eyes and vitreous hemorrhage in 15 (47%) eyes. Both immediate and delayed uncommon complications were observed, including siderosis and proliferative vitreoretinopathy in one (3%) eye each, and endophthalmitis, enucleation, and rectus muscle injury in two eyes each (6%). All nine epiretinal membranes and four retinal detachments formed more than a month following the injury.

Best Corrected Visual Acuity

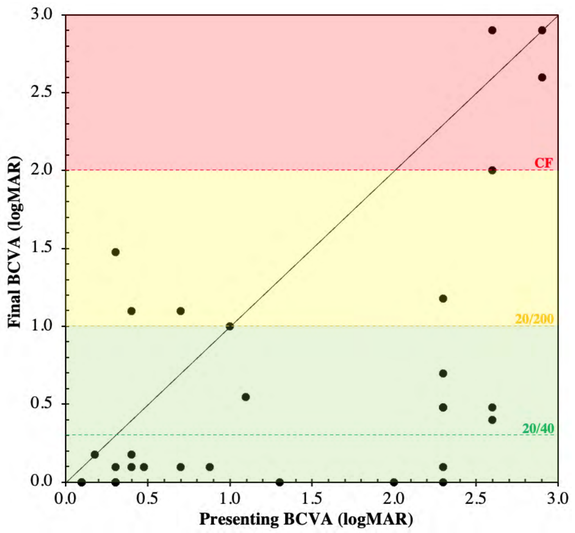
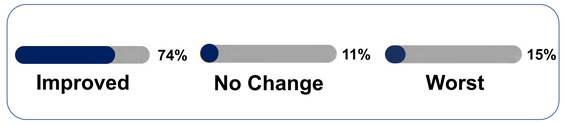


Figure 4 – Scatter plot of the BCVA for each respective eye. The points on the diagonal line represent cases where there was no change in BCVA, while points above the line represent a decrease in BCVA, and points below the line represent an improvement in BCVA.



At final follow-up, BCVA was ≥20/40 in 17 eyes (53%), compared to only 7 eyes (22%) at presentation. Patients who presented with BCVA ≥20/200 were more likely to achieve final BCVA ≥20/40 (p=0.027). The IOFB was removed in 28 eyes (88%), of which 21 (75%) were extracted within 24 hours of injury. The IOFB was retained in 3 eyes (9%), and one eye (3%) required acute enucleation.

DISCUSSION & CONCLUSIONS

- **Demographics** – The average age, higher proportion of male patients, and greater incidence of metallic IOFBs observed in this study are consistent with findings from other large cohort studies conducted in the United States and China. Although work-related injuries are often the primary cause of IOFBs in studies from these countries, this study found that only 46.9% of the injuries were work-related. Additionally, while weapon-related injuries accounted for 19% of IOFB cases in the US, this study recorded only three accidental gunshot injuries, which comprised 9.4% of the cases.
- **Imaging** – According to the literature, CT scans are the most sensitive imaging modality and are preferred in emergency settings due to their availability and convenience. MRI and B-scan imaging are appropriate additional tests, but in Canada, limited accessibility to MRI and the risk of harm associated with metal IOFBs make it impractical. To reduce radiation exposure, B-scan is a reasonable initial test, especially for closed-globe and non-metal IOFB cases. X-rays can be used as screening tests for metal IOFBs but may require follow-up images if no IOFB is identified in the context of a strong clinical history.
- **Surgical approach and strategy** – Involved performing surgery under general anesthesia, repairing the penetrating site, addressing both the anterior and posterior segments, and extracting the IOFB.
- **Complications** – Similar to studies reported in the literature, vitreous hemorrhage and traumatic cataract were some of the most common complications observed. In our study, complications were captured throughout the entire follow-up period of patients. We observed 9 eyes (28%) had developed ERM, all of which occurred more than a month after the initial trauma. This complication may not be captured in other studies where only the initial presenting injuries and complications are noted.
- **Significance** – This study provides valuable insight into the diagnosis, treatment, and outcomes of IOFB injuries in Southern Alberta. Clinical measures were stratified by timeframes, with the late-presenting complications highlighting the importance of extended follow-up for timely intervention. The study participants had a lower incidence of work-related injuries, indicating a strong workplace safety culture and emphasizing the need for protective eyewear in extracurricular settings.

REFERENCES

Advancing eye care through innovation, education, and advocacy

L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

Long-Term Efficacy and Safety of the Port Delivery System With Ranibizumab in Patients With Neovascular Age-Related Macular Degeneration: Results From the Portal 5-Year Subgroup Analysis

calgary RETINA CONSULTANTS

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1Calgary Retina Consultants, Calgary, Alberta; 2Wolfe Eye Clinic, West Des Moines, Iowa; 3Retina Associates of Utah, Salt Lake City, Utah; 4Genentech, Inc. South San Francisco, California

Financial Disclosures: GW: Research Support: Novartis, Roche, Genentech, Regenxbio, Iveric, Regeneron, Parexel, Opthea; Consultant/Advisory Board: Novartis, Bayer, Roche, Biogen, Allergan/Abbvie, Alcon, Apellis; Speakers Bureau: Bayer, Novartis, Roche, Biogen, Allergan/Abbvie, Apellis; Other: Artic Dx, MD Collaborate; JN: Research Support: Alexion, Eyepoint Pharmaceuticals, Gemini Therapeutics, Genentech, Gyroscope Therapeutics, Iveric Bio, Kodiak Scientific, Novartis, Novo Nordisk, Regeneron, Regenxbio, Roche; Consultant/Advisory Board: Iveric Bio, Regeneron; Speakers Bureau: Apellis, Genentech; JH: Consultant: Genentech, Inc.; Speaker honoraria: Genentech, Inc.; MCC, NS, SG: Employment: Genentech, Inc.

INTRODUCTION

PDS was approved by the US FDA in October 2021, as a drug-device combination with 2 refills per year for maintenance of vision and retinal anatomy in patients with nAMD[1,a]

- PDS is an innovative drug delivery system for continuous delivery of a customized formulation of ranibizumab into the vitreous
- The Portal extension trial (NCT03683251) is evaluating long-term safety and tolerability of the PDS 100 mg/mL and includes patients with neovascular age-related macular degeneration who have completed the phase 2 Ladder (NCT02510794) trial

The Port Delivery System With Ranibizumab (PDS)

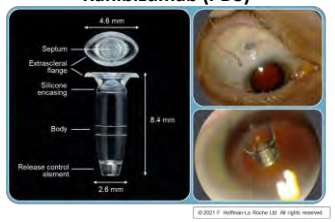

Figure 1. Dimensions of the PDS implant

AIM

The aim of this study is to report the efficacy and safety data for the subgroup of Portal patients from Ladder treated with PDS for at least 5 years

METHODS

Portal is an ongoing, multicenter, open-label extension study enrolling patients who completed the Ladder or Archway (NCT03677934) trials, or who will have participated in the Velodrome trial (NCT04657289)

- Ladder patients received the PDS (10, 40, or 100 mg/mL) with PRN refills or monthly intravitreal ranibizumab 0.5 mg injections (monthly ranibizumab)
- Once rolled over to Portal, patients received PDS 100 mg/mL with fixed refill-exchanges every 24 weeks from day 1
- Patients who were in the intravitreal arm received the PDS Implant on Portal day 1
- Efficacy outcomes were assessed for Ladder-to-Portal patients treated with PDS 100 mg/mL for at least 5 years
- Long-term safety data will be pooled to include any patient in the10, 40, and 100 mg/mL groups of Ladder who had the PDS for at least 5 years

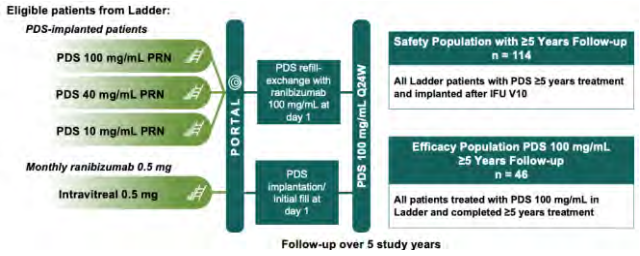

Figure 2. Ladder Patients of the Portal Extension Study. Portal is designed to evaluate the long-term safety and tolerability of the PDS for nAMD

RESULTS

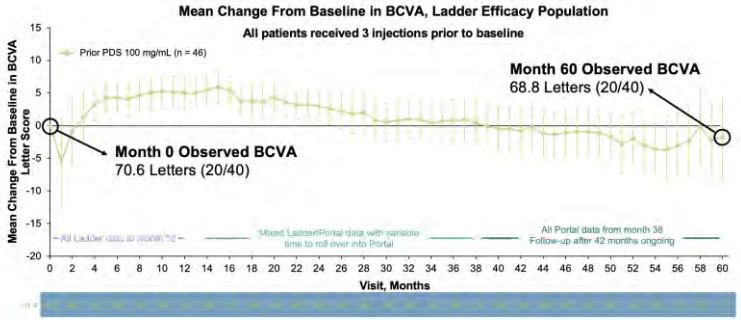

Figure 3. Baseline BCVA of 20/40 Snellen Maintained Over 5 Years (60 Months) in Patients Who Received PDS 100mg/ml Q24W

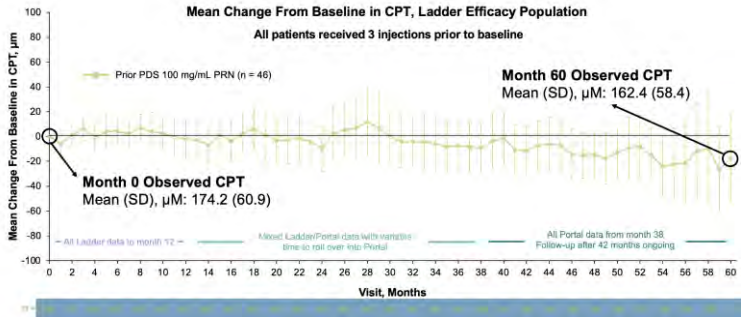

Figure 4. CPT Remained Stable Over 5 years (60 Months) in Patients Who Received PDS 100 mg/ml Q24W

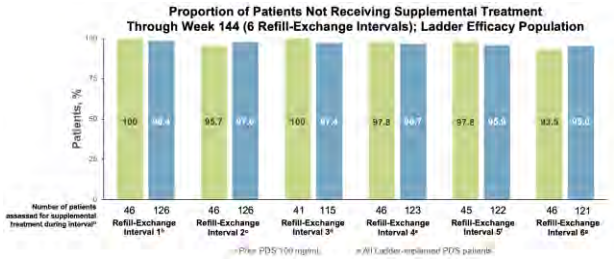

Figure 5. ~95% of PDS Q24W Ladder-Implanted Patients ≥ 5 Years Previously Did Not Receive Supplemental Treatment Through Each Refill-Exchange Interval During Portal

RESULTS

MedDRA Preferred Term[c]	All Ladder-Implanted Patients with PDS ≥5 Years[b] (July 2022 Data-cut); n = 114	
Overall number of AESIs	76	
Mean (SD) follow-up time, weeks	276.3 (17.2)	
	All	Sight-threatening[e]
Total number of patients with ≥ 1 AESI, n (%)	47 (41.2)	1 (0.9)
Cataract[d]	31 (27.2)	0
Conjunctival bleb/conjunctival filtering bleb leak	7 (6.1)	0
Vitreous hemorrhage	8 (7.0)	0
Conjunctival erosion	10 (8.8)	0
Conjunctival retraction	1 (0.9)	0
Endophthalmitis[d]	0	0
Implant dislocation	0	0
Septum dislodgement	0	0
Hyphema	3 (2.6)	1 (0.9)
Rhegmatogenous retinal detachment	1 (0.9)	0

Figure 6. Ocular Adverse Events of Special Interest From Time of Implant Insertion: Ladder-Implanted PDS Patients with ≥ 5 Years Follow-Up

CONCLUSIONS

- Results from Portal suggest that vision and anatomical outcomes with PDS 100 mg/mL are generally stable over 60 months
- ~95% of PDS Q24W patients assessed did not receive supplemental ranibizumab treatment through 6 refill-exchange intervals
- The long-term safety profile of PDS is well characterized and manageable in the 114 patients that completed 5 years of treatment

REFERENCES

1. Susvimo [prescribing information]. South San Francisco, CA: Genentech, Inc.; 2022.

ABBREVIATIONS

BCVA, best-corrected visual acuity; CPT, center point thickness; nAMD, neovascular age-related macular degeneration; PDS, port delivery system with ranibizumab; PRN, pro re nata.

STUDY DISCLOSURES

PDS has been approved by the US Food and Drug Administration for the treatment of nAMD in adults who have previously responded to ≥ 2 anti-VEGF injections. Please note that the PDS has not been approved for use outside of the United States, nor in Canada

- **Roche/Genentech has voluntarily recalled the PDS (Susvimo) Ocular Implant and Insertion Tool Assembly, including the ranibizumab drug vial and initial fill needle (lot numbers 3499188 and 3523071), which are sold together, and paused implantations including in ongoing global clinical trials**
- **The US FDA has issued a boxed warning for the PDS because it has been associated with a 3-fold higher rate of endophthalmitis compared with monthly intravitreal injections of ranibizumab**

Long-Term Re-Detachment Rates of Pneumatic Retinopexy versus Pars Plana Vitrectomy in Retinal Detachment: a PIVOT Post-Hoc Analysis

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BACKGROUND & PURPOSE

- Pars Plana Vitrectomy (PPV) remains the globally popular surgical treatment of primary Rheumatogenous Retinal Detachment (RRD).[1, 2]
- However, the **Management of Primary RDD Outcomes Randomized Trial (PIVOT)** suggested that Pneumatic Retinopexy (PnR) should be considered first-line treatment.[2]
  - PnR demonstrated better functional outcomes and less morbidity compared to PPV.
  - Looked at redetachment rates at 1 year.

What is Pneumatic Retinopexy?

- Intravitreal injection of an expansile gas bubble + specific patient positioning → tamponade of the retinal break as fluid is resorbed
- Chorioretinal adhesion made with laser or cryotherapy seals the break
- However, PnR does not address vitreous traction, and some may fear subsequent retinal detachment
- PIVOT assessed success at 1 year, but what about longer-term outcomes?
- Limited data exists regarding long-term follow up of patients following PnR

- The purpose of our study is **to assess long-term re-detachment rates of patients who underwent PnR and PPV in the PIVOT trial**, a prospective randomized clinical trial performed with rigorous inclusion and exclusion criteria.

MATERIAL & METHODS

Eligible PIVOT Participants
No subsequent reintervention to reattach the retina within the first year

- **≥ 6 years of documented follow up on EMR**
  Redetachment assessed by EMR chart review
- **2 - 5 years of documented follow up on EMR**
  Redetachment assessed by EMR chart review
  +
  Direct patient phone call to assess outcome
- **<2 years of documented follow up on EMR**
  Direct patient phone call only

Excluded Participants
Unreachable by telephone

Telephone Interview
- Retinal detachment since last recorded follow up?
  - Past or upcoming planned procedures?
  - Comments or concerns regarding study eye?

Statistical Analysis
- Normally and non-normally distributed continuous variables presented as mean ± SD.
  - Categorical variables are presented as absolute values and percentages.
  - Two-tailed T-test was used for statistical significance, with an alpha of 0.05.

RESULTS

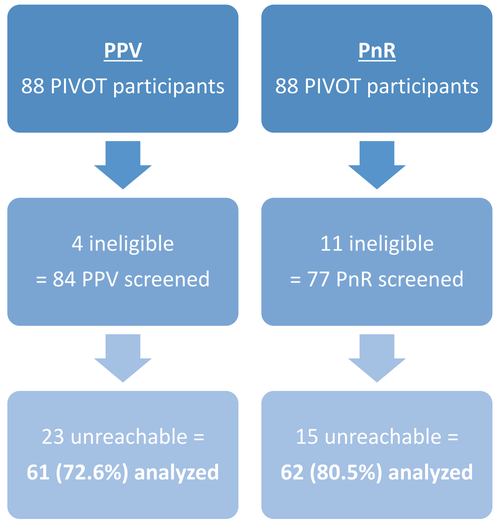

Figure 1. A visual Representation of screening/selection criteria. Participants part of the original PIVOT trial were marked as ineligible and excluded if re-intervention to reattach the retina was performed within one year of the initial procedure or if they withdrew from the study. For participants with less than 2 years of follow-up, only a telephone interview was accepted otherwise they were marked as unreachable and excluded.

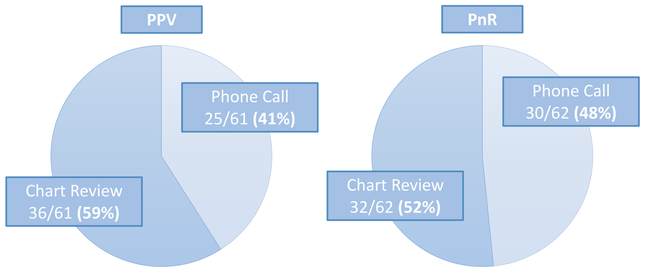

Figure 2. A visual representation of the method used to determine redetachment rates in PPV and PnR groups. Mean age: 68.4 ± 7.7 and 69.3 ± 9.7 years and mean follow-up duration: 4.34 ± 2.8 and 4.26 ± 2.81 years for PPV and PnR groups, respectively.

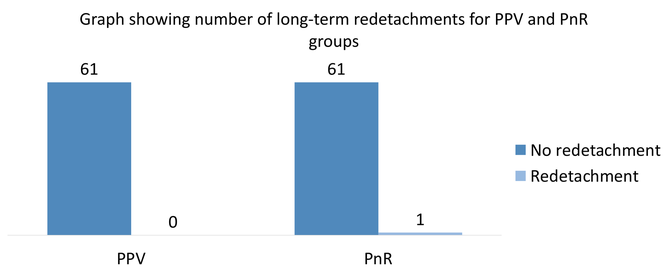

Figure 3. Long-term redetachment rate was 0% (0/61) and 1.6% (1/62) for PPV and PnR groups, respectively (p=0.32). Notably, the sole patient with RRD recurrence was a 68yo male with initially successful PnR but redetachment after subsequent PPV for symptomatic floaters.

SUMMARY & CONCLUSION

- There was **no statistically significant difference in long-term redetachment** rates for PnR vs PPV groups.
- Both procedures are durable treatment options for RRD over an extended period, rarely requiring reintervention for redetachment.
- Suggests that the strong chorioretinal adhesion induced by laser or cryopexy is sufficient to overcome tractional forces on the retina.
  - Relieving vitreous traction with PPV or SB is not necessarily required for long-term success for most primary RRDs.
- Combining this knowledge of a similar functional outcome with other benefits of PnR can help make an informed treatment decision.
  - Research shows that PnR is minimally invasive, associated with improved VA, reduced vertical metamorphopsia and aniseikonia, reduced morbidity, and higher scores in mental health and vision-related functioning.[3]
  - PPV and SB have been found to have greater rates of cataract formation versus PPV.[4,5]
  - PnR is the more cost-effective procedure.[6,7]
- PnR can be considered a **first line treatment option for eligible RRDs**, as per the criteria of the PIVOT study.

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Margin Delineation and Objective Assessment of Choroidal Nevi Melanin Content with Polarization Diversity Optical Coherence Tomography (PD-OCT)

COS 2024

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INTRODUCTION

Clinical differentiation between choroidal nevi and melanomas requires multimodal imaging. Imaging modalities such as fundus photography or optical coherence tomography (OCT) provide structural information, but to date there are no imaging modalities that provide molecular-specific contrast.

Polarization-diversity OCT (PD-OCT) is a functional extension of OCT that enables non-invasive visualization of melanin within the eye[1-3].

AIM

To assess the utility of PD-OCT imaging of nevi in the objective assessment of lesion pigmentation and delineation of lesion margins.

METHOD

Study Design:

Cross sectional study.

Recruitment, Data collection

Patients with a choroidal nevus between Oct 2021 and Aug 2022 at two high-volume ophthalmology clinics in the Vancouver General Hospital (Vancouver, BC) were imaged with a custom-built 55-degree field-of-view 400kHz PD-OCT system.

Data Analysis

Using PD-OCT data, lesions were manually segmented and lesion size measurements were compared with measurements from clinical ultrasonography.

Various objective melanin metrics were also calculated:

- Attenuation coefficient (AC)
- Degree of polarization uniformity (DOPU)
- Melanin occupancy rate (MOR)

RESULTS

Table 1. *Patient demographics.*

Feature	Pigmented	Mixed	Non-pigmented
Number of nevi	11	3	3
Average age, years (SD)	68 (17)	84 (6)	61 (15)

- Pigmented nevi demonstrated greater light attenuation, lower degree of polarization uniformity (DOPU), and greater melanin occupancy rate (MOR) than mixed-pigmented or non-pigmented nevi (**Figure 2**).
- 9 of 11 (82%) pigmented nevi had a corresponding melanotic appearance on PD-OCT. 3/3 (100%) of mixed pigmentated nevi and 3/3 (100%) of non-pigmented nevi had a corresponding mixed melanin and amelanotic appearance on PD-OCT, respectively.

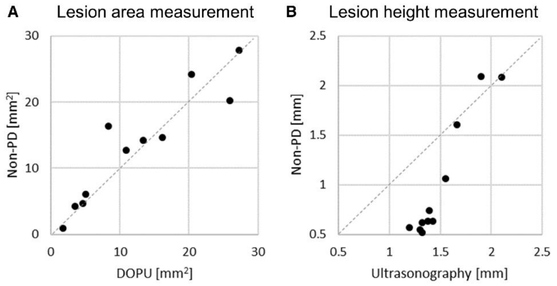

Figure 1. *Comparison of margins assessed with non-polarization-diversity optical coherence tomography (non-PD-OCT) B-scans, degree of polarization uniformity (DOPU) en face projections, or ultrasonography.*

CONCLUSION

Melanin-specific contrast provided by PD-OCT can be useful in assessing lesion margin, melanin content, and size. Further studies are also needed to refine our understanding of how melanin distribution within nevi is implicated in tumor pathogenesis and risk of malignant transformation.

