ILLINOIS COLLEGE OF OPTOMETRY

2022 RESEARCH PRESENTATIONS

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Considerations and Cautions for Teaching in Higher Education in the Era of Distance Learning

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INTRODUCTION

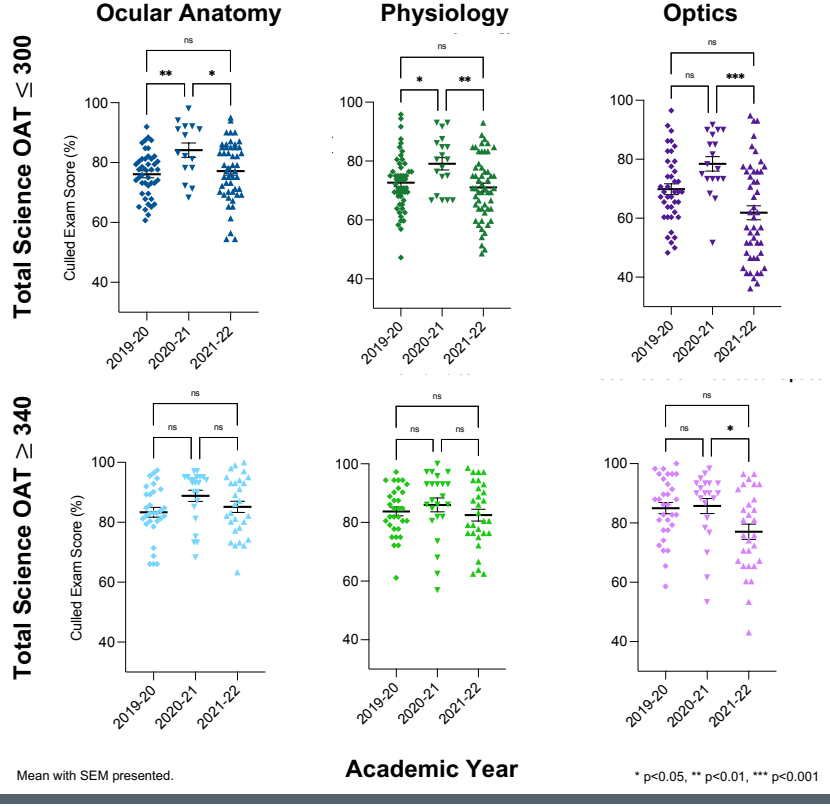
Distance learning (DL) continues in optometric education as students desire flexibility, efficiency, and self-paced learning. In this new era, designing an online course and supplemental activities to facilitate student success becomes critical. Students may lack accountability with a flexible schedule, which can lead to poor time management, superficial understanding, and inferior academic outcomes. This study examines the performance of first-year optometry students in 3 didactic courses across 3 years, in the context of their Optometry Admission Test (OAT) scores. The study aims to determine if students who earned a total science (TS) OAT ≤ 300 and students who earned a TS OAT ≥ 340 are achieving similar academic success in DL courses, and if their DL performance is noninferior to traditional lecture format. The results may highlight the need for purposefully-designed course assignments should DL formats continue for all learners.

METHODS

The courses examined were Human Physiology II (Physiology), Ocular Anatomy (OA), and Geometric and Theoretical Optics II (Optics). After the last traditional lecture year in 2019-20, each course adopted distance learning modalities with the emergence of COVID-19 in 2020-21 and continued in a new normal, flexible DL course formats in 2021-22.

Total Science (TS) OAT scores upon entering optometry school were used to organize students by presumed academic preparedness, comparing students with TS OAT ≤ 300 and TS OAT ≥ 340. Using identical exam items in each didactic course, culled exams were created to calculate student performance in each course each academic year. Performance of the students organized by TS OAT score, in each course across the three years, was compared. Data were analyzed with Microsoft Excel and GraphPad Prism v9.4.1. This study was approved by the Illinois College of Optometry IRB.

Academic performance is noninferior in purposefully-designed distance learning courses compared to traditional lecture



RESULTS

For all 3 courses, students with TS OAT ≤ 300 achieved noninferior academic success in the new DL format of 2021-22 compared to traditional lecture format of 2019-20. Students with TS OAT ≤ 300 showed a significant increase in performance in OA and Physiology during fully online learning in 2020-21 compared to traditional 2019-20 and new DL 2021-22 course modalities. These students showed a significant decrease in performance in Optics in the flexible DL format of 2021-22 compared to the online learning format of 2020-21.

Students with TS OAT ≥ 340 showed no change in performance in OA or Physiology across the 3 years of variable course formats. In the flexible DL format of 2021-22, this group had significantly lower performance in Optics compared to the online learning format of 2020-21, and nearly significant lower performance (p=0.087) compared to the traditional lecture format of 2019-20. The data suggest the DL format for this course may require additional student accountability strategies to maintain equivalence with the traditional lecture environment.

DISCUSSION

The data support that flexible DL course formats of 2021-22 are noninferior to traditional course formats for all students. For courses which require knowledge integration and applied problem solving, such as Optics, we caution educators that a DL format may require purposeful supplemental activities for increased student engagement, accountability, and success.

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Supp. Material

Effect of First Year of Optometric Education on Binocular Vision Measurements

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INTRODUCTION

First year optometry students are faced with a rigorous academic demand associated with a high amount of near work and near point stress. This population, possibly as a result of increased near visual demand, has been shown to have a high prevalence of accommodative excess which can lead to an esophoric eye posture.[1,2] Esophoria at near can accompany lower base in vergence ability and symptoms such as headaches and eye strain.[1] This study was designed to investigate whether there is a significant difference between binocular vision (BV) measurements, particularly phoria and vergences, at the start of optometry school versus at the end of the first academic year.

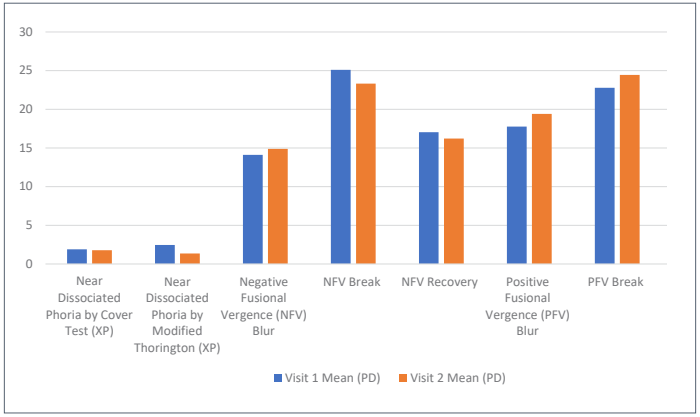
METHODS

First year students from the Illinois College of Optometry were subjects in this study and all voluntarily participated and provided informed consent. The study consisted of 19 participants greater than 18 years of age with no sex or race predilection. Exclusion criteria consisted of any student who had a history of strabismus; nystagmus; amblyopia; known accommodative excess or insufficiency; or near visual acuity worse than 20/25 in either eye. Visit 1 occurred at the beginning of participants' fall quarter and consisted of near visual acuity, dissociated phoria by near cover test, Modified Thorington (MT), and near positive and negative fusional vergence (PFV & NFV) using Risley Prism (RP). All testing was performed through the participants' best correction. Visit 2 occurred at the end of participants' spring quarter and all tests were repeated by the same examiner. The examiners ensured that none of the participants met the exclusion criteria and none had received vision therapy or binocular vision treatment prior to Visit 2.

TABLE 1
Binocular Vision Test Results

Test	Visit 1		Visit 2		P Values
	Mean (PD)	Std. Deviation (PD)	Mean (PD)	Std. Deviation (PD)	
Near Dissociated Phoria by Cover Test	1.89 exo	4.24	1.78 exo	5.17	0.641
Near Dissociated Phoria by Modified Thorington	2.47 exo	3.66	1.36 exo	4.23	0.297
Negative Fusional Vergence (NFV) Blur	14.11	7.18	14.89	5.32	0.633
NFV Break	25.11	5.19	22.33	5.41	0.008
NFV Recovery	17.05	5.18	16.22	5.40	0.607
Positive Fusional Vergence (PFV) Blur	17.76	8.15	19.41	9.64	0.540
PFV Break	22.78	8.06	24.44	11.69	0.534
PFV Recovery	10.06	5.07	14.33	8.85	0.028

FIGURE 1
Comparison of Binocular Vision Measurments



RESULTS

A paired t-test was performed to compare the BV measurements of participants at the beginning and end of their first year of optometric education. The following BV measurements were not normally distributed: phoria by cover test, phoria by MT, and negative fusional vergence recovery value, thus Wilcoxon Signed ranks test was used to analyze the difference at two administrations.

Table 1 outlines the test results during Visits 1 and 2. The average changes (in prism diopters) were: cover test 0.11 (4.99), Modified Thorington 1.03 (4.62), NFV blur 0.78 (6.80), NFV break -2.78 (3.89), NFV recovery -0.44 (3.97), PFV blur 2.44 (11.05), PFV break 1.67 (11.13), PFV recovery -7.22 (8.63). Overall, the change in binocular vision measurements was not statistically significant (Ps>0.05) except NFV break (Ps=0.008) and PFV recovery (Ps=0.028). Figure 1 visually demonstrates the average for each clinical test performed at Visits 1 & 2.

CONCLUSION

Within academic optometry communities, students and faculty often state anecdotally that due to the high near demand in optometry curricula, optometry students may become more esophoric or less exophoric and have reduced vergence ranges with time. In this particular study, binocular vision measurements did not significantly change when comparing the start and end of the subjects' first academic year, except NFV break and PFV recovery values. Study limitations include a small sample size, and for this reason the investigators hope to repeat the study with a larger cohort in the future.

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The Application of Scleral Contact Lenses in the Management of Coexisting Keratoconus and Stevens-Johnson Syndrome

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INTRODUCTION

Scleral contact lenses are large-diameter lenses that vault over the cornea and rest on the sclera. Indications for these lenses include preventing desiccation due to ocular surface disease or improvement of vision due to irregular astigmatism; there is a greater indication for the use of scleral lenses when treating these conditions concurrently. Stevens-Johnson syndrome (SJS) is a complex immune-mediated mucocutaneous disease. It is characterized by the acute blistering and keratinization of various mucous membranes leading to sloughing of the mucosal surfaces, including the ocular surface. Keratoconus (KCN) is a noninflammatory corneal disorder where the central or paracentral corneal tissue progressively thins and steepens, ultimately causing decreased vision. This case highlights the therapeutic use of scleral lenses in KCN coexisting with SJS.

CASE REPORT

A 25-year-old African American male presented for blurry vision at distance and near without correction OU, along with ocular irritation OU. He previously wore glasses, but they offered little improvement of vision. His medical history was positive for SJS secondary to phenytoin use. He also reported burns secondary to SJS that gradually healed. Treatment included Restasis BID OU, Prednisolone Acetate QID OU, and artificial tears.

Entering uncorrected distance acuities were 20/80 OD and 20/200 OS. Trichiasis and thickening of the upper and lower eyelid margins in addition to diffuse conjunctival injection and scarring of the palpebral conjunctiva of both eyes was noted. The corneas of both eyes had peripheral neovascularization 360 OD>OS and inferior corneal steepening OS>OD as highlighted in Figure 2. Corneal tomography confirmed KCN OS>OD (Figure 1). The patient was diagnosed with SJS with concurrent KCN. Dilated fundus exam was deferred.

DIAGNOSIS AND DISCUSSION

There are only a few case reports on patients with SJS and concurrent KCN with no known associations between the two conditions at this time. However, it is postulated that the corneas of SJS patients may be susceptible to corneal ectasia due to eye rubbing, blink related micro-trauma, and increased inflammatory mediators. Regardless of the pathophysiology both conditions can benefit from treatment with scleral lenses.

FIGURE 1
Tomography showing anterior and posterior corneal steepening OU.

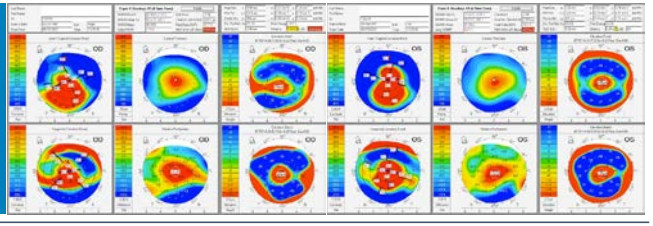

FIGURE 2
OU on the day of presentation showing trichiasis and thickening of the upper and lower eyelid margins OU, 1+ conjunctival injection OU, and peripheral corneal neovascularization 360 OD>OS.

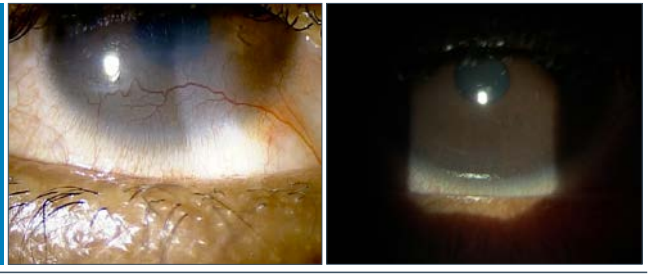

FIGURE 3
OU after 1.5 months of full-time scleral lens wear showing improved peripheral corneal neovascularization 360.

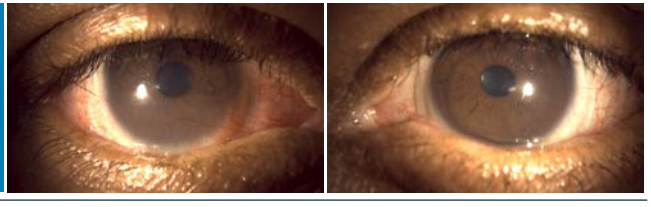

FIGURE 4
Onefit MED scleral lens parameters

	Power	Sag	OAD	M	L	Edge	Material
OD	+0.50 DS	4150	16.0	STD	STD	+100/-50	Optimum Infinite
OS	+2.00 DS	4350	16.0	STD	STD	+125/-25	Optimum Infinite

TREATMENT/ MANAGEMENT

The patient was fit into Onefit MED (CooperVision Specialty EyeCare) scleral contact lenses of 16.0mm diameter (Figure 4) that were selected based off corneal irregularity and horizontal visible iris diameter. The scleral contact lenses vaulted the cornea allowing the tissue to be continuously bathed in sterile saline. This allowed for healing of the ocular surface and protection of the cornea from aberrant eyelashes/keratinized eyelid margin trauma as highlighted in Figure 3. The scleral lenses also allowed for a smooth refractive surface which improved the acuity from 20/80 to 20/40 OD and from 20/200 to 20/40 OS. The patient also reported symptomatic relief of the ocular irritation OU.

CONCLUSION

Although rare, clinicians should be aware of the co-existence of SJS and KCN. Patients with concurrent KCN and SJS can be fitted with scleral lenses to improve quality of vision and prevent corneal desiccation. Management with scleral lenses can prevent further scarring and keratinization which reduces the risk of vision loss while improving comfort.

ACKNOWLEDGEMENTS

Support provided by CooperVision Specialty EyeCare.

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Strabismus and Ocular Motility Deficits in a Patient with ZC4H2-Associated Rare Disorder (ZARD1)

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INTRODUCTION

This case presents the ocular findings in a female child diagnosed with ZC4H2-Associated Rare Disorders (ZARD1), an "ultra-rare" genetic condition that results in multiple musculoskeletal and neuromuscular abnormalities. Ocular manifestations of this condition most commonly include ptosis, strabismus and oculomotor apraxia. This case report adds to the current literature regarding ZARD1 and will consider the possible therapeutic benefits of vision therapy to improve ocular motility.

INITIAL EXAMINATION

A 20-month-old female diagnosed with a ZC4H2 genetic mutation presented for strabismus evaluation. Her parents report an inward eye turn, possibly OS>OD; however, it does alternate between the two eyes. Her vision appears clear, and she shows interest in objects placed in front of her. Her medical history included a repaired craniosynostosis and multiple contractures of fingers and toes. She was enrolled in speech therapy, physical and occupational therapy working on relaxing tight muscles of fingers and toes to improve reaching, grasping and use of her fingers in addition to increasing muscle tone for improved core strength and mobility.

On examination, the patient was diagnosed with strabismus along with ocular motility deficits, including bilateral abduction deficits, bilateral infraduction deficits and hypometric saccades. Smooth pursuit eye movements appeared intact. Initially, there was concern over visual field restriction inferiorly; however, patient appeared to be aware of objects in the inferior periphery OU but unable to make full infraversion eye movements, resulting in delayed response to objects in her inferior field. The patient had a (+) OKN response OD and OS, normal pupillary responses and no nystagmus in any position of gaze. Her refractive error and ocular health evaluation were unremarkable.

Summary of abnormal exam findings:
- 35-45Δ CAET, OD fixation preference
- Bilateral abduction deficits, OS>OD
- Bilateral infraduction deficits
- Hypometric saccades (see below)

Description of saccadic eye movements:
Head movements guided saccadic eye movements, both to the left and to the right. Low amplitude saccades were initiated via the vestibular system in response to quick head movements. Multiple head movements/saccades needed to move gaze from side to side when a visual or auditory stimulus was used.

After a discussion of goals and treatment options, the patient's parents elected to begin home vision rehabilitation exercises emphasizing improved abduction OS>OD, infraduction OU and saccadic eye movements. Her parents were instructed to begin working on monocular duction exercises and to position the patient to either the right or left side during dinner and other therapeutic activities to force her into extreme gazes. Additionally, eye-hand coordination activities were added to her other therapies, both along and off midline.

THREE MONTH FOLLOW UP

At follow up three months later, the patient's parents noted progress from all home-based therapies. She was able sit on her own, though unable to catch herself from falling backwards, and she had recently taken her first steps with a gait trainer. They reported noting an improved range of motion on duction work; however, were aware of cross-fixation when the patient was binocularly viewing in extreme lateral gazes.

The patient's esotropia showed more frequent alternation between the right and left eyes, with improved OS abduction. She continued to demonstrate difficulties with infraduction and saccadic eye movements (head movements guided eye movements). However, given the progress noted on abduction, her parents were instructed to continue home vision rehabilitation. She will continue to be monitored over time.

DISCUSSION

ZC4H2 gene expression is hypothesized to be an important factor during neurodevelopment, and mutations result in a variety of neuromuscular abnormalities. This case of ZARD1 presented with strabismus (constant alternating esotropia), bilateral abduction deficits, bilateral infraduction deficits and hypometric saccadic eye movements that were primarily elicited via the vestibular system following brief head movements. Current therapies for ZARD1 are primarily supportive; however, recent reports from The ZC4H2 Research Foundation have identified favorable outcomes with early therapeutic interventions. Treatment in this case is aimed at improving the patient's ocular motility skills by employing home-based vision rehabilitation exercises. Early outcomes appear promising and may add to anecdotal evidence in support of therapeutic interventions for patients diagnosed with this rare disease.

CONCLUSION

This case adds to the current literature regarding the ocular manifestations of ZC4H2-Associated Rare Disorders. Though long-term follow ups and future case reports are needed to understand the full efficacy of vision therapy to treat these conditions, early indications support optometry's role in the management of this "ultra-rare" disease.

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Bilateral peripheral retinal hemorrhaging secondary to undiagnosed von Willebrand disease

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INTRODUCTION

Von Willebrand disease, an inherited clotting disorder, is caused by either a deficiency or mutation in the von Willebrand factor protein. Three types exist with type 1 being the mildest. Symptoms are directly related to the clotting deficiencies and can include frequent nosebleeds, easy bruising, and heavy periods in women. However, many patients can be asymptomatic and therefore the condition is likely under diagnosed. We report a rare case of bilateral peripheral retinal hemorrhaging secondary to undiagnosed von Willebrand disease.

CASE HISTORY

A 57-year-old black female presented for a comprehensive eye exam. Her medical history included hypertension and type two diabetes with all conditions being controlled with medications. Her last HbA1C was 5.7 with her blood pressure being 135/75 at examination. Best corrected visual acuity was 20/20 OD and OS. External examination, entrance testing, and slit lamp examination findings were unremarkable. IOP's were 16 mmHg OD/OS with Goldmann applanation tonometry. Dilated fundus examination revealed optic discs with 0.25/0.25 cup to disc ratio with clear maculas OD and OS. Peripheral retinal examination revealed scattered pinpoint hemorrhaging and micro aneurysms more so in the temporal quadrants of each eye. Based on the bilateral nature of the hemorrhaging and controlled blood sugar levels the patient was referred for extensive blood work including but not limited to: complete blood count with differentials, sickle cell, ESR, CRP, PT, PTT, INR, and auto immune testing. Lab testing was all unremarkable except for low levels of von Willebrand factor. Hematology consultation confirmed the diagnosis of type 1 von Willebrand disease. Consultation with a retina specialist and subsequent fluorescein angiography was unremarkable. As the patient was asymptomatic with no other retinal findings present, she continues to be monitored on a semi-annual basis.

DISCUSSION

Although rare, von Willebrand retinopathy, secondary to decreased von Willebrand factor, ultimately leads to blood vessel destabilization which can manifest as retinal hemorrhaging. Only a handful of cases have been described in the literature. Case reports have shown retinopathy presenting as vitreal, intraretinal, and subretinal hemorrhages with one case revealing retinal neovascularization. This case demonstrates the importance of clinicians considering von Willebrand disease as a cause of retinal hemorrhaging especially when patients present with an unremarkable medical history and/or controlled systemic conditions. As many patients are asymptomatic, appropriate testing is vital for diagnosis.