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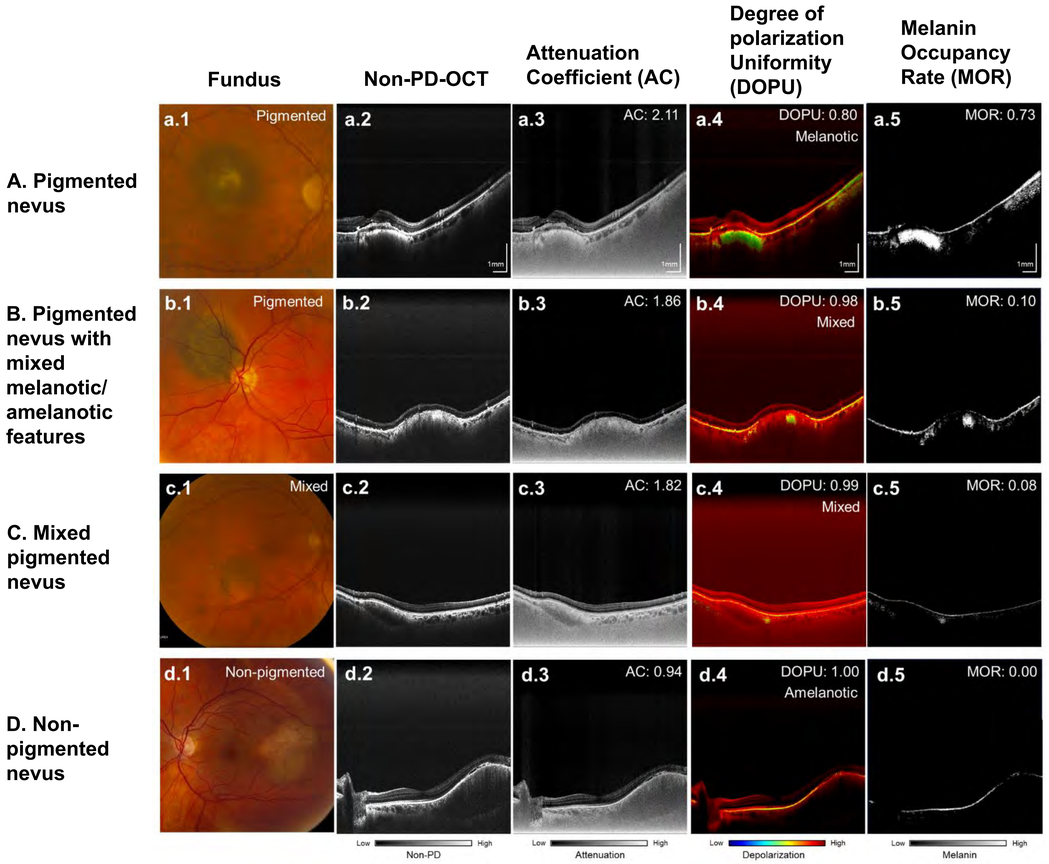

Figure 2. *Quantitative assessment of four nevi from polarization-diversity optical coherence tomography (PD-OCT), organized by row (A-D). Column 1: Fundus photograph. Column 2: Non-PD-OCT B-scan with linear scale representation. Column 3: Attenuation coefficient (AC) projection. Column 4: Degree of polarization uniformity (DOPU) projection. Column 5: Melanin occupancy rate (MOR) projection.*

ACKNOWLEDGEMENTS

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Morphologic Features and Implications of Regulated versus Dysregulated Rhegmatogenous Retinal Detachment Using Swept-Source Optical Coherence Tomography

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BACKGROUND & PURPOSE

- **Dysregulated Rhegmatogenous Retinal Detachment (RRD)**

Acute, progressive, extensive RRD

The influx of liquified vitreous from the retinal break overwhelms the RPE pump's capacity, leading to disruption of the subretinal homeostatic mechanism that controls outer retinal hydration

- **Regulated RRD**

Localized, slow, or non-progressive

The RPE pump can maintain relative control of the subretinal space

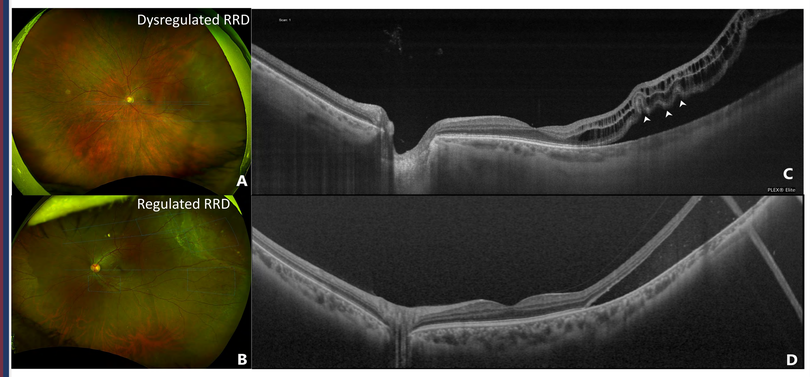
Purpose: To describe the differences in baseline morphological features with SS-OCT between RRDs with RPE-photoreceptor dysregulation vs regulated cases

Regulated RRD | **Dysregulated RRD**

MATERIAL & METHODS

METHODS:

- **Prospective cohort of consecutive primary RRDs,** August 2020-August 2023.
- PLEX Elite 9000 SS-OCT and Ultra-Widefield Optos Silverstone at baseline and 3 months postoperatively.



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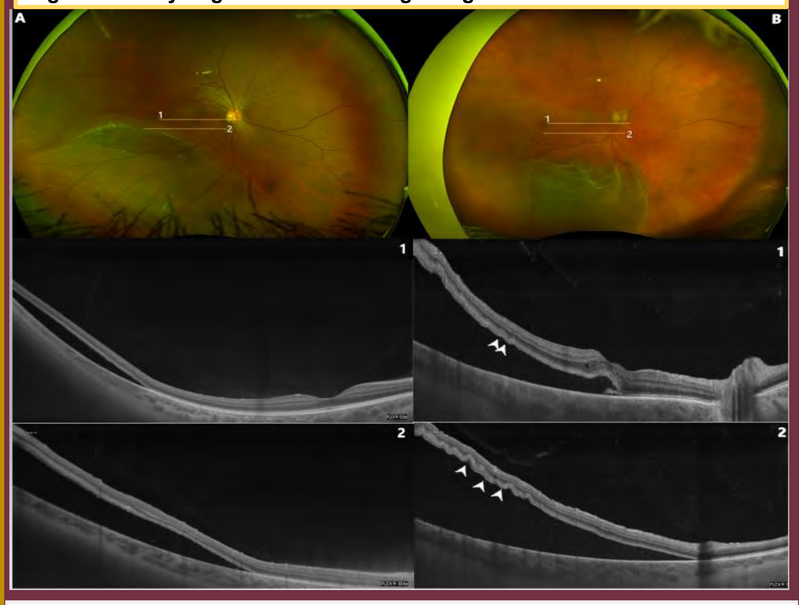
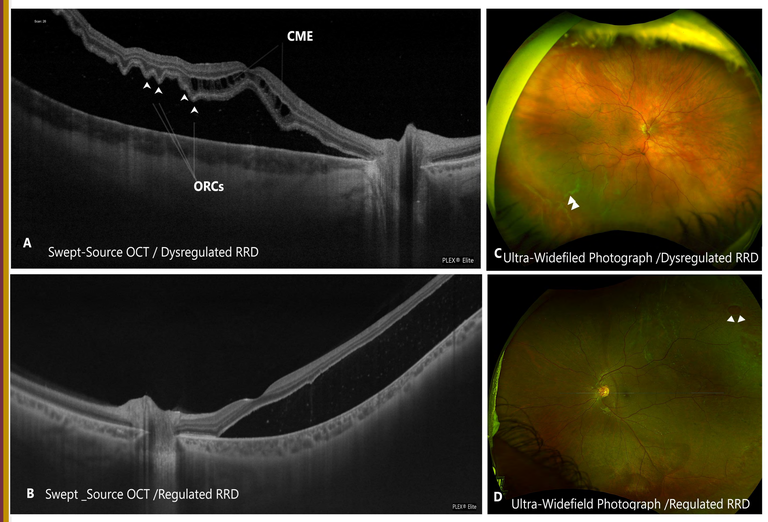
Regulated vs dysregulated inferior rhegmatogenous retinal detachment



- Ultra-widefield color fundus photo demonstrating inferior fovea on RRD, subclinical, shallow (regulated RRD) –A and bullous (dysregulated) inferior fovea involving RRD.
- Swept-source optical coherence tomography (SS-OCT) scans locations with corresponding images (A1,2) demonstrating the absence of outer retinal corrugations, despite the vertical thickening of the photoreceptor layer . SS-OCT scans in the corresponding locations demonstrated thickening of photoreceptors and early outer retinal corrugations (ORCs) B1 and B2 high-frequency ORCs,(white arrowheads)

Clinical and morphological differences in dysregulated vs regulated RRD



RESULTS

Variable	Regulated RRD	Dysregulated RRD	P Value
Age	43.9(SD18.4)	62.9(SD12.7)	<0.001
Lens (Phakic)	84.6%(22/26)	53.1%(41/95)	0.001
Horseshoe retinal Tear	0 % (0/18)	87.3% (48/55)	<0.001
Small/atrophic holes	100%(18/18)	46% (7/15)	<0.001
OCT Features			
Outer Retinal Corrugations(ORC)	3.8%(1.26)	84.4%(81/96)	<0.001
Height of Foveal Detachment	365.29(SD 300.3)	894.3(SD 664.1)	0.01
Cystoid Macular Edema (CME)	50% (8/16)	87.2(85/94)	<0.001
Bacillary Layer Detachment and Macular Hole	0%(0/18)	13.8%(13/94)	0.1
Ellipsoid Zone Thickness	68.4 (SD 50)	77.0 (SD 34.2)	0.2
Hyperreflective Dots	61.5%(16/26)	3.8 (42/96)	0.1
Subretinal Material	46.2%(12/26)	5.2%(5/96)	<0.001
Stages of RRD	Stage 1: 0 % (0/16) Stage 2: 31.3% (5/16) Stage 3A : 0% (0/16) Stage 3B: 6.3% 1/16 Stage 4:0.0 % (0/16) Stage 5: 62.5 % (10/16)	Stage 1: 0%(0/94) Stage 2: 14.9 %(14/94) Stage 3A: 15.9% (15/94) Stage3B: 38.3%(36/94) Stage 4 : 23.4% (22/94) Stage 5: 7.4% (7/94)	<0.001
Foveal photoreceptors	Intact 31.2%(5/16) Patchy loss 50% (8/16) Total loss 18.8% (3/16)	Intact 69.7%(53/76) Patchy loss 25%(19/76) Total loss 5.3% (4/76)	<0.001
Treatment Modality			0.001
Pneumatic Retinopexy (PnR)	50% (13/26)	68.8%, (66/96)	
Pars Plana Vitrectomy (PPV)	3.8% (1/26)	26.0% (25/96)	
Scleral Buckle(SB)	19.2% (5/26)	2.1% (2/96)	
SB+PPV	11.5% (3/26)	2.1%(2/96)	
Suprachoroidal Viscopexy		1.0 %(1/96)	
Laser Retinopexy	3.8% (1/26)		
Observation	7.7%(2/26) 3.8% (1/26)	0% (0/96) 0%(0/96)	
Postoperative Outer Retinal Folds	0% (0/10)	12.9%(11/85)	0.5
Subfoveal residual fluid	40%(4/10)	21.1%(18/85)	0.08

SUMMARY/CONCLUSION

- This is the first study to assess the morphologic differences between regulated and dysregulated RRDs using SS-OCT.
- ORCs = compensatory response to IPM hydration/lateral expansion due to continuous influx of hypo-osmolar liquified vitreous into the subretinal space in dysregulated RRD.
- We found a significant difference between the mean height of detachment, presence of CME and ORCs, morphologic stage of RRD, and type of causative break.
- These differences may have implications for optimal treatment strategy

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Morphologic Stages of Full-Thickness Macular Hole Assessed with Spectral Domain Optical Coherence Tomography

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BACKGROUND & PURPOSE

- The integrity of the outer retinal bands as surrogate markers of photoreceptor health in macular holes (MHs) has attracted increasing interest.
- Additionally, the evolving nature of photoreceptor disruption at the macular hole border preoperatively has been documented (1).
- However, progressive morphologic changes following FTMH have never been described in humans *in vivo*

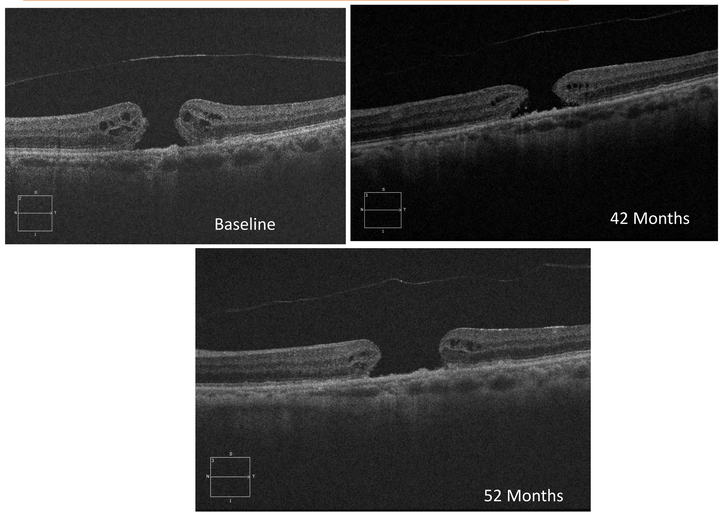
Purpose: To describe the sequential morphological changes following full-thickness macular hole (FTMH) formation, utilizing a novel, objective staging system based on optical coherence tomography (OCT), and to determine its association with baseline visual acuity (VA) and duration of symptoms.

MATERIAL & METHODS

METHODS:

- **Retrospective multicenter cohort study,** January 2009-August 2022.
- Multimodal imaging of 1000 patients diagnosed with primary FTMH were assessed.
- Patients with at least 2 preoperative OCT scans (Signal strength >= 6) were included.

Preoperative OCT scans (same patient)



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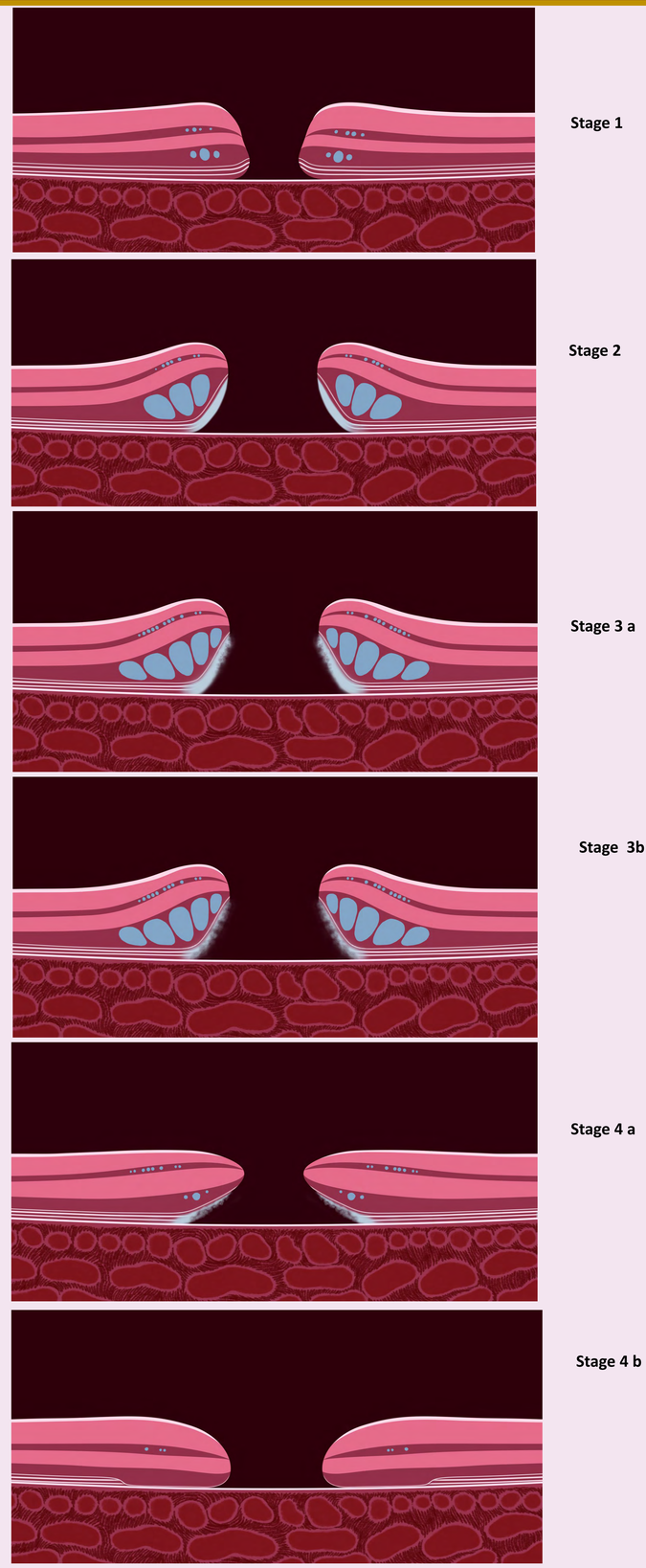


Sequential morphologic changes in outer retina following FTMH

RESULTS

- **52 patients were included**

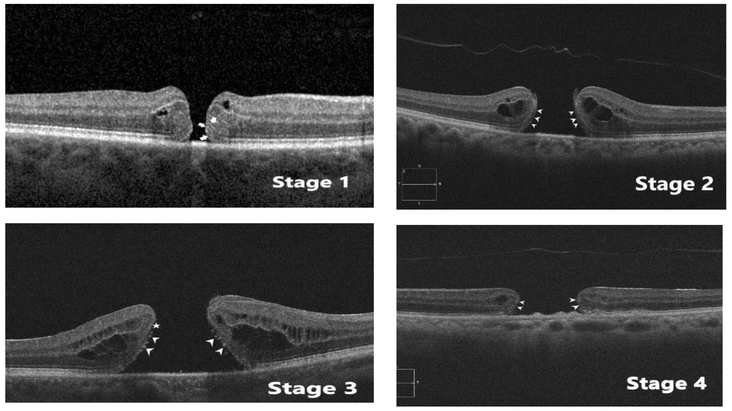
Outer retinal changes following FTMH occurred in 4 stages:

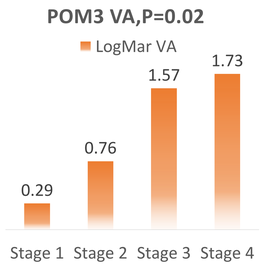
Stage 1 - Separation of the neurosensory retina from the RPE with a well-defined interdigitation zone (IDZ), ellipsoid zone (EZ), and external limiting membrane (ELM) (4/52, 7.7%)

Stage 2 -Hydration: thickening of photoreceptor inner (IS) and outer segments (OS) (27 /52;51.9 %)

Stage 3 - Patchy (moth-eaten)photoreceptor loss (16/52;30.8 %)

Stage 4- Severe or complete loss of ISs and OSs and /or bare ELM (5/52, 9.6%).





	Progression Time (Days, SD)
Stage 1 to Stage 2	21(0)
Stage 2 to Stage 3	284 (216.7)
Stage 3 to Stage 4	482 (543.4)

SUMMARY/CONCLUSION

This novel staging system describes the sequential morphologic changes in FTMH with SD-OCT over time.

- The baseline morphological stage of FTMH was associated with the duration of symptoms and baseline visual acuity and most importantly with 3 months postoperative VA
- This objective staging system provides a potential novel imaging biomarker for FTMH.

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Advancing eye care through innovation, education, and advocacy
L'avancement des soins oculaires grâce à l'innovation, la formation et la représentation

Myopia and its associations between axial length and Optical Coherence Tomography Angiography biomarkers

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PURPOSE

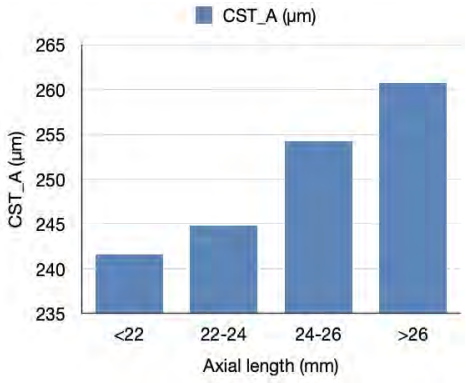
To determine the associations between axial length (AL) and optical coherence tomography angiography (OCTA)-based eye-related parameters.

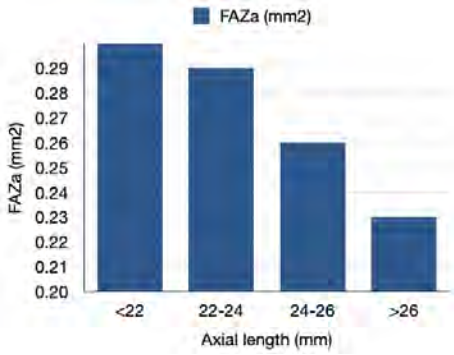
METHODS

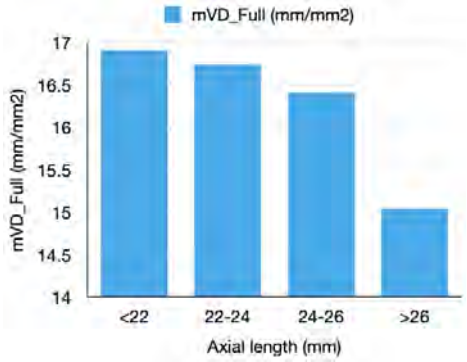
- A prospective cross-sectional study of the right eye of 6953 individuals between the ages 50 and 97, with a range of AL from 19.1 to 31.7 mm was performed.
- Central subfield thickness (CST), foveal avascular zone (FAZ) and mean vessel density (mVD) were measured by OCTA.
- Associations between OCTA-based parameters, eye-related and systemic-related parameters were assessed using one-way ANCOVA, multivariable linear regression analysis and multiple regression analysis.

RESULTS

- AL and OCTA-based parameters were negatively correlated with age.
- Increased AL was associated with increased CST (ß=3.59), decreased FAZ (ß=0.02), and decreased mVD (ß=-0.4) (all p=0.000).
- Better best corrected visual acuity (BCVA) was associated with larger FAZ (ß=-0.07) and higher mVD (ß=-3.160) (p=0.002, p=0.000).
- Hypertension and diabetes mellitus correlated with increased mVD (ß=0.5) and decreased mVD (ß=-0.18) respectively (p=0.000, p=0.023).







CONCLUSION

Increased AL is associated with lower mVD which may be a potential factor between myopia and poor BCVA.

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Novel Vitreous Substitutes in Animal and Human Models: A Systematic Review

COS 2024

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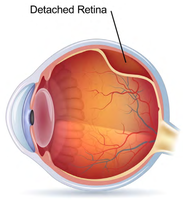
INTRODUCTION



- Vitreous substitutes are crucial adjuncts during vitreoretinal surgery to treat conditions such as retinal detachment, macular holes, and complications of diabetic retinopathy.
- Common vitreous substitutes include sterile room air, expansile gases such as SF_6, C_3F_8, BSS, PFCLs, SFAs, and silicone oils.
- These vitreous substitutes pose limitations in terms of post-operative decrease in visual sharpness, non-favourable refractive indices, significant need for patient positioning, as well as complications including corneal toxicity, cataract, glaucoma, intraocular inflammatory reactions, emulsification, or retinal toxicity/disruption
- Over the past 30 years, research in animal and human models has focused on finding the ideal vitreous substitute.

AIM

- Vitreous substitutes are crucial adjuncts during vitreoretinal surgery for retinal detachment, macular holes, and vitreous hemorrhage.
- The aim of this systematic review is to examine the optical, biological, and clinical outcomes of experimental vitreous substitutes evaluated in animal and human models over the last 30 years.