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FIGURE 1
Optos widefield photo OD showing scattered pinpoint hemorrhaging temporally

FIGURE 2
Optos widefield red free photo OD showing scattered pinpoint hemorrhaging temporally

FIGURE 3
Optos widefield photo OS showing scattered pinpoint hemorrhaging temporally

FIGURE 4
Optos widefield red free photo OS showing scattered pinpoint hemorrhaging temporally

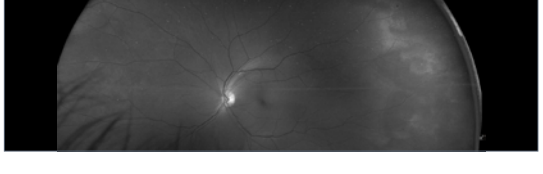

FIGURE 5
FA OD showing micro aneurysms in the temporal periphery with no obvious neovascularization

FIGURE 6
FA OS showing micro aneurysms in the temporal periphery with no obvious neovascularization

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Genetics and Geography: A milder presentation of an ABCA 4 c.6320G>A mutation in an African American female

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BACKGROUND

ACBA4 mutations number in the hundreds and are responsible for Stargardt disease, cone rod dystrophy, and retinitis pigmentosa. Many of the mutations are now known to be specific for patients from particular geographic areas and ethnic backgrounds. Research has also shown that these wide-ranging mutations in certain populations results in different funduscopic presentations along with varying symptoms. We report an atypical macular presentation, mild and late onset, in an African American female with a ABCA4 mutation that was verified through genetic testing.

CASE HISTORY

A 65-year-old black female presented for a comprehensive eye exam. Best corrected visual acuity was 20/20 OD and OS. External examination, entrance testing, slit lamp examination findings were unremarkable. IOP's were 16 mmHg OD/OS with Goldmann applanation tonometry. Dilated fundus examination revealed optic discs with 0.25/0.25 cup to disc ratio OD/OS. RPE atrophy was noted inferior to the fovea OU. Fundus autofluorescence revealed circular hyper-auto fluorescence around the fovea that corresponded to the RPE atrophy. SD-OCT revealed loss of the inner segment/outer segment junction layer along with RPE atrophy. An inherited retinal disease panel was ordered and revealed a mutation in the ABCA4 gene at c.6320G>A. Further history revealed the patient to be of West-African origin. Based on the examination findings and the patient's ethnic origin, the patient was diagnosed with late onset Stargardt disease. Genetic counselling was advised. The patient continues to be followed with her last visit showing stable findings.

FIGURE 1
Optos image OD showing obvious RPE atrophy more so inferior to the fovea along with scattered RPE and drusen like changes

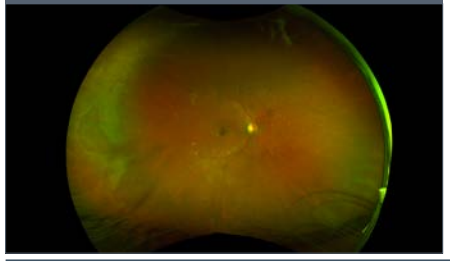


FIGURE 2
Optos image OS showing obvious RPE atrophy more so inferior to the fovea along with scattered RPE and drusen like changes

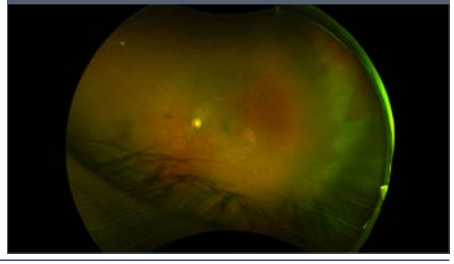


FIGURE 3
FAF OD revealed circular hyper-auto fluorescence around the fovea that corresponds to the RPE atrophy

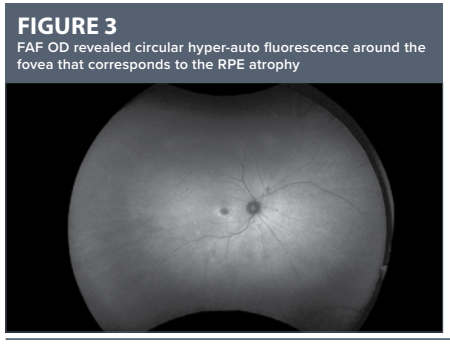


FIGURE 4
FAF OS revealed circular hyper-auto fluorescence around the fovea that corresponds to the RPE atrophy

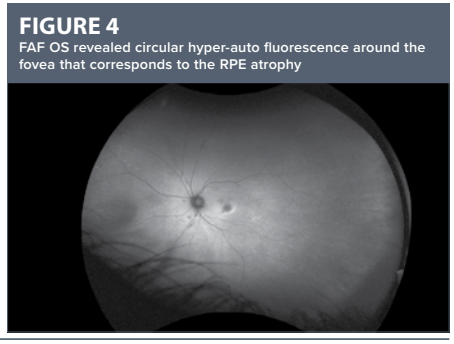
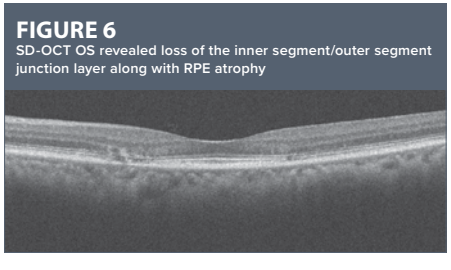


FIGURE 5
SD-OCT OD revealed loss of the inner segment/outer segment junction layer along with RPE atrophy

FIGURE 6
SD-OCT OS revealed loss of the inner segment/outer segment junction layer along with RPE atrophy



DISCUSSION

Autosomal recessive Stargardt disease is linked to hundreds of mutations in the ABCA4 gene. These mutations can be specific to certain racial and ethnic groups. Research has shown that African American patients with mutations in ABCA4, especially those of West African descent, present with a milder fundoscopic presentation and patient symptoms along with a later age of onset (5th decade or later) when compared to patients of European origin. The most common mutation in this study was the mutation noted in our patient, ABCA 4 c.6320G>A. Clinicians should be aware of the varied clinical and genetical heterogeneity in ABCA4 related disease, especially in patients of West African descent. Genetic testing is recommended in all suspected patients in order to provide a better prognosis on their condition.

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Prevalence of Central Serous Chorioretinopathy at the Illinois Eye Institute before and during the COVID-19 Pandemic

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Chicago, Illinois

PURPOSE

Central Serous Chorioretinopathy (CSCR) is a retinal disorder related to the dysfunction of the retinal pigmented epithelium (RPE) layer that allows choroidal fluid to enter the retina. With this subretinal fluid accumulation, there is a chance of permanent decrease in visual acuity and visual distortion that impacts activities of daily living. Increased levels of stress show to be a significant risk factor in developing CSCR. It has also been well documented that stress levels have increased since the COVID-19 pandemic emerged. Therefore, it is possible that there might have been an increase in CSCR cases during the COVID-19 pandemic compared to the preceding year; this observational study investigates how the prevalence of CSCR has changed since the onset of the COVID-19 pandemic.

METHODS

A retrospective chart review of electronic medical records at the Illinois Eye Institute was conducted. Cases were identified into two groups: pre-COVID pandemic (June 2018-February 2020) and during the pandemic (March 2020-November 2021). Any other causes of serous edema were excluded. Demographic data including age, race, sex, self-reported stress and steroid use were recorded and compared between the two groups. Descriptive analysis and t-tests were performed. All statistical analysis was completed using SPSS V27.

RESULTS

A total of 26 patients were identified, 11 patients with CSCR in the pre-COVID pandemic group, and 15 patients during the pandemic group. A majority of patients in both groups were between the ages of 40-65 years old (72.7% pre-pandemic, 73.3% during pandemic). All patients (100%) in the pre-pandemic group were males and 80% of patients in the during pandemic group were males. Overall, there was no significant difference (p>0.05) between the prevalence of CSCR before and during the pandemic. From pre-pandemic to during the pandemic, there was an increase in stress (from 27.3% to 40%) and an increase in steroid use (from 18.2% to 33.3%) self-reported among patients, however both were non-significant (p=0.509, p=0.399, respectively). A sample size power analysis showed that a sample size of 103 patients would be needed in order to assess the potential difference between the two groups.

FIGURE 1
Prevalence of CSCR pre-pandemic (June 2018-Feburary 2020) and during the pandemic (March 2020-November 2021)

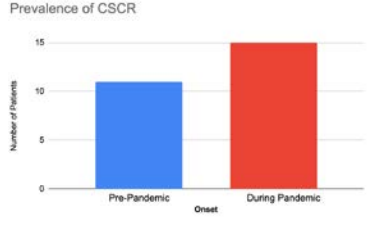

FIGURE 2
From pre-pandemic to post-pandemic, there was an increase in stress (from 27.3% to 40%) and an increase in steroid use (from 18.2% to 33.3%) self-reported among patients, however both were non-significant (p=0.509, p=0.399, respectively)

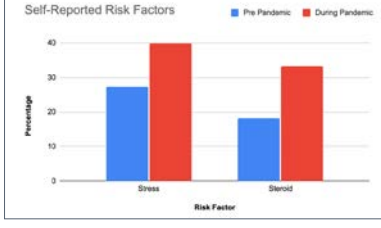

FIGURE 3
Combining the data from pre pandemic and during the pandemic; Unspecified followed by African American showed the highest number in CSCR prevalence and Native American Indians showed the lowest number in CSCR prevalence. African American race group leading the prevalence numbers is likely due to the patient population seen at Illinois Eye Institute consisting majority of African Americans

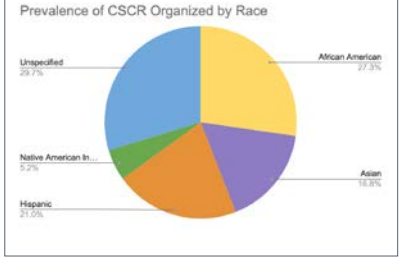

FIGURE 4
A classic presentation of CSCR as imaged with SD-OCT

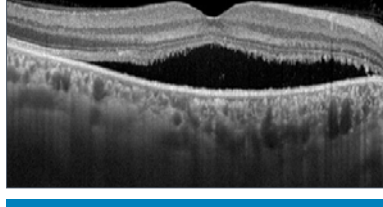

TABLE 1
The above tables are a breakdown of the data regarding gender and various age groups comparing individuals with CSCR at IEI pre-pandemic and during pandemic

Gender	Pre- Pandemic	During Pandemic
Male	11 (100%)	12 (80%)
Female	0 (0%)	3 (20%)

Age Group	Pre-Pandemic	During Pandemic
0-17 yo	1 (9.1%)	0 (0.0%)
18-39 yo	1 (9.1%)	3 (20.0%)
40-64 yo	8 (72.7%)	11(73.3%)
65+ yo	1 (9.1%)	1 (6.7%)

CONCLUSION

Overall, the prevalence of CSCR in this small sample did not significantly increase during the pandemic. A recent retrospective study also noted no changes to, vision, subretinal fluid, or size of detachment secondary to stress in patients with a diagnosis of chronic CSCR during the COVID-19 pandemic. Although, non-significant, it is evident that patients have reported increased stress levels since the COVID-pandemic emerged. Larger studies are needed in order to evaluate the impact of stress on CSCR.

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Moving the Profession To Embrace Myopia Management

Sandra S Block[1], Peter Hendicott[1], Elizabeth Lumb[2], Susan Cooper[1], Sidsel Bockhahn- Tylecote[1]

[1]World Council of Optometrists [2]CooperVision, Inc.

Introduction

The World Council of Optometry (WCO) in 2021 began to focus on the growing prevalence of myopia and the need to shift from considering pediatric myopia as simply a refractive error, to a condition which may be slowed and ultimately help reduce the visually compromising conditions that occur in association with myopia.[1] In an effort to maximize our efforts, WCO and CooperVision (CV) have collaborated to address the growing pandemic.

Methods

Efforts to move optometry towards adopting myopia management as a standard of care include signing and ongoing dissemination of a WCO resolution which advocates for staying abreast of evidence-based methods for the diagnosis and management of myopia and the WCO myopia microsite (https://myopia.worldcouncilofoptometry.info/) in which current research is translated into usable practice tools.[2]

In February 2022, a four-hour virtual seminar 'Myopia Management: Putting it into practice' was conducted. Designed to span multiple time-zones, speakers with expertise in the field of myopia presented on a variety of topics with a focus on usable clinical research, techniques and educational information that aligned to the mitigation, measurement and management pillars of the WCO resolution. (Figure 1)

Figure 1. Lecture program

To measure the impact of the educational content from the program on clinical practice, 2 online surveys were fielded, one ahead of the event (pre-event survey) and one immediately following the event (post-event survey). Questions sought to capture an understanding of the demographics of the audience, participants' level of engagement with myopia management, and any changes to attitudes following the seminar.

Lectures can be viewed on-demand by scanning the QR code

Results

1,245 individuals, representing 95 countries attended the seminar. 375 participants responded to the pre-survey of which 326 (86.9%) were practicing eye care professionals and 53.6% were female. There were 257 responses to the post-survey questionnaire of which 231 (89.9%) were practicing eye care professionals and 51.9% were female (Figure 2 and 3). Approximately half of those attending the seminar (45.6%) had 10 years or less in-practice experience. (Figure 4)

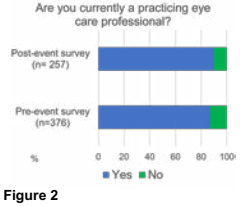

Figure 2

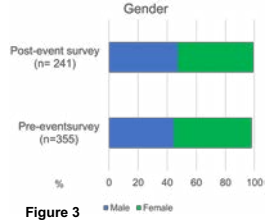

Figure 3

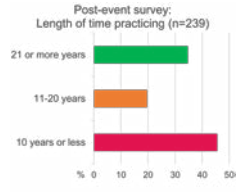

Figure 4

The majority of delegates who responded to the pre-event survey were already offering a range of myopia management options in their practices (Figures 5 and 6). Reasons for not offering myopia management are shown in figure 7 with the need to learn more the biggest barrier (76%) .

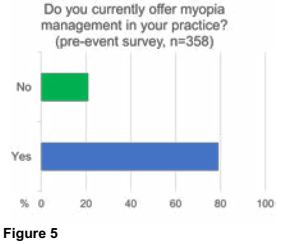

Figure 5

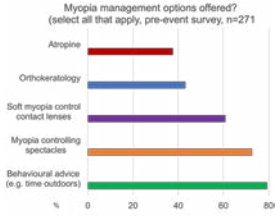

Figure 6

Figure 7

Post survey, 96% of delegates who were already engaging in myopia management were likely to change their current approach (figure 8) and 83% of those yet to incorporate myopia management were inspired to incorporate myopia management in their practices (figure 9). 83% of the pre-survey group responded that they 'strongly agree' and 13% 'somewhat agree' that myopia management should be the standard of care. On the post survey, these increased to 87% strongly agree and 9% somewhat agree (figure 10).

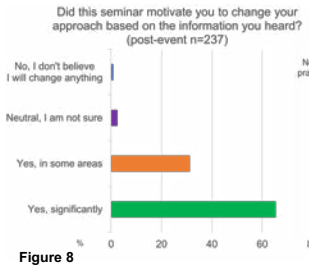

Figure 8

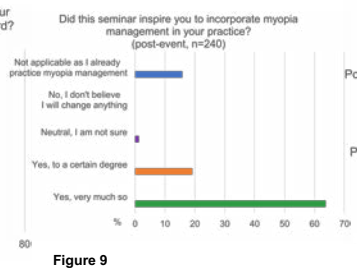

Figure 9

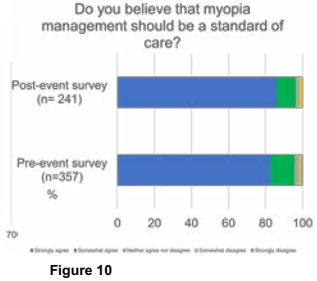

Figure 10

Discussion

There are clear indicators that despite high levels of engagement with myopia management among delegates who attended the seminar, eye care professionals (ECPs) have an appetite for ongoing education.

The authors appreciate there are limitations in drawing conclusions from survey responses where those completing were likely self-selected with the majority declaring active engagement in myopia management. Nevertheless, whether active or not, the results of the survey demonstrated that the ECPs felt on-going learning about managing childhood myopia was important. There was a strong positive response from those yet to engage with myopia management following the seminar demonstrating the impact of evidence-based educational content.

One concern in interpreting the results was the high number or respondents from the Philippines which was driven through local activity.

Conclusion

In order to move the profession towards embracing myopia management as a standard of care, the optometry sector should be mindful to create accessible, multi-platform evidence-based educational resources that reflect the fast-based growth of knowledge in how to approach the management of progressive myopia.

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1. Flitcroft DI. The complex interactions of retinal, optical and environmental factors in myopia aetiology. Prog Retin Eye Res. 2012 Nov;31(6):622-60.
2. Block S., et al. Development and Introduction of World Council of Optometry Resolution on Myopia Management Standard of Care. Optom Vis Sci 2022; :E-abstract 05215016

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Effect of Low-Dose Atropine on Accommodation and Visual Acuity in Children Aged 6 to 17 Years

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PURPOSE

To determine the effect of 0.01%, 0.03%, and 0.05% atropine on visual acuity at distance and near, pupil size, and accommodation in children aged 6 to 17 years.

METHODS

Forty-six children (28 girls and 18 boys) aged 6 to 17 years were randomized into 4 eye drop groups: placebo (n=10), 0.01% (n=13), 0.03% (n=11), or 0.05% (n=12) atropine. One drop of atropine or placebo was administered into each eye once. The following measurements were collected before drop administration, and then 30 minutes, 60 minutes, and 24 hours following application of eye drops: pupil size, accommodative lag using the Grand-Seiko WAM-5500 Binocular Autorefractor, amplitude of accommodation using pull away and a 20/50 target, and visual acuities at distance OD, OS, and OU, and at near OU. All measurements were taken through habitual correction. Repeated measures ANOVA with post hoc comparison was performed to determine the effect of 0.01%, 0.03%, and 0.05% atropine eye drops on accommodation, visual acuity, and pupil size at each time point.

TABLE 1
Characteristics of Participants

	Control	0.01% Atropine	0.03% Atropine	0.05% Atropine
	n=10	n=13	n=11	n=12
Age (years)				
Mean	11.08 ± 2.75	11.38 ± 3.18	10.28 ± 2.63	10.13 ± 3.04
Spherical equivalent of cycloplegic refractive error (D)				
OD	-1.69 ± 1.82	-1.75 ± 2.48	-1.93 ± 1.60	-1.45 ± 1.67
OS	-1.66 ± 1.91	-1.92 ± 2.78	-1.54 ± 1.57	-1.52 ± 1.61

FIGURE 1
Effect of Low-Dose Atropine on Accommodation Amplitude Over Time

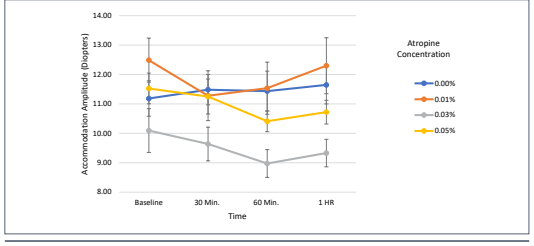


FIGURE 2
Effect of Low-Dose Atropine on Accommodation Lag Over Time

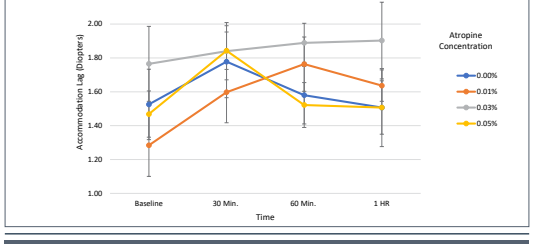
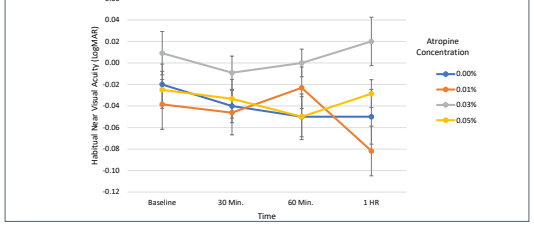


FIGURE 3
Effect of Low-Dose Atropine on Habitual Near Visual Acuity Over Time



RESULTS

The mean age of participants was 10.73 ±3.01 years. Average spherical equivalence by cycloplegic refraction was -1.70 ± 1.98 D and -1.72 ± 2.10 D, OD and OS respectively. Difference in pupil diameters in bright and dim illumination was statistically significant when comparing all 3 atropine groups to the placebo group over time (P <0.001). Atropine eye drops had the most effect on pupil diameter 60 mins after installation (P <0.001). Pupil diameter was partially recovered at 24 hours with no statistical significance compared to the 30-minute time point (P >0.05), although still significantly different from baseline in the 0.03% atropine group (P=0.002). In the 0.01% and 0.05% atropine groups pupil diameter fully recovered after 24 hours with no significant difference from baseline (Ps >0.05). There was no significant difference in accommodation measurements including accommodation lag and amplitude of accommodation comparing 0.01%, 0.03%, and 0.05% atropine to the placebo eye drop group at baseline, or 30 minutes, 60 minutes, and 24 hours following application of the eye drops (Ps >0.05). There was also no significant difference in distance visual acuity OD, OS, and OU or near visual acuity OU (Ps >0.05) at any of the time point of measurements.