METHOD

Systematic Review

- Search of Ovid Medline, Embase and Scopus from Jan 1 1990 to Mar 31 2022 was performed to identify articles reporting on novel experimental vitreous substitutes tested *in vivo* in animal or human models with at least 10 eyes receiving the substitute.

Inclusion Criteria:

For studies to be included, they reported on at least one aspect:

1) optical properties e.g. refractive index
2) biological interactions e.g. ocular tissue toxicity
3) clinical outcomes e.g. retinal tamponade effect and surgical complications.

- Studies that only examined room air, expansile gases, perfluorocarbon liquids, semifluorinated alkanes, and silicone oils were not considered novel and excluded unless compared to a novel substitute.
- The SYRCLE and Cochrane ROBINS-I tool were used to assess risk of bias. Results were reported with descriptive statistics.

RESULTS

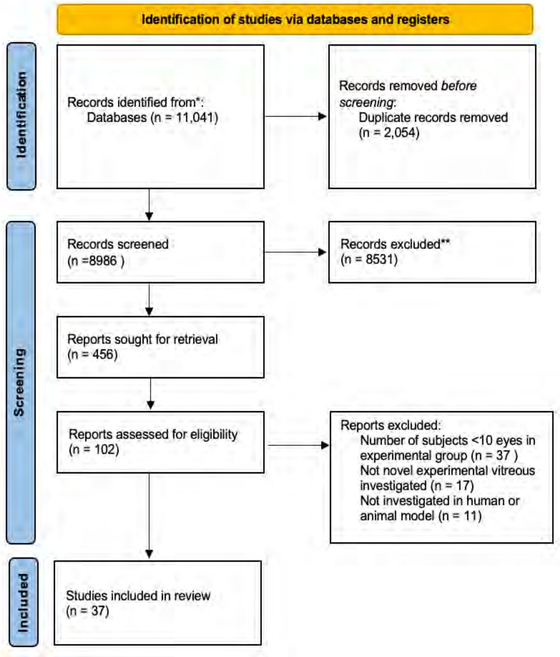


Figure 1: PRISMA Search Diagram

Of 11,041 search results, 37 studies investigating novel hydrogels (n = 15), polymers (n = 5), liquids (n = 5), and devices (n = 12) were included.

16/37 substitutes had >80% success in tamponade of RDs:

- UV-CHA
- TCHA hydrogel
- WTG-127
- EPC
- PEG hydrogel
- Thiol-containing hydrogel
- CoP hydrogel
- PanaceaGel SPG-178
- Vitargus ABV-1701
- HA-PEG oxime-crosslinked hydrogel
- Foldable capsular vitreous body (FCVB)
- E10KDC18
- Chitosan solution
- PFO
- F6H8
- O_{62}

12/37 substitutes showed high tissue biocompatibility:

- Healaflow
- UV-CHA
- EPC
- Thiol-containing hydrogel
- CoP hydrogel
- PanaceaGel SPG-178
- Vitargus ABV-1701
- HA-PEG oxime-crosslinked hydrogel
- FCVB
- E10KDC18
- FL-HA
- MCTs

14/37 substitutes associated with no significant changes in IOP

- UV-CHA
- TCHA hydrogel
- HPCTS-ADA
- WTG-127
- EPC
- CoP hydrogel
- PanaceaGel SPG-178
- HA-PEG oxime-crosslinked hydrogel
- FCVB
- E10KDC18
- FL-HA
- Chitosan solution
- MCTs
- PFP

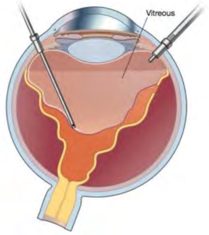
13/37 substitutes showed optical properties similar to vitreous:

- UV-CHA
- TCHA hydrogel
- HPCTS-ADA
- WTG-127
- EPC
- PEG hydrogel
- Thiol-containing hydrogel
- CoP hydrogel
- PanaceaGel SPG-178
- Vitargus ABV-1701
- HA-PEG oxime-crosslinked hydrogel
- E10KDC18
- O_{62}

15/37 substitutes showed low ocular Inflammation:

- Healaflow
- UV-CHA
- WTG-127
- PEG hydrogel
- Thiol-containing hydrogel
- CoP hydrogel
- PanaceaGel SPG-178
- PVA/chitosan hydrogel
- Vitargus ABV-1701
- HA-PEG oxime-crosslinked hydrogel
- FCVB
- E10KDC18
- FL-HA
- Chitosan solution
- MCTs

CONCLUSION



- Novel experimental vitreous substitutes such as UV-CHA, Vitargus ABV-1701, PanaceaGel SPG-178, E10KDC18 or FCVB show promising biological, optical, and physical properties for additional investigation as vitreous substitutes.
- Further research is needed regarding the optimal vitreous substitute

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Patient knowledge of pentosan polysulfate maculopathy in Alberta: a population wide survey-based study

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Introduction

Pentosan polysulfate (PPS) is prescribed for interstitial cystitis, a syndrome of chronic bladder and pelvis pain more commonly seen in women. PPS is the only oral medication available for this indication and most patients who are on PPS continue the medication indefinitely.

PPS toxicity manifests as a dose-related progressive maculopathy (PPSM) with characteristic clinical and imaging findings. Current literature suggests that PPS toxicity can occur as early as 3 years[1] and that the risk increases significantly with increased duration and cumulative dose. One study found the risk of PPS as high as 41.7% for greater than 1500 g cumulative dose.[2] Standard dosing regimen is 100 mg TID, achieving an average cumulative dose of approximately 100 g per year. Progression of PPS toxicity is possible even after drug cessation.[3]

To date, studies examining PPSM have consisted primarily of institutional case series and epidemiological studies derived from insurance claim administrative databases. No population level studies nor studies examining patient knowledge of PPSM have been conducted.

Purpose

To characterize the prevalence of pentosan polysulfate sodium usage and associated knowledge of pentosan polysulfate sodium maculopathy in patients prescribed PPS in Alberta using a population wide administrative database-based survey

Methods

Identification

Query of Pharmaceutical Index Number database for patients dispense PPS by DIN number: 02029448 between 01/2007 – 12/2021 in Alberta (n = 3,767)

→ Exclusion: <5 years of cumulative years prescribed PPS (n = 3,264)

Screening

Cases less exclusion criteria (n =503)

→ Exclusion: Deceased, moved out-of province, withdrawn from provincial heath program(n = 74)

Eligibility

Cases contacted for study participation through AHS anonymous permission to contact initiative (n = 429)

Included

Cases completing survey and study (n = 74)

→ Data extraction and analysis

Results

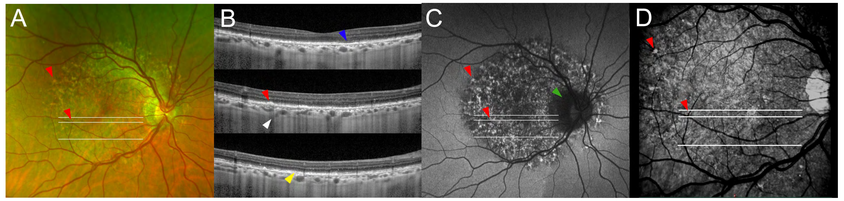


Figure 1A. Color photography. Early findings are often subtle and consist of parafoveal hyperpigmented or yellow/orange spots (red arrows) at the level of the RPE. Advanced stages demonstrate RPE atrophy.
Figure 1B. Optical coherence tomography. Early findings include a loss of definition of the interdigitation zone and thickening between the ellipsoid and interdigitation zone (yellow arrows). Nodular excrescences at the level of the RPE correspond with the clinically hyperpigmented and orange lesions (red arrows). These are distinguishable from drusen from their projection of a shadow onto choroid (white arrows). Advanced cases demonstrate complete RPE and outer retinal atrophy (blue arrows).
Figure 1C. Autofluorescence. Autofluorescence findings are often more apparent than clinical exam and demonstrate a well-delineated region of irregular, mixed hyper and hypo-autofluorescence pattern. The hyperautofluorescent lesions correspond to the nodular excrescences on OCT (red arrows). A peripapillary hypoautofluorescent halo is characteristic (green arrows) Advanced cases of RPE atrophy demonstrate solid hypoautofluorescence.
Figure 1D. Near infrared imaging. NIR demonstrates an irregular reflectance pattern with prominent hyper reflectance matching with the nodular excrescences on OCT (red arrows). The hyperreflectivity of PPS lesions are often more pronounced than that of drusen. NIR may show evidence of PPS toxicity before other imaging modalities are clearly present.

Table 1. Patient demographic characteristics

		RANGE
GENDER	67F:7M	
AGE	62 +/- 13 years	32-93
ACTIVE PPS USE	Yes: 33/74 (45%) No (Discontinued): 41/74 (55%)	
SELF REPORTED DURATION OF PPS USE	11.5 +/- 8 years	2-33
MEDIAN PPS DAILY DOSE	300 +/- 100 mg/day	100-600
SMOKING STATUS	Never: 46/74 (62%) Previous: 24/74 (32%) Current: 4/74 (5%)	
PRIOR MEDICATION* USE ASSOCIATED WITH MACULOPATHY	Yes: 6/74 (8%) No: 68/74 (92%)	
PRIOR MACULOPATHY** DIAGNOSIS	Yes: 5/74 (7%) No: 69/74 (93%)	
PRIOR INTRAVITREAL INJECTION	Yes: 19/74 (26%) No: 55/74 (74%)	
PPS PRESCRIBER	Urologist: 49/74 (66%) Family Physician: 18/74 (24%) Ob/Gyn: 7/74 (10%)	

*Hydroxychloroquine, chloroquine, thioridazine, deferoxamine, tamoxifen, canthaxanthine
**Macular degeneration, pattern dystrophy, retinal pigment changes, retinal spots, other retina or macular problem

Figure 2. Prior to receiving our study invitation, were you aware of the effects of Elmiron on retinal/eye health?

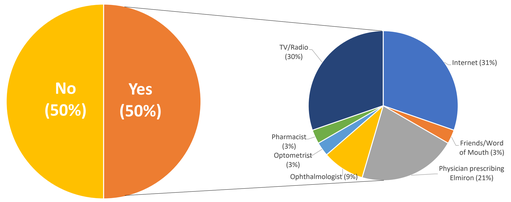


Figure 3. Prior to receiving our study invitation, had you had an eye exam in the last year?

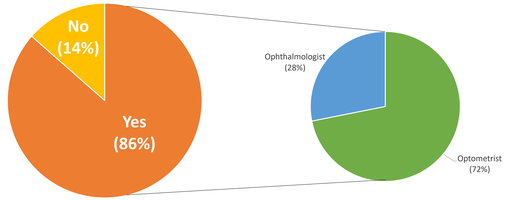
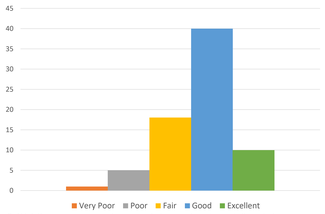
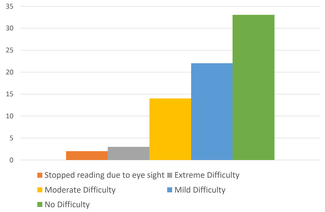


Figure 4. Patient self evaluated vision rating



Q: At this time, how would you rate your eye sight when using both eyes (with contact lenses or glasses to achieve the best vision):

Figure 5. Patient self evaluated reading difficulty



Q: How much difficulty do you have reading ordinary print in books, newspapers, or magazines (with corrective glasses or contact lenses)

Conclusion

From 2007-2021, approximately 0.12% of the population in Alberta were dispensed PPS for ≥ 5 years and were at risk of PPSM. Only half of patients surveyed were previously aware of the potential harmful effects of PPS on retinal health and in most cases this was through media rather than interactions with health care professionals. Prescribing physicians, dispensing pharmacists and eye care professionals need to improve patient education regarding the ocular risks of PPS.

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Perspectives on Efficacy and Safety of Anti-VEGF Biosimilars in the Treatment of nAMD

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INTRODUCTION

- With expiry of originator anti-vascular endothelial growth factor (anti-VEGF) patents, anti-VEGF biosimilars are entering the market.
- There are concerns regarding the safety and efficacy of anti-VEGF biosimilars and the clarity of rollout policies between provinces.
- It remains unclear as to how this transition will impact patient outcomes and provider practices.
- This study focuses on anti-VEGF use for the treatment of neovascular age-related macular degeneration (nAMD).

AIM

The aim of this study was to explore the perspectives of Canadian ophthalmologists and patients with neovascular AMD on anti-VEGF biosimilar safety and efficacy, as well as current knowledge on rollout policy.

METHODS

- Ophthalmologists performing anti-VEGF injections were invited from August to October 2023 to participate in a physician survey, through the Canadian Ophthalmological Society (COS) and Canadian Retina Society (CRS).

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

CRS SCR — Canadian Retina Society | Société canadienne de la Rétine

- nAMD patients in Ontario were invited in-person in August 2023 to participate in a patient survey.
- All survey participants were invited to a semi-structured interview to supplement survey responses. Surveys included ranking questions and visual analogue scales (VAS) (1-10) to measure agreement with given statements. A priori, "agreement" with these statements was defined as a VAS response of between 7 and 10.
- All survey participants were invited to a semi-structured interview to supplement survey responses.
- Analysis of interview data was performed in Dedoose, a specialized software for qualitative analysis, where responses were assigned codes and grouped into key themes using Thorne's interpretive description approach.

RESULTS

- 37 ophthalmologists across 9 provinces participated in the survey and 3 subsequently completed an interview.
  - 50% of ophthalmologists were unaware of their province's biosimilar rollout policy and 75% were uncomfortable with incorporating biosimilars into their practice.
  - 78% of ophthalmologists felt that the switch to biosimilars should not be mandatory.
  - Safety and efficacy of biosimilars were most often ranked as the most important factors in choice of treatment.
- 50 nAMD patients participated in the survey and 11 subsequently completed an interview.
  - 88% of patients in our sample were not comfortable being switched to a biosimilar.
  - 94% indicated that they believe their doctor should have the choice to decide which drug is best for them.
  - Financial coverage of anti-VEGF injections was most often ranked as the least important factor for treatment.
- See Figure 1 for key themes from physician and patient interviews.

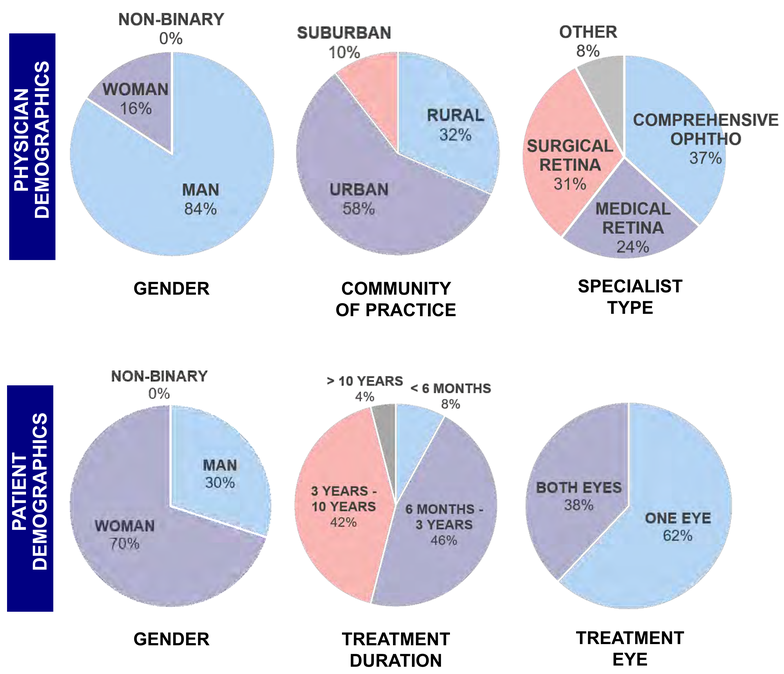
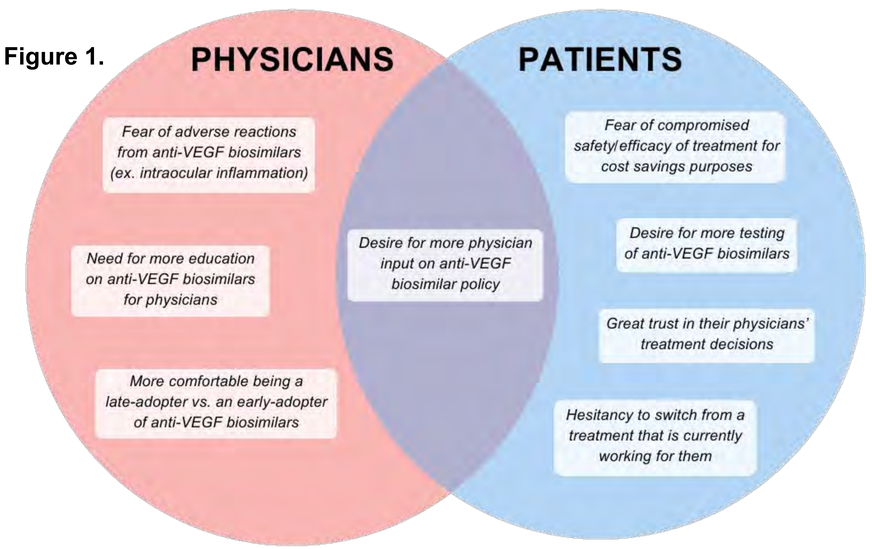


Figure 1.



> *I think it shouldn't be black and white. […] In general, I think if there's no specific reason why I feel strongly against having that medication for a patient, I don't mind using it. But basically the bottom line is, I think there should definitely be some physician input as to what we're using. - Physician ID 11*

> *So if the physician prescribes [a biosimilar] and says to me that "no, this will be exactly the same thing." Then I'm fine! I don't have any issues, I want that coming from my physician. Not because they've been mandated by the government or by insurance companies on cost savings. - Patient ID 28*

CONCLUSION

Hesitancy with the use of anti-VEGF biosimilars was seen both among Canadian ophthalmologists and patients with nAMD. Most physicians and patients believed that a switch to biosimilars should not be mandatory in Canada.

Thank you to all the physicians and patients who shared their experiences.

Contact: a.tran@queensu.ca

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Predictors of Intravitreal Dexamethasone Implant Outcomes in Diabetic Macular Edema: A Systematic Review and Meta-Analysis

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INTRODUCTION

- Diabetic retinopathy (DR) is a leading cause of visual impairment globally. Vision loss in DR can result from diabetic macular edema (DME), ischemia, neovascularization, or tractional retinal detachments.[1,2]
- DME has been estimated to affect over 746 000 individuals aged 40 and above in the United States alone with a prevalence of 3.8%.[2]
- Traditionally, the mainstays of DME management have been glycemic control and laser photocoagulation. However, new treatments have emerged including anti-VEGF agents and corticosteroids.[3]
- In particular, intravitreal dexamethasone implant (DEX) has been shown to achieve remarkable vision outcomes and anatomic outcomes both as a primary and adjunctive treatment due to its sustained release of corticosteroid therapy.[4]
- However, there is limited literature assessing predictors of DEX success in patients with DME. A comprehensive understanding of predictors associated with DEX success and DME will allow clinicians to better identify patients who can benefit most from this treatment.

AIM

To summarize the association between baseline demographic and clinical characteristics on outcomes of DEX therapy in DME patients.

METHODS

Study design: Systematic Review and Meta-Analysis

- A systematic review searching MEDLINE, Embase, and Pubmed from inception to November 2022 was performed.
  - **Inclusion criteria**: (1) adults (≥18 years of age), (2) patients diagnosed with DME, (3) patients treated with intravitreal DEX implant; (4) stratify outcome data based on baseline factors (e.g. treatment-naivety, history of vitrectomy); and (5) human subjects.
  - **Exclusion criteria**: (1) cadaver studies, (2) review articles, (3) non-diabetic etiologies of macular edema, or (4) non-intravitreal dexamethasone or other corticosteroids
- A random-effects meta-analysis was conducted. The primary and secondary outcomes were best corrected visual acuity and changes in OCT findings, respectively. Bias of studies was assessed with the Quality in Prognosis Studies tool.

RESULTS

STUDY CHARACTERISTICS

- A total of forty-nine articles met inclusion criteria after full-text review, of which 83.7% (k = 41) were retrospective cohorts, 12.2% (k = 6) were prospective cohorts, 2.4% (k = 1) were case-controls, and 2.4% (k = 1) were randomized controlled trials (RCT).
- Studies most commonly originated from Italy (16.3%, k = 8) and Spain (16.3%, k = 8)

PATIENT CHARACTERISTICS

- A total of 5310 eyes from 4947 patients were included. The mean age of this sample was 67.2 years (SD = 17.5). The sample was composed primarily of males (66.4%).

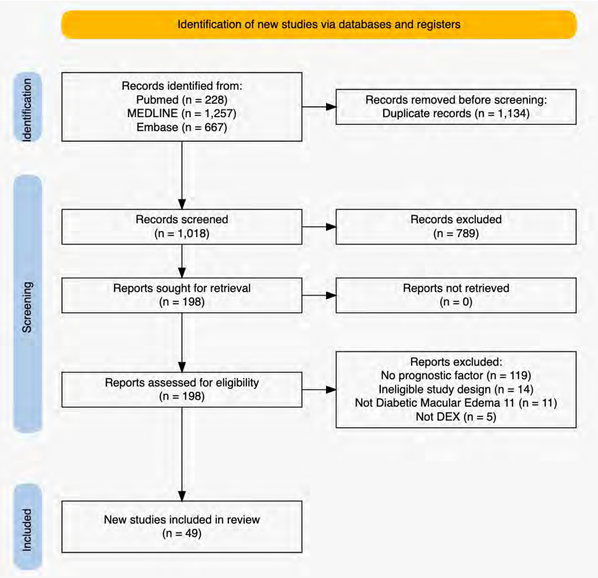
PRIMARY OUTCOMES: Visual Acuity

- In the meta-analysis (n = 1150 eyes, k = 6), treatment-naivety was associated with significantly higher odds of achieving ≥10 letters of vision (OR = 2.98; 95% CI 1.98–4.51; p = 0.001) following DEX treatment.
- Age, gender, glycemic control (HbA1c levels), prior vitrectomy or cataract surgery, prior anti-VEGF treatment, presence of subretinal fluid, ellipsoid zone disruption, and DME duration were not significantly associated with improved vision (i.e., logMAR or change in letters) at any given time point up to 12 months (Table 1).

SECONDARY OUTCOMES: OCT Findings

- Treatment-naivety, prior vitrectomy, and type of DME (e.g., cystoid versus subfoveal neuroretinal detachment) were not significantly associated with differences in central macular thickness, central subfield thickness, or subfoveal choroidal thickness at 6 and 12 months.

Figure 1: Process of study screening according to the PRIMSA guidelines.



QUALITY ASSESSMENT/RISK OF BIAS

- Studies were most commonly at high risk of bias with respect to study attrition (95.9%, k = 47) and study confounding (95.9%, k = 47).

Table 1: Meta-analysis between baseline factors of DME patients and vision outcomes following intravitreal DEX therapy.

Factor	Variable	Effect Size (95% CI)	Number of Studies	Heterogeneity
Age	5 letters	SMD = 0.03 (-0.14, 0.21)	2	I^2 = 0%
Gender	5 letters	SMD = 1.66 (0.02, 137.16)	2	I^2 = 24%
TN	5 letters	OR = 2.21 (0.18, 27.74)	2	I^2 = 0%
TN	10 letters	OR = 2.98 (1.98, 4.51)*	6	I^2 = 20%
TN	logMAR (2 mo)	SMD = -0.50 (1.21, 0.20)	4	I^2 = 64%
TN	logMAR (3 mo)	SMD = 0.12 (-0.92, 1.16)	2	I^2 = 0%
TN	logMAR (4 mo)	SMD = -2.16 (-4.91, 0.59)	2	I^2 = 0%
TN	logMAR (6 mo)	SMD = -0.49 (-1.15, 0.17)	2	I^2 = 0%
TN	logMAR (12 mo)	SMD = -0.22 (-1.32, 0.87)	4	I^2 = 84%
TN	Letters (4 mo)	SMD = 0.64 (-0.60, 1.88)	3	I^2 = 77%
TN	Letters (6 mo)	SMD = 0.64 (-3.60, 4.87)	2	I^2 = 75%
TN	Change in Letters (6 mo)	SMD = 0.19 (0.13, 0.50)	2	I^2 = 0%
Vitrectomy	logMAR (1 mo)	SMD = -0.14 (-0.34, 0.06)	4	I^2 = 0%
Vitrectomy	logMAR (2 mo)	SMD = 0.07 (-1.79, 1.92)	2	I^2 = 0%
Vitrectomy	logMAR (3 mo)	SMD = 0.06 (-0.19, 0.31)	3	I^2 = 0%
Vitrectomy	logMAR (6 mo)	SMD = -0.04 (-0.16, 0.09)	4	I^2 = 0%
Vitrectomy	logMAR (12 mo)	SMD = -0.03 (-0.76, 0.70)	2	I^2 = 0%
Vitrectomy	15 letters	OR = 1.24 (0.01, 239.82)	2	I^2 = 0%
HbA1C ≥ 8%	Change in Letters (6 mo)	SMD = 0.10 (-0.34, 0.54)	2	I^2 = 0%
DME Duration ≥ 6 months	Change in Letters (6 mo)	SMD = 0.12 (-0.86, 1.09)	2	I^2 = 0%
SRF	Change in Letters (3 mo)	SMD = 0.27 (-3.79, 4.33)	2	I^2 = 64%
SRF	15 letters	OR = 1.31 (0.15, 11.28)	2	I^2 = 0%
EZ Disruption	Change in Letters (3 mo)	SMD = -0.37 (-3.90, 3.17)	2	I^2 = 0%

*Abbreviations: Treatment-naivety (TN), Standardized Mean Difference (SMD), Odds Ratio (OR), 95% Confidence Interval (95% CI), diabetic macular edema (DME), subretinal fluid (SRF), ellipsoid zone (EZ), months (mo). *p < 0.05*

CONCLUSIONS

- In this systematic review, there was reasonable methodological homogeneity among the 49 studies that allowed for meta-analyses of visual acuity and OCT outcomes in patients with DME treated with intravitreal DEX therapy.
- The most significant finding was that treatment-naivety was significantly associated with a 2.98 greater odds of achieving ≥ 10 letters of vision compared to treatment-refractory counterparts. Otherwise, no specific baseline demographic or clinical characteristics among patients with DME were associated with improved visual or anatomical outcomes.
- Higher quality and appropriately powered studies with prospective data collection and standardized outcome documentation are necessary to validate these preliminary findings.

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Proliferative Vitreoretinopathy Retinal Changes on Swept-Source Optical Coherence Tomography

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INTRODUCTION

To date, PVR gradings have been mostly focused on characterizing peri retinal membranes, while **intraoperatively, intraretinal changes** with retinal shortening and stiffening **is what mostly affects retinal reattachment**.[1]

AIM

To describe the morphologic changes of the different types of PVR using SS-OCT, with a special focus on the intrinsic retinal changes related to intraretinal PVR. We propose a new conceptual framework of PVR for the management of RRDs.

METHODS

- Single-center retrospective study.
- Primary RRDs from Jan 2020-April 2022
- Baseline imaging with PLEX Elite or Silverstone UW-SS-OCT.
- **OCT were graded** for baseline **morphologic stage of RRD, predominant type of PVR (pre, intra or subretinal), and its associated retinal changes.**

RESULTS

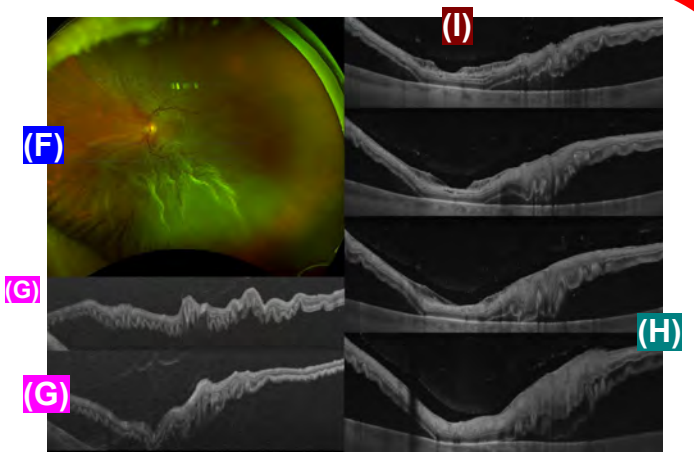
- 41 patients were included:
  - 44% (18/41) had signs of sub-retinal PVR
    - 17% (3/18) had coexisting pre-retinal PVR
  - 56% (23/41) had signs of intra-retinal PVR
    - 83% (19/23) had coexisting pre-retinal PVR

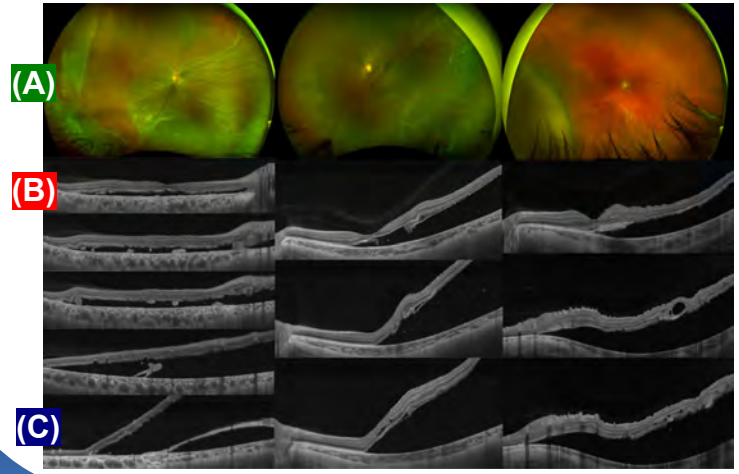
Subretinal PVR associations (p<0.001):

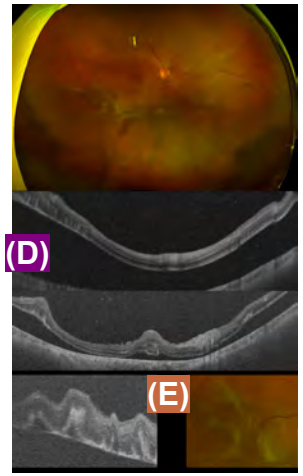
- Shallow regulated RRDs (A)
- RRD Morphologic Stage 5 (B)
  - Patchy/complete loss of IS and OS
- Retinal thinning (C)
- Straightening of the outer retinal surface (D)
- Horizontal traction along the outer retina (E)

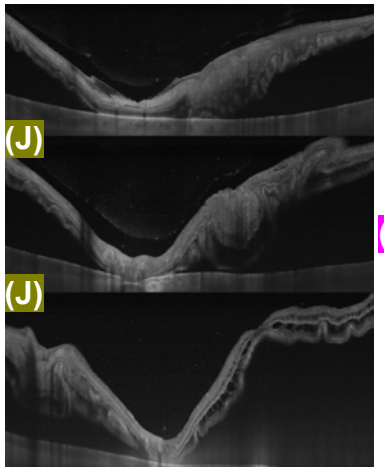
Intra-retinal PVR associations (p<0.001):

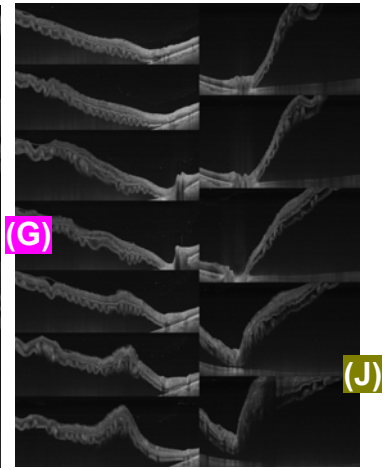
- Bullous dysregulated RRDs (F)
- Fused outer retinal corrugations (ORCs) (G)
- RRD Morphologic Stage 3b and 4 (G)
- Retinal thickening (H)
- Pre-retinal PVR (I)
- Disorganized inner retinal layers (J)











CONCLUSION

PVR seems to be associated with a **proliferative pathway (intra-retinal), which occurs in dysregulated cases, vs. an atrophic pathway (subretinal), which occurs in regulated cases**. Fused ORCs seem to be an early sign of intraretinal PVR.

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Quantitative Assessment of Retinal Vasculature Using Artificial Intelligence-Based Analysis of Fluorescein Angiography in Age-Related Macular Degeneration

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COS 2024

INTRODUCTION

- Neovascular age-related macular degeneration (nAMD) represents a significant cause of visual impairment/blindness
- Optical coherence tomography angiography may reveal abnormalities even in the absence of leakage, hence ultra-widefield fluorescein angiography (UWFA) parameters may offer a more comprehensive assessment of disease

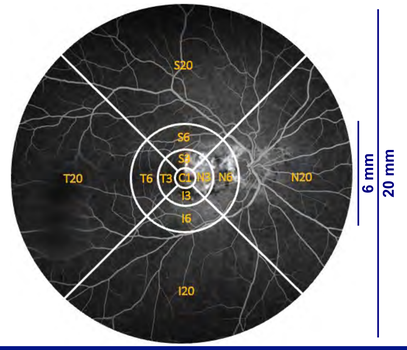
AIM

- Examine associations between quantitative vascular parameters extracted from UWFA & baseline clinical characteristics of nAMD patients

METHODS

- **Design:** Prospective single-centre trial in Toronto, Canada from 2017-2023
- **Inclusion Criteria:** Active CNV secondary to AMD, age >50
- **Coordinate System:** 9 central and 4 peripheral based on ETDRS grid **[Figure 1]**
- **UWFA Analysis:** Quantitative measurements of blood-retinal barrier (BRB) permeability, perfusion, and blood flow were extracted from arterial, arteriovenous and late phases of the UWFA sequence using the artificial intelligence-based RETICAD FA_{assist} system v5.12 (Emagix) **[Figure 2]**
- **Statistical Analysis:** Univariable and multivariable regression models on Stata (StataCorp, TX, USA) were used to examine associations between IVFA parameters and best-corrected visual acuity (BCVA), central macular thickness (CMT), and macular volume (MV)

Figure 1. Coordinate system for central and peripheral areas defined by ETDRS grid



RESULTS

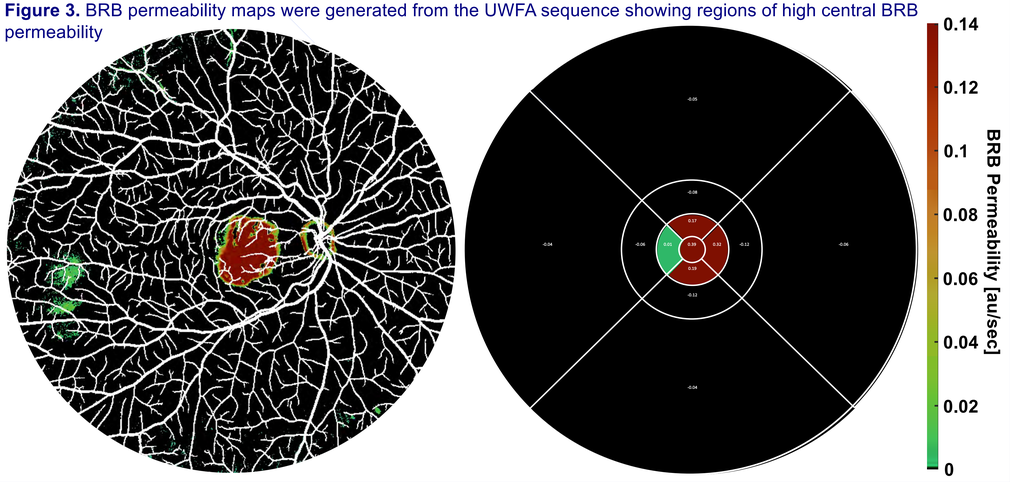
- 81 nAMD eyes & 7 control eyes were included **[Table 1]**
- **nAMD** eyes had a higher central & peripheral BRB permeability than *controls*
  - **Central: 0.03 (0.02) au/sec** vs. *-0.03 (0.01)* (p<0.001), 5th-95th percentile range [-0.09-0.00]
  - **Peripheral: 0.01 (0.01) au/sec** vs. *-0.03 (0.01)* (p<0.001), 5th-95th range [-0.11-0.00]
- In **nAMD** eyes, central perfusion and BRB permeability were higher than peripheral regions
  - **Perfusion: 2.93 (1.15) au/sec [centra]** vs. *2.45 (1.93)* **[peripheral]** (p=0.009)
- On univariable analysis, central perfusion (p=0.043) and blood flow (p=0.037) were independently associated with macular volume in **nAMD** eyes
- On multivariable analysis, central BRB permeability was associated with CMT (p=0.026) in **nAMD** eyes **[Figure 3]**

Table 1. Demographic and Clinical Characteristics of Patients

	AMD (n=81)
Sex n (%)	
Male	31 (38.3%)
Female	50 (61.7%)
Age (Mean ± SD)	79.8 ± 7.9
Eye Laterality n (%)	
OD	41 (50.6%)
OS	40 (49.4%)
Race n (%)	
Caucasian	61 (75.3%)
Black	2 (2.5%)
Asian	9 (11.1%)
Hispanic	2 (2.5%)
Not Reported	7 (8.6%)
Lens Status n (%)	
Phakic	35 (43.2%)
Pseudophakic	46 (56.8%)
Clinical Exam (Mean ± SD)	
BCVA (ETDRS)	51.1 ± 15.4
CMT (μm)	348.4 ± 107.4
IOP (mmHg)	13.9 ± 3.0
Macular Volume (mm^3)	10.6 ± 1.3

Figure 2. Representative images from the UWFA sequence highlighting the arterial and late phases of an eye with neovascular AMD

Figure 3. BRB permeability maps were generated from the UWFA sequence showing regions of high central BRB permeability



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CONCLUSION

- BRB permeability measured on IVFA may serve as a clinically relevant biomarker in nAMD
- Future studies should explore UWFA parameters & clinical outcomes in diverse patient populations

Reattachment Rate with Pneumatic Retinopexy vs Pars Plana Vitrectomy for Rhegmatogenous Retinal Detachment with a Single Break in the Detached Retina

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Financial disclosure: None

Background

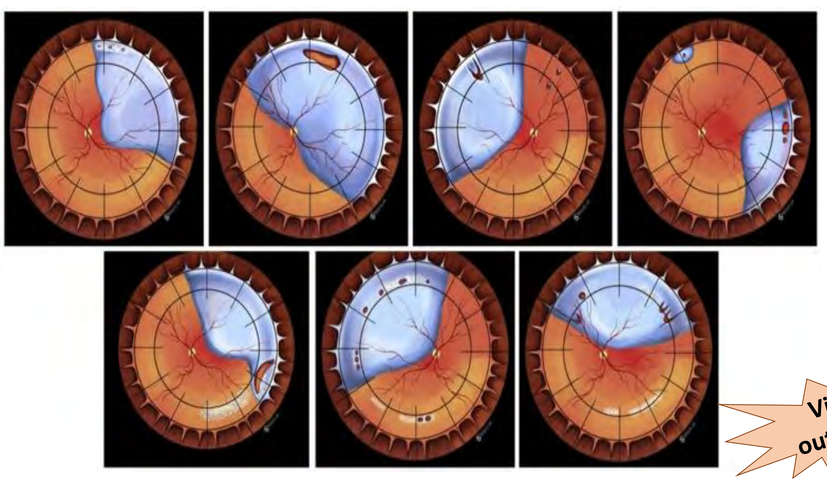
Pneumatic retinopexy (PnR) is associated with superior functional outcomes compared to **PPV**. In most studies, **PPV** is associated with a higher **primary anatomic reattachment rate (PARR)**. **PARR** with **PnR** is likely to increase with reduced case complexity

Purpose

To assess the primary reattachment rate in pneumatic retinopexy (PnR) vs pars plana vitrectomy (PPV) for RRD meeting PIVOT trial criteria with only a single break in detached retina.

Materials and Methods

Inclusion criteria: PIVOT trial criteria and **one break** only in detached retina.



Pivot trial criteria(Hillier et al 2018)

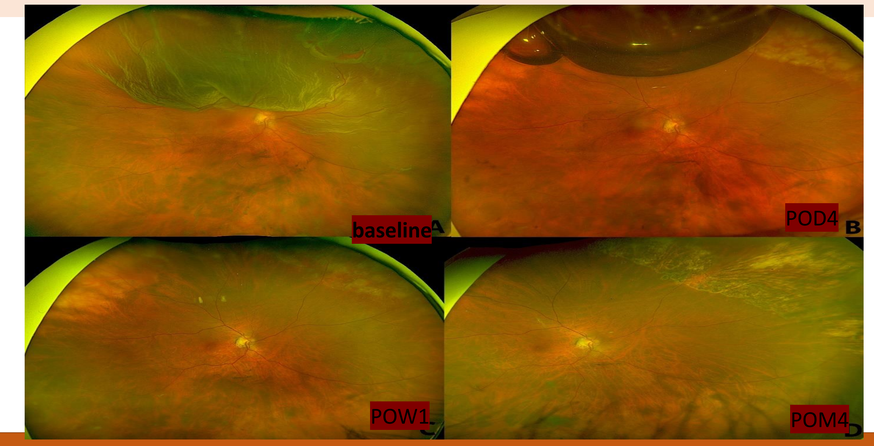
A posthoc analysis of **two prospective multicenter clinical trials** that included primary RRDs referred to St. Michael's Hospital, Toronto, Canada, Hamilton Regional Eye Institute, Hamilton, Canada, and Newcastle Eye Center, UK, between **August 2012-April 2021**

Baseline Characteristics

Variable	PnR	PPV	P Value
n	86	76	
Age(Mean)	61.58 +/-10.5	60.9 +/-9.17	0.7
Gender(F)	33.72%	35.53%	0.8
1 year follow-up	99% (85/86)	86.8% (66/76)	0.002
Preop BCVA (Log mar)	1.23+/-0.98	1.28+/-1.0	0.8
Lens status (phakic%)	51%	67%	0.034
Macula status (Fovea off) %	79.9%	67.1%	0.08
RD Quadrants Ex.	2.08 +/-0.8	1.94+/-0.9	0.34

Visual outcomes

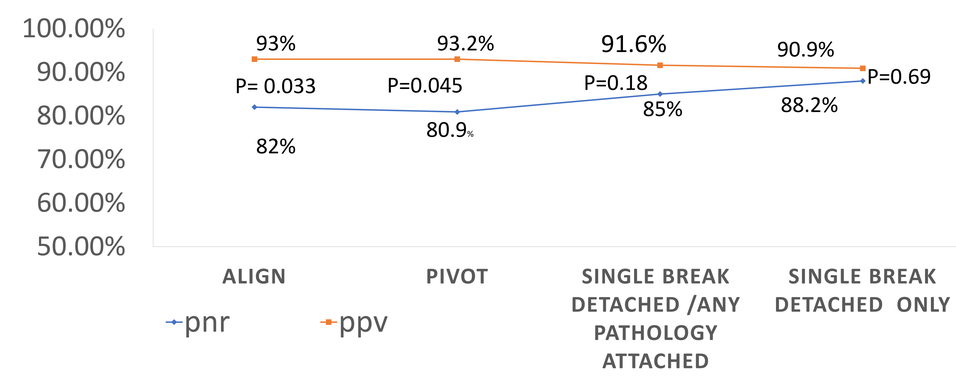
	PnR	PPV	P value
1 year- Logmar BCVA	0.19 ± 0.25	0.34 ± 0.37	0.01
1 year- Logmar BCVA Fovea on	0.1 ± 0.12	0.2± 0.24	0.134
1year-Logmar BCVA Fovea off	0.23 ± 0.27	0.42 ± 0.41	0.012



Results

The PARR was **88.0% (74/84)** in the **PnR** group and **90.9% (60/66)** in the **PPV** group **(P=0.6).**

In a further additional analysis of patients who were also allowed to have other breaks or lattice degeneration in the attached retina, the **PARR was 85.0% (91/107) and 91.6% (66/72) in the PnR and PPV groups respectively (P=0.18).**



Conclusions

PnR and PPV provide similar long-term PARR in a substantial proportion of patients meeting PIVOT criteria but with a single break in the detached retina. Prior studies have demonstrated superior functional outcomes with PnR compared to PPV. Therefore, PnR is an appropriate first-line therapy for patients meeting these specific criteria.