CONCLUSION

Pupil size was significantly enlarged by 0.01%, 0.03%, and 0.05% atropine in both dim and bright illumination with more effect at 60 minutes after application. However, low dose atropine eye drops have no significant effect on accommodation or visual acuity at distance or near as compared to baseline. Thus, in respect to accommodation and visual acuity, it is relatively safe to use low-dose atropine to treat myopia progression in children aged 6 to 17 years.

DISCUSSION

Some of the strengths presented in our study include the testing of several atropine concentrations (0.01%, 0.03%, and 0.05%), the variety of tests performed at each time point, and the objectivity of the tests selected. Our study was limited primarily by sample size, as well as study drop-out at the 24-hour time point of 6 participants (13.04%). Further investigation must be conducted to explore the effect of low-dose atropine on accommodation and visual acuity.

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Autoimmune Retinopathy: A Systemic Approach

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INTRODUCTION

Autoimmune retinopathy (AIR) is a rare but visually devastating ocular condition. Patients often present with bilateral sub-acute decreased vision with a normal appearing fundus initially and vascular attenuation, optic nerve pallor, and macular ganglion cell loss later on in the clinical course. Autoimmune retinopathy may be caused by either non-paraneoplastic (nPAIR) or paraneoplastic (PAIR) etiology. A multidisciplinary approach is necessary for the diagnosis, treatment, and management of the patient. Visual prognosis is often poor and a referral to low vision rehabilitation is highly recommended as the patient may have difficulties with activities of daily living. This case report highlights the work-up that is pertinent to diagnosis as well as treatment and management of condition and patient's overall functional vision.

CLINICAL FINDINGS

A 53 y/o African-American male presented to clinic with a complaint of progressive bilateral vision loss over the course of six months.

	OD	OS
ANTERIOR SEGMENT		
Visual acuity	5ft/80 Feinbloom acuity	20/400 Snellen acuity
Color Vision (Ishihara)	3/14	4/14
Pupils, EOMs, CVF, SLE	NL	NL
POSTERIOR SEGMENT		
ONH	1-2+ temp pallor	2+ temp pallor, inf temp neuroretinal rim thinning
Macula, vitreous, periphery	NL	NL
Vessels	Arteriolar attenuation	Arteriolar attenuation, isolated resolving cotton wool spot present along the inferior temporal arcades

DIAGNOSIS AND DISCUSSION

There is no gold standard for diagnosis. One proposed criteria for diagnosing non-paraneoplastic autoimmune retinopathy is:

(1) no history of or current cause of decreased vision
(2) an abnormal but not specific pathologic pattern of ERG results +/- a visual field defect
(3) anti-glycolytic serum antibodies
(4) no intraocular inflammation

Furthermore, other testing that may aid in diagnosis are: OCT RNFL which may show optic nerve atrophy, OCT macula showing retinal thinning (such as with ganglion cells), fundus autofluorescence, unremarkable fluorescein angiography, and decreased color vision. Many of the systemic and ocular testing is done to rule out other causes of vision loss.

FIGURE 1
Fundus photography

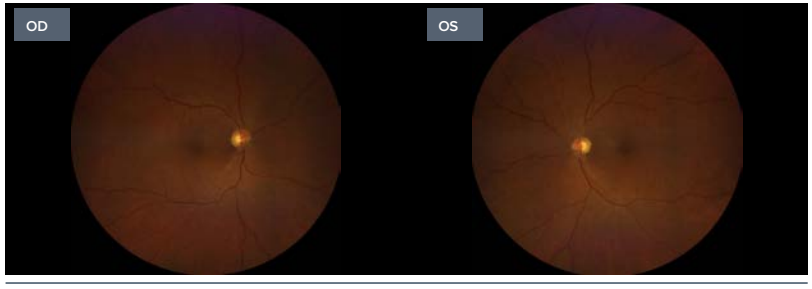

FIGURE 2
Ganglion cell analysis of the right and left eye respectively

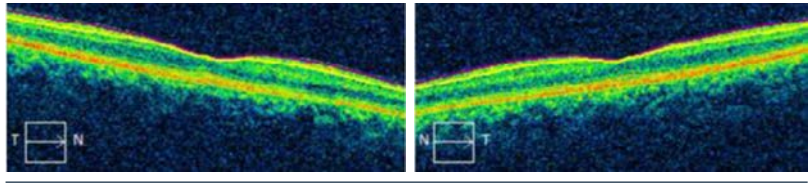

FIGURE 3
Lab testing for infectious, toxic, nutritional, and other categories

INFECTIOUS		**AUTOIMMUNE RETINOPATHY PANEL**	
Syphillis	Non-reactive	Carbonic anhydrase II	Negative
Quantiferon gold	Non-reactive	HSP27	Negative
Hepatitis B and C	NL	Aldolase	Negative
HIV	Non-reactive	α- Enolase	Positive
TOXIC		Arrestin	Positive
Lead, zinc, arsenic, copper	NL	Tubulin	Positive
NUTRITIONAL	NL	PKM2 (pyruvate kinase M2)	Positive
RBC folate	NL	GAPDH (glyceraldehyde- 3-phosphate dehydrogenase)	Negative
Vitamin B1, B6, and A	NL		
OTHER		CANCER-ASSOCIATED RETINOPATHY	
		PANEL	
Beta HCg	NL	Recoverin	Negative
ACE	NL	Carbonic anhydrase II	Negative
Alpha fetoprotein	NL		
Creatine	NL		

PATHOGENESIS

The overarching consensus is that auto-antibodies are made against glycolytic enzymes in the retina which degrade retinal cells and their function. The glycolytic enzymes targeted are: aldolase, α-enolase, pyruvate kinase M2 (PKM2), and glyceraldehyde- 3-phosphate dehydrogenase (GAPDH). Under normal conditions, these glycolytic enzymes are crucial to the function of retinal cells. Auto-antibodies are also made against tumor antigens or chronic inflammation (such as in systemic autoimmune conditions or bacterial infection) which then target the retinal antigens through molecular mimicry, thus producing an autoimmune reaction. The autoimmune reaction may cause apoptosis which clinically manifests as vision loss.

MANAGEMENT

The patient requires multidisciplinary care:
- retinal specialists
- rheumatology
- hematology/oncology
- neuro-opthalmology
- low vision

Repeat clinical testing such as OCT RNFL, OCT macula, color vision, are generally repeated every 3 months to monitor for any signs of improvement.

CONCLUSION

Each subtype of autoimmune retinopathy may be treated differently but generally long-term systemic immunosuppression is initiated.
- CAR: oral steriods, IVIG, immunosuppression, or antioxidants
- MAR : plasmapheresis, IVIG, or radiation
- nPAIR: local/systemic steroids and/or metabolites

Currently no gold standard for diagnosis, management, or treatment exists. A series of ocular and systemic testing is warranted for diagnosis. This includes an abnormal OCT macula and RNFL with normal appearing fundus and systemic work-up. Once diagnosis is made, long-term therapy of immunosuppressive agents is prescribed and the patient is followed every 3 months with poor visual prognosis. A low vision referral or vision rehabilitation consult may assist the patient in their activities of daily living and improve their quality of life.

BIBLIOGRAPHY

Available upon request

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Impact of Clinical Enhancement on Emotional Status and Confidence in Optometry Students

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INTRODUCTION

As optometry school populations trend towards more non-traditional backgrounds we see more students who need additional support to help them succeed. At Illinois College of Optometry, if a student is identified by a faculty as struggling in clinic they are referred for clinical enhancement. Research suggests that students who are identified as struggling often report more negative emotions. While the clinical enhancement process varies for each student, the end of enhancement for all students is based on their clinical performance rising to the level of being competent compared to their peers. How enhancement impacts clinical confidence should also be considered in this assessment of success. This study aims to qualify some of the feelings that students who went through enhancement had towards being identified as a struggling clinician and the impact the process has on their confidence as a clinician.

METHOD

An IRB approved anonymous survey was sent to 17 students who participated in clinical enhancement for primary care between Summer 2020-Spring 2022. There were 9 questions in the survey. The survey centered around the emotions of students upon being referred for clinical enhancement as well as their clinical confidence levels pre and post enhancement.

FIGURE 1
If you were referred by an attending faculty member, did you agree with the decision?

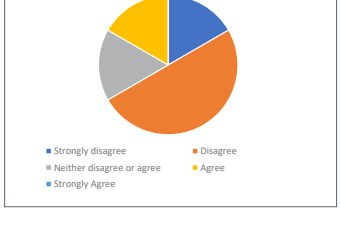


FIGURE 2
What best describes how you felt upon being referred/self-referred to clinical enhancement?

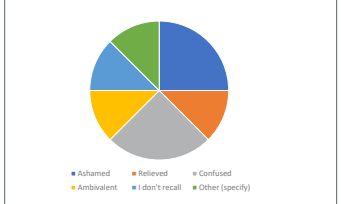


FIGURE 3
What area(s) of clinic would you consider to be the least confident in prior to starting enhancement?

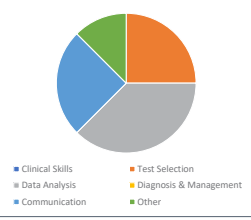


FIGURE 4
What area(s) of clinic did you see the greatest improvement in confidence after enhancement?

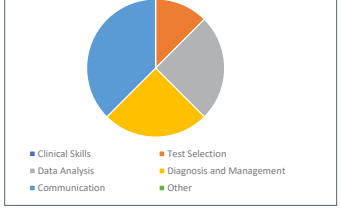


FIGURE 5
How would you rate your overall clinical confidence prior to starting enhancement?

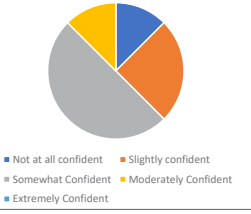


FIGURE 6
How would you rate your overall clinical confidence after completing enhancement?

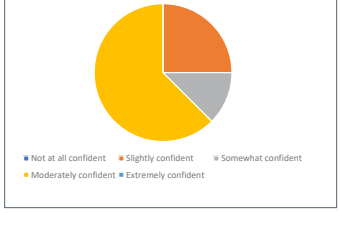
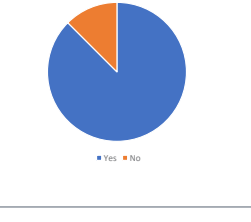


FIGURE 7
Overall did you find clinical enhancement helpful?



RESULTS

Eight students responded to the survey. Of those respondents, the majority either strongly disagreed (17%) or disagreed (50%) with the faculty referral for clinical enhancement. [*Figure 1*] The most common adjectives used to describe their feelings upon referral was "Ashamed" (25%) and "Confused" (25%), followed by "Relieved" (12.5%) and "Ambivalent" (12.5%). [*Figure 2*] The clinical area that respondents felt the least confident in prior to enhancement were "Data Analysis" (37.50%), "Test Selection" (25%), "Communication" ("25%"), and "None" (12.5%). [*Figure 3*] The clinical area's that respondents saw the greatest improvement in confidence after enhancement were "Communication" (37.5%), "Data Analysis" (25%), "Diagnosis and Management" (25%), "Test Selection" (12.5%). [*Figure 4*] When considering overall clinical confidence prior to starting enhancement, 12.5% reported being "not at all confident", 25% reported being "slightly confident", 50% reported being "somewhat confident" and 12.5% reported being "moderately confident". [*Figure 5*] After clinical enhancement this shifted to 62.50% reporting being "moderately confident". [*Figure 6*] When considering the overall benefit of clinical enhancement, 87.50% found it to be helpful. [*Figure 7*]

CONCLUSION

The results of this study highlight the emotional and self-awareness hurdle involved in initiating clinical enhancement. This barrier is very real and often delays students getting the help that they need. That being said, the study also indicates in this small sample that there is a true benefit to the confidence levels of students undergoing clinical enhancement.
While confidence may not equate to competence, it certainly plays an important role in a student's ability to meet the needs of their patients and succeed in clinic.

REFERENCES

Available upon request

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Acute Onset of Complex Ocular Migraine Associated with A Nasal Bone Spur

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Chicago, IL

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INTRODUCTION

Migraines are the most common type of primary headache disorder seen clinically. A migraine is differentiated from an ocular migraine in that the hallmark sign of an ocular migraine is unilateral visual loss that is accompanied or followed by a headache. The visual loss is shorter than that of a migraine, lasting less than 5 minutes. The visual symptoms in an ocular migraine are typically complete vision loss, blurring, and/or dimming of vision. The headache accompanying the vision loss will typically be ipsilateral and concurrent to the visual loss. Although typically additional investigation is not required in patients under 40 years of age, this case illustrates the importance of neuroimaging in patients with acute ocular symptoms of an atypical ocular migraine or migraine with aura.

CASE REPORT

A 23 y/o white male presented with transient blurry/diminishing vision for the past month. Symptoms worse OS, sporadic, and initial episode lasting 1 minute. The next episode occurred 2 weeks after with similar visual symptoms along with slurred speech x 10 minutes. The following occurrence was 1 week after with blurred vision lasting less than a minute and no associated speech deficits. Headache and nausea reported with each episode. Poor sleep quality and alcohol consumption reported the day prior to each episode. LME was 1 month prior, yielding normal blood work, thyroid function, and CT scan.

TABLE 1
Pertinent Initial Presentation

	OD	OS
Visually Acuity (cc)	20/20	20/20
Pupils	Equal, round, reactive, no APD	Equal, round, reactive, no APD
CVF	FTFC	FTFC
EOMs	FULL, (-) pain	FULL, (-) pain
Anterior Segment	wnl	wnl
IOP	16mmHg	28mmHg
Fundus	wnl – Optos Figure 1A	wnl – Optos Figure 1B
Diagnostic Testing	24-2 SITA Fast HVF – Figure 2A Cirrus ONH OCT – Figure 3A	24-2 SITA Fast HVF – Figure 2B Cirrus ONH OCT – Figure 3A

FIGURE 1A

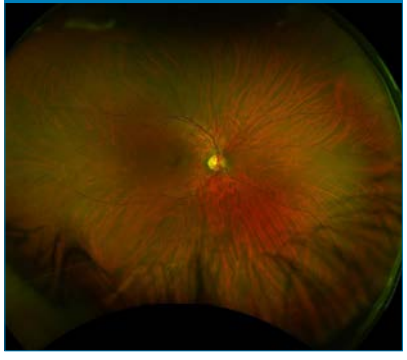


FIGURE 1B

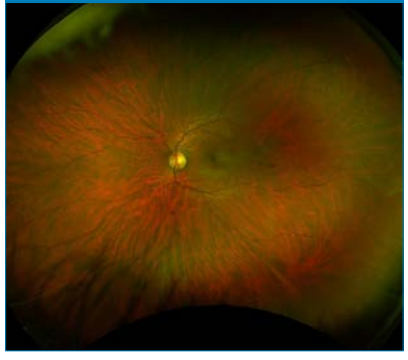


FIGURE 2A

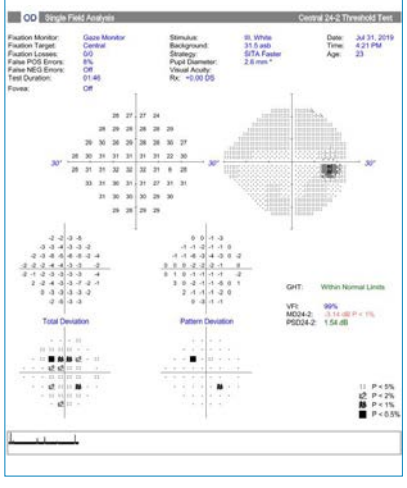
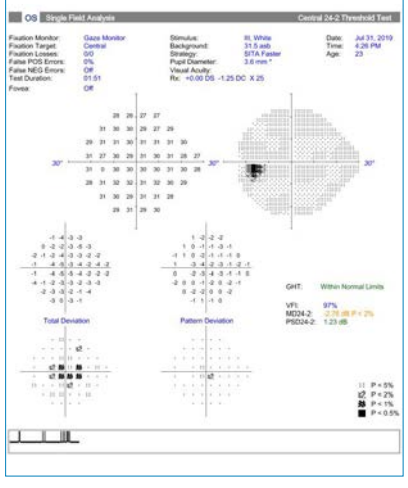


FIGURE 2B



DIAGNOSIS

The patient was referred for neuroimaging and neurology consultation urgently along with continued care with his PCP. Recommended neuroimaging included MRI/MRV/MRA of brain and orbits to rule out neurologic complications due to acute onset of symptoms and stroke-like symptoms associated with visual changes.

The MRI results of the brain revealed a moderate-sized rightward directed nasal spur, which may be associated with chronic migraine symptoms. The patient was referred for an ENT consultation to discuss treatment options.

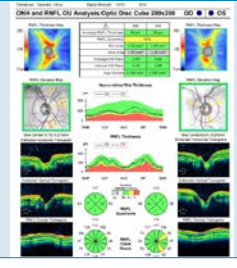
CONCLUSION

Contact between the nasal spur and the adjacent mucosa of the nasal wall may cause migraines, though patients may first present for an ocular evaluation due to associated visual symptoms. Thus, highlighting the significant role of the optometrist in the interprofessional health care team. Patients presenting with urgent symptoms including abrupt onset and neurological symptoms should be further evaluated with neuroimaging to rule out secondary causative etiologies.

REFERENCES

Available upon request.

FIGURE 3



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Comparison of point-of-care antigen testing to PCR for adenoviral conjunctivitis over 21 days

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PURPOSE

To compare results of a point-of-care antigen test for adenoviral conjunctivitis to PCR-confirmed adenoviral titers over a period of 21 days.

INTRODUCTION

Point-of-care antigen testing has been available to clinicians to provide immediate results and guide management for patients with suspected viral conjunctivitis.

Point-of-care antigen test sample collection, test assembly, and results interpretation is demonstrated in Figure 1.

A point-of care test from the Reducing Adenoviral Patient Infected Days band and blue control band. (RAPID) study is shown. There is a blue control line a red line visible indicating a positive test result shown in Figure 2.

PCR has emerged as the gold standard for diagnosing adenoviral conjunctivitis.[1,2] PCR testing, although very accurate, is expensive, typically requires 24 to 48 hours for results, and is often limited in availability to academic medical centers.

METHODS

Adults with red eye symptoms of ≤ 4 days and a positive point-of-care antigen test were enrolled in the RAPID pilot study.

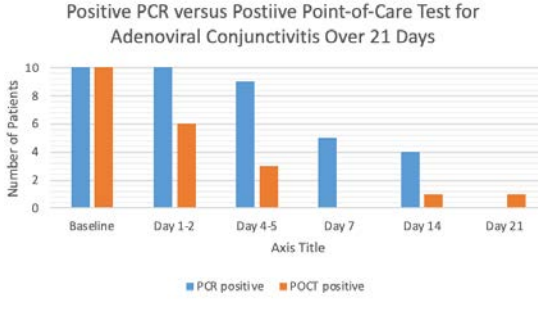
Conjunctival swab samples for qPCR analyses were collected at all visits-baseline, day 1-2, 4, 7, 14, and 21. Point-of-care antigen tests were performed at all visits until two consecutive tests were negative.

Conjunctival swab samples were collected from the inferior palpebral conjunctiva and stored in a -80 degree Celsius freezer prior to DNA extraction and qPCR analysis for adenovirus. The lower limit of detection for qPCR was 182 copies/mL. The lower limit of detection for the point-of-care antigen AdenoPlus test (now named QuickVue Adenoviral Conjunctivitis Test, Quidel Corporation, San Diego, CA) was 6 ng/mL or 60 pg per test (estimated to be equivalent to 40-50 adenoviruses). This report is limited to patients with all follow up data through day 21.

FIGURE 1
Point-of-care test for adenoviral conjunctivitis provides rapid results in 10 minutes.[5]

FIGURE 2
Example of positive point-of-care test with visible blue control band and red test band.[4]

FIGURE 3
This graph demonstrates point-of-care and PCR test results for 10 patients over a period of 21 days. Samples were collected for PCR testing at every visit and point-of-care testing was repeated until the patient had 2 negative tests.



RESULTS

Ten patients completed all study visits up until day 21 with both point-of-care and PCR results. At baseline, all 10 patients tested positive for adenoviral conjunctivitis with both point-of-care immunoassay and PCR testing. Figure 3 compares point-of-care testing and PCR for each visit over 21 days. Mean qPCR viral titer at baseline was 32,487,115 DNA copies per ml. (range 8,892- 256,341,826).

Most patients (n=9) were negative with point-of-care testing by day 7; however, some (n=4) remained positive with PCR testing through day 14. The patient with the positive point-of-care test on day 21 had the highest viral titers at baseline.

CONCLUSIONS

These results demonstrate that over 21 days of follow-up, viral titers are detected by PCR after point-of-care testing yields negative results. While point-of-care testing is more affordable and available, patients with adenoviral conjunctivitis may still have detectable virus more than 14 days after initial presentation.