Restoring Vision and the Environment: Review on the environmental impact of intravitreal injections

COS 2024

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INTRODUCTION

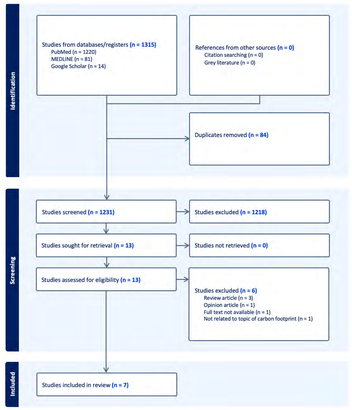
- Human health is influenced by climate change[1,2]
- Ocular conditions are impacted by **environmental** emissions as well[3,4]
- Intravitreal injections have revolutionized treatment of retinal conditions, but contribute to global CO_2 emissions and waste

OBJECTIVE

- To review the literature to determine the carbon footprint of intravitreal injections

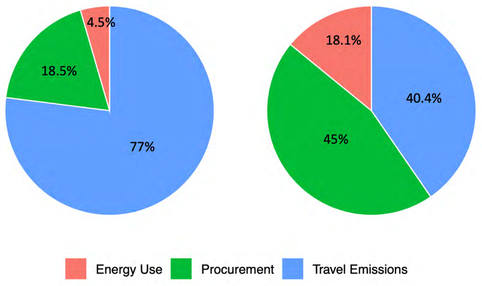
METHODS

Search words: *carbon footprint, emissions, waste, sustainability, environmental, ecological, intravitreal injections, anti-VEGF*



RESULTS

Contributing Factors



- **Travel** emissions includes emissions emitted by both patients and staff to and from the place of injection
- **Procurement** includes the purchasing of materials, as well as the use and disposal of any materials and packaging
- **Energy Use** includes that consumed by building (such as heating, cooling, lighting)

13.68 – 14.1 kg CO_2 equivalents[5,6]

65.6kg of waste from 337 consecutive injections[7]

83% of this waste resulted from shipping materials[7]

Efficient waste protocols can reduce waste by up to 67%[8]

DISCUSSION

Proposed Solutions to Improving Sustainability

1. Perform bilateral same day injections where applicable
2. Outreach clinics to reduce travel
3. Implement treat and extend regimens (TER)[9]
4. Incorporate gene-therapy into intravitreal injections[10]
5. Reduce packaging waste & minimize materials within kits

Identified Barriers to Improving Sustainability

1. Lack of collaboration → physicians and manufacturers to reduce waste
2. Hesitancy to change practices → Aravind Eye Centre reduces footprint by implementing efficient sterilization, re-use of materials, and optimizing use of equipment
3. Lack of **research** and **action** → more detailed studies on footprint and need to implement changes to practices

CONCLUSION

- Intravitreal injections provide extremely beneficial treatment to those with retinal conditions, but result in significant emissions
- Largest contributing factors are: travel emissions, procurement and use of materials, and energy consumed from equipment and buildings
- Increasing demand of these injections speaks to the urgency for this treatment to become more sustainable
- Proposed solutions should be discussed and implemented
- Further research should be conducted on the footprint of these injections, as they vary by region and surgeon providing the injections
- This research should be done using a standardized, validated method, such as the "Eyefficiency" tool[11]

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Retinal Displacement Following Rhegmatogenous Retinal Detachment: A Systematic Review and Meta-Analysis

COS 2024

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INTRODUCTION

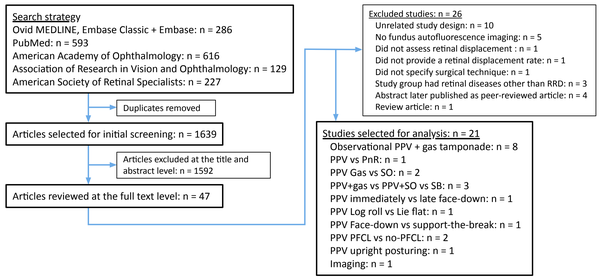
- Rhegmatogenous retinal detachment (RRD) is one of the most common sight-threatening ophthalmic surgical emergencies.
- Refinements in pars plana vitrectomy (PPV), scleral buckle (SB) and pneumatic retinopexy (PnR) have led to excellent anatomic reattachment rates.
- Nevertheless, many patients report unsatisfactory functional outcomes including metamorphopsia and/or aniseikonia.
- Suboptimal functional outcomes may be the result of retinal displacement, as identified by fundus autofluorescence (FAF) findings of hyperfluorescent lines representing 'retinal vessel printings'.

AIM

- There are limited data comparing the rates of retinal displacement in RRD repair by various surgical techniques.
- The aim of this study was to assess quantitatively the proportion of patients who develop retinal displacement following RRD repair with PPV, SB, and PnR by systematic review and meta-analysis.

METHODS

- A search of English-language articles of retinal displacement following RRD repair with FAF identified 21 studies encompassing 1258 eyes.
- Study and evidence quality was assessed using ROBINS-I, Cochrane risk of bias, and GRADE frameworks.
- Outcome measures included frequency of retinal displacement, visual acuity, metamorphopsia, and displacement direction.
- Meta-analysis was performed by a Mantel-Haenszel method to report risk ratios (RR) for categorical variables with a fixed-effects model.
- Weighted mean difference (WMD) and 95% CI was computed for continuous variables using the inverse variance method and random-effects model as studies used differing surgical techniques.



RESULTS

- Retinal displacement was found in 35±20% of RRD repairs, making it a common complication
- SB without tamponade had the lowest rate of retinal displacement (RR=9.60 [2.01-45.95], p=0.005), followed by PnR and finally PPV.
- Macula-off RRDs were more likely to have retinal displacement (2.66 [1.82-3.90], p<0.001), but there was no clear relationship between the presence of displacement and extent of initial RRD.
- Silicone oil tamponade may reduce risk of displacement following PPV compared to gas (2.16 [1.22-3.83], p<0.009), as may immediate face-down positioning for 2 hours.
- Retinal displacement following PPV occurred in the downward direction in 92±14% of cases and with gas tamponade. Interestingly, when silicone oil tamponade is used or when PnR is performed, superior retinal shift is more frequent.
- Retinal displacement does not appear to significantly impact visual acuity (0.05 [-0.21-0.31, p=0.70), although it may increase postoperative metamorphopsia.
- There is currently no robust evidence to suggest that retinal displacement substantially reverses over time.

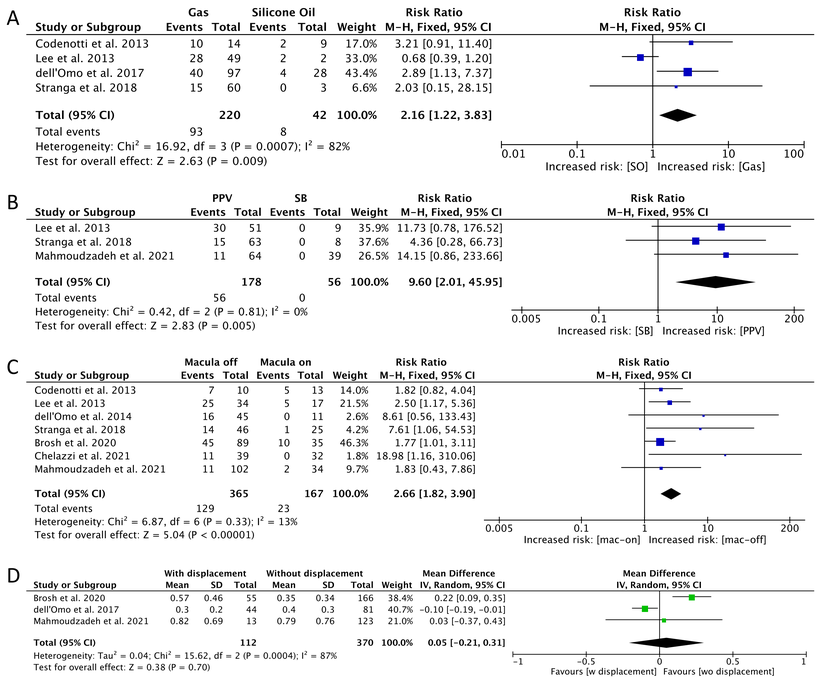


Figure 1. Meta-analyses of retinal displacement rates following rhegmatogenous retinal detachment repair involving (A) gas versus silicone oil tamponade in pars plana vitrectomy, (b) pars plana vitrectomy versus scleral buckle, (C) patients with macula-on versus macula-off detachments, and (D) a comparison of final logMAR best corrected visual acuity between patients with and without retinal displacement.

Outcome	No. of studies	Result	Quality (GRADE)	Comments
Retinal displacement following repair by PPV	21	Frequent complication, found in approximately half of cases	⊕⊕⊕⊖ Moderate	Rate of displacement amongst studies ranged from 4.5% to 62.8% (36±19%)*
Gas vs silicone oil as the tamponade agent in PPV	4	Higher retinal displacement rates when using gas; RR=2.16, 95% CI 1.22 to 3.83, p=0.009	⊕⊕⊖⊖ Low	Stated result was found in 3 of 4 studies, with the conflicting study likely underpowered
PPV vs SB	3	Higher retinal displacement rate when using PPV; RR=9.60, 95% CI 2.01 to 45.95, p=0.005	⊕⊕⊖⊖ Low	Consistent in the applicable studies, but non-randomized trials and small overall sample sizes
Effect of RRD extent on retinal displacement	10	No clear relation between retinal displacement and extent of RRD	⊕⊕⊕⊖ Moderate	5 of the 10 studies found statistical significance and one additional study a positive trend, but the most powered studies found no relation
Effect of macular status on retinal displacement	10	Higher rates of displacement in macula-off RRD; RR=2.66, 95% CI 1.82 to 3.90, p<0.00001	⊕⊕⊕⊖ Moderate	The 7 studies were included in the meta-analysis had consistent results, and were supported by 2 of the 3 studies not included for insufficient data
Effect of PVR on retinal displacement	2	No clear relation between retinal displacement and PVR	⊕⊖⊖⊖ Very low	Both studies found no significant relation – there may be a complicating factor where patients with PVR grade B undergo SO tamponade, whereas those without PVR had gas in some studies
Postoperative BCVA	7	No clear relation between retinal displacement and BCVA; WMD=0.05, 95% CI -0.21 to 0.31, p=0.70	⊕⊕⊖⊖ Low	3 of the 7 studies were included in the meta-analysis, and only 3 of 7 studies found a significant relation between retinal displacement and BCVA
Postoperative metamorphopsia	8	Metamorphopsia is related to the extent of retinal displacement	⊕⊕⊕⊖ Moderate	5 of the 8 studies found a significant relation, and one of the conflicting studies may have found a relation if more powered (p=0.08)
Direction of displacement in RRD repair by PPV	10	Downward direction in most cases	⊕⊕⊕⊖ Moderate	The overall downward displacement rate was 92±14%* – the only significant deviation was with silicone oil tamponade, where upward displacement could be more frequently observed

Table 1. Summary of systematic review and meta-analysis findings for primary outcomes, associated factors, and secondary study outcomes with GRADE quality of evidence evaluation.

CONCLUSIONS

- Functional outcomes are of paramount importance to patients, and there is increasing evidence that a high-integrity anatomic attachment may lead to superior functional outcomes.
- Increasing evidence supports the hypothesis that retinal displacement occurs from subretinal fluid flow under the thin elastic retina, induced by the buoyant force of the tamponade, which leads to stretching of the retina.
- SB and PnR are likely associated with less retinal displacement compared to PPV with a full gas fill, and PPV with silicone oil also has a comparatively low rate of retinal displacement.
- When performing PPV with gas, immediate face-down positioning for 2 hours may reduce displacement.
- Larger prospective studies may provide the conclusive evidence that allows the surgeon to adopt techniques that minimize displacement and provide high-integrity retinal attachment and superior functional outcomes.

REFERENCES

- For a complete list please scan the QR code or visit https://pubmed.ncbi.nlm.nih.gov/35007619/

Visual Status of Métis Children in Northern Saskatchewan

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INTRODUCTION

Indigenous children often exhibit higher rates of avoidable vision impairment (VI) that can be partly attributed to limited access to eye care services in remote, underserved communities[1]. Accessible eye care is important for all children as poor vision can lead to socio-economic consequences such as poor mental health and depression[2].

AIM

This study aims to report on the prevalence of VI in Métis 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, Métis and Inuit) communities across Canada.

METHODS

This retrospective chart review comprised of data gathered through the ICEE project of 50 Métis children, aged 1 year to 18 years of age. At least one comprehensive eye examination, including a cycloplegic refraction, performed by local eye-care professionals, was provided to children living in Île-à-la-Crosse, Saskatchewan, Canada in May 2023.

Figure 1: ICEE Team in Île-à-la-Crosse, Saskatchewan.

RESULTS

- 50 Métis children (age range 1-18 years, mean 8.1 years, median 8.0 years) received a comprehensive eye examination.
- 31 of 50 children examined (62%) required prescription eyeglasses to improve their vision.
- 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) as seen in Chart 2.
- 38 of the 50 children examined (76%) received their first eye examination through the ICEE eye care team.

Chart 1: Types of Refractive Errors among Eyes Assessed

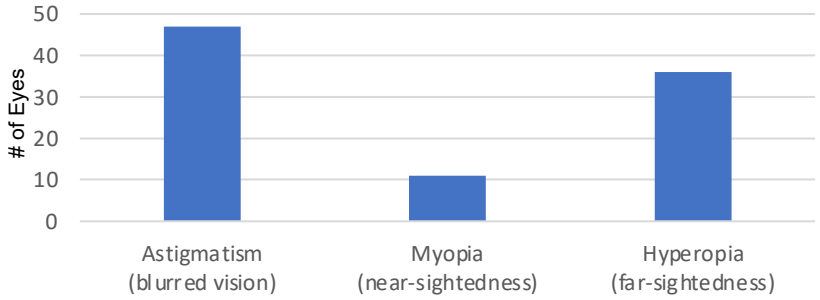
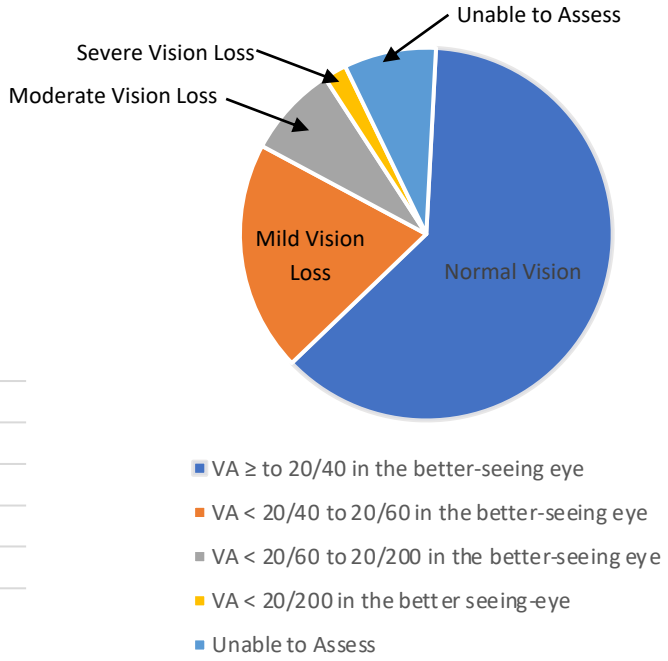


Chart 2: Degree of Vision Loss Based on Better-Seeing eye



CONCLUSION

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 all Indigenous (First Nations, Métis and Inuit) children living in remote communities across Canada.

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Université de Montréal

CONTEXT

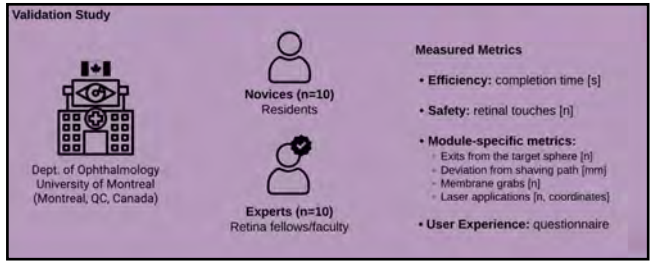
Virtual reality (VR) simulation is a cornerstone of ophthalmic surgical education. The EyeSi Surgical Simulator is frequently used for cataract and vitreoretinal surgery training. Despite its potential, the very high cost (USD $200,000) limits its accessibility in developing nations. In parallel, since the 1970s, VR headsets have moved beyond academic labs and are now commercially available with prices starting at $350.

AIM

We built a VR simulation app for vitreoretinal surgery training that is compatible with commercially available VR headsets. **RetinaVR** is fully-immersive, affordable, and portable. It leverages the hardware of the VR headset and does not require external haptic devices. We focus on four fundamental skills: core vitrectomy, peripheral shaving, membrane peeling, and endolaser application.

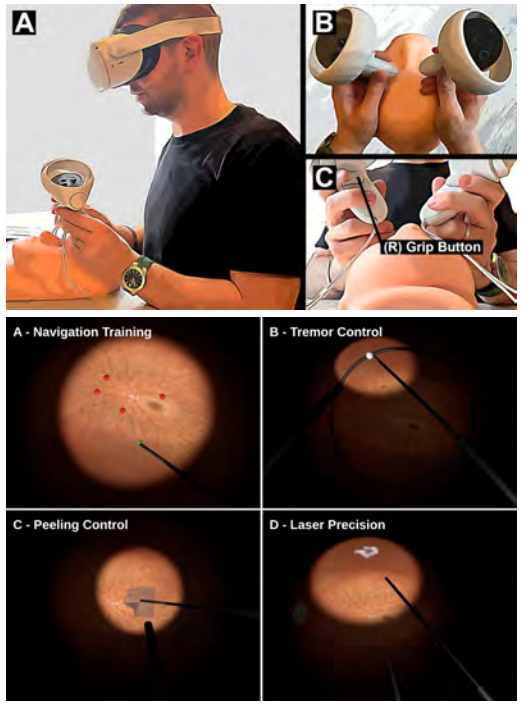
PROJECT OVERVIEW

We developed **RetinaVR** as an app for the Meta Quest 2, a general-purpose VR headset that allows for a standalone experience. The headset comes with two light-weight plastic controllers that we used to simulate the vitrector, endolaser probe and light source. We ran a validation study of 10 novice and 10 expert surgeons to determine construct validity and to gather feedback.



RESULTS

Simulation set up



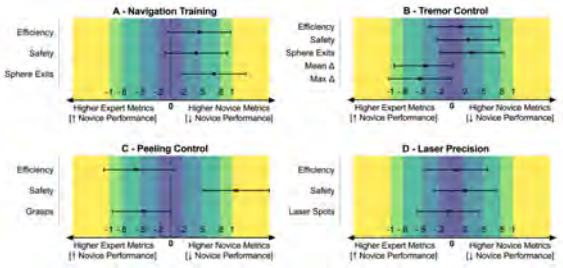
Data collection and analysis methods

We measured **efficiency** (completion time), **safety** (iatrogenic retinal touches), and **module-specific performance** (target sphere exits, deviations from the shaving path, membrane grasps and laser spot applications). We explored unadjusted performance differences through an effect size analysis. A linear mixed-effects model was also used to isolate the impact of age, sex, expertise and repetition on performance.

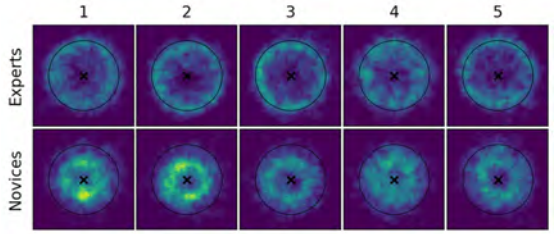
Main findings

Experts were significantly safer in membrane peeling but not when controlling for other user factors. Experts were significantly better in core vitrectomy, even when controlling for other user factors (p=0.014). Heatmap analysis of endolaser applications showed more uniform and consistent retinopexy among experts (see **Figure**). Age had no impact on performance, but males were faster than females in peripheral shaving (p=0.036) and membrane peeling (p=0.004). A learning curve was demonstrated with improving efficiency at each experimental run for all modules. Repetition also led to improved safety during membrane peeling (p=0.003), and better task-specific performance during core vitrectomy (p=0.038), peripheral shaving (p=0.011) and endolaser application (p=0.043).

Unadjusted effect sizes (novices vs experts)



Heatmap analysis (Laser Precision)



For a detailed account of our experiments and results, see the preprint.

CONCLUSION

RetinaVR is an affordable and portable training tool for vitreoretinal surgery. Its construct validity is established, showing varying performance that correlates with runs, age, sex, and expertise. Immersive VR technology has the potential of democratizing surgical simulation access to developing nations through the metaverse.

SUPPLEMENTALS

arXiv

X

ACKNOWLEDGEMENTS

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Surgical drainage methods during pars plana vitrectomy for rhegmatogenous retinal detachment: a meta-analysis

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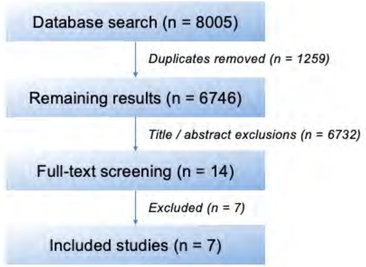
COS 2024

INTRODUCTION

- Rhegmatogenous retinal detachment is a sight-threatening ocular condition, which occurs in approximately 1 in 10 000 people globally.[1]
- Scleral buckle, pneumatic retinopexy, and pars plana vitrectomy are three surgical treatment options for rhegmatogenous retinal detachment, with pars plana vitrectomy currently being the most popular procedure in North America.[2]
- During pars plana vitrectomy for rhegmatogenous retinal detachment, surgeons typically drain subretinal fluid either through pre-existing retinal breaks, via posterior retinotomy, or with the use of perfluorocarbon liquids.[3]
- There remains an absence of well-established guidelines for the optimal intraoperative drainage method in this setting.
- The aim of this systematic review was to investigate the efficacy and safety of different subretinal fluid drainage methods in pars plana vitrectomy for rhegmatogenous retinal detachment.

METHODS

- We conducted a systematic search on Cochrane CENTRAL, Ovid MEDLINE, EMBASE and Google Scholar for peer-reviewed articles reporting on the safety or efficacy of two or more subretinal fluid drainage modalities during vitrectomy for rhegmatogenous retinal detachment.
- A random effects model was used to perform the meta-analysis. Weighted mean difference and 95% confidence intervals were reported for all continuous data using the inverse variance approach. The number of eyes was used as the weighted variable for WMD. Dichotomous data were presented as risk ratios (RR) and 95% confidence intervals using the Mantel-Haenszel method.



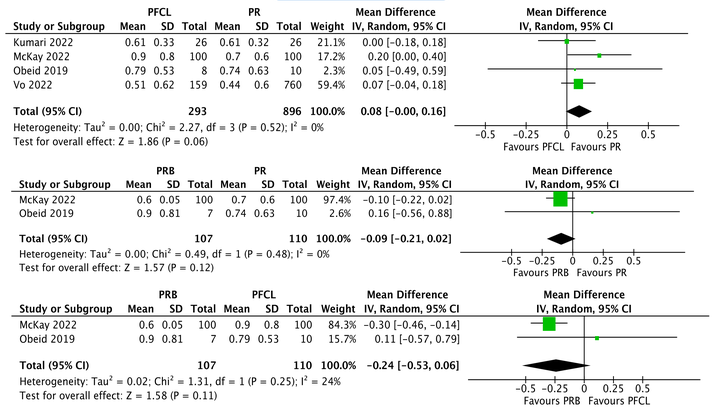
RESULTS

- Five observational and two randomized studies reporting on 1524 eyes were included.
- No significant differences were found in final BCVA between: 1. perfluorocarbon liquid versus posterior retinotomy (p=0.06, Figure 1a), 2. through pre-existing retinal break versus posterior retinotomy (p=0.12, Figure 1b), and 3. through pre-existing retinal breaks versus perfluorocarbon liquid (p=0.11, Figure 1c).
- Comparisons of BCVA at various timepoints yielded similar results to the analysis of BCVA at final observation
- The risk of epiretinal membrane formation was lower with PFCL (p=<0.01, Figure 2a) or through pre-existing retinal breaks (p=<0.01, Figure 2b) compared to posterior retinotomy.
- In two studies, an abnormal foveal contour occurred significantly more frequently with PFCL compared to posterior retinotomy (p=<0.01, Figure 3).
- No significant differences were observed between groups in primary reattachment rate after surgery.
- No significant differences between groups in the rates of cystoid macular edema, external limiting membrane discontinuity, ellipsoid zone discontinuity, and retinal pigment epithelium disruption were observed.