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Persistence of signs and symptoms of adenoviral conjunctivitis (Ad-Cs) after viral clearance

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PURPOSE

To examine whether signs and symptoms of Ad-Cs persist after viral clearance in patients with qPCR confirmed Ad-Cs at baseline.

INTRODUCTION

Clinicians commonly use patient-reported symptoms (ocular discomfort, tearing, eyelid swelling, photophobia, and decreased vision) as well as clinical signs (bulbar conjunctival redness, chemosis, follicles, and serous discharge) to diagnose and manage adenoviral conjunctivitis (Ad-Cs).

The presence of signs and symptoms over the course of Ad-Cs may not be an accurate predictor of viral clearance.

METHODS

- The Reducing Adenoviral Patient Infected Days (RAPID) study is a double-masked, pilot randomized trial to compare the efficacy of a single, in-office administration of 5% povidone-iodine (PVP-I) to artificial tears (AT).
- Institutional review board approval was obtained by each study site and the Coordinating Center at Washington University in St. Louis, MO.
- Eligible participants were ≥ 18 years of age with duration of "red eye" symptoms in one or both eyes for 4 days or less at the time of presentation.
- At baseline and follow-up days 1-2, 4, 7, 14 and 21, the following measures were obtained:
  1. masked clinician-graded signs
     - clinicians graded 7 ocular signs: serous discharge, bulbar redness, mucoid discharge, eyelid edema, eyelash matting, bulbar edema, follicles on a scale from "0" (absent) to "4" (severe)
  2. masked participant-reported symptoms
     - participants rated "bothersomeness" of 10 symptoms: tearing, eyelash matting, burning, itching, gritty/sandy, eyelid swelling, redness, blurred vision, sensitivity to light and overall discomfort on a scale of "0" (not at all bothersome) to "10" (very bothersome)
  3. conjunctival swab for qPCR analysis to measure viral titers
- At each visit, we calculated the proportion of participants who continued to have signs and symptoms of Ad-Cs in the absence of detectable virus by qPCR analysis.

RESULTS

Patient sample:
Of 212 participants screened, 28 with Ad-Cs confirmed by qPCR were enrolled, 17 of 28 completed the day 21 visit and are included in this report.

To determine if signs and symptoms persisted after viral titers became undetectable, symptoms and clinical signs were classified as "present" at each visit when symptom grade was greater than "1" on a scale from "0" to "10" and when clinical grade was greater than "0" on a scale from "0" to "4".

Viral Titers at Day 21
At day 21, none of the 17 participants had detectable viral titers by qPCR analysis.

Masked Participant-Reported Symptoms at Day 21
Despite the absence of detectable viral titers at day 21, the following symptoms were reported by participants: 41% (7 of 17) blurred vision, 29% (5 of 17) overall discomfort, 24% (4 of 17) ocular redness, 24 % (4 of 17) sensitivity to light, 18% (3 of 17) grittiness, 12% (2 of 17) eyelash matting, and 6% (1 of 17) tearing, stinging/burning, and eyelid swelling. No participants reported itching. (Figure 1)

FIGURE 1
Participant reported symptoms at 21-day visit when the viral titers were undetectable (n=17)

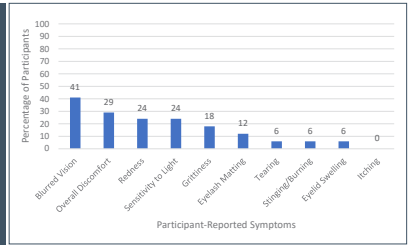
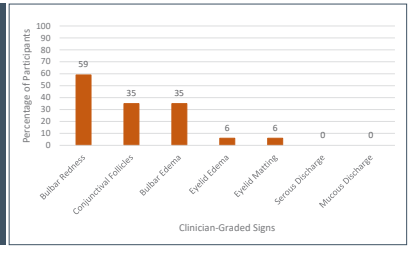


FIGURE 2
Clinician graded signs at 21-day visit when viral titers were undetectable (n=17)



Masked Clinician-Graded Signs at Day 21
Despite the absence of detectable viral titers at the day 21 visit, masked clinicians graded the presence of Ad-Cs signs: bulbar redness in 59% (10 of 17), 35% (6 of 17) conjunctival follicles, 35% (6 of 17) bulbar edema, 6% (1 of 17) eyelid edema, and 6% (1 of 17) eyelid matting in patients without detectable virus. No participants had serous or mucous discharge. (Figure 2)

CONCLUSIONS

After 21 days from baseline, the persistence of classic signs and symptoms of Ad-Cs is unlikely to be indicative of the presence of viral titers or infectivity. By day 21, no patient had detectable viral titers and no patient had serous or mucous discharge. However, many patients continued to have other signs and symptoms of Ad-Cs at day 21. Of all the signs/symptoms typically used clinically to aid in the diagnosis of Ad-Cs, it appears that the disappearance of serous discharge most closely correlates with the viral clearance, however, further investigation is warranted. To determine clearance of viral titers and non-infectivity, and objective assessment of viral titers by real-time qPCR could be useful.

ACKNOWLEDGEMENTS

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Data Safety Monitoring Committee: James Chodosh, MD, MPH, Thomas Freddo, OD, PhD, FAAO, Thomas Lietman, MD, Sally Atherton, PhD, William Mathers, MD (retired) 10/2015 – 10/2016

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Patient Tolerability of Intracanalicular Dexamethasone Insert Compared to Topical Loteprednol Etabonate Ophthalmic Gel

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INTRODUCTION

- Keratoconus (KC) is a bilateral, asymmetric, non-inflammatory corneal ectasia and is associated with not only decreased visual acuity, but also reduced tear film quality [1].
- The TFOS DEWS II Report has included allergic conjunctivitis as a risk factor for dry eye disease [2].
- Topical steroids play an important role in the treatment of both allergic conjunctivitis and dry eye disease.
- Drug delivery platforms may allow patients to eliminate topical medications which are generally associated with lack of compliance and difficulty of use, particularly for those patients who wear contact lenses.

PURPOSE

The purpose of this study was to look at patient tolerability of intracanalicular dexamethasone insert compared to traditional topical steroid use for patients with keratoconus wearing rigid contact lenses also diagnosed with allergic conjunctivitis and dry eye disease.

FIGURE 1
Intracanalicular dexamethasone being inserted

METHODS

- Patients ≥ 18 years of age with bilateral keratoconus, wearing rigid contact lenses (corneal and sclerals), who had been diagnosed with allergic conjunctivitis and dry eye disease were invited to participate in a prospective randomized study which was reviewed and approved by the Illinois College of Optometry's IRB.
- After screening and informed consent was obtained, per participant, one eye was randomized to receive:
  - Intracanalicular dexamethasone insert at the baseline visit (study eye) (Figure 1)
  - The other eye was assigned to receive topical loteprednol etabonate ophthalmic gel 0.38% (control eye) and tapered over one month (4,3,2,1 weekly taper)
- Subjects were evaluated for a screening/ baseline evaluation, day 0, day 7, day 30 and day 90 evaluations.
  - Subjects completed the OSDI at each visit.
- At the 90 day follow up, patients completed the Comparison of Ophthalmic Medications for Tolerability (COMTOL) questionnaire.
- Descriptive statistics are presented.

RESULTS

- 18 individuals (10 females and 8 males) with keratoconus (36 eyes) wearing bilateral gas permeable contact lenses completed the study.
- The average age of subjects at the time of the study was 48.4 ± 14.8 (range: 24-74 years).
- Mean overall OSDI score at baseline screening exam was 48.6 ± 15.9 and at the final visit was 33.7 ± 12.7.
- Clinical signs were similar between treatment arms at baseline and final visit (Table 1).

TABLE 1
Summary of clinical signs at baseline and final visits (mean ± SD) for intracanalicular insert (study eye) and topical loteprednol (control eye) treatments.

Clinical Signs	Baseline Visit Study Eye (mean ± SD)	Final Visit Study Eye (mean ± SD)	Baseline Visit Control Eye (mean ± SD)	Final Visit Control Eye (mean ± SD)
Conjunctival Papillary Grade	1.8 ± 0.7	1.1 ± 0.3	1.8 ± 0.7	1.2 ± 0.4
Osmolarity	320 ± 20.1	297.8 ± 31.6	321.8 ± 17.0	304.5 ± 21.6
Tear Break-Up-Time	3.3 ± 1.8	3.4 ± 1.7	3.4 ± 1.9	3.6 ± 1.8
Corneal Stain	7.3 ± 2.7	5.0 ± 2.2	7.7 ± 2.9	5.2 ± 2.1
IOP	14.6 ± 3.1	14.7 ± 3.1	14.9 ± 3.2	15.1 ± 3.1

- At the 90-day visit, subjects were asked which treatment regimen they preferred (COMTOL questionnaire).
  - 88.9% (16) preferred the intracanalicular insert and 11.1% (2) preferred the topical loteprednol administration.
  - 33.3% (6) of subjects who received the intracanalicular insert reported ocular itching and dryness rarely but when asked how bothered they were by these symptoms, 33.3% (2) stated some, and 66.7% (4) stated a little.
  - 44.4% (8) who received the topical loteprednol reported redness and dryness, 38.9% (7) tearing and itching, and 22.2% (4) reported problems with reading. 25% (2) were bothered quite a bit by these symptoms, 37.5% (3) a little, and 37.5% (3) were not at all.

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- 33.3% (6) of subjects who received the intracanalicular insert reported ocular itching and dryness rarely but when asked how bothered they were by these symptoms, 33.3% (2) stated some, and 66.7% (4) stated a little.
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DISCUSSION

It has been reported that patients with keratoconus have a history of dry eye syndrome and allergies [3]. Topical steroids play an important role in the treatment of inflammation and have traditionally been available in vials or bottles as a suspension. Adherence to using eye drops is generally poor, with the literature suggesting about 30% rate of nonadherence [4]. Patients wearing contact lenses generally must remove their lenses to instill medicated eye drops, increasing their burden of care.

CONCLUSION

Both intracanalicular dexamethasone insert and topical loteprednol improved signs and symptoms of dry eye and allergy in patients with keratoconus. However, the intracanalicular dexamethasone insert was the preferred treatment of choice by patients. This may enhance comfort and compliance for this cohort due to not having to remove contact lenses during treatment. Further studies are needed to compare larger study cohorts regarding additional subjective and objective measures.

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This study was an investigator-initiated trial sponsored by Ocular Therapeutix.

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A Case Series of Geographic Corneal Abrasions secondary to Epidemic Keratoconjunctivitis

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INTRODUCTION

This case series describes three patients who presented to the Illinois Eye Institute with similar, but uncommon, clinical presentations of epidemic keratoconjunctivitis (EKC). All patients developed a large diameter central corneal epithelial defect during their infection. Corneal involvement in the form of sub-epithelial infiltrates (SEI) and punctate keratitis is commonly seen with EKC, but large geographic corneal abrasions are rarely encountered or documented.

CASE PRESENTATION

TABLE 1
CC-HPI

Case #:	Demographic	Chief complaint	Ocular/Medical history
1	40-yo AA female	Redness, swelling and eye pain OD>OS	No known ocular history, (+) anemia
2	21-yo Hispanic male	Redness OS>OD	None
3	35-yo AA male	Redness and eye pain OD>OS	None

TABLE 2
Clinical Findings

Case #:	BCVA	Conjunctiva	Cornea
1	20/20 OD, 20/20 OS	Diffuse injection, (+) follicles OU	5mmx4.5mm abrasion on day 3 OD
2	20/25 OD, 20/50- OS	Diffuse injection, (+) follicles OU **(Image 3)**, (+) pseudo-membrane LLL&RLL	(+) SEI OD, 6mmx5mm abrasion OS **(Image 1)** at presentation
3	20/30 OD, 20/25 OS	Diffuse injection, (+) follicles OU, (+) pseudo-membrane RLL **(Image 4)**	Large central, superficial abrasion OD at presentation **(Image 5)**

Additional pertinent findings:

Case #1: (+) Quickvue Adenoplus test, **Case #2**: Palpable pre-auricular lymphadenopathy

TABLE 3
Treatment

Case #:	Tx for corneal abrasion	Tx for EKC	Response to Tx
1	BCL + Polytrim qid OD, PF AT q1hr OD	Betadine wash OS. PM* peel OS. FML qid OS.	Corneal abrasion resolved on day 8.
2	Erythromycin ung qid OS, PF AT q1hr OS	PM* peel OU, Betadine wash OD. Steroid/AB combo.	Corneal abrasion resolved on day 4 **(Image 2)**
3	Erythromycin ung tid OD, PF AT q1hr	PM* peel OD. TobraDex qid OS	Corneal abrasion resolved on day 4.

*PM = Pseudo-membrane

IMAGE 1
6mmx5mm corneal abrasion OS at initial presentation; patient 2

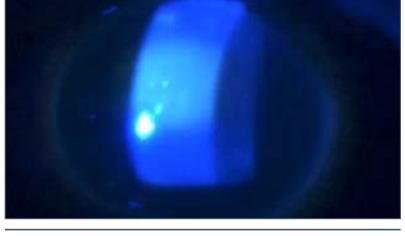


IMAGE 2
Resolved abrasion 4 days after initial presentation; patient 2

IMAGE 3
3+ follicular reaction on lower lid OD at initial presentation; patient 2

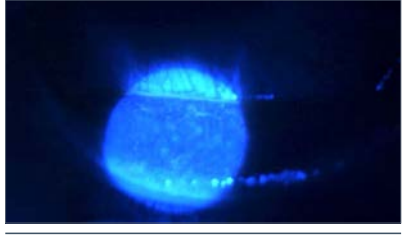
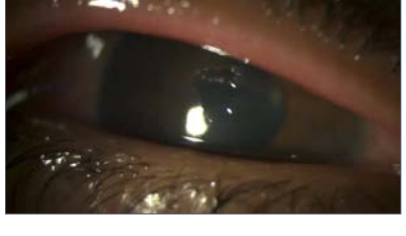


IMAGE 4
pseudo-membrane OD lower eyelid at initial presentation; patient 3

IMAGE 5
central, superficial corneal abrasion OD at initial presentation; patient 3



DIAGNOSIS & DISCUSSION

All three patients presented with similar complaints and classic clinical presentations of EKC including follicular reaction, pseudo membrane formation and conjunctival injection. Interestingly, they each developed large, superficial corneal abrasions during their infection. Few case reports exist of EKC presenting with geographic corneal abrasion, and all reported patients had confirmed human adenovirus serotype 8 (HAdV8). The underlying pathophysiology of an epithelial defect due to EKC is not well understood. It is thought to be due to pre-existing anterior segment disease and/or replication of the virus within the corneal epithelium.

EKC is difficult to manage given the patient's significant symptoms and additional discomfort of pseudo-membrane removal and Betadine wash. A concomitant epithelial defect exacerbates EKC related symptoms and presents concern for secondary infection. Additionally, it complicates the treatment options for the provider. Debate exists over the use of a BCL in the setting of viral infection, and a Betadine wash is contraindicated in the presence of an epithelial defect. Ultimately, a BCL was selected for patient 1 due to the non-resolving nature of the epithelial defect and significant patient pain, but a BCL was not necessary for patient 2 and 3.

CONCLUSION

HAdV8 is the most common cause of EKC worldwide. Its distinguishing clinical features include SEI, punctate keratitis and severe conjunctivitis. Geographic corneal abrasion, though less reported and understood, is another potential clinical finding during the course of the infection. Clinicians should be aware of this unique presentation of EKC, and the management challenges it presents.

REFERENCES

Available upon request

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A pilot study of low dose doxycycline to lower IOP in patients with glaucoma and ocular surface disease

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INTRODUCTION

Glaucoma and ocular surface disease (OSD) are common comorbid conditions. Glaucoma medications can exacerbate OSD which may decrease treatment adherence resulting in elevated intraocular pressure (IOP) and glaucoma progression. We previously presented a case report that demonstrated an IOP lowering effect of 26-35% when low dose doxycycline was used to treat pre-existing OSD in a glaucoma patient. The purpose of this pilot study is to prospectively evaluate the IOP lowering effect of low dose doxycycline when used as an adjunctive medication for glaucoma.

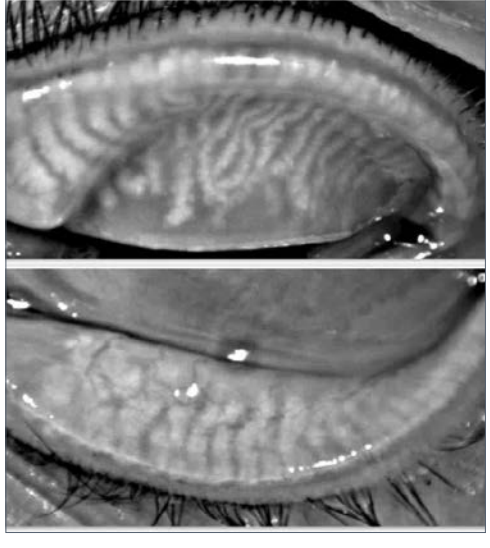
METHODS

Subjects treated with topical IOP lowering medications for mild or moderate open angle glaucoma (OAG) and who had at least one sign or symptom of OSD (see Image 1) were enrolled in this prospective study at the Illinois Eye Institute (see Table 1). All subjects must have been consistently using their prescribed glaucoma medications, without changes, for at least 18 months, and exhibited <3mmHg IOP variation. Severe OAG, unstable IOP, and history of glaucoma surgery or laser trabeculoplasty were excluded. After informed consent, baseline measurements included visual acuity, slit lamp examination, Goldmann IOP, corneal hysteresis and SPEED questionnaire. Patients continued their prescribed glaucoma medications throughout the study and began doxycycline hyclate 50 mg per day for 3 months. Baseline measurements were repeated at 1-month, 3-months, and 6-months (3 months after discontinuation of doxycycline). Six subjects were analyzed. Right eye was designated as the study eye.

TABLE 1
Patient Demographics

Sex	Age	Diagnosis	Glaucoma tx	Dry Eye tx
F	72	POAG mild OU	latanoprost qhs OU	Systane AT's daily
M	73	NTG mild OU	latanoprost qhs OU	none
M	67	POAG moderate OU	latanoprost qhs OU, dorzolamide-timolol bid OU	none
F	75	POAG mild OD	Travatan Z qhs OU	Refresh AT's prn
F	73	POAG mild OU	Vyzulta qhs OU	none
M	83	POAG mild OU	latanoprost qhs OU	AT's daily, Lumify prn

IMAGE 1
Meibography of the left eye of one study patient prior to course of doxycycline tx. Gland tortuosity, segmentation and dropout present on upper lid and lower lid.



RESULTS

TABLE 2
Mean baseline IOP was 16.0 mmHg ± 3.58. At 1-month there was 8.31% IOP reduction (mean 14.67 mmHg ± 3.33, p=0.102). At 3-months, IOP was significantly reduced by 15.63% from baseline (mean 13.5mmHg ± 3.83, p= 0.007). At 6 months, after discontinuing doxycycline 3 months prior, IOP was 4.38% lower than baseline (mean 15.3 mmHg ± 3.67, p=0.235).

TABLE 3
At 6 months, after discontinuing doxycycline 3 months prior, mean IOP (15.3 mmHg ± 3.67) was 11.76% significantly higher when compared to mean IOP at 3-months (mean 13.5mmHg ± 3.83, p= 0.006).

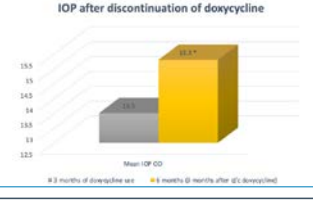


TABLE 4
Mean SPEED score at baseline was 10.17 ± 7.55. SPEED score decreased significantly at 1-month (mean 2.83 ± 3.37, p= 0.04), 3-month (mean 2.67 ± 2.50, p=0.024), and 6-month follow up (mean 4.50 ± 4.37, p=0.031). SPEED scoring: 1-5 (mild); 6-9 (moderate); 10+ (severe).

CONCLUSIONS

Low dose doxycycline improved SPEED scores and provided significant IOP reduction at 3 months. In low doses, doxycycline exhibits anti-inflammatory effects and is often used for OSD.
We postulate that doxycycline's anti-inflammatory effect can also reduce trabecular meshwork (TM) inflammation and reduce TM resistance to outflow. The overall IOP lowering effect was not as high as we previously reported, but the baseline IOP in our previous report was also higher. From our experience, greater pressure reduction is often seen with higher IOPs. Based on this small sample pilot study, low dose doxycycline shows promise as an adjunctive therapy in reducing pressure, particularly in higher IOPs, but additional studies are necessary to confirm these preliminary results.

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Don’t call it a comeback: a case of a Recurrent Central Retinal Vein Occlusion

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INTRODUCTION

Central retinal vein occlusions (CRVO) are a common type of vascular occlusion seen in elderly patients. This case highlights the rare re-occurrence and progression of a CRVO in an elderly female.

CASE PRESENTATION

- Chief Complaint: 76-year-old African American Female presents for ocular health examination.
- Ocular/Medical History: CRVO OS 2019 (resolved without treatment), cataract extraction OD/OS 2022, benign hypertension (HTN), rheumatoid arthritis, hypothyroidism, asthma
- Medications: Atenolol, Calcium, Enbrel, Fluticasone Propionate, Folic Acid, Furosemide, Levothyroxine Sodium, Lisinopril, Methotrexate, ProAir HFA, Vitamin D2

PERTINENT FINDINGS

- VAsc: 20/25+1 OD, 20/40 OS, PH 20/20
- Entrance Testing
  - EOMs: Full range of motion OD/OS
  - CVF: Full to finger counting OD/OS
  - Pupils: equal, round, reactive to light, no APD OD/OS
- Slit lamp exam: Unremarkable OD/OS
- DFE:
  - OD: Disc collaterals
  - OS: Disc collaterals, scattered intraretinal hemorrhages in all 4 quadrants on posterior pole, tortuous vessels
- Additional Testing:
  - Fundus Photos: Disc collaterals OD/OS, scattered intraretinal hemorrhages with tortuous vessels OS
    - Fundus photos 3 months prior showed no signs of intra-retinal hemorrhaging
  - Macular OCT: No evidence of macular edema OS
  - Fluorescein angiography: no retinal neovascularization, edema or ischemia noted OS
  - BP: 143/81

FIGURE 1
Posterior pole photo from 2019 showing disc collaterals OS

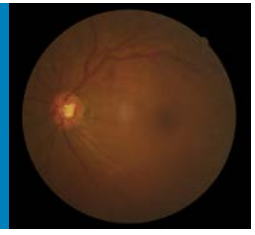


FIGURE 2
Optos photo taken May 2022 showing disc collaterals with no signs of intraretinal hemorrhaging OS

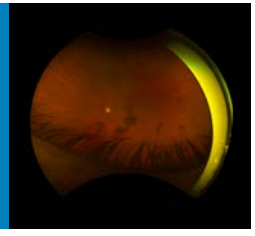
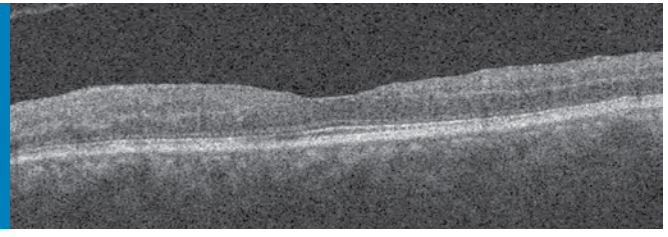


FIGURE 3
Optos photo taken July 2022 (date of examination) showing disc collaterals with early stage of CRVO OS (trace scattered intraretinal hemorrhages with tortuous vessels)

FIGURE 6
MAC OCT showing no evidence of macular edema OS



DIFFERENTIAL DIAGNOSIS

- Primary: Recurrent CRVO
- Others: Diabetic Retinopathy, hypertensive retinopathy

FIGURE 4
Optos photo taken August 2022 showing disc collaterals with CRVO OS (scattered intraretinal hemorrhages in all 4 quadrants of posterior pole with tortuous vessels)

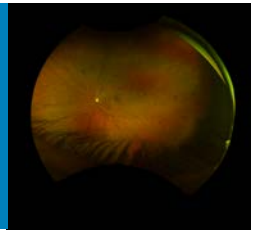
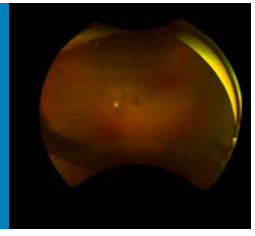


FIGURE 5
Optos photo taken September 2022 showing disc collaterals with resolution of CRVO OS



DIAGNOSIS AND DISCUSSION

- Diagnosis: Recurrent non ischemic CRVO OS without macular edema
- Discussion: The incidence of acute recurrent CRVOs in eyes originally diagnosed with non-ischemic CRVOs is rare: 0.9% within 2.5 years and 2.2% within 5 years. Almost all recurrent CRVOs present with poor acuity owing to macular edema. The edema tends to be resistant to traditional anti-VEGF therapy. This case is unique owing not only to the recurrent CRVO but its presentation without macular edema. In addition to hyperlipidemia, systemic hypertension is commonly associated with recurrent CRVO’s, (as seen in our patient).

TREATMENT AND MANAGEMENT

Continue to monitor for resolution of hemorrhaging, development of macular edema and/or conversion to an ischemic CRVO. The patient is to follow up with her primary care physician for continued control of systemic conditions.

CONCLUSION

Although rare, clinicians should be aware of the possible reoccurrence of CRVOs with or without macular edema. Baseline/serial fundus photos and OCT’s allow clinicians to make comparisons overtime. Further studies are necessary to showcase more instances of recurrent CRVO’s without poor acuity or macular edema.

References: Available on request

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MICE, Blood, and Pizza Pie

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INTRODUCTION

- A healthy cornea is able to clearly transmit and refract light to the crystalline lens. Systemic disease, infections, and trauma can compromise the cornea's transparency by introducing neovascularization into the previously avascular tissue.
- Conventional treatments of corneal neo include topical steroids, penetrating keratoplasty (PK), and Avastin (bevacizumab) injections
- Mitomycin C, most commonly used for certain gastrointestinal cancers[3], has recently been shown to be effective at eliminating corneal neovascularization[4]

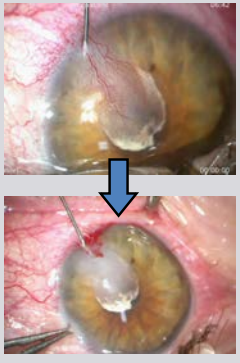
CASE HISTORY

A 49-year-old male with persistent corneal neo OD x 2yrs

HPI
- Possible poison ivy insult
- Decreased vision
- History of failed topical steroid treatment

Ocular History
- Poison ivy keratitis 2yrs ago

FIGURE 1
MICE Procedure



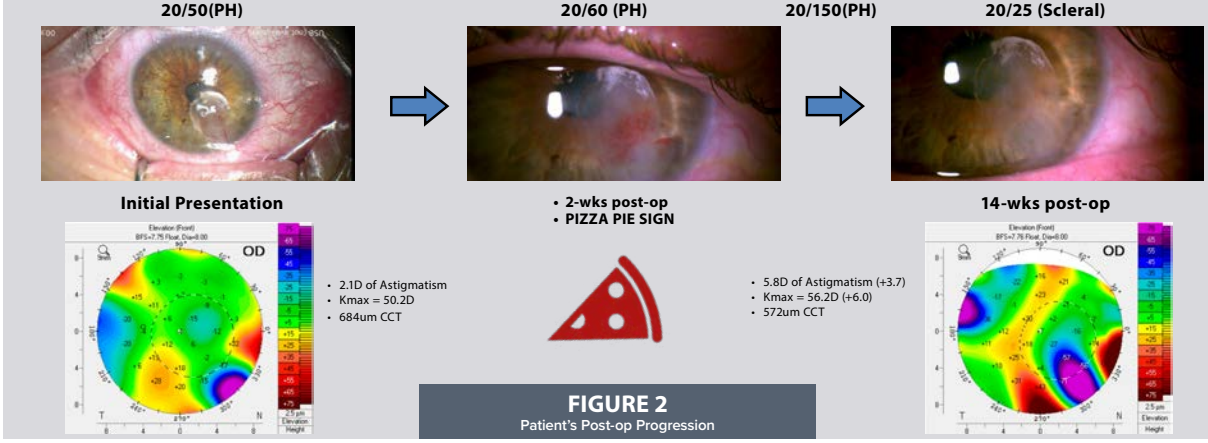


FIGURE 2
Patient's Post-op Progression

CLINICAL FINDINGS

	OD
VAcc	20/60-2 (PH **20/50**)
Cornea	Thick vascular frond with TWO large vessels at 5:00 extending into visual axis with lipid keratopathy
Lens	1+ PSC (Clear OS)
Pachymetry	684um (581 um OS)

Treatment Options Considered
- Avastin injection
- PK
- Mitomycin intravascular chemoembolization (**MICE**)*

Mitomycin
- Antineoplastic antibiotic – inhibits DNA synthesis of tumor cells
- Used in trabeculectomies to prevent bleb scarring[4]
- Chemoembolization properties more recently used in hepatocellular carcinoma[1]
- Hypothesized to inhibit vascular endothelial proliferation[1]

DISCUSSION

- Original MICE study by Mimouni and Ouano involved 3 participants[4]
  - Each attained complete resolution of neo
  - 20/20 in 1yr, 4 months, and 4 months
- MICE common themes:
  - 1-day: ablation of cornea neo
  - 1-3wks: "Pizza Pie Sign"
  - 1-2m: lipid absorption with corneal flattening
    - Induced irregular astigmatism
    - IMPROVED in all 3 study participants[4]
  - Vision may get worse before it gets better
- Our patient
  - Served well by scleral contact lenses
  - Vision currently limited by PSC or stromal haze
  - If intolerable to contact lenses, can now consider PK
    - Risk of rejection substantially less with no neo

CONCLUSION

- MICE procedure effective
- Variety of post-op courses, but share common themes
- Scleral lenses will likely provide best vision

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ACKNOWLEDGEMENTS

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Effect of Extensive Near Work on Binocular and Accommodative Systems

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INTRODUCTION

In a world where the dependence on technology is constantly increasing, the demand on the near visual system is also increased simultaneously. The purpose of this study is to investigate how increased near work, especially digital near work, required in a graduate program, affects the near visual system over time. This study looks at changes in the near visual system of optometry students from year one to year three of their rigorous graduate school education.

METHODS

Subjects of this study were eligible volunteers from the Illinois College of Optometry (ICO), Classes 2021-2023, who had all provided informed consent. Students at ICO were given a comprehensive eye exam at the beginning of their first year, which included a measurement of eye posture through cover test, accommodation through negative relative accommodative (NRA), positive relative accommodation (PRA), and minus lens amplitude (MLA) testing, and compensating vergences through Risley Prism (RP). To measure changes to the near visual system, these tests were performed again, best corrected and in phoropter at a working distance of 40 cm, on the same students during their third year. Additionally, each subject was required to complete an online survey which included questions on time spent and symptoms when performing extended near work. Data was analyzed using a paired samples t-test with a significance level of $p<0.05$ (IBM SPSS v27).

RESULTS

Forty-nine subjects were analyzed, and notable statistically significant p-values include those for cover test, PRA, and blur or break for base out (BO) RP vergences, which are 0.038, 0.004, and 0.038 respectively. Each of these values showed an overall increase when comparing first and third year student data. All mean values for eye posture, vergences, and PRA all fell within, or were better than, clinical norms.

Survey analysis from the Class of 2023, which included twenty-three subjects, revealed that 95.65% of subjects reported symptoms after starting optometry school including asthenopia, headaches, diplopia, and blurry vision, listed in order of most to least common. 95.65% of subjects reported using digital devices as a primary study tool with screen time of 6-16 hours/week. 56.52% of subjects reported spending 20-40 hours/week studying and 39.13% of subjects spent 41-75 hours/week studying. 95.65% of subjects reported increased screen time per week since the beginning of the COVID-19 pandemic.

FIGURE 1
Symptoms Reported by Third Year Optometry Students

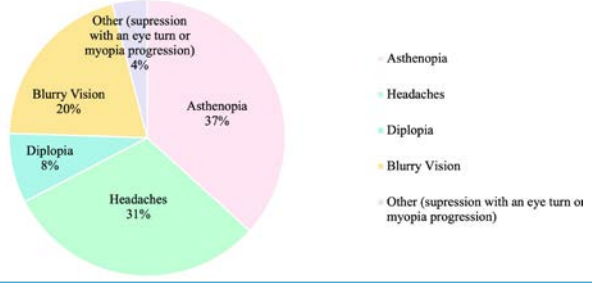

FIGURE 2
Survey

- Did you have time off between your undergraduate studies and optometry school? If so, how long?
- If coming straight from undergrad, what was your primary method of studying (computer, tablet, paper, etc.)? If you took time off, please answer "N/A".
- How many hours on average did you study per week in undergrad (including lecture time)?
- What is your primary method of studying in optometry school (computer, tablet, paper, etc.)?
- How many hours on average do you study per week in optometry school (including lecture time)?
- On average, what is your amount of screen time per day including school, work, social media, television, etc.?
- If your electronic device records your screen time per week, what is it? If it does not, please answer "N/A".
- Do you feel like your eyes have changed since starting optometry school? If so, what symptoms have you started experiencing?
  - No, my eyes haven't changed since starting optometry school
  - Eyestrain
  - Diplopia
  - Headaches
  - Blurry vision
  - Other: (please list)

FIGURE 3
Paired Sample T-Test Results

Technique Name	Year	Mean ± Standard Error	N	T-value	Significance (2-tailed)
Cover Test	1st Year	-2.53 ± 0.363	49	2.14	0.038
	3rd Year	-3.55 ± 0.509	49		
Negative Relative Accommodation	1st Year	2.4388 ± 0.5856	49	-0.247	0.806
	3rd Year	2.4592 ± 0.07043	49		
Positive Relative Accommodation	1st Year	2.2806 ± 0.09798	49	-3.019	0.004
	3rd Year	2.8878 ± 0.19358	49		
Minus Lens Amplitude (OD)	1st Year	8.7772 ± 0.45499	46	1.922	0.061
	3rd Year, Age Adjusted	7.7916666666666 ± 0.267023066	46		
Minus Lens Amplitude (OS)	1st Year	8.7609 ± 0.46359	46	0.988	0.328
	3rd Year, Age Adjusted	8.2644927536232 ± 0.287887343	46		
Negative Fusional Vergence	1st Year	16.92 ± 0.913	49	0.508	0.614
	3rd year	16.29 ± 1.076	49		
Positive Fusional Vergence	1st Year	21.35 ± 1.254	48	-2.139	0.038
	3rd year	25.19 ± 1.522	48		

DISCUSSION

In 2021, Dr. Mohan et al. measured the visual impact of increased online class time in children during the COVID-19 pandemic, by having participants complete a Convergence Insufficiency Symptom Survey (CISS) and through measurement of binocular vergence and accommodative parameters. The study found a statistically significant difference in mean near exophoria, negative fusional vergence, negative relative accommodation, and accommodative amplitude between children who spent more than 4 hours and those that spent less than 4 hours on online classes.

Dr. Iribarren et al. conducted a study in 2001, measuring accommodative facility and asthenopia symptoms in students and office workers that spend an average of 9 ± 3.4 hours performing near work. Subjects reported symptoms of asthenopia which positively correlated with time spent performing near work. Additionally, results indicated a statistically significant negative correlation between extended near work and blurred vision, when compared to accommodative facility.

CONCLUSION

A statistically significant increase in exophoric posture in third year students may be due to the increased accommodative demand and fatigue from extended near work, and likely contributed to symptoms of binocular vision (BV) fatigue and strain. A statistically significant increase in blur and break values of BO vergences and PRA values are likely due to knowledge and awareness of BV related eye movements, through didactic education in BV and easy access to the vision therapy clinic at Illinois Eye Institute, which is something the average sample size of non-optometry school graduate school students would not have knowledge or ready access to.

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Validity of a nontraditional, hybrid learning environment in optometric education

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INTRODUCTION

- Pandemic safety measures (AY20/21) necessitated a change to a nontraditional, hybrid learning environment for many Illinois College of Optometry courses with a return to a new normal post-pandemic (AY21/22) where some changes were maintained.
- Change to the learning environment can contribute to concern and skepticism among the varied stakeholders in optometric education.
- To confirm the validity of changes to the educational modality we sought an objective comparison of academic performance before and during the pandemic, and with the new normal established after the pandemic.

METHODS

- Academic performance of 3 cohorts of optometry students was compared across 3 first-year, winter quarter courses from AY19/20, AY20/21, AY21/22.
- Exact, in-common multiple-choice questions were culled from exams from Geometric and Theoretical Optics-II (58 questions), Applied Ocular Anatomy (101 questions), and Human Physiology (72 questions), and were aggregated to form comparable composite exams (one exam per course per academic year).
- Exam scores and metrics were calculated and compared across cohorts for each course separately.
- To ensure the validity of the comparison, composite exam reliability indices were calculated, and the cohorts' pre-optometric aptitude metrics (TS-OAT) were evaluated.

RESULTS

- Total Science-OAT scores [Figure 1] were chosen as proxy for academic aptitude given the three basic science courses chosen for study. Kruskal-Wallis ANOVA indicated no differences between the 3 cohorts: AY19/20, AY20/21, and AY21/22 ($p = 0.0723$), suggesting comparable cohorts.
- Point biserial correlation exam item outcomes (Kruskal-Wallis tests) and KR-20 exam validity scores (calculated 95% CI) were not significantly different for any course, suggesting similar relationship between material taught and tested for each academic year.
- Differences between AY19/20, AY20/21 and AY21/22 composite exam scores [Figure 2] were statistically significant for ocular anatomy, human physiology, and optics (Kruskal-Wallis, $p < 0.0001$ for each course), especially with paired comparisons with AY20/21.

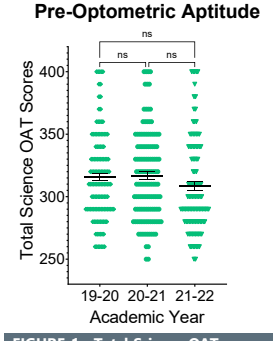

FIGURE 1. Total Science OAT scores with mean and standard error of the mean. No significant differences with individual Kruskal-Wallis comparisons AY19/20 and AY20/21, AY19/20 and AY21/22 and AY20/21.

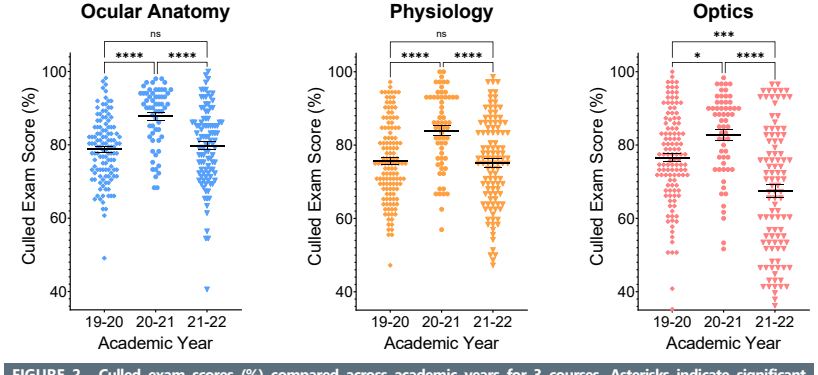

FIGURE 2. Culled exam scores (%) compared across academic years for 3 courses. Asterisks indicate significant differences (Kruskal-Wallis multiple comparisons). Significant differences were found between the AY20/21 cohort and the other two cohorts for all courses and between the AY19/20 and AY21/22 cohorts for Geometric Optics. However, no significant differences were found between AY19/20 and AY21/22 cohorts in Ocular Anatomy and Human Physiology (where the latter cohort, AY21/22, served as an exemplar of the new normal, post-pandemic learning environment.

DISCUSSION

- Results suggest the cohorts in ocular anatomy and human physiology were not disadvantaged during the pandemic or by the "new normal", post-pandemic learning environment (AY21/22).
- A significantly lower culled exam average score in optics in AY21/22 suggests a flexible, hybrid format is not equivalent to the traditional format in all courses.
- Courses, such as optics, that require a higher level of content integration and analysis may also require a higher level of student engagement and accountability.
- These outcomes broaden the possibilities for the future of optometric education but suggest caution as not all classes performed equally well.

CONCLUSION

The hybrid learning modality is a viable alternative for optometric education, but some courses may require a higher level of engagement and accountability.

CONTACT INFORMATION

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Persistent Left Abducens Nerve Palsy Secondary to a Prepontine Cistern Meningioma

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INTRODUCTION

Abducens nerve palsies are the most common ocular motor paralysis in adults. The abducens nerve innervates the lateral rectus muscle, allowing for abduction of the eye. It can become compromised anywhere along its intracranial course, leading to a non-comitant esodeviation and subsequent diplopia. There are a variety of etiologies for abducens nerve palsies, ranging from microvascular ischemia and trauma as the most common, to other less common etiologies such as neoplasm, multiple sclerosis, increased intracranial pressure, and giant cell arteritis. This case demonstrates a patient with a persistent left abducens nerve palsy that was originally presumed to be secondary to her diagnosis of hypertension. Additional MRI imaging revealed the presence of a left prepontine cistern meningioma as the cause of the persistent palsy.

CASE PRESENTATION

Clinical Findings

- A 65-year-old African American female presents to the Illinois Eye Institute for a follow-up visit for a left abducens nerve palsy that was diagnosed 1.5 years prior. Initially, the palsy was presumed secondary to microvascular ischemia, due to her history of hypertension and unremarkable neuroimaging at the time of the first presentation. Although she notes gradual resolution of her diplopia over the past several follow-up visits, her abduction deficit in the left eye remains, prompting additional imaging.

TABLE 1
Entrance testing

OD		OS
20/20	**VA (cc)**	20/20
PERRL, (-)RAPD	**Pupils**	PERRL, (-)RAPD
FROM	**EOMs**	2+ abduction deficit w/slowed glissade in left gaze
FTFC	**CVF**	FTFC

FIGURE 1
Simplified pathway of the abducens nerve from its origin in the pons to the lateral rectus muscle. Green star indicates the approximate location of the patient's meningioma. Created with BioRender.com

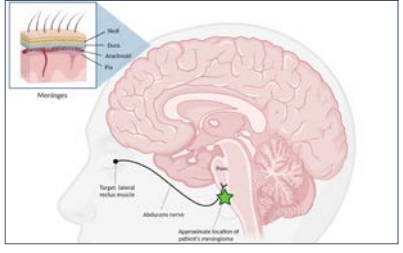


FIGURE 2
Patient's extraocular motility testing displayed in **A)** right, **B)** primary, and **C)** left gazes. Abduction deficit and temporal scleral show of the left eye can be seen.