CONCLUSION

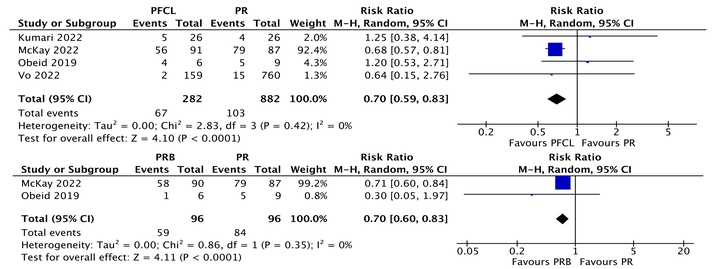
- There is a paucity of evidence examining the efficacy and safety of different subretinal fluid drainage modalities during vitrectomy for rhegmatogenous retinal detachment.
- It is possible that current comparisons are underpowered, and that a higher-powered study may reveal additional important anatomic differences between drainage methods
- Despite the limited evidence, this paper suggests that visual acuity is minimally impacted by subretinal fluid drainage method, however posterior retinotomy is associated with an increased risk of epiretinal membrane formation.

FIGURE 1



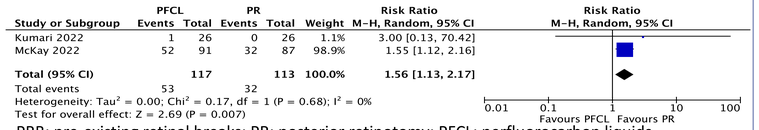
PRB: pre-existing retinal breaks; PRL posterior retinotomy; PFCL: perfluorocarbon liquids

FIGURE 2



PRB: pre-existing retinal breaks; PR: posterior retinotomy; PFCL: perfluorocarbon liquids

FIGURE 3



PRB: pre-existing retinal breaks; PR: posterior retinotomy; PFCL: perfluorocarbon liquids

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CONFLICTS OF INTEREST

J,G: None Declared, A.M None Declared, P.H: None Declared, M.P: Conflict with PSI Foundation, Fighting Blindness Canada, B.M: None Declared, P.K: Conflict with Bayer, Roche, Novartis; Equity owner – ArcticDx, R.M: Conflict with Bayer, Novartis

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Use Of Amniotic Membrane in Macular Hole Repair: A Scoping Review

COS 2024

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INTRODUCTION

Macular holes (MHs) are an anatomic discontinuity of the neurosensory retina that develops in the center of the macula or fovea. They are treated surgically, with the gold standard of a pars plana vitrectomy (PPV), internal limiting membrane (ILM) peeling, and gas endotamponade. **Human amniotic membranes (hAM)** have recently emerged as an effective method for **MH repair and closure**.

AIM

To review the role, applications and techniques for use of **human amniotic membrane grafts** for **macular hole** repair.

METHODS

Databases used:

1. MEDLINE (from inception to August 2023)
2. EMBASE (from inception to August 2023)
3. Web of Science (from inception to August 2023)

Citations were imported into **Covidence** and analysed independently by two reviewers based on the criteria below. Eligibility assessed and disagreements resolved through discussion.

Inclusion	• Evaluate use of human amniotic membrane for macular hole repair • English-language studies • Study designs: Retrospective studies, observational studies, case reports, case series, randomised controlled trials
Exclusion	• No translation available • No mention of using human amniotic membrane for macular hole repair • Study designs: Research letters, commentaries and review papers

Table 1. Inclusion and exclusion criteria of scoping review

RESULTS

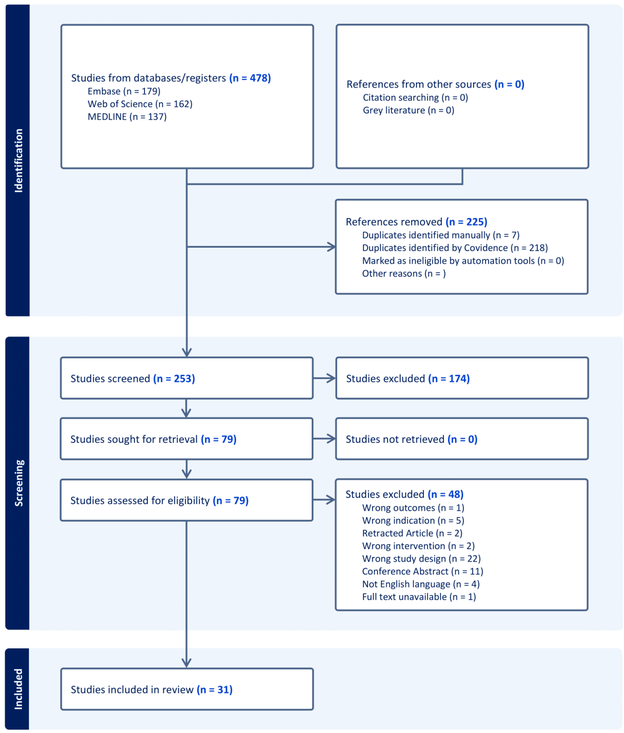

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR)

Total eyes: 401 eyes

Surgical techniques

- **PPV** with **ILM peeling** prior to the insertion of the hAM (100%)
- Direction of hAM placement: 24/24 (100%) inserted **stroma facing-down**
- Techniques for insertion: using **ILM forceps**, **ophthalmic viscosurgical device (OVD) injection** and manipulation under **fluid** or **perfluorocarbon liquid (PFCL)**
- Insertion orientation: **chorion layer** of the hAM determined by identifying the **sticky side** of the plug using **vitreal forceps**

Common endotamponade materials

- **SF6 (67.74%)**
- C3F8 (35.48%)
- Silicone oil (32.25%)

Best Corrected Visual Acuity (BCVA) improvement

- Overall rate of BCVA improvement across all studies is **59.10%** (logMAR and Snellen)
- **74.19%** of studies: BCVA improvement in **> 50%** of patients

MH closure

- Overall rate of MH closure was **89.02%** (357 eyes)
- **93.55%** of studies showed that **> 50%** of patients achieve **full MH closure** with hAM

Types of MH

- MH with high myopia
- MH with retinal detachment
- Recurrent MH
- Full thickness MH
- Large MH

Complications

- **74%** of studies reported **no post-surgical complications**
- Most common: graft dislocation, retinal tear, more than one surgery

Adverse events

- None reported

DISCUSSION

Strengths

1. **Positive trend** in findings of resultant BCVA, MH closure rate and complication rates
2. Patients with more complex MH can **achieve treatment and visual outcome goals** with new technique

Limitations

1. **Not specific** to one type of MH
2. **Fail to report** the complete parameters for data collection and full analysis
3. **Selection bias and small sample size**, requiring **longer follow-up** to elucidate **errors** and **complications/adverse events**
4. Difficulty of **hAM access** by institution
5. **Limitation in training** to use unfamiliar technique/comfortable using previously known technique over hAM

CONCLUSION

1. **hAM grafts are a promising technique for MH repair** based on current reports on BCVA improvement, success with MH closure rates and low complication risks
2. **Protocols are available** for study replication and technique application in the OR
3. **Further studies** to be completed to elucidate **outcomes** and **risks/complications**
4. **Surgeons** may find **specific techniques** work better with **experience** and that **patient selection** and **post-operative expectations** may also be a deciding factors in choosing the preferred approach in the management of MH, but **not to dismiss hAM** if available as an option for repair

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The Mini-steamroll: A modified abbreviated variation of the steamroller maneuver following pneumatic retinopexy for rhegmatogenous retinal detachment with large superior breaks

COS 2024

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INTRODUCTION

- Proper patient positioning is crucial for the success of pneumatic retinopexy (PnR), a minimally invasive procedure which uses intravitreal gas injection to treat rhegmatogenous retinal detachment (RRD).
- Two conventional positioning methods are direct to the break and the steamroller maneuver. The direct to break technique immediately positions the patient's head to place the gas bubble against the retinal break to tamponade it. This prevents further fluid entry and promotes reabsorption by the retinal pigment epithelium (RPE) pump. The steamroller maneuver involves 4-6 hours of face-down positioning followed by gradual head raising, aiming to express subretinal fluid into the vitreous cavity. However, this technique can be difficult for patients.
- The mini-steamroll is introduced in this study as a hybrid approach, combining the benefits of both techniques

AIM

To describe a novel positioning maneuver for patients with large superior breaks in RRD following pneumatic retinopexy.

METHOD

- A total of six patients who presented with RRD to St.Michael's Hospital were included in this case series. All patients had RRD and underwent PnR.
- After obtaining a full ocular history and detailed depressed scleral exam at presentation (Best corrected visual acuity (BCVA), duration of vision loss or visual field defect, foveal status, extension of retinal detachment, and presence of retinal breaks or lattice degeneration), all patients underwent ultra-widefield retinal imaging at baseline and repeat imaging 10 minutes after the gas injection.
- Patients were injected with sulfur hexafluoride (SF6), and they were required to maintain a face-down position immediately after the procedure.
- After the gas injection, patients were instructed to perform the mini-steamroll maneuver which consists of a face-down position for ten minutes followed by positioning to the retinal break.
- The mini-steam roll maneuver was considered successful if we observed a significant reduction in the amount of subretinal fluid after 10 min face-down. In case of failure (no substantial reduction in subretinal fluid volume), the patient would switch to the full steamroller maneuver.

METHOD

1. Illustrations portraying the three positioning maneuvers that may be employed following pneumatic retinopexy

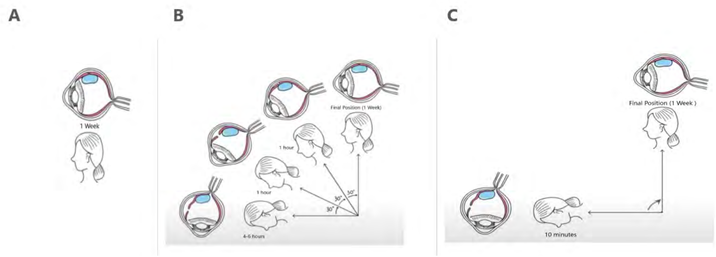


Figure 1. *A. Direct-to -break; Head is immediately positioned to place the gas bubble against the retinal break(s) to tamponade the break(s).*
B . Steamroll; initial face-down positioning for 6 hours for fovea-off cases (4 hours for fovea-on cases) followed by a gradual elevation of the head (usually by 30° every hour) towards the retinal break.
C. Mini-steamroll; Face-down positioning for ten minutes, followed by direct-to-break positioning

2. Schematic of the setup of the pressure drops in series

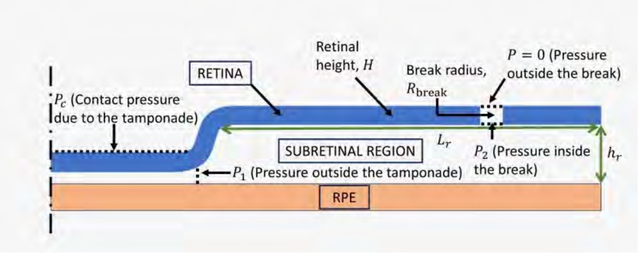


Figure 2. *The pressure exerted by the tamponade is transmitted first through the subretinal layer within the tamponade, then the subretinal region outside the tamponade, and then the break*

RESULTS

In each case (figures 3-8), the mini-steamroll maneuver resulted in a significant reduction in subretinal fluid, aiding in reattachment

Figure 3

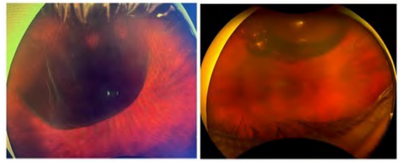


Figure 4

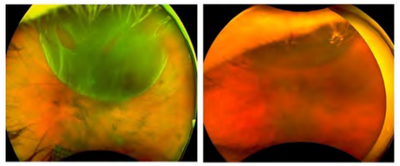


Figure 5

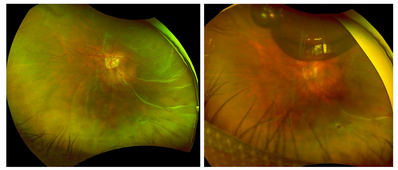


Figure 6

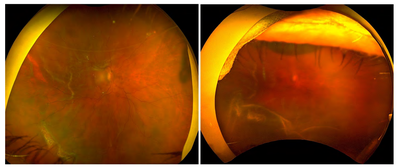


Figure 7

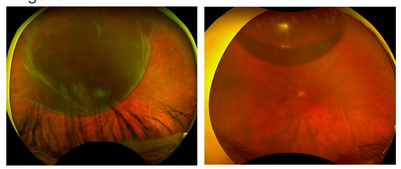
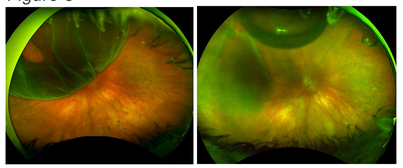


Figure 8



Figures 3-8. *The technique was effective for patients with large superior breaks or multiple smaller superior breaks, allowing subretinal fluid to escape into the vitreous cavity during face-down positioning. This approach was well-tolerated and encouraged patient compliance with treatment.*

CONCLUSION

- This case series demonstrates that the mini-steamroll maneuver may be considered an alternative for patient positioning following PnR in certain cases.
- Mini steamroll has the potential to carry the benefits of both direct-to-the-break and the steamroller maneuver techniques that are currently in use.

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The Quebec experience with Voretigene Neparvovec-rzyl- Clinical and surgical insights for successful delivery and outcomes

COS 2024

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INTRODUCTION

In 2020, Health Canada granted approval for voretigene neparvovec-rzyl, making it available to eligible Canadian individuals with RPE65-mediated Leber congenital amaurosis.

Quebec was the first province to approve provincial coverage of the treatment in September 2022.

AIM

This study describes the process leading to the first patient in the province being treated, as well as the patient's follow-up findings up to 5 months post treatment and details the step-by-step surgical enhancements that the authors developed.

METHOD

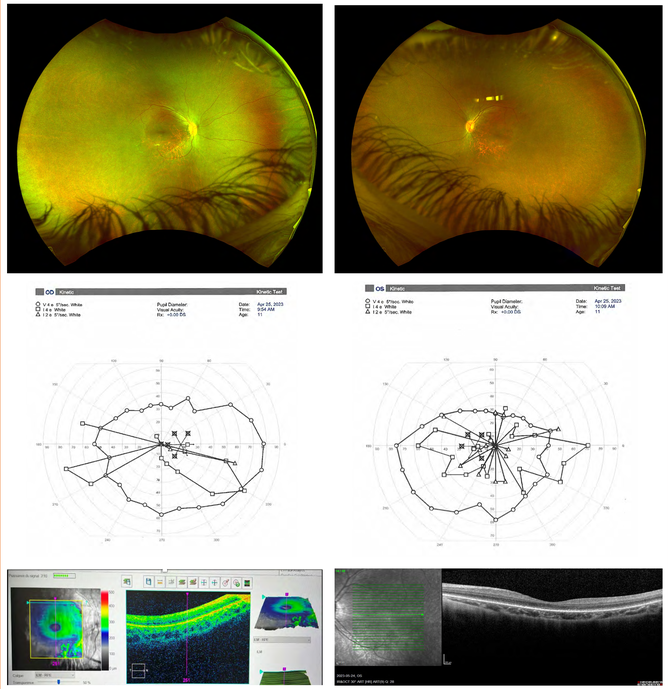
- Study design:
  - Retrospective study of the first patient in Quebec who received the treatment in both eyes through vitrectomy and subretinal delivery of Voretigene Neparvovec-rzyl.
- The following data were analyzed pre and post-surgery
  - Best corrected visual acuity (BCVA)
  - Optical coherence tomography
  - Full-field stimulus threshold (FST)
  - Goldman visual field (GVF)
  - Electrophysiological recordings
  - Surgical techniques were analysed and modified after surgery for the first eye.

CASE PRESENTATION

- 11-year-old boy
- RPE65 mutations
  - c.1451G>A, p.(Gly484Asp)
  - c.(94+1_95-1)_(245+1_246-1)del, encompassing exon 3
- Luxturna surgery
  - OD: May 15, 2023
  - OS: May 29, 2023

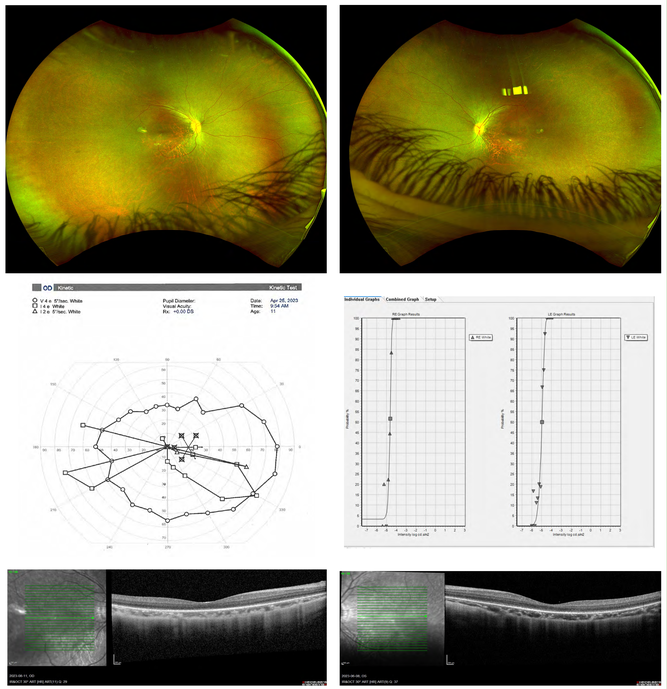
RESULTS

Pre-operative multimodal imaging and functional testing parameters: Top row: fundus photos OD and OS, second row: kinetic visual field OD and OS, third row: macular OCT findings OD and OS, bottom row: summary table of parameters including FST measurements



Pre-Op	BCVA	Visual Field	FST log(cd.s/m²)	OCT (average macular thickness)
OD	20/150	V4e 5º	-3.061	233µm
OS	20/150	V4e 5º	Unable	216µm

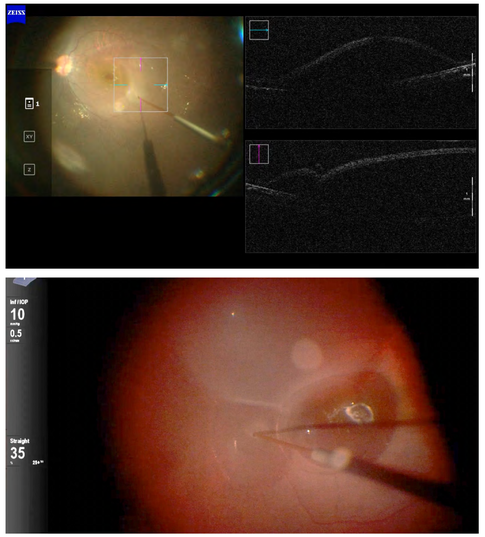
Post-operative multimodal imaging and functional testing parameters at 3 months: Top row: fundus photos OD and OS, second row: left image kinetic visual field OD, right image FST recordings OU, third row: macular OCT findings OD and OS, bottom row: summary table of parameters including FST measurements



Post-Op	BCVA	Visual Field	FST log(cd.s/m²)	OCT (average macular thickness)
OD	20/100	V4e 5º	-4.624	240µm
OS	20/80	Unable	-4.981	209µm

SURGICAL TECHNIQUE

Top image. Balanced salt solution injection to create a pre-bleb.. MI-OCT centered on the medication bleb confirms the retinal elevation and the amount of stretch sustained by the retina during this process.
Bottom image. With the PFCL bubble in place protecting the foveal area, the steady injection of subretinal gene therapy through foot-pedal controlled injection generates a homogeneous bleb of subretinal medication that spreads evenly, circumventing the foveal area and protecting it from excess shear and stretch forces on the photoreceptors.



The highlights of our technique can be summarized in six main points:

1. use of multimodal imaging
2. meticulous lifting of the posterior hyaloid
3. creation of a BSS pre-bleb at the site chosen for gene therapy injection
4. use of PFO to protect the central fovea from detachment
5. use of the MI-OCT throughout the case
6. Use machine settings for a controlled surgical environment and a smooth vector delivery

CONCLUSION

- We report the first case of Voretigene Neparvovec-rzyl administration in a patient in Quebec
- While visual field and ERG recordings remained stable, BCVA, night vision and FST all improved
- The current poster also highlights the technical enhancements of our surgical approach to ensure best patient safety and clinical outcomes.

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The role of artificial intelligence in macular hole management
A scoping review

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Background and Purpose

AI demonstrates potential in analyzing ophthalmic imaging, often matching ophthalmologists' performance

Machine learning (ML): Subset of AI which performs tasks by learning from large datasets
→ applies pattern recognition for new cases

Supervised ML: Method of ML training involving manual labelling of training data by human expert in a relevant field (e.g., ophthalmologist labelling OCT scans as normal/abnormal)

Problem: The range of ML models for macular hole (MH) management is unknown
→ variations in training regimen, data analyzed, and performance

In this study, we explored AI's role in MH care, reporting development, validation, function, performance, and strengths/limitations

Methods

Literature search
Searched Ovid MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, and Web of Science Core Collectic from inception to September 26, 2023.