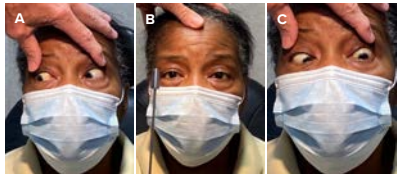
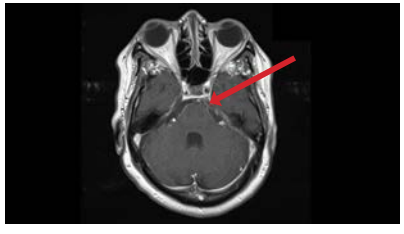


FIGURE 3
QR Code link to a video of the patient's extraocular motility testing in right and left gazes. Abduction deficit and slowed glissade of the left eye in left gaze can be seen.

FIGURE 4
Axial T1-weighted post-contrast magnetic resonance image depicting a partially mineralized meningioma in the left half of the prepontine cistern.



Additional Testing

- MRI of brain and orbits with contrast: reveals partially mineralized meningioma in the left half of the prepontine cistern, which was undetectable on previous imaging due to small size and subtle nature of lesion
- Erythrocyte sedimentation rate and C-reactive protein: within normal limits for patient's age and gender

DISCUSSION

The abducens nerve has the second longest intracranial course of all the cranial nerves. Damage or disruption to the abducens nerve anywhere along its intracranial course can cause a palsy. When affected, the abducens nerve is unable to stimulate the lateral rectus muscle, leading to an overaction of the medial rectus muscle and subsequent esodeviation. The diplopia is usually greater at distance and with head turn towards the affected side. The majority of abducens nerve palsies occur secondary to microvascular ischemia and should self-resolve within 3-6 months. If the palsy does not resolve, other etiologies, such as a compressive lesion, should be considered.

In this case, the slowly progressive onset of her symptoms and condition suggested a compressive etiology, but the initial neuroimaging was unremarkable. When the palsy persisted past the natural course for a microvascular ischemic etiology, repeat neuroimaging revealed the small, slow-growing meningioma in the prepontine cistern. Meningiomas are tumors that arise from the meninges, and the vast majority are benign, slow-growing, and do not warrant treatment. Risk factors for a meningioma include obesity, female hormones, previous radiation therapy, and neurofibromatosis type 2. Surgical removal may be recommended, depending on the size, location, and rate of growth, but observation only is usually preferred.

MANAGEMENT

Treatment of abducens nerve palsies is based on the underlying cause uncovered by the workup. In this case, the patient's meningioma is small, slow-growing, and her diplopia has resolved, so no surgical removal was warranted. The patient is currently being monitored in six-month intervals by optometry and as directed by her primary care provider. For persistent, stable deviations, an occlusion patch, prism, and/or surgery may be considered.

CONCLUSION

Abducens nerve palsies can have a variety of etiologies, ranging from microvascular ischemia to neoplasms. Prompt diagnosis, imaging, and serology are essential to preventing both acute and chronic complications. Although vasculopathic etiologies are the most common causes, palsies that have not resolved in approximately six months warrant additional or repeat imaging to rule out other intracranial abnormalities or space-occupying lesions. Although a patient's symptoms may resolve, their condition may persist, warranting continued evaluation and management.

REFERENCES

Available upon request

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Spontaneous Closure of a Chronic Idiopathic Full-thickness Macular Hole

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BACKGROUND

Spontaneous closure of idiopathic full-thickness macular holes is rare but has been reported in 5-6% of cases. This report describes a unique case of a stage IV macular hole that self-sealed nine years after onset, as monitored with optical coherence tomography (OCT).

CLINICAL FINDINGS

A 73-year-old African American male presented with an ocular history of an idiopathic full-thickness macular hole in his left eye since 2012 (Fig. 1) with a complete PVD noted since 2019. The patient had continuously declined surgical intervention and was being monitored annually.

Medical History:
1) Type 2 diabetes
2) Hypertension
3) Hyperlipidemia
4) Coronary artery disease

Medical Allergies: hydrochlorothiazide, niacin, felodipine, lisinopril, terazosin

In 2021, the patient reported stable vision, but his potential visual acuity had improved from 20/70 to 20/30 (Table 1).

TABLE 1
Summary of ocular exams from 2012 and 2021

2012 Exam			2021 Exam		
CC: Central blur OS x 7 months			CC: Vision stable OU, no complaints		
	OD	OS		OD	OS
VA	20/20	20/70 PHNI, PAP NI	VA	20/25 PAP: 20/20	20/70 PAP: 20/30
Pupils	NL	NL	Pupils	NL	NL
EOM's	NL	NL	EOM's	NL	NL
IOP	19 mm Hg	18 mm Hg	IOP	21 mm Hg	19 mm Hg
Lens	1+ NS	1+ NS	Lens	1+ NS, 2+ ACS	1+ NS, 3+ ACS
C/D	0.60	0.55	C/D	0.60	0.55
Periphery	NL	NL	Periphery	NL	NL

Serial OCT's of the macula since 2012 documented a full-thickness hole with an operculum in the vitreous cavity and an epiretinal membrane. A complete PVD OS was documented in 2019 and the previously seen operculum was no longer appreciated on the OCT. A repeat OCT of the macula in 2021 showed resolution of the macular hole with a residual sub-foveal area of focal photoreceptor loss (Fig. 2a, 2b).

FIGURE 1

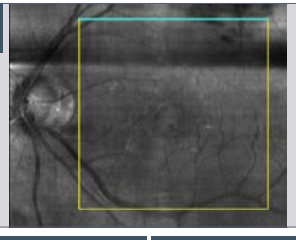


FIGURE 2A

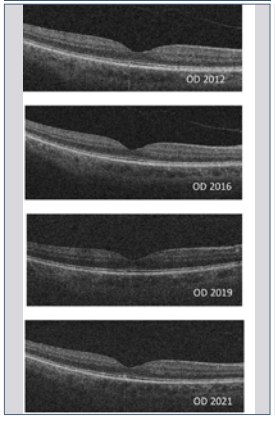


FIGURE 2B

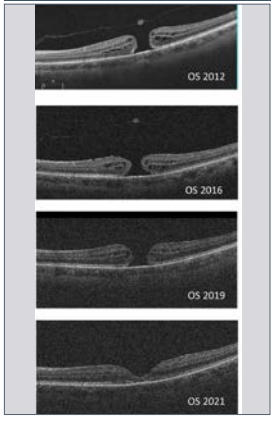
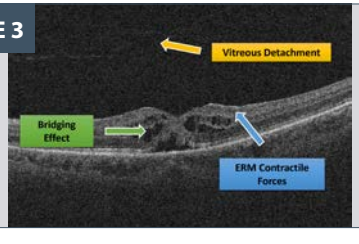


FIGURE 3



Although the patient's acuity was reduced from visually significant cataracts, the patient declined intervention and elected to monitor annually.

Assessment:
1) Chronic full-thickness macular hole OS with spontaneous resolution
2) Visually significant cataracts OS>OD

Plan:
1) Continued observation at annual exam
2) Patient declined intervention

DISCUSSION

- Prior to the OCT era, spontaneous closure of stage III and IV idiopathic macular holes was reported to occur in 5-6% of cases (Michalewska et al, 2008)
- *Observation of Idiopathic Full-thickness Macular Holes* (Yuzawa et al, 1994)
  - o Spontaneous closure occurred at an average of 25 months with an overall range from 7 to 41 months.
  - o BCVA Outcome
    - Initial exam: 20/200 or 20/100
    - Spontaneous closure within 24 months: 20/30 or better
    - Spontaneous closure 38 months or longer: 20/50 or worse
- Possible mechanisms for spontaneous closure (Fig. 3)
  1) Complete vitreous detachment relieving traction
  2) Bridging of retinal tissue across the hole
  3) Contractile forces from an epiretinal membrane
  4) Glial cell proliferation at the base
- This case of a self-sealing hole likely had multiple contributing factors given the presence of an ERM, a complete PVD in 2019, and a bridge at the edges of the hole
- The timeline of self-resolution in this case is unique as it resolved 9 years after onset.

CONCLUSION

This report describes a unique example of spontaneous closure of a chronic full-thickness macular hole. Mechanisms for closure are not fully understood, but utilization of OCT has helped elucidate potential contributing factors. Although spontaneous closure has been reported, the occurrence is rare and surgical intervention should still be considered in cases of macular holes.

CONTACT INFORMATION

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When Tensions Run High: Managing Ocular Hypertension in a Child with Optic Nerve Hypoplasia

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INTRODUCTION

Limited research exists regarding diagnosing and treating ocular hypertension in a pediatric patient. Diagnosis is largely based on clinical findings as there is currently no normative OCT database for patients under the age of 18. Treatment typically includes topical medications, which may be lifelong and carry financial and emotional burdens. This poster highlights the management strategy of an 11-year old with monocular status secondary to optic nerve hypoplasia.

CASE HISTORY

An 11-year old female was referred from an outside provider for evaluation of ocular hypertension. She had been using Latanoprost 0.005% QHS OU for one year as prescribed by her referring doctor. Her Tmax was 25mmHg OD and 24mmHg OS with normal corneal thicknesses of 547µm OD and 543µm OS. She has no family history of glaucoma. She has light perception vision OS since birth secondary to optic nerve hypoplasia and has worn glasses for low myopia OD since she was 5 years old. She was born full term without complications and all other history was unremarkable.

CLINICAL FINDINGS

Externals

	OD	OS
VA cc	20/25-	LP @ 2ft
CVF	FTFC	FT transilluminator @ 2ft
EOMs	FROM	FROM
Pupils	PERRL	PERRL (+)APD
Cover Test		22PD CLET

Ocular Health

	OD	OS
IOP	16mmHg c Latanoprost 0.005% (measured with Goldmann)	16mmHg c Latanoprost 0.005% (measured with Goldmann)
Gonio	Open to CB 360	Open to CB 360
ONH	Pink, healthy, distinct 360 C/D 0.3	Hypoplastic, double ring sign C/D <0.1

Additional Testing

	OD	OS
OCT GCC and Macula	Normal	RNFL thinning Lack of foveal dip Decreased ganglion cell number
Visual Field	Non-glaucomatous defects	Non-glaucomatous defectsglaucomatous defects
MRI w/ and w/o contrast	No brain abnormality, optic pathway glioma, or septo-optic dysplasia	No brain abnormality, optic pathway glioma, or septo-optic dysplasia
VEP	Normal	Severely decreased p-wave amplitudes consistent with LP vision

FIGURE 1
OD normal, OS hypoplastic optic nerve head with double ring sign, C/D <0.1

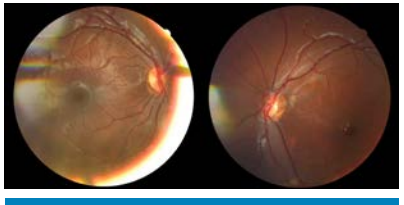
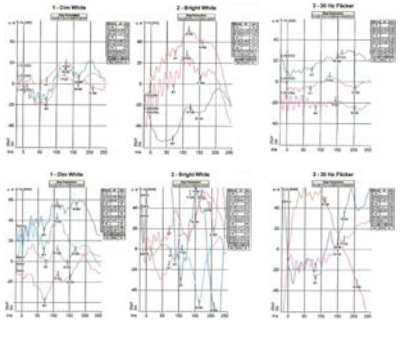


FIGURE 2
VEP showing severely decreased p-wave amplitudes consistent with LP vision OS. Normal OD.



DIAGNOSIS

- Given the patient's history of consistently high IOPs, RNFL thinning and decreased ganglion cell count, they were diagnosed with pediatric ocular hypertension and started on Latanoprost 0.005% QHS OU.
- Given the clinical findings of a small optic nerve with a double ring sign, (+)APD, sensory strabismus and light perception VA, the patient was diagnosed with optic nerve hypoplasia OS. Their MRI and endocrine workup ruled out septo-optic dysplasia.

DISCUSSION

Pediatric Ocular Hypertension

Risk Factors	Family history of glaucoma, large C/D ratios, consistently high IOPs, thin central corneal thicknesses, greater pattern standard deviation, myopia
Clinical Signs	RNFL thinning, visual field defects, optic nerve head cupping, optic nerve atrophy
Diagnostic Tests	Goldmann tonometry, central corneal thickness measurements, visual fields, OCT

- In determining when to treat ocular hypertension in a pediatric patient, it is important to consider the risk factors and probability of visual impairment. The decision to treat is individualized and one must consider the cost, side effects, and quality of life as treatment will likely be lifelong.
- Treatment targets IOP reduction, and so topical medication is the first line of treatment. Target pressures are lower for children compared to adults due to the longer life expectancy and severe nature of pediatric glaucoma. For extremely high IOPs, surgical intervention may be necessary.

Optic Nerve Hypoplasia

Risk Factors	Young maternal age, premature birth, maternal diabetes, maternal use of alcohol or drugs, sporadic
Clinical Signs	Small optic disc, double ring sign, vascular tortuosity, thinning of RNFL and ganglion cell layer, (+)APD, sensory nystagmus and strabismus. Vision can range from normal to light perception.
Diagnostic Tests	MRI and endocrine workup

- An important differential diagnosis to consider is septo-optic dysplasia, which presents with CNS abnormalities (thinning of the optic chiasm, absent septum pellucidum, agenesis of corpus callosum) and endocrine abnormalities (growth hormone deficiency, hypothyroidism, hypercortisolism) and typically runs in families. An MRI and endocrine workup is indicated to rule out septo-optic dysplasia.

TREATMENT AND MANAGEMENT

- The patient had a good reduction of IOP with Latanoprost 0.005% QHS OU. Given their history of an IOP spike when they self-discontinued the drops, the patient and their mother were motivated to continue using the drop. The patient will continue to be managed every 6 months for IOP checks.
- The pros of treatment outweigh its cons in this case given the patient's monocular status. In our more conservative approach, we reduce the risk of any possible glaucomatous damage early on, thus preserving as much vision for the patient as possible.
- The cons of treatment include emotional and financial burdens of having to pay for a medicated eye drop with possible lifelong use.
- Due to their monocular status, the patient was also prescribed full time wear of specs for protection and referred to low vision services.

CONCLUSION

- The decision to treat ocular hypertension in a pediatric patient is individualized. Factors to consider are consistently elevated IOPs, family history of glaucoma, optic nerve head cupping, RNFL thinning, and high probability of visual impairment. In this case, the patient's monocular status rendered more conservative management.
- Topical medications are typically the first line of treatment. Extremely high IOPs may require surgical intervention.
- When diagnosing optic nerve hypoplasia, it is important to rule out septo-optic dysplasia with an MRI and endocrine workup.

REFERENCES

Available upon request

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Herpes Zoster Ophthalmicus with Associated Viral Meningitis Following COVID-19 Booster Vaccination

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INTRODUCTION

There are several reported cases of varicella zoster virus (VZV) reactivation following COVID-19 vaccination. This case describes a rare occurrence of herpes zoster ophthalmicus (HZO) and varicella-associated meningitis, confirmed with lab work, following COVID-19 booster vaccination.

CASE HISTORY

Patient MP is an 86-year-old Hispanic female that presented with chief complaint of left upper eyelid irritation for the past two days following a presumed spider bite. Secondarily she complained of decreased vision in the left eye. Additionally, she reported recently feeling "under the weather" and sleeping many hours of the day. She attributed this general malaise to her recent COVID-19 booster vaccination that she had received two days prior to this visit.

Patient ocular history
- mild stage primary open angle glaucoma OU
- dry eye disease OU
- pseudophakia OU

Patient medical health history
- rheumatoid arthritis
- borderline type II diabetes mellitus

EXAM FINDINGS

TABLE 1: Entrance testing

	OD	OS
Dist VA	20/20	20/60 PH 20/40-2
Pupils	PERRLA, (-)APD	PERRLA, (-)APD
EOMS	FROM	FROM
CVF	FTFC	Constricted superiorly d/t ptosis

TABLE 2: Slit Lamp Examination

	OD	OS
Adnexa	normal	Vesicular rash respecting vertical midline
L/L	normal	1-2+ upper lid edema
Conjunctiva	White and quiet	Diffuse injection greatest inferiorly encroaching cornea
Sclera	White and quiet	White and quiet
Cornea	diffuse punctate epithelial staining greatest inferiorly, (-)KP	1.5 mm pseudodendrite @5:00, (-)KP
Angle/PI	GR 3 N/T	GR 3 N/T
A/C	Deep and quiet, (-)cell/flare	Deep and quiet, (-)cell/flare
Iris	normal	normal
Lens	PCIOL	PCIOL
IOP mmHg	19	17

FIGURE 1
Slit lamp examination revealed a 1.5mm pseudodendrite present on cornea OS, which stained with sodium fluorescein

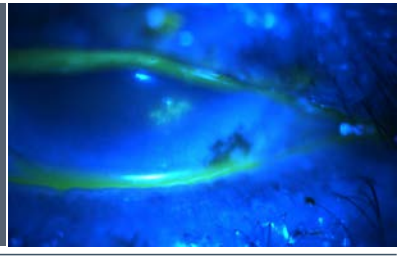


FIGURE 2
External appearance consistent with a vesicular rash respecting the vertical midline with left upper lid edema

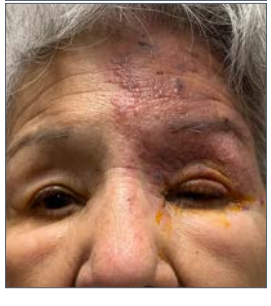
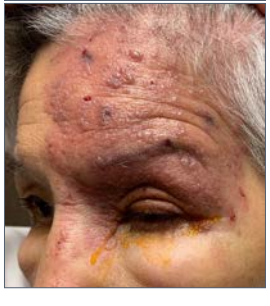


FIGURE 3
External appearance consistent with a vesicular rash respecting the vertical midline extending on to the scalp with left upper lid edema



DIAGNOSIS AND DISCUSSION

Diagnosis: Herpes Zoster Ophthalmicus OS

Patient MP was started on Valtrex (valacyclovir) 1-gram po TID with a plan to have her return to clinic in two days for further evaluation. On the day of the scheduled follow-up appointment, patient MP did not return to clinic due to hospitalization after sustaining a fall. She was transferred to the emergency room and was treated for her acute injuries. The emergency room noted pronounced cognitive changes and she was admitted to the hospital for further evaluation.

The leading differentials for her condition given these new symptoms were:
1.) Varicella Zoster Virus Associated Meningitis
2.) Valtrex-Induced Neurotoxicity

LABORATORY TESTING

Imaging modalities such as CT/MRI can be used to aid in the differential diagnosis of these conditions. However, the results of CT/MRI alone cannot exclude the diagnosis of meningitis and are often inconclusive. Laboratory testing of cerebral spinal fluid (CSF) obtained via lumbar puncture (LP) along with clinical picture will confirm the diagnosis of meningitis. In the case of patient MP, the imaging results were consistent only with age related change and acute injuries as the result of blunt trauma from sustaining a fall. CSF findings (Table 3) confirmed varicella zoster virus associated meningitis.

TABLE 3: CSF laboratory results

VZV PCR	(+) DNA Detected
VZV IgG	1,393 (reference range >165 = positive)
VZV IgM	1.19 (reference range >1.09 = positive)
WBC	378 with pleocytosis (High)

MANAGEMENT

Patient MP was started on IV acyclovir 605mg x 21 days followed by a course of oral Valtrex 1g q8h x 7 days. In addition, the patient received Zovirax 5% topical ointment for her vesicular lesions. While hospitalized, patient MP began experiencing symptoms consistent with post-herpetic neuralgia and was prescribed gabapentin 100mg po TID. She was managed by onsite ophthalmology for the duration of her hospital stay and was instructed to proceed with Shingrix vaccination 8 weeks following the resolution of her condition, as she had not previously been vaccinated for shingles.

CONCLUSION

The risks/benefits of Valtrex should be evaluated on a case-by-case basis and include considerations of patient demographics such as age and kidney function due to the possibility for rare complications following Valtrex use. Alternatively, famciclovir can be considered as it has a safer side-effect profile compared to acyclovir/valacyclovir. Although rare, clinicians should be aware of the possibility for reactivation of varicella virus following COVID-19 vaccination, especially in those who are immunocompromised or elderly, and that it may manifest as HZO with a possibility for VZV associated meningitis.

References available upon request.

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Optometry's Role in Diagnosing and Managing Patients with Stickler Syndrome

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INTRODUCTION

Stickler Syndrome (SS) is a hereditary multisystem collagen disorder with ocular, auditory, craniofacial, and musculoskeletal manifestations. The most common and earliest ocular finding is childhood myopia, occurring in 80-90% of SS patients, with 40% of those having a severe refractive error of -10.00 diopters or worse. Retinal detachments (RD) have been reported to occur in 50-70% of SS patients. Pre-senile cataracts can also be present (36-59%) with both nuclear and quadrantic lamellar cataracts that spare the visual axis described. Less common ocular manifestations include glaucoma (11%), either secondary to RD surgery or, more rarely, infantile-onset glaucoma. Due to the high rates of ocular signs in SS, eye care professionals play a vital role in the health care team. Particularly, optometrists can fit these pediatric patients with contact lenses to improve visual quality.

CASE PRESENTATION

A 15-year-old male with Stickler Syndrome was referred for a specialty contact lens fitting. He had been wearing glasses for most of his life with symptoms of blurry vision OU.

Ocular History

- degenerative myopia OU
- lattice degeneration s/p 360-degree prophylactic barricade laser OU (Figure 1)
- quadrantic cortical cataracts, not within the visual axes OS>OD
- glaucoma, managed with latanoprost qhs OU by ophthalmology

Manifest Refraction

OD: -22.00 -1.25 x180 VA 20/80
OS: -24.25 -0.75 x180 VA 20/60

Corneal Topography (Figure 2)

OD: Keratometry 42.0D / 44.0D @107, HVID 11.3mm
OS: Keratometry 42.3D / 43.6D @093, HVID 11.3mm

MANAGEMENT

The patient was determined to be a good candidate for corneal gas permeable (GP) contact lenses and was fit diagnostically. Table 1 shows the final contact lens order, resulting in improved visual acuity to 20/25- OD/OS.

However, after 8 months of wear, the patient complained of discomfort with GPs and only wore the lenses 1-2 days per week for about 8 hours per day. He was happy with the improved visual quality but was unable to tolerate wearing the lenses daily. The patient was scheduled for a refit into scleral contact lenses, which has not been completed at the time of publication.

FIGURE 1
Optos fundus photography shows prophylactic barricade laser OU to treat degenerative myopia, and an artifact OS due to quadrantic cataract.

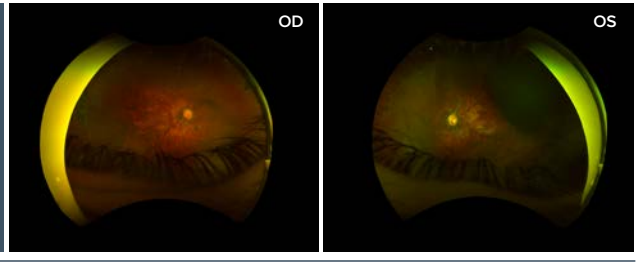

FIGURE 2
Axial topography maps reveal regular with-the-rule (WTR) astigmatism OU.

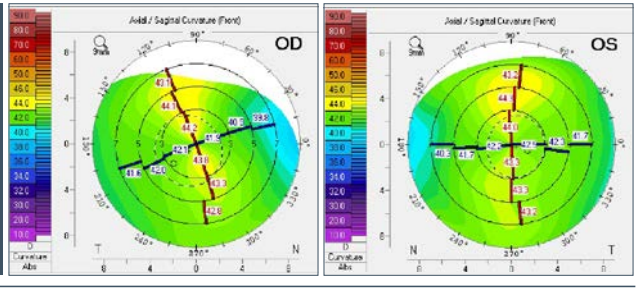

TABLE 1
Contact Lens Parameters

	Design	Material	Power	BC	Dia	Edge	VA
OD	Spherical GP	Boston XO	-22.50	8.08	9.2	TPC (vertical steep)	20/25-
OS	Spherical GP	Boston XO	-21.25	7.80	9.2	TPC (vertical steep)	20/25-

TABLE 2

Ocular Manifestations of Stickler Syndrome
Congenital myopic refractive error (> -3.00 D)
Retinal detachment (1st and 2nd decades of life)
Cataracts (nuclear and quadrantic lamellar)
Glaucoma

CONCLUSION

Stickler Syndrome is commonly encountered at a young age and eye care professionals may be the first to diagnose this condition due to the many ocular manifestations (Table 2). Optometrists are essential members of the health care team and can monitor for RD, glaucoma, and cataracts in conjunction with ophthalmology, referring for surgical intervention when warranted. Prophylactic laser and cryotherapy can be considered to prevent RD.

This case promotes awareness of Stickler Syndrome as a condition that often results in degenerative myopia. The unique role of optometry is to manage SS patients with contact lenses to rehabilitate vision.

Furthermore, some children with Stickler Syndrome may exhibit ocular findings without other systemic involvement (auditory, craniofacial, and musculoskeletal findings). Therefore, molecular genetic testing for SS should be considered when examining a young patient with high myopic refractive error and other comorbid findings such as RD, glaucoma, or congenital cataracts.

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CONTACT

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Visual and Ocular findings in a Rohingya Refugee Population in Chicago

Tracy Matchinski, OD, FAAO, Alexander Pitts, B.S., Paul Eros B.S.

INTRODUCTION

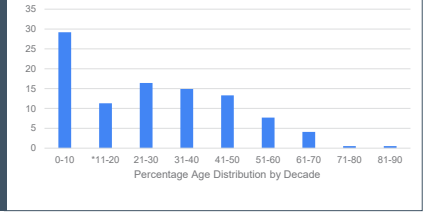
The Rohingya are a Muslim minority ethnic group that number about one million. They are a displaced people that currently live in refugee settlements worldwide. Little is known about the eyecare needs of the Rohingya people. Lack of basic eye care for refugees is a major concern and clinical evidence of visual and ocular health problems can help support the establishment of vision care within healthcare provided. This project reports visual and ocular findings in a cohort of Rohingya refugees settled in Chicago, Illinois.


Rohingya flag

METHODS

Two community clinics were organized by VOSH-Illinois in conjunction with a local Rohingya organization to provide eyecare for Rohingya refugees settled in Chicago. Comprehensive eye examinations were provided, and prescription glasses were provided by OneSight EssilorLuxottica Foundation. The examinations followed the standard of care and in the state of Illinois under the Department of Professional Regulation section 1320.90.

GRAPH 1 Age Distribution



GRAPH 2 Sex

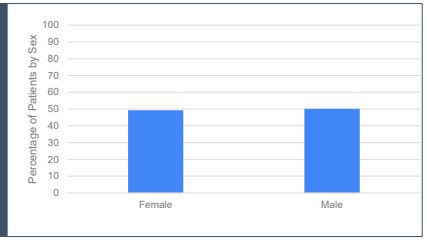
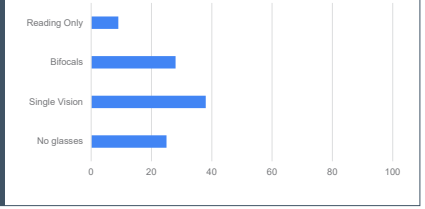


TABLE 1

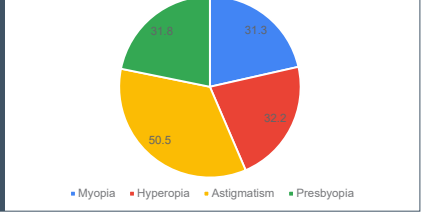
Visual Acuity	Right Eye	Left Eye
Entering VA	20/38.8 (SD +/- 40.2)	20/40.2 (SD +/-32.4)
Exiting VA	20/21.4 (SD +/-5.5)	20/21.5 (SD (+/-6.1)

*Note: entering VA is with habitual correction if any and exiting VA is with best correction determined during examination

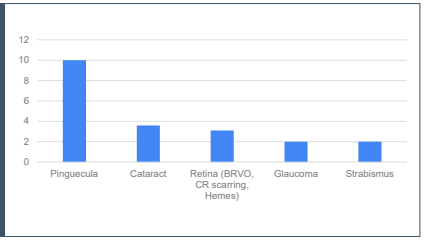
GRAPH 3 Percentage Glasses Prescribed



GRAPH 4 Percentage Refractive Error



GRAPH 5 Percentage of Significant Ocular Health Findings



RESULTS

195 patients were examined, and 146 prescription glasses were provided. Demographics, visual and ocular findings are displayed in accompanying graphs and table.

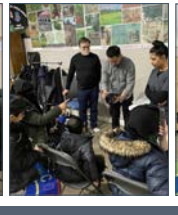
CONCLUSION

The prevalence and causes of vision loss in this local Rohingya cohort contributes to the limited information known about this population's eyecare needs. The primary problem was found to be uncorrected refractive error followed by concern for retinal problems and glaucoma. Determining trends within this local Rohingya population can contribute to validating the need for eyecare for this population in any location. Some location may have access to eyecare, such as in Chicago, however, some locations may not yet have access to eyecare established. Within a refugee population, the need for eyecare as part of healthcare is needed. Improved vision and the prevention of vision loss leads to better quality of life, ability to participate in educational, vocational, and avocational pursuits.

ACKNOWLEDGEMENTS

The authors would like to thank SVOSH-ICO, VOSH-Illinois and VOSH/International, vosh.org, for support and OneSight EssilorLuxottica Foundation, onesight.essilorluxottica.com, for the provision of new eyewear.

ONESIGHT EssilorLuxottica Foundation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Branch Retinal Artery Occlusion Following Moderna COVID-19 Vaccination

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INTRODUCTION

A branch retinal artery occlusion (BRAO) results from obstruction of one of the branches from the central retinal artery[1]. The most common cause of retinal artery occlusion is an embolism. Seventy four percent of retinal emboli are from carotid plaques which are derived from cholesterol (Hollenhorst Plaques). The heart is the second most common source of retinal emboli of which 10.5% are calcific and 15.5% platelet-fibrin[3]. Although extremely rare, BRAOs have previously been reported as a potential adverse effects of mRNA vaccines, specifically Pfizer-BioNTech COVID-19 vaccine. This case report highlights a patient diagnosed with a BRAO, after having received her second Moderna COVID-19 vaccine (also a mRNA vaccine), 12 hours prior.

CASE HISTORY

A 68-year-old African American female presented with a left, painless, superior visual field loss, 12 hours after the administration of the second Moderna COVID-19 vaccine. She stated over time she regained some vision but reported an area of grayness in vision remaining. The patient's ocular history was remarkable for primary open angle glaucoma mild stage OU which was managed with Alphagan BID and a history of cataract extraction OU. The patient's medical history was remarkable for atrial fibrillation which was controlled with Eliquis. Best corrected acuity was 20/20 OD/OS. Confrontation fields revealed superior field loss OS. All other external testing and slit lamp examination were unremarkable IOP's were 9/11 mmHg OD/OS via Tonopen. Dilated fundus exam OD was unremarkable; OS findings included whitening of the left inferior retina and a yellow refractile deposit, within an artery, radiating inferiorly off the nerve. Subsequent visual field testing was significant for a superior field defect OS while OCT revealed inner retinal thickening OS.

FIGURE 1
Optos photo OS showing whitening of the left inferior retina and a yellow refractile deposit, within a retinal artery, radiating inferiorly off the nerve

FIGURE 2
Visual field testing showing a left superior field defect.

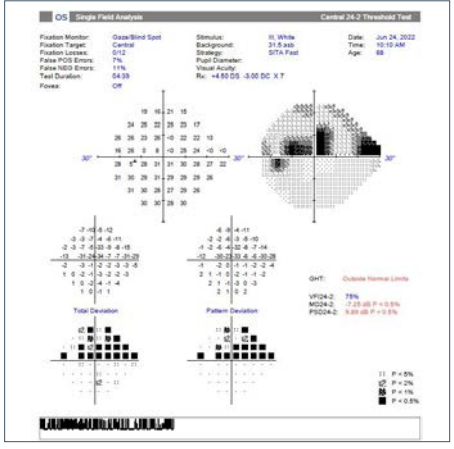


FIGURE 3
SD-OCT showing nasal inner retinal thickening OS.

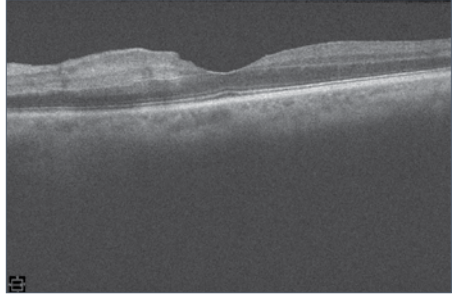
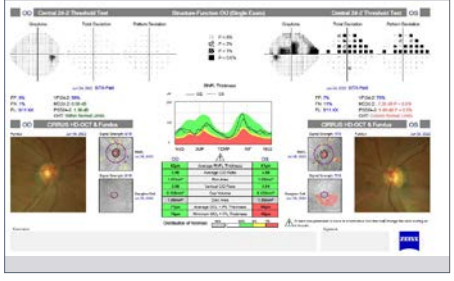


FIGURE 4
Structure Function Correlation OD and OS



CONCLUSION

Based on the patient's clinical presentation, the patient was diagnosed with a BRAO OS. The patient was referred to a stroke center where a transthoracic echocardiogram and carotid ultrasound were performed. The findings were unremarkable with no findings of additional emboli or plaques. The patient continues to be monitored.

DISCUSSION

Although rare, retinal adverse events such as retinal artery occlusions may occur after the administration of mRNA COVID-19 vaccinations. There have been four documented cases of patient's suffering from a BRAOs/ischemic events post Pfizer-BioNTech COVID-19 vaccine.[2] The exact mechanism by which the COVID-19 vaccine causes a BRAO is still unclear. It has been proposed that COVID-19 infection can directly affect the endothelial cells, causing a pro-coagulatory and inflammatory state, which can lead to vascular thromboembolic complications[2]. However, vaccines do not contain live virus. Thus, the mechanism of action could be an immunologic response to the spike antigen, other viral antigens, or to components of human adenovirus[4]. Although the timing of vaccination in this case correlates to the patient's presentation with a BRAO, further studies should be conducted to establish a definite causal relationship between COVID-19 vaccinations and retinal artery occlusions.[4]

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Chronic Retinal Detachment Secondary to Choroidal Hemangioma in Sturge-Weber Syndrome

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INTRODUCTION

A patient presents for pediatric eye exam complaining of blurred vision in their left eye. Examination reveals port wine stain and reduced visual acuity secondary to chronic serous retinal detachment due to choroidal hemangioma. He is subsequently diagnosed with Sturge-Weber Syndrome (SWS) after further evaluation and diagnostic testing.

CLINICAL FINDINGS

TABLE 1: Entrance testing

Entrance Testing	OD	OS
Visual Acuity	20/20-1 sc	20/100- sc *PH NI **no improvement w/ SRx OS
Pupils	Equal, Round, Reactive, (-)APD	Equal, Round, Reactive, (-)APD
EOMs	Full Range of Motion	Full Range of Motion
Confrontation Visual Fields	Full to Finger Count	Full to Finger Count

TABLE 2: Slit lamp

Anterior Segment	OD	OS
Adnexa	adnexa normal	Port-Wine Stain @ V1 + V2 Dist.
Lids/Lashes	lids and lashes normal	hyperpigmentation @ lateral canthus
Conjunctiva	white and quiet	dilated, tortuous vessels temporal limbus
Sclera	white and quiet	white and quiet
Cornea	normal endothelium, epithelium, stroma and tear film	normal endothelium, epithelium, stroma and tear film
Angles	3-4+ N/T ; open 360 via Gonio	3-4+ N/T ; open 360 via Gonio
Anterior Chamber	deep and quiet	deep and quiet
Iris	normal	normal ; (-) heterochromia
Lens	clear lens capsule, cortex, and nucleus	clear lens capsule, cortex, and nucleus

TABLE 3: Posterior Segment

Posterior Segment	OD	OS
Vitreous	Vitreous clear	Vitreous Clear
Optic Nerve	Flat, sharp, good color	Flat, sharp, elevated area temporal to disc c/w choroidal hemangioma
CD Ratio	0.35/0.35	0.55/0.55
Macula	Flat, no hemorrhages, exudates, pigmentary changes, or macular edema	Pigmentary changes with sub-retinal fluid ; central macular scarring
Vessels	Normal vessels	Normal vessels
Periphery	Flat x 360 degrees, no RD, no holes	Flat x 360 degrees, no RD, no holes
IOP	17 mmHg	17 mmHg

TABLE 4: Additional Testing

Additional Testing	OD	OS
Gonioscopy	Open to CB 360 ; (-) blood / angle abnormality	Open to CB 360 ; (-) blood / angle abnormality
OCT	Healthy RNFL ; (-) RD ; See Figure 3.	See Figure 3.
B-Scan	Normal	See Figure 5.
Fluorescein Angiography / OCT-A	Normal	See Figure 4. Grossly distended choroidal macro-vessels on OCT-A

Computerized Tomography	No intracranial calcification noted. However, hyperreflective in posterior left globe.

FIGURE 1
Anterior Segment Photos
External Photos. A.) Shows Port-Wine Stain (PWS) affecting the left side of the patient's face. B.) PWS affecting the V-1 and V-2 distribution of the Trigeminal Nerve. In addition, hypertrophy of lesion can be noted.

FIGURE 2
Posterior Segment Photos
Posterior Segment Photos : A.) OD reveals healthy optic nerve and macula with no SWS involvement. B.) OS shows healthy optic nerve with circumpapillary diffuse choroidal hemangioma with fibrosis + pigmentary changes involving the macula.

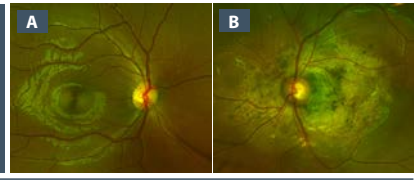


FIGURE 3
OCT – A.) Macular scan shows chronic serous sub-macular retinal detachment secondary to diffuse choroidal hemangioma B.) ONH scan reveals OD within normal limits, while OS shows deep cup with no significant RNFL thinning. Significant artifact limiting scan reliability OS due to elevation caused by hemangioma.

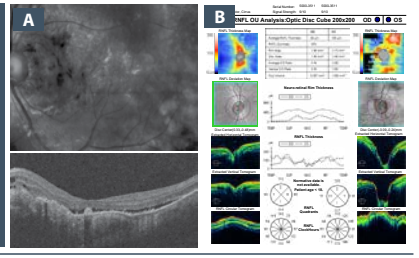


FIGURE 4
Fluorescein Angiography
Fluorescein Angiography OS only, A.) Early extensive peripapillary and sub-macular leakage from abnormal choroidal vasculature. B.) Late peripapillary staining of circumpapillary and sub-macular fibrosis

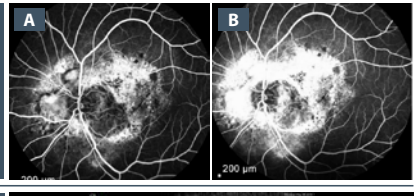
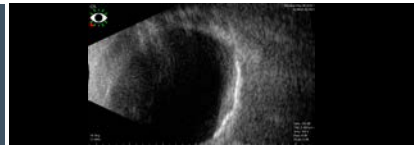


FIGURE 5
B-Scan OS only shows hyperreflective lesion (particularly inferiorly) surrounding optic nerve with increased choroidal thickening.



DIAGNOSIS & DISCUSSION

SWS Type 2: facial port-wine stain (PWS) with no leptomeningeal involvement without glaucoma

SWS is a rare, sporadic neuro-oculo-cutaneous syndrome characterized by leptomeningeal angiomatosis, facial PWS, neurologic problems, and ocular complications. The extent of PWS, leptomeningeal, and ocular involvement depend on the moment in which mutation of the GNAQ gene occurs. This is thought to cause impaired development of neural crest cells. Ocular complications include pathological changes involving the lid, cornea, anterior chamber, choroid, and retina. Due to our patients' age and lack of seizure history, it was presumed neurologic sequela were unlikely. 75-90% of patients with SWS develop seizures before the age of 2. If patients are diagnosed with SWS after 2, the need for MRI is debatable in asymptomatic patients, since late-onset seizures are much less likely to occur in early adolescence. However, management of serous RD secondary to choroidal hemangioma and close monitoring for late-onset glaucoma are critical. 30-70% of patients with SWS develop glaucoma and 40-50% have choroidal hemangiomas. Subsequent glaucoma can be difficult to manage with medical therapy, and often requires surgical intervention.

Glaucoma pathogenesis is complex in SWS patients due to interplay of various interlinked mechanisms that change with aging. Congenital or early-onset glaucoma typically angle dysgenesis plays a pivotal role, while in late-onset glaucoma an increase in episcleral venous pressure is the driving force.

TREATMENT

- Recommended retinal consult to determine the need for PDT treatment of choroidal hemangioma. Due to the location of hemangioma, the retinal specialist recommended annual monitoring.
- No topical aqueous suppressants were recommended at this time due to normotensive IOP, healthy optic nerves, and stable RNFL/GCA on repeat OCT. Close monitoring every 4 months with IOP check and annual OCT-RNFL + visual field recommended.
- Discussed possibility of pulsed dye laser (PDL) treatment for PWS. Family will pursue dermatology referral through their PCP.
- Emphasized importance of monitoring for seizure episodes, migraine-like headaches, and episodes like cerebrovascular events.

CONCLUSION

SWS is a rare syndrome that can have a severe impact on visual acuity. It is critical for the optometrist to be aware of all the ocular and neurological complications that can be associated with PWS in a pediatric patient. Co-management with neurology and ophthalmology are critical due to the significant systemic complications associated with SWS.

REFERENCES

Available upon request.