Studies from databases **(n = 1258)**
Duplicates removed (n = 351)
Studies screened **(n = 907)**
Studies excluded (n = 836)
Full-texts assessed for eligibility **(n = 71)**
Studies excluded (n = 836)
Studies included in review **(n = 21)**
Classify by task in MH management

1. Detection Diagnosis
2. ID MH Characteristics
3. Postop Predictions

Categorized by data type: ophthalmic image analysis or clinical characteristics (e.g., age, MH morphology)

Results

Figure 1: Most commonly utilized learning strategies

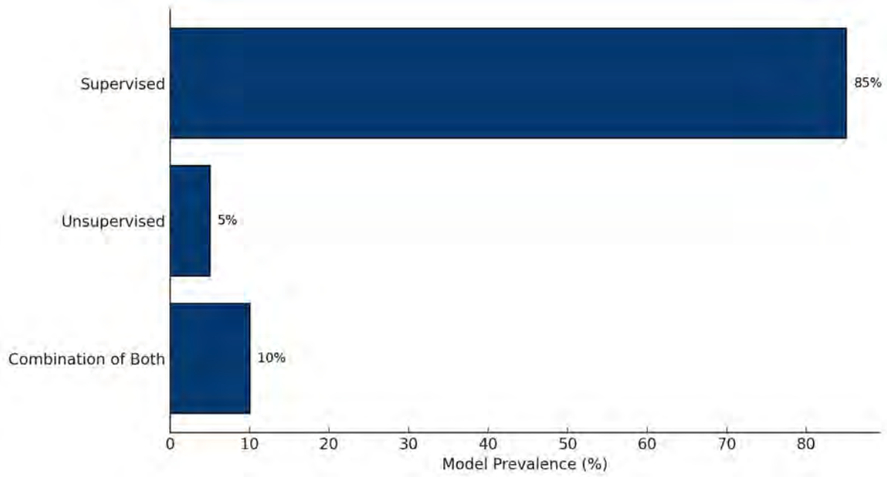


Figure 2: Most common supervised learning algorithms

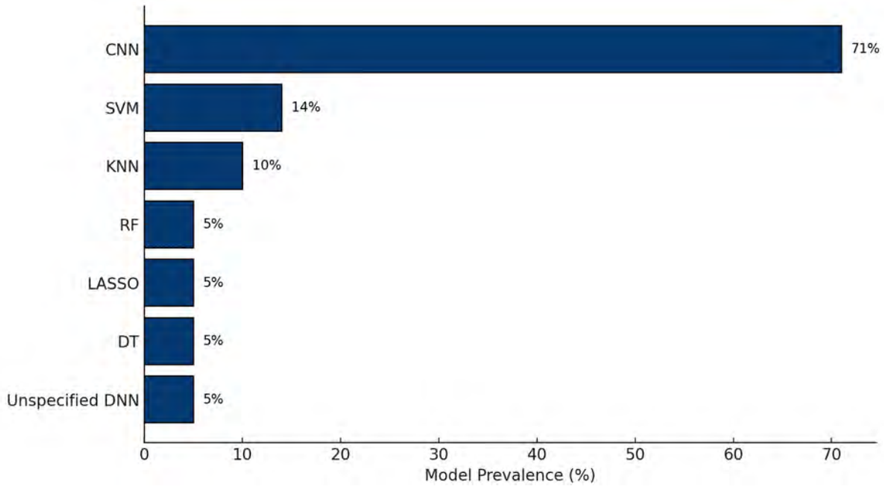
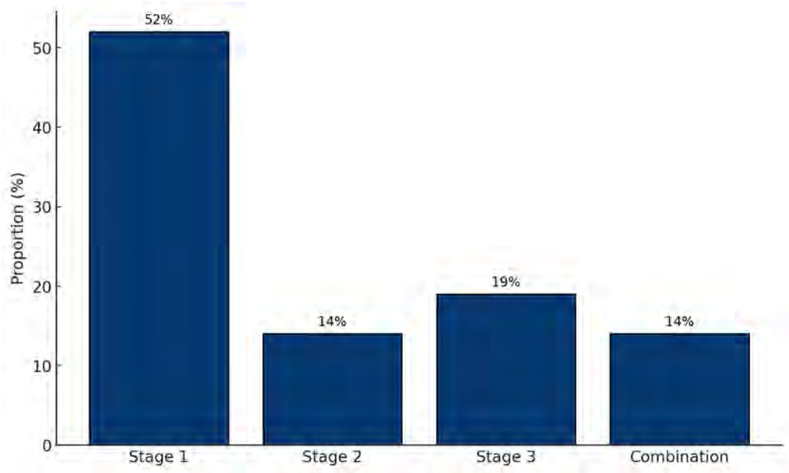


Figure 3: AI model tasks in MH management



Key message
Most models were supervised **CNNs** which **detected or diagnosed** MH from **OCT** scans (76%) and **fundus** photographs (24%)

Table 1. Sample summary of prevalent AI algorithms used in macular hole management

AI Algorithm	Algorithm Tasks	Advantages	Disadvantages
CNN	Contain 3 types of layers: convolutional, pooling, and fully-connected Layers become increasingly complex and identify more of the image until object recognition	•Hierarchical feature learning critical for image recognition •Can use transfer learning	•Computationally demanding •"Black box" phenomenon •Misclassification due to adversarial attacks on input data; poses security risk in clinical settings
SVM	Used in binary classification. Identifies hyperplanes (decision boundary) to distinguish between categories.	•Effective in high-dimensional spaces with many features (thus suitable for image recognition)	•Multiclass classification is slow and memory-intensive •Cannot handle missing values in dataset
KNN	Classify or predict based on proximity of a new data point to the average of the k nearest data points.	•Few hyperparameters required (a k-value and distance metric) •Simple implementation •Adapts well to new data	•Performs poorly with highly dimensional data •Prone to overfitting

Table 2. Sample characteristics and performance of AI models in MH management

Publication	AI model	Training Database (images)	Task	AI Class	Analysis	Data Analyzed	Accuracy (if reported)
Bai 2022	CNN	1311	1	Supervised	Image	OCT B-scans	NR
Dong 2022	CNN	208,758	1	Supervised	Image	Fundus images	0.996 (0.995 -0.996)
Xiao, 2023	DL	3300 features	3	Supervised	Clinical Data	Age, symptom duration, MH morphology	0.875

Key message
50% of studies comparing AI to human graders reported equivalent or higher performance

Despite high performance, no articles studied treatment planning, and none have been deployed clinically.

Why?

- Regulation & patient safety
- Black Box Phenomenon
- Insufficient MH Datasets

Conclusion

- The integration of AI in guiding MH treatment decisions remains unexplored, suggesting an opportunity for developing models as clinical decision support systems.
- Future research may validate algorithms that propose personalized treatment plans and explore their clinical applications.

Time-course of Outer Retinal Restoration following Vitrectomy for Fovea-off Rhegmatogenous Retinal Detachments

COS 2024

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INTRODUCTION

Rhegmatogenous retinal detachment (RRD) has an estimated annual incidence of 10.5 per 100 000[1]. Based on the present-day standard of 23–27-gauge micro-incisional vitrectomy systems, the currently accepted single-operation anatomic reattachment rates are between 84-92% depending on the complexity of the detachment and surgical techniques utilized[2]. As techniques have improved, we have begun to question if primary single-operation reattachment rate is the best outcome metric for retina reattachment surgery. To understand how microstructural change post-surgery effect final visual outcome we first must understand time timeline of microstructural repair following surgery.

AIM

To investigate the natural time-course of outer retinal restoration following vitrectomy for fovea-off rhegmatogenous retinal detachments (RRD) over 2 years post-surgery.

METHOD

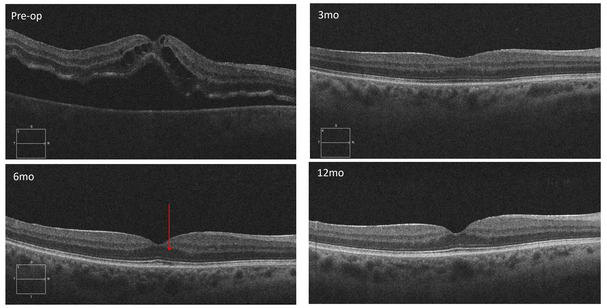
- Retrospective analysis included 198 eyes (198 patients, 59+/-12y) with primary uncomplicated fovea-off RRD that underwent 23g pars plana vitrectomy (PPV). Primary outcomes were visual acuity (BCVA) and discontinuity of the external limiting membrane (ELM), ellipsoid zone (EZ) and interdigitation zone (IDZ) on spectral-domain optical coherence tomography (SD-OCT) at 3-, 6-, 12- and 24-months post-surgery.
- All surgeries were performed by three experienced vitreoretinal surgeons who used similar techniques
- Surgeries were all completed in the same operating rooms using the same 23-gauge vitrectomy systems (Alcon Constellation, Alcon Canada, Mississauga Canada) and widefield operating microscope system (Carl Zeiss Meditc, Jena, Germany).
- The gas tamponade was with isoexpansile concentrations of SF6 or C3F8 with complete gas fill and postoperative face down positioning.
- OCT data were analysed using SD-OCT 5-line raster scans (Cirrus HD-OCT, Carl Zeiss Meditec, Jena, Germany). The integrity of the outer retinal photoreceptors was evaluated by two masked graders (BRM and AB) with any discrepancies resolved by a third senior masked grader (RHM). The assessment of ERM was standardized and bias reduced using the OCT grading system

RESULTS

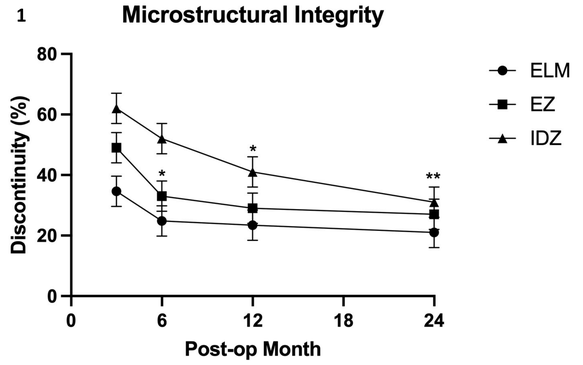
Table 1&2: Baseline data and surgical outcomes:

Baseline Data	(n=198)
Age (years)	
Mean (SD)	59 (12)
Sex: %	
Male	73
Female	27
Vision: mean (SD)	
Snellen Eqiv.	20/640
LogMAR	1.50 (0.79)
Lens Status: %	
Phakic	45
Pseudophakic	54
Aphakic	1
Macular Status: No. (%)	
On	0 (0)
Off	100 (100)
Detachment Size: %	
<2 quadrants	59
>2 quadrants	41

Surgical Outcomes	(n=198)
Total Visits (12mo)	
Mean (SD)	11.5 (6.5)
Anatomical Success (single procedure): %	
Attached at 24 mo	85.5
Tamponade: %	
C3F8	81
SF6	14.5
Air	4.5
Patients requiring post-PPV laser : Number	9



Representative OCT demonstrating restoration of the outer retina over time, Arrow indicates discontinuity of the interdigitation zone (IDZ) at 6 months



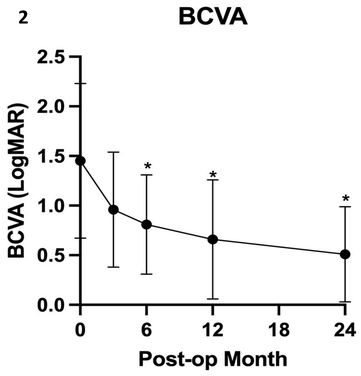
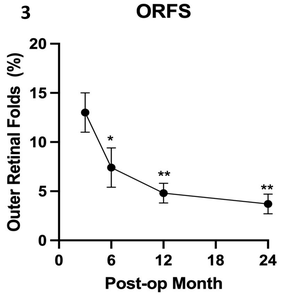


Figure 1: *Discontinuity of the external limiting membrane (ELM), ellipsoid zone (EZ), and the Interdigitation zone (IDZ) over 24 months. *p<0.05 is EZ and IDZ, **P<0.05 vs. from 3 and 6 months (Time)*

Figure 2: *Change in best-corrected visual acuity (BCVA) from pre-op to 24 months post-op. *p<0.05 vs. previous time point*



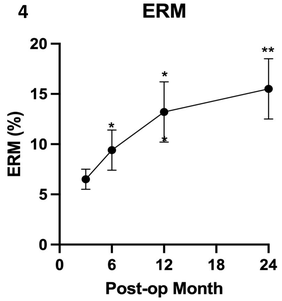
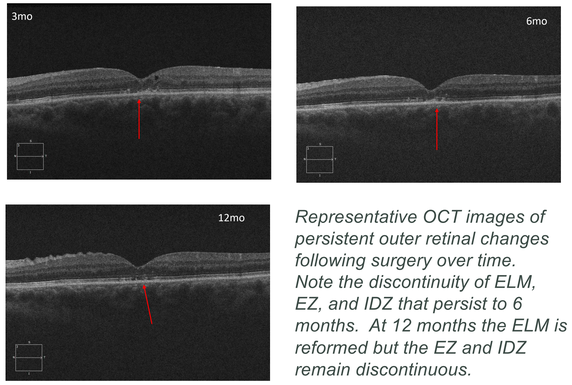


Figure 3*: Outer retinal folds (ORFs) over time. *p<0.05 vs. 3 months, **p<0.05 vs. 3 and 6 months*

Figure 4*: Epiretinal membrane formation (ERM) over time. p<0.05 vs. 3 months, **p<0.05 vs. 3 and 6 months*



Representative OCT images of persistent outer retinal changes following surgery over time. Note the discontinuity of ELM, EZ, and IDZ that persist to 6 months. At 12 months the ELM is reformed but the EZ and IDZ remain discontinuous.

CONCLUSION

1. Following vitrectomy for fovea-off RRD, time-course of restoration of the outer retinal microstructure occurs in a step-wise fashion with reconstitution of the ELM followed by the EZ and lastly the IDZ.
2. The time-course of outer-retinal microstructural recovery closely parallels the timeline of improvement in BCVA.
3. Improvement in retinal microstructure and BCVA improves significantly through the first 12 months and continues to improve out to 2 years post-surgery.

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Utilizing Artificial Intelligence to Predict Post-Operative Outcomes in Ophthalmic Surgeries in the Posterior Segment: A Systematic Review

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INTRODUCTION

- Recent developments in Artificial Intelligence (AI) and machine learning promise to revolutionize various fields of medicine, including ophthalmology.
- The predictive ability of these algorithms using large datasets is well-suited to forecast patients' post-operative outcomes.
- AI also has the potential to identify important pre-operative risk factors and guide both surgical planning and decision-making.
- Current methods of predicting post-operative outcomes to optimize surgical decision-making rely largely on linear regression-based models. These methods are limited in their application to large datasets with many variables[1].
- Despite its potential, the body of literature surrounding the implementation of AI in the prediction of ophthalmic surgical outcomes in the posterior segment has yet to be evaluated using a systematic methodology.

PURPOSE

To provide an overview and narrative analysis of the state of current literature regarding the utilization of AI to predict post-operative outcomes in patients undergoing ophthalmic surgery in the posterior segment.

METHODS

A systematic search of MEDLINE, Embase, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Compendex, IEEE, Web of Science, and Scopus was performed. An iterative web search through grey literature was completed. RevMan was implemented by using a hierarchical summary receiver operating characteristic (HSROC) model to assess the relationship between sensitivity and specificity. Stata version 18 was used to perform all other analyses. with a P<0.05 considered statistically significant. A random effects model was used to combine the included studies and better account for heterogeneity.

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart of study selection process.

Inclusion criteria

- Primary studies using AI to predict outcomes after ophthalmic surgical procedures in the posterior segment.

Exclusion criteria

- Studies of laser procedures, intra-ocular lens power calculations, injections, and non-predictive AIs.

RESULTS

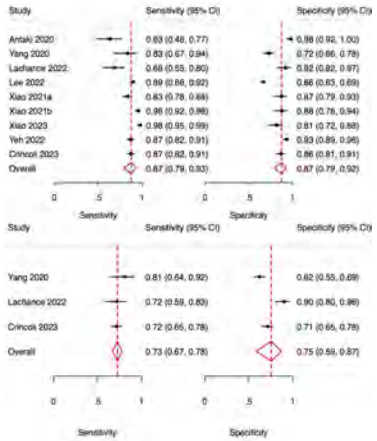

Figure 2. Forest plots for the sensitivity and specificity of studies examining A) deep-learning (Random effects pooled sensitivity: 0.8743 [95% CI: 0.7906; 0.9276]; Random effects pooled specificity: 0.8678 [95% CI: 0.7931; 0.9183]) and B) non-deep learning (NDL) studies (Random effects pooled sensitivity: 0.7273 [95% CI: 0.6748; 0.7741]; Random effects pooled specificity: 0.7556 [95% CI: 0.5873; 0.8704]).
Deep-learning models demonstrate superior sensitivity and specificity.

87% of included studies found that AI models were able to predict post-operative outcomes in ophthalmic surgical patients. These models outperformed traditional, non-deep learning methods of outcome prediction. Convolutional neural networks were the most widely used model, while visual acuity was the most assessed outcome in these models.

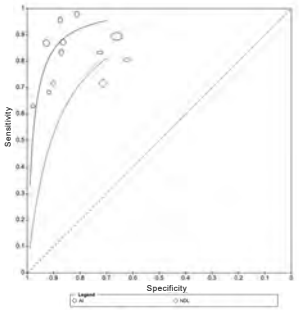

Figure 3. Summary receiver operator curve (SROC) for the sensitivity and specificity of studies examining deep-learning and non-deep learning (NDL) studies. **Deep-learning models show superiority to non-deep learning techniques in a combined model of sensitivity and specificity.**

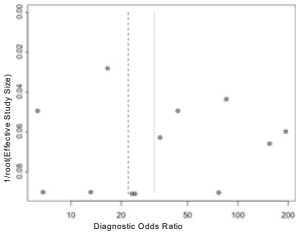

Figure 5. Funnel plot for diagnostic odds ratios used to assess for publication bias (p=0.5695). **This non-significant funnel plot indicates that there was no significant source of publication bias.**

Figure 4. Risk of bias assessment as determined using the PROBAST tool. **This tool assesses 4 domains of bias, including in the participants, predictors, outcomes, and analysis chosen by the authors. A concern for bias in any domain resulted in the paper overall being judged at a high level of bias.**

Outcome Assessed	Number of Studies
Visual Acuity	8
Macular hole status	4
Proliferative vitreoretinopathy	1
Dry eye disease	1
Foveal thickness	1
Surgical success	1

Table 1. Studies included in the systematic review organized by primary outcome assessed.

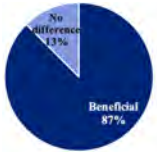

Figure 6. Percentage of Studies that reported improvement over controls or established significant predictive ability in the absence of a control.

Citation	Year	Study Design	Chief Concern	Surgical Intervention	Number of eyes	Number of Patients	Age (mean [SD])	Gender (percent male)	Best performing AI model studied
Antaki et al.	2020	Retrospective	Rhegmatogenous retinal detachment	Pars plana vitrectomy	506	-	-	-	Quadratic support vector machine
Meng et al.	2023	Retrospective	Open globe injury	Vitrectomy	531	530	43 (14)	89.60%	XGBoost
Rizzo et al.	2021	Retrospective	Full thickness macular hole	25-Gauge Pars Plana Vitrectomy (PPV/25G) with inner limiting membrane removal and endotamponade of sulfur hexafluoride gas	35	35	70.45 (8.24)	40%	Convolutional neural network
Obata et al.	2022	Retrospective	Idiopathic macular hole	23- or 25-gauge pars plana vitrectomy	259	-	67.5	46%	Deep neural network
Yang et al.	2020	Prospective	Conditions requiring vitrectomy	Vitrectomy	-	250	-	62.20%	Artificial neural network
Lachance et al.	2022	Retrospective	Idiopathic full-thickness macular hole	Pars plana vitrectomy	-	121	67 (8)	27%	Hybrid CNN+logistical regression
Lee et al.	2022	Retrospective	Diabetic retinopathy	Vitrectomy	1504	1175	54.5 (11.4)	54%	Ensemble decision tree
Xiao et al.	2021	Retrospective	Idiopathic macular hole	Vitrectomy and internal limiting membrane peeling	292	-	60.36 (10.83)	36.63%	VGG16 convolutional neural network
Xiao et al.	2021	Retrospective	Idiopathic macular hole	Vitrectomy and internal limiting membrane peeling	288	-	60.3 (10.8)	36.46	Random forest
Xiao et al.	2023	Retrospective	Macular hole (idiopathic or secondary)	Vitrectomy and internal limiting membrane peeling	330	-	59.54 (11.03)	34.24%	Multimodal deep fusion network
Zgolli et al.	2022	Retrospective	Idiopathic macular hole	Pars plana vitrectomy and inverted flap internal limiting membrane peeling	120	114	65.97 (4.7)	32%	Medical Decision Support System
Yeh et al.	2023	Retrospective	Idiopathic epiretinal membrane	Pars plana vitrectomy with internal limiting membrane peeling	-	529	67.74 (10.24)	45.37%	Convolutional neural network
Kim et al.	2022	Retrospective	Idiopathic epiretinal membrane	Vitrectomy	1876	1832	65.1 (7.9)	27.60%	VGG16 convolutional network
Crincoli et al.	2023	Prospective	Idiopathic epiretinal membrane, symptomatic for metamorphopsia and a visual acuity <20/40	Pars plana vitrectomy with internal limiting membrane peeling	-	411	71 (7.9)	47.40%	Convolutional neural network
Fung et al.	2023	Retrospective	Idiopathic epiretinal membrane, symptomatic for metamorphopsia and a visual acuity <20/40	Pars plana vitrectomy with internal tamponade	6661	-	61.5	64%	Convolutional neural network

Table 2. Studies included in the systematic review organized by primary outcome assessed.

CONCLUSIONS

- In a meta-analysis of predictive accuracy, AI significantly outperformed conventional models in predictive accuracy a combined metric of sensitivity and specificity (p=0.034).
- Using the PROBAST tool, 10 (67%) of the studies included in this review were found to contain low concern of bias in all domains, while 5 (33%) of the included studies had some concern of bias in at least one domain.
- We found no significant source of publication error (p=0.5695).
- Low sample size was a limiting factor in deep learning algorithm performance [2-3].
- To the best of our knowledge, this is the first study to systematically summarize the published efforts utilizing AI to predict post-operative outcomes for ophthalmic surgeries.
- This review demonstrates that AI tools have the potential to improve accuracy in the prediction of post-operative outcomes in the field of retinal surgery. Continued creation of large patient databases will be essential to the future development of these tools.

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ACKNOWLEDGEMENTS

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X-linked Cone Dystrophy with an Uncommon Tapetal-like Sheen Caused by a Novel RPGR Variant

COS 2024

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INTRODUCTION

The tapetal-like sheen is a prominent, golden metallic retinal reflection seen on clinical fundus examination that resembles the reflection seen in the fundus of felines and canines with a bona fide tapetum lucidum. It is usually observed most prominently in the perifovea and has been extensively described in females carrying pathogenic RPGR gene variants.

AIM

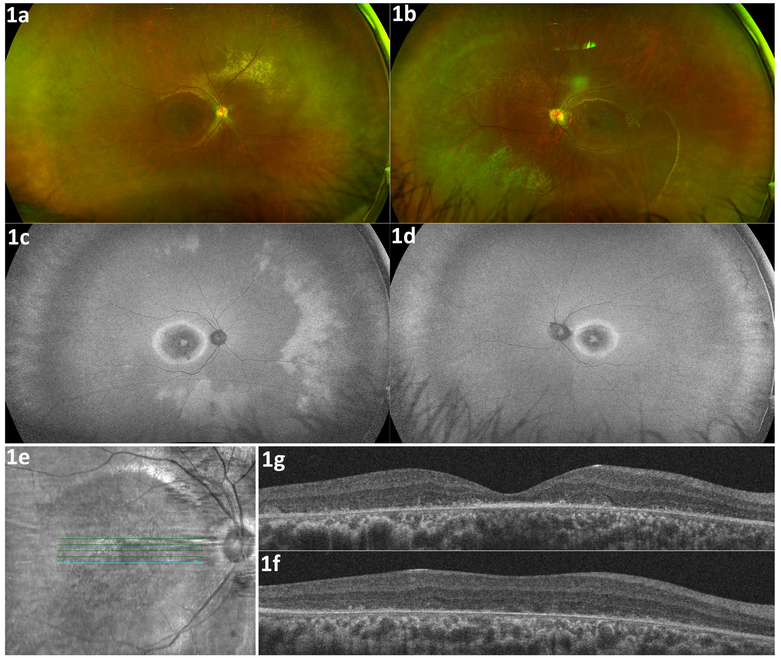
To present comprehensive phenotyping data and expand the molecular spectrum of X-linked cone dystrophy with tapetal-like sheen, associated with a novel disease-causing variant in the *RPGR* gene.