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Is BAK the Culprit?: A Glaucoma Case Report Featuring Anterior Uveitis and Uncontrolled IOP

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PURPOSE

Congenital glaucoma is an aggressive form of glaucoma. It can cause large variations of intraocular pressure (IOP) meriting difficult control. Multiple IOP lowering agents are often required to achieve acceptable IOP. Benzalkonium chloride (BAK), a common preservative, has been well-documented to cause or exacerbate ocular surface disease (OSD).[1] We present a case of a patient with congenital glaucoma who developed uncontrolled IOP and chronic anterior uveitis (AU) following an uncomplicated YAG capsulotomy. Herpes simplex virus-1 (HSV-1) was initially thought to be the underlying cause. After treatment with oral antiviral medication, the AU and IOP improved significantly, but did not resolve. Only when the IOP lowering medications were changed to BAK-free medications did the AU completely resolve and IOP normalize. The purpose of this case report is to consider BAK as a confounding factor influencing IOP control and AU resolution.

CASE REPORT

A 42-year-old Caucasian female with congenital glaucoma was using BAK-free travoprost 0.004% QHS, brinzolamide-brimonidine 1%-0.2% BID and timolol 0.5% BID. An uncomplicated YAG capsulotomy was performed OS. One week later, IOP OS was 27mmHg with 0.5+ anterior chamber cells. Prednisolone acetate 1% QID was added and BAK- free travoprost was switched to latanoprostene bunod 0.024% QHS. Brinzolamide-brimonidine and timolol were continued BID. IOP fluctuated (18-32 mmHg OS) for 6 months with persistent low-grade AU. The AU resolved after addition of valacyclovir 500mg BID, but IOP remained above target even after discontinuing prednisolone acetate 1%. Micro pulse (MP3) laser was performed to further lower IOP. Thirteen months after MP3, IOP was 43mmHg OS with low grade AU. At this time latanoprostene bunod, brinzolamide-brimondine and timolol were discontinued. The patient was switched to BAK-free medications including BAK-free travoprost 0.004% QHS, brimonidine 0.1% with Purite BID, and preservative-free dorzolamide-timolol 2%-0.5% BID. One-week later IOP was 28mmHg and after four weeks IOP was 13mmHg with resolution of the AU. IOP has been consistently 11-17mmHg for 2 years since switching to BAK-free glaucoma medications (see Table 1).

TABLE 1

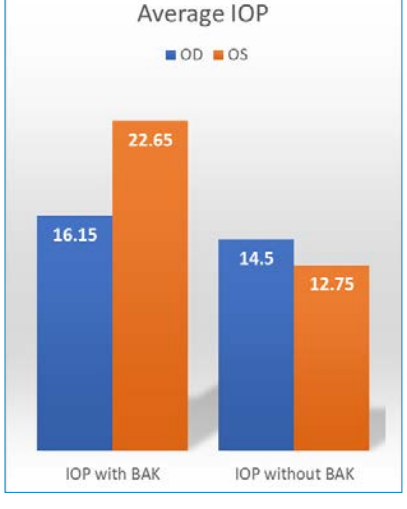


FIGURE 1

Pre-YAG capsulotomy of the visually significant posterior capsule opacification in the left eye.

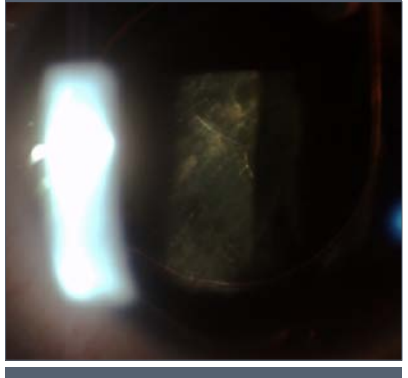
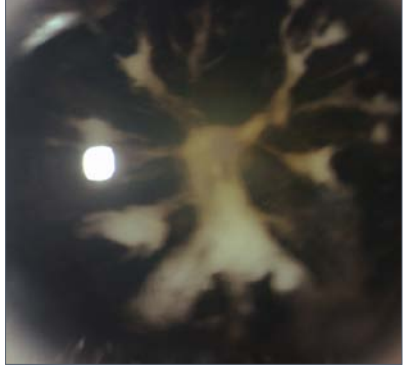


FIGURE 2

Congenital cataract of the right eye.



CONCLUSION

BAK causes ocular surface inflammation and may contribute to an already low-grade anterior uveitis and IOP elevation.[2-5] We hypothesize that switching to BAK-free medications, in this case, may have reduced inflammation not only to the ocular surface but also to intraocular structures. Reducing intraocular inflammation, especially if the trabecular meshwork is involved, may help lower IOP. Use of BAK-free glaucoma medication should be considered in susceptible individuals on multiple medications. Although HSV-1 was initially suspected as the underlying etiology, this cannot be excluded as an additional comorbid condition since it is well known that inflammation can reactivate dormant HSV-1.

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Sixth Nerve Palsy and Nasopharyngeal Granuloma; A Rare Initial Manifestation of Neurosarcoidosis

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Introduction

Sarcoidosis is a chronic, multisystemic, inflammatory disease characterized by the formation of noncaseating granulomatous lesions with an unknown etiology. Neurological manifestations are uncommon, however can still occur in 5-16% of sarcoid patients, of which the abducens nerve is not readily impacted. Further, the nasopharynx is infrequently considered as the primary site of the disease. This case highlights a unique ocular and systemic clinical presentation of neurosarcoidosis.

Case History

A 62-year-old white male was referred to the VA from an ophthalmologist with a recent history of a right sixth nerve palsy. His diplopia coincided with a sporadic papulous rash throughout his body, including his legs, face and nose along with sudden weight loss.

Medical History: Hypertension, Benign Prostate Hypertrophy
Ocular History: Cataracts
Medications: Barium, Cyclobenzaprine, Fluticasone, Tramadol
Allergies: nKDA

Pertinent Clinical Findings

Entrance Examination

	OD	OS
BCVA	20/20	20/20
Pupils	(+) D&C (-) APD	(+) D&C (-) APD
Cover Test	35 Δ BO Right hypertropia	
Extraocular Motility	Unable to abduct or cross midline	FROM, no nystagmus
Marginal Relative Distance	MRD1: 9 MRD2: 6	MRD1: 7 MRD2: 5
CN Testing	CN1 and CN8 affected (longstanding)	

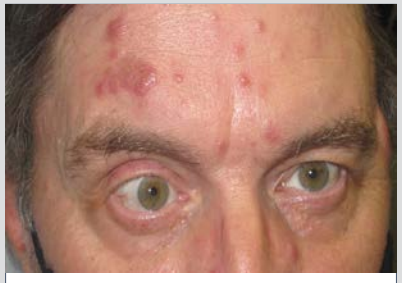
Ocular Examination

External Adnexa	Large red, variable pustules on forehead, temples, nose; crossing midline
Cornea	Clear, no herpetic dendrites, No endothelial pigment
Anterior Chamber	Deep & quiet
Iris	WNL, no TID
Posterior Pole	unremarkable

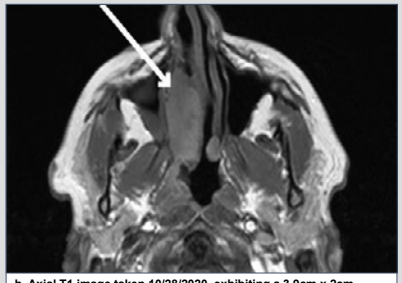
Maddox Rod

	E40 LH1	
E47.5 RH2.5	E45 RH1	E5 RH1
	E40 LH0	

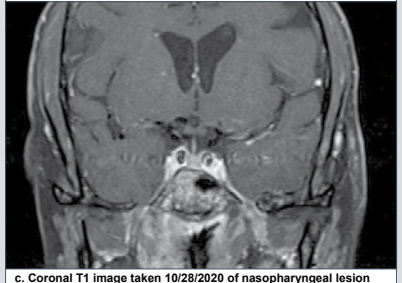
Rt Head Tilt: LH3, Left Head Tilt: RH3, Near E14



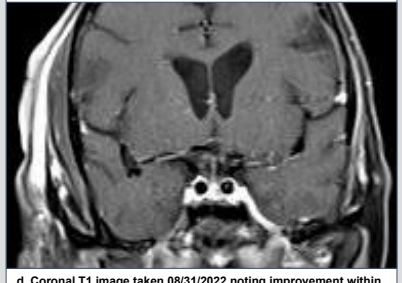
a. Facial rash with a right esotropia and a small right hypertropia.



b. Axial T1 image taken 10/28/2020, exhibiting a 3.9cm x 2cm nasopharyngeal granuloma.



c. Coronal T1 image taken 10/28/2020 of nasopharyngeal lesion affecting the abducens nerve within the cavernous sinus.



d. Coronal T1 image taken 08/31/2022 noting improvement within the nasopharynx and cavernous sinus.

Ancillary Testing

LABORATORY STUDIES			
ACE	89 U/L RR: 9-67	**ESR**	37mm/hr RR: 0-15
LYME TITER	Negative	**COVID**	Negative
LUMBAR PUNCTURE	Declined		

IMAGING	
MRI brain	Heterogeneously enhancing expansive soft tissue mass in posterior aspect of right nasal cavity approximately 3.9 x 2 cm with extension into the nasopharynx
CT Chest, Abdomen and Pelvis	No CT evidence of neoplasm, emphysema with multiple 2-4mm lung nodules, no lymphadenopathy
PET/CT Eye to Thigh	Large nasopharyngeal mass, multiple cutaneous / subcutaneous nodules consistent with sarcoidosis with significant FDG activity

BIOPSY	
Left Arm Punch Skin Biopsy	A dense collection of atypical lymphocytes and histiocytes seen in sarcoidosis
Right Nasal Cavity Mass	Noncaseating epithelioid granulomatous inflammation

Treatment and Management

Upon presentation to the VA, our patient had been prescribed 18Δ BO Fresnel for his diplopia. Initial ocular examination yielded 45Δ BO, of which 35Δ Fresnel was prescribed to alleviate his symptoms. More importantly, an abducens nerve palsy with a concurrent papulous rash, and multiple possible cranial neuropathies warranted consultations with dermatology and neuro-ophthalmology with MRI imaging. Skin and nasopharyngeal biopsies, laboratory studies and the PET scans all confirmed a diagnosis of a noncaseating epithelioid granuloma characteristic of sarcoidosis. While a lumbar puncture would solidify a neurosarcoid diagnosis, our patient deferred this testing. Treatment was therefore initiated for neurosarcoid given the known neurological symptoms.

Managed with rheumatology, our patient was initially prescribed 60 mg of prednisone daily for two weeks, with a slow taper over three months, along with methotrexate. Over the course of eighteen months, the nasopharyngeal mass decreased in size and his double vision improved. His vision remained at 20/20 OD and 20/20 OS. Fresnel prism was reduced to 12Δ BO and later removed from his lenses upon resolution.

Discussion

Many rarities in the initial ocular examination are exemplified in this neurosarcoidosis case. It provides a valued prospective and showcases a clinical course that we, as primary eye care providers, should be cognizant of for prompt referral, diagnosis, treatment and management.

- Neuro-ophthalmic manifestations represent one-third of neuro-sarcoidosis cases and etiologies beyond common microvascular ischemia and trauma should be investigated.
- When ocular motility does not suggest a specific cranial nerve pathway, or when multiple cranial nerves are affected, differentials beyond neoplastic disease such as sarcoidosis are possible.
- According to Pihlblad et. al. and as evidenced by our case, small angle hypertropia often presents with a concurrent isolated abducens palsy. Studies found <5Δ hypertropia was unmasked by a paralytic esotropia.
- Nasopharyngeal sarcoidosis is uncommon but should remain a differential when a mass in the nasopharynx is discovered.
- Henderson et. al. found the incidence of a normal CT chest was higher in whites and warranted a PET scan, particularly in older white patients when sarcoidosis is suspected.
- While sudden onset facial rashes are often thought of as herpetic in an optometric setting, it is imperative to confirm the pattern is consistent with a dermatome, otherwise other etiologies must be considered.

Conclusion

Clinically, ocular sequelae of sarcoidosis often present as uveitis or with lacrimal gland involvement, however, rarely has a sixth nerve palsy been reported. While common etiologies of neuropathies include ischemia, trauma or neoplastic disease, this case exemplifies how sarcoidosis must also be considered. Additionally, the nasopharynx is rarely involved in sarcoidosis and has only been reported in 3% of cases. As primary eye care providers, it is imperative to consider sarcoidosis as a differential diagnosis as evidenced by this unique clinical presentation.

Acknowledgements

- Evan Price M.D. — Neuro-Ophthalmology
- Larissa Ghadiali M.D. — Neuro-Ophthalmology
- Rochella Ostrowski M.D. — Rheumatology
- Peter Rogers M.D. — Radiology

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Comparison of Heidelberg Spectralis OCT with Disc-Macula Distance to Disc Diameter Ratio in Diagnosing Optic Nerve Hypoplasia

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PURPOSE

Congenital optic nerve hypoplasia (CONH) is the most common congenital optic nerve disorder and is among the three leading causes of blindness in children. Diagnosis of CONH can be challenging in children or uncooperative individuals. The purpose of this study was to evaluate whether Heidelberg Spectralis OCT is a valid test for diagnosing congenital optic nerve hypoplasia (CONH) compared to disc-macula distance to disc diameter (DM:DD) ratio.

METHODS

A total of 48 participants (24 normal and 24 with CONH) aged from 9-80 years were recruited. All participants underwent comprehensive eye examinations, fundus photography and Spectralis OCT. Normal participants were age matched with participants having CONH in four age categories (0 - <9 years, 9 - <18 years, 18 - <40 years, 40 years and up). Asymmetric optic disc size and DM:DD ratio were noted in the cases of bilateral CONH; thus, both eyes were used for data analysis in the bilateral CONH cases, resulting in 37 eyes with CONH. Only the right eyes of control participants were used for data analysis. DM:DD ratios were determined from fundus photographs by one of the authors who was masked to the diagnosis of CONH. Receiver operating characteristic (ROC) curves for DM:DD ratio and Spectralis OCT Bruch's membrane opening (BMO) area were constructed. The Mann-Whitney test was performed to compare DM:DD ratio in normal eyes versus those with CONH. Paired t-test was used to compare BMO area in normal eyes versus those with CONH.

FIGURE 1

Unadjusted receiver operating characteristic (ROC) curve analysis for DM:DD ratio. The unadjusted area under the curve (AUC) for DM:DD ratio is 0.66 (95% confidence interval: 0.54-0.77). The optimal cutoff value for DM:DD ratio is 3.00 ; at this point, sensitivity is 58% and specificity is 61%.

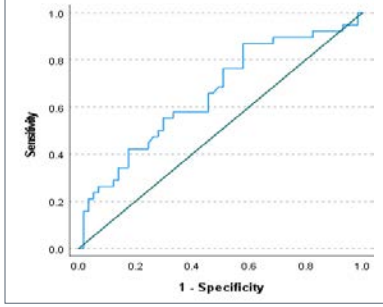


FIGURE 2

Unadjusted receiver operating characteristic (ROC) curve analysis for Spectralis OCT BMO area. The unadjusted area under the curve (AUC) for OCT BMO area is 0.36 (95% confidence interval: 0.23-0.48).

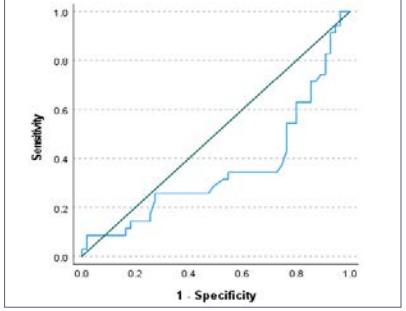


FIGURE 3

Fundus photos and Spectralis OCT of Participant # 10. 64-year-old Black female. BCVA: OD 20/20, OS 20/20, DM:DD ratios were 4.46 OD, 5.38 OS. BMO area was 1.68 OD, 1.07 OS. Manifest refraction was -2.25-4.75 x 105 OD, -2.50-4.75 x 80 OS

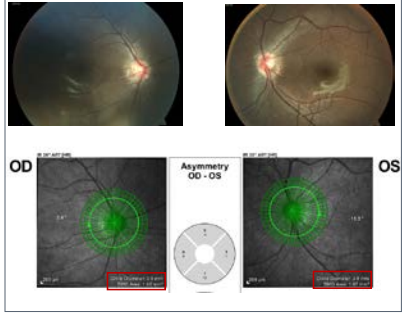
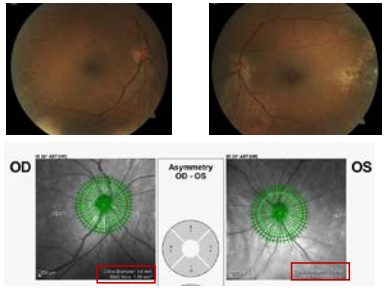


FIGURE 4

Fundus photos and Spectralis OCT of Participant # 39. 57-year-old Caucasian female. BCVA: OD 20/20, OS 20/20, DM:DD ratios were 4.24 OD, 4.3 OS. BMO area was 1.90 OD, 1.90 OS. Manifest refraction was +3.00-4.75 x 100 OD, -4.25-1.75 x 80 OS



RESULTS

Table 1 shows the demographic characteristics of our participants. Mean (± SD) DM:DD ratio was 3.11 (±1.13) for the normal eyes and 3.52 (±1.05) for the eyes with CONH, with a statistically significant difference (P = 0.01). BMO area by Spectralis OCT was 1.88 (±0.46) mm^2 for the normal eyes and 1.72 (±0.50) mm^2 for the eyes with CONH, without a statistically significant difference (P=0.85). The area under the curve (AUC) of the ROC curve for DM:DD ratio was 0.66 (95% confidence interval: 0.54-0.77), shown in Figure 1. The AUC for BMO area by Spectralis OCT was 0.36 (95% confidence interval: 0.23-0.48) (Figure 2). A statistically significant difference was found between AUC for Spectralis OCT BMO area and that for DM:DD ratio (P<0.001).

CONCLUSIONS

- The DM:DD ratio is a valid test to aid in diagnosis of CONH.
- BMO area by Spectralis OCT is not helpful in diagnosing CONH. Caution is needed when interpreting BMO area in individuals with CONH.

TABLE 1

Characteristics of CONH and Control Participants

	CONH Participants (%) (n = 24)	Control Participants (%) (n = 24)	*P* value
Gender			0.64
Female	14 (58.3)	13 (54.2)	
Male	10 (41.7)	11 (45.8)	
Race/Ethnicity			0.46*
Black	20 (83.3)	17 (70.8)	
Hispanic White	1 (4.2)	1 (4.2)	
Non-Hispanic White	3 (12.5)	6 (25.0)	
Age (years)			0.07
Range	9.6-80.1	12.6-70.0	
Mean (SD)	44.0 (21.4)	35.5 (18.7)	

*Due to the small number of CONH subjects, p-value indicates probability of black race vs. non-black race differing in the two groups.

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Comparison of the Performance of the Dry Eye Questionnaire (DEQ-5) to the Ocular Surface Disease Index (OSDI) in Children Aged 5 to 18 Years

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PURPOSE

To compare those results obtained from the Dry Eye Questionnaire-5 (DEQ-5) to those obtained from a modified Ocular Surface Disease Index (OSDI) survey in pediatric patients aged 5 to 18 years

- A DEQ-5 survey cut-off score was **determined to differentiate symptomatic from asymptomatic children**

METHODS

A total of **116 children** seen at the Illinois Eye Institute for a comprehensive exam were recruited into the study between May and July 2021.

Participants were surveyed on dry eye symptoms using both the Dry Eye Questionnaire (DEQ-5) as well as a modified, "child-friendly" Ocular Surface Disease Index (OSDI) with 11 questions total (standard survey is 12).

- Each survey question was delivered verbally; questions were repeated as needed

- **Modified OSDI questions:**
  - Q2: ("Eyes that feel gritty") was modified to "feels like something is inside your eyes"
  - Q7: ("Driving at night") was left as "not applicable" as majority of study population does not drive
  - Q8: ("Working with a computer or bank machine (ATM)") was adjusted to "using an iPad or tablet"
  - Standard OSDI calculation was used (sum of scores for all questions answered x 25 divided by 11 questions answered (since Q7 was "skipped" for all participants)[1]

- **Spearman rank correlation was performed** to determine any relationships between DEQ-5 and modified OSDI responses.

- **An ROC (receiver operating characteristic) curve was generated** to determine the sensitivity and specificity of the DEQ-5 questionnaire for identifying dry eye symptoms in children.

RESULTS

Of the 116 children included in the study, 57 (49%) were male and 69 (51%) were female (mean age = 12.2 years, range 5.2 to 17.8 years). The average results for each survey can be seen in Table 1. DEQ-5 scores stratified (asymptomatic, mild, moderate, and severe) based on OSDI are noted in Table 2.

TABLE 1
Demographics of Pediatric Patients

Age	Mean: 12.2 years (5.2 – 17.8)
Gender	Male: 57 (49%) Female: 69 (51%)
Race/Ethnicity	Non-Hispanic White: 0 (0%) Asian: 19 (16%) African American: 64 (53%) Hispanic-White: 37 (31%)

TABLE 2
OSDI Scores Compared to DEQ-5 Scores in Pediatric Patients

	OSDI Score	DEQ-5
Mean ± SD	12.5 ± 12.6	4.0 ± 3.5
Range	0-61	0-13

TABLE 3
Mean