METHOD

Detailed past ocular and medical history, along with a family history, was collected. Dilated fundus examination and multimodal retinal imaging, including ultra-widefield colour fundus photographs, ultra-widefield fundus autofluorescence, and spectral-domain optical coherence tomography (SD-OCT) scans of the macula were performed. Retinal function was assessed by semi-automated kinetic perimetry (OCTOPUS 900), full-field electroretinogram (ERG), and multifocal ERG. A panel-based genetic testing approach was used for molecular analysis. A review of the current literature on male RPGR-related tapetal-like sheen was also conducted.

RESULTS

A 37-year-old Filipino male was being evaluated for cone-rod dystrophy. He has amblyopia, high myopia, with change in colour vision and daytime vision since 10 yo. Night vision remains unaffected. His anterior segment examination was unremarkable. Additional ophthalmic phenotypic data are presented in Figures 1 and 2.



Sequencing Results

Panel-based next generation sequencing testing detected a novel hemizygous RPGR c.2785G>T, p.Glu929X variant categorized as likely pathogenic. The variant causes a premature stop codon in the Open Reading Frame 15 (ORF15) exon of RPGR and is predicted to cause loss of normal protein function through protein truncation.

Figure 1: a and b fundus reveal bilateral central macular hypopigmented atrophy. A prominent inner retinal **tapetal-like sheen** was observed bilaterally in the perifovea, along the major arcades and extending to the superior nasal mid-periphery of the retina in the right eye, and extending to the temporal mid-periphery and mid -to-far nasal periphery of the retina in the left eye. **c and d** show preserved foveolar autofluorescence amid granular central macular hypoautofluorescence, and a bright hyperautofluorescence outer border in the perifovea. There was normal peripheral retinal autofluorescence. OCT scans of OD show some preserved foveolar outer nuclear layer **(g, 3/5)** with indistinct outer retinal banding (ELM/EZ complex), while the parafovea scan **(f, 1/5)** has more pronounced outer retinal and RPE atrophy.

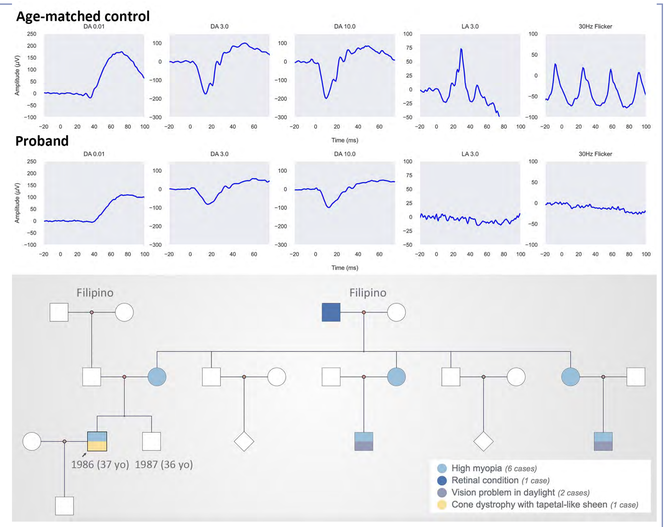


Figure 2: Figure 2: upper panel Full-field electroretinogram of right eye showing preserved response to scotopic stimuli with a-wave and b-wave amplitudes close to lower expected limits in DA 0.01 cd, DA 3.0 cd and DA 10.0 tests supporting a preserved rod function. Response is not measurable to photopic stimuli in LA 3.0 cd and LA 30 Hz Flicker tests, supporting a cone dystrophy. **lower panel** A family pedigree reveals X-linked inheritance. Only the proband underwent comprehensive phenotyping with a confirmed cone dystrophy with tapetal-like sheen.

CONCLUSION

We reported a case of cone dystrophy featuring a rare tapetal-like sheen primarily located in the peripheral retina, caused by a novel RPGR gene variant (c.2785G>T, p.Glu929X). Our case suggests that a tapetal-like sheen could also serve as an early indicator of photoreceptor distress in male X-linked cone dystrophy patients caused by RPGR pathogenic variants, and an alternative mechanism for tapetal-like sheen, apart from the RPGRORF15-TTLL5-a interaction, may exist.

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Uveitis | Uvéite

2-Year Visual and Rheumatologic Outcomes of Patients with Uveitis on Adalimumab (Humira): A Retrospective Review of 82 Eyes

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Background & Research Aim

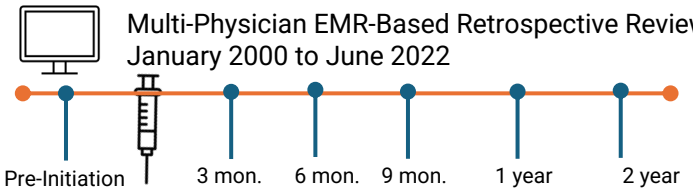
- Treatment of non-infectious uveitis follows a step-ladder approach: corticosteroids → steroid-sparing agents such as biologics.
- Adalilumab (Humira) is a tumour necrosis factor alpha (TNFα) inhibitor shown in randomized control trials to improve inflammatory control and prolong time to treatment failure.
- Limited literature on Adalilumab (Humira) in heterogenous, real-world clinical populations.

Research Aim

To examine the visual and rheumatologic outcomes of refractory non-infectious uveitis patients managed on Adalimumab (Humira) over a 2-year follow-up period.

Methodology

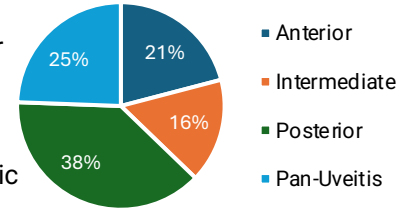
Multi-Physician EMR-Based Retrospective Review
January 2000 to June 2022



Study Sample

43 patients; 82 eyes; 67% female; mean age at ocular diagnosis at 28 years.

53 eyes considered idiopathic
13 eyes HLAB-27 +

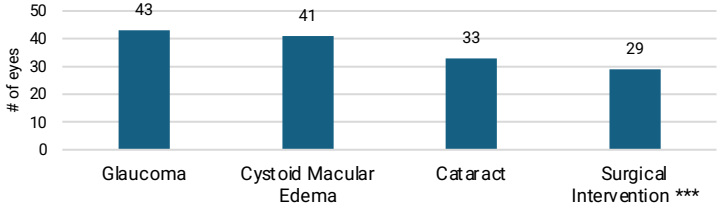


Results

Pre- Biologic Initiation

- Average pre-biologic logMAR: 0.2299
- Average pre-biologic central macular thickness: 335.81µm
- 18 patients on oral steroids: 21.87 mg on average a day, >12 patients on >10mg per day.
- 37 patients on DMARDs, 11 on 2 agents.

Complications (# of eyes)



*** Most common surgeries included cataract, glaucoma, ERM peel and vitrectomy

Biologic Initiation

Average time to biologic initiation from ocular diagnosis: 2297.23 days

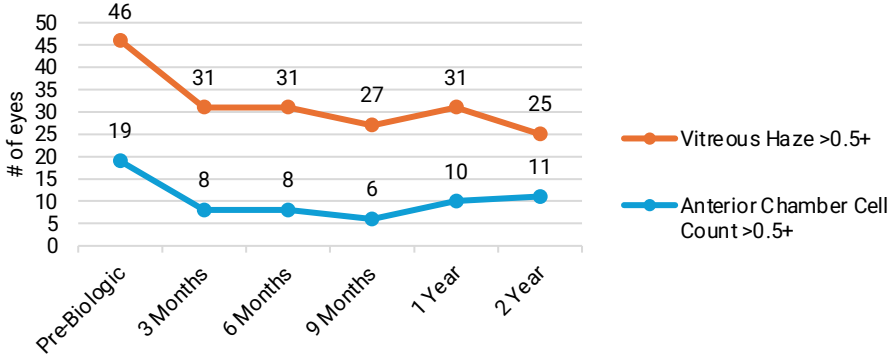
All patient dosed at 40mg, q2weeks

After 2 Years of Biologic Therapy

- Only 3 patients remained on oral steroids, all at a dose <10 mg per day.
- 24 patients remained on DMARDS, only 1 patient on 2 agents.
- No patient required IV steroids during the 2 years.

After 2 Years of Biologic Therapy Cont.

- Average post-biologic logMAR: 0.2024 (improved)
- Average post-biologic central macular thickness: 296.87µm (improved)



Conclusion and Discussion

- Adalimumab (Humira) is an essential agent for management of uveitis.
- Demonstrated improved vision, inflammatory control and macular OCT outcomes.
- Demonstrated effective steroid sparing and DMARD reduction, mitigating side effect profile risks with long term use.
- Longitudinal, prospective, real-world studies with >2- year follow-up are needed.

References

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Current Evidence for Handling, Storage, and Analysis of Ocular Fluid Samples for Cytokine Analysis: A scoping review

COS 2024

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UNIVERSITY OF TORONTO

INTRODUCTION

Ocular fluids hold high clinical value as they contain biomarkers for cytokine analysis which aids in the development of therapeutic drugs.[1,2] There is a variety of methods for ocular fluid collection, sample handling, and storage including Schirmer strips, kits, or microarrays.[3,4] However, different collection methods and storage conditions can either enhance degradation or better preserve cell integrity, which can misinform conclusions drawn from analyses and affect diagnosis.[5,6]

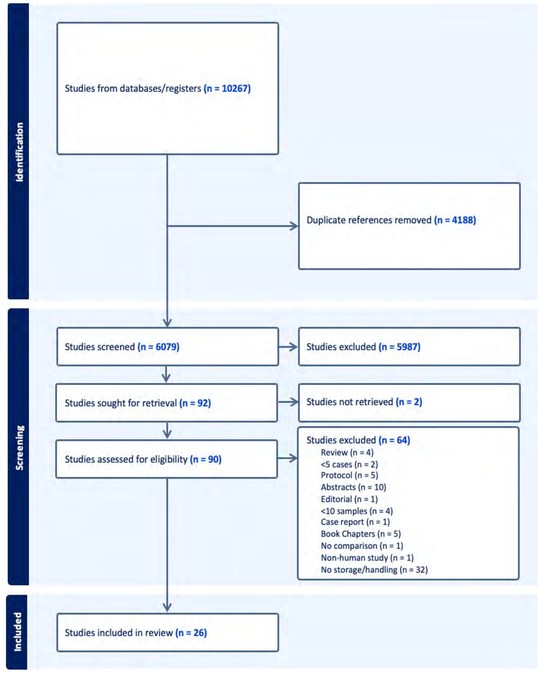
AIM

Considering the limited number of studies available in ophthalmology, there is a lack of synthesized reviews and consensus on the techniques of storage and handling of ocular fluid samples for cytokine analysis.[3] This review aims to investigate and thematically analyze the current evidence for storage and handling of ocular fluid samples for the purpose of cytokine analysis.

METHOD

- A comprehensive search of the literature was conducted in Ovid MEDLINE, Ovid EMBASE and Cochrane Central Register of Controlled Trials, and Web of Science from inception until May 7, 2023 (OSF, Registration doi: https://doi.org/10.17605/OSF.IO/WGFE3).
- Eligible studies included adult or pediatric ocular fluid, and study designs with greater than 5 fluid sample units collected.
- The main variables of interest accepted were studies comparing collection, handling or storage of ocular samples.
- Results were divided into collection, handling and storage and grouped based on study characteristics, ocular fluid, cytokine biomarkers, type of storage or handling method, as well as results.
- The codes were sorted into themes to represent major topics. Results were reported descriptively.

RESULTS



Prisma flow diagram.

- Overall, 6,079 records were reviewed, 26 of which met the inclusion criteria.

Collection Methods

1. Sample collection method depends on the type of ocular fluid and biomarker of interest as different collection methods yield different results.
2. There is no statistical difference in protein concentration and profile within vitreous fluid between the absorption method of Millipore filters when compared to the aspiration method using micropipettes
   - However, both techniques revealed higher proteins concentrations when compared to undetectable levels using two other absorption methods (i.e. Schirmer strips and microsponges).
3. If the biomarkers of interest are lipids, collecting flush or reflex tears was proven to not be appropriate as concentration levels are significantly higher in basal samples.
4. If the target biomarkers are intracellular proteins, Schirmer's strips have yielded higher concentrations if the target biomarkers are extracellular proteins.

Handling Methods

The following conclusions were drawn:

1. Larger sample volume and higher concentrations on lateral flow immunoassay for the detection of matrix metalloproteinase-9 affects the detection limit of protein.
2. The use of TCA precipitation alone resulted in efficient sample concentration and desalting, where Tergitol improves protein separation.
3. The punch method yielded higher protein detectability compared to the elution methods.
4. An ammonium bicarbonate buffer yielded better protein results using Schirmer strips compared to other buffers and the capillary tube method.
5. The highest number of proteins was identified using 100 mM of ammonium bicarbonate solution containing 50 mM NaCl in a 1-D LC-MS/MS.

Storage Methods

The type of ocular fluid and biomarker of interest must be considered.

1. When handling aqueous fluid, results have demonstrated that frozen samples and /or delayed measurement both significantly reduce the concentration of VEGF when compared to fresh samples.
2. When handling vitreous fluid, no significant difference of a variety of biochemical markers was found between fresh and frozen and/or stored samples.
3. When considering total protein concentration in tear fluid, no statistically significant difference was found between samples of various timepoints (i.e. less than or up to 6 hours), or between the novel dry method at room temperature and traditional frozen wet-based method.
   - These results suggest that cell integrity preservation or degradation is dependent on the type of ocular fluid as well as the biomarkers of interest.

CONCLUSION

It is essential to determine which specific biomarkers will be analyzed for the ocular fluid type as different methods are better suited for the collection and preservation of certain biomarkers than others.

It is additionally important to take into consideration variable factors such as patient comfort level, the amount of time, clinician skills, resources, and limitations.

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Global Economic, Humanistic and Epidemiological Burden of Non-Infectious Uveitis

COS 2024

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INTRODUCTION

Uveitis is estimated to be the 5th or 6th leading cause of blindness in the developed world, accounting for 10-15% of all cases of blindness.[1] The management of uveitis often necessitates long term follow-up and numerous interventions.[2] Moreover, uveitis is known to precipitate early cataract formation and glaucoma, with each requiring additional care.[3] While clinical burden of uveitis is well understood, the humanistic impacts of disease are not. Uveitis patients also have a higher risk of developing anxiety and depression as a result of the condition.[4] Notably, individuals with non-infectious uveitis exhibit a higher likelihood of leaving the workforce when compared to healthy individuals.[5] Thus, it is important to highlight that uveitis predominately affects individuals who are working age (20-50 years old), underscoring the potential economic costs associated with uveitis.[6]

AIM

This project is a series of systematic reviews that aimed to evaluate the burden of non-infectious uveitis (NIU) from an economic, humanistic, and epidemiological perspective on patients, caregivers, the healthcare system, and society.

METHOD

- Three separate search strategies were performed using Embase, Ovid MEDLINE, and Scopus databases with the help of an information specialist.
- Economic burden and humanistic burden were separately searched from inception to 2023.
- The epidemiological burden study sought to evaluate recent trends in incidence and prevalence of NIU by reporting data published in 2020 to 2023.
- Studies were included if they measured economic evidence, quality of life outcomes, and incidence or prevalence of NIU
- Quality of studies was evaluated using the Joanna Briggs Institute Critical Appraisal Tools.

RESULTS

- The searches identified a total of 16,197 articles (3763, 3939, 8495 for economic, humanistic, and epidemiological burden, respectively), 173 of which met the review inclusion criteria. Out of 80 articles that met inclusion criteria for the epidemiological burden review, 50 reported prevalence and 45 reported incidence of NIU. Incidence and prevalence in the general and pediatric populations were reported in 12 and 4 articles, respectively.
- Average prevalence ranged from 14.8 to 704.2 per 100,000 persons, averaging to 316.4 persons in the most recent data. Epidemiological studies were most often conducted in the USA (n=12) and the UK (n=8). Incidence and prevalence of NIU were reported in various comorbid contexts, including Juvenile Idiopathic Arthritis (JIA) (n=9), Ankylosing Spondylitis (n=7), Spondyloarthritis (n=5), and Psoriatic Arthritis (n=4).
- Out of 68 articles that met the inclusion criteria of the humanistic burden review, the National Eye Institute 25-Item Visual Function Questionnaire (VFQ-25) was the most frequently used questionnaire (n=35), followed by the 36-Item Short Form Survey (SF-36) (n=29). VFQ-25, SF-36 Physical Component, and SF-36 Mental Component were found to have a mean (SD) composite score of 63.6 (8.9), 46.3 (11.2), and 47.3 (11.5), respectively. Quality of life scores were associated with the existence and severity of comorbid conditions, visual acuity, and sociodemographic factors.
- Out of 25 articles that met the inclusion criteria of the economic burden review, 17 evaluated costs of disease from a patient, payer, and societal perspective, while 6 evaluated cost-effectiveness and 2 evaluated cost-utility of treatments and management of NIU. Total annual healthcare utilization and costs ranged from $15,651 to $23,100 USD from a payer and patient perspective.

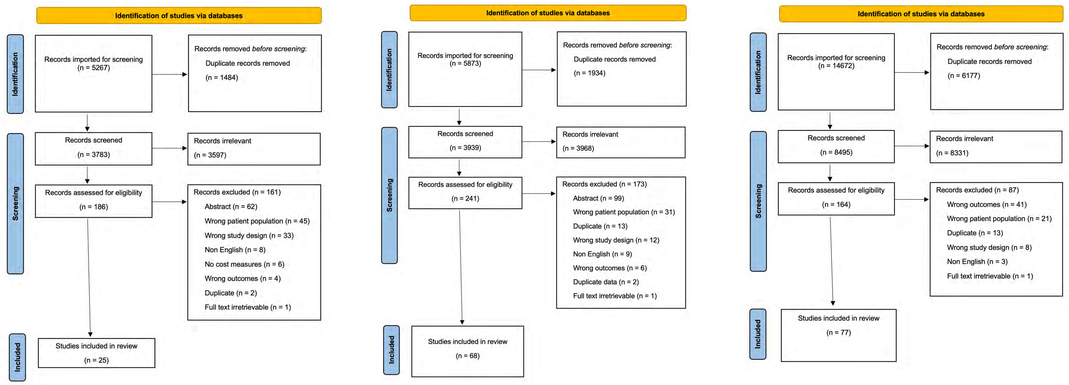

Figure 3. PRISMA diagrams of economic burden, humanistic burden, and epidemiology of NIU, respectively

Table 1. Summary of incidence and prevalence data

Context	Incidence	Prevalence
NIU in the population	3.9—207.8 per 100,000 person-years	4.5—704.2 per 100,000 persons
Pediatric NIU in the population	4.6—7.3 per 100,000 person-years	8.3—106 per 100,000 persons
NIU in Ankylosing Spondylitis (AS)	5.4—14.4 per 1,000 person-years with AS	113.2—321.0 per 100,000 persons
NIU in Psoriatic Arthritis (PsA)	0.5 (95% CI 0.00—0.35) per 100,000 person-years or 1.7 (95% CI 1.5—2.0) per 1,000 person-years with PsA	2.19 (95% CI 1.24—3.79) per 100,000 persons or 31.7—49.3/1,000 persons with PsA
NIU in axial Spondyloarthropathy (axSpA)	33.15 per 1,000 person-years with axSpA	107.1—225.8 per 1,000 persons with axSpA
NIU in Spondyloarthropathy (SpA0	7.7 (95% CI 7.0xv8.5) per 1,000 person-years with SpA	Not reported
NIU in Juvenile Idiopathic Arthritis (JIA)	2.2 (95% CI 1.6—3.0) per 100,000 person-years or 2.2—20.3 per 1,000 persons with JIA	37.3—221.2 per 1,000 persons with JIA
Non-JIA childhood uveitis	0.66 (95% CI 0.52—0.82) per 100,000 person-years	Not reported
NIU in a hospital	Not reported	11.2 per 1,000 patients
NIU hospitalization	15.6 per 100,000 patient-years	Not reported
Pediatric NIU hospitalization	5.4 (95% 5.0—5.9) per 100,000 person-years	Not reported

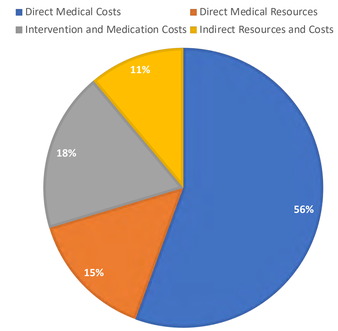

Figure 2. Frequency of quality-of-life instruments used

Table 2. Frequency of quality-of-life instruments used

Quality of Life Scale	Number of studies (%)
Visual Function Questionnaire 25 (VFQ-25)	35 (51%)
EuroQol 5-Dimensions (EQ-5D)	8 (12%)
36-Item Short Form Survey (SF-36) and 8-Item Short Form Survey (SF-8)	30 (44%)
Effects of Youngsters' Eyesight on Quality of Life (EYE-Q)	8 (12%)
Childhood Health Assessment Questionnaire (CHAQ)	5 (7.4%)
Pediatric Quality of Life (PedsQL)	9 (13%)
State-Trait Anxiety Inventory I (STAI-I)	2 (2.9%)
State-Trait Anxiety Inventory II (STAI-II)	1 (1.5%)
Beck's Depression Inventory (BDI)	1 (1.5%)
Vision-Related Quality of Life Core Measure (VCM1)	5 (7.4%)
Zerssen Mood Scale	1 (1.5%)
Inventory for Assessing the Quality of Life in Children and Adolescents (ILC)	1 (1.5%)
KINDL-R-100	1 (1.5%)
Time Trade-Off (TTO)	2 (2.9%)

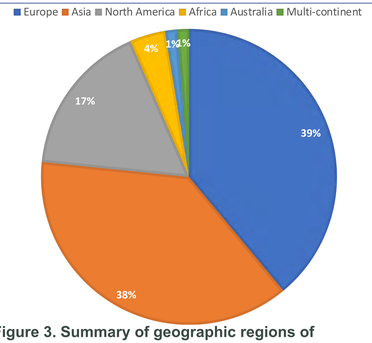

Figure 3. Summary of geographic regions of epidemiological studies

CONCLUSION

This report provides a comprehensive synthesis of the literature published on the global burden of NIU that will assist in decision-making on NIU treatment selection and management guidelines. Optimized and cost-effective management options are needed to improve the quality of life in patients with NIU.

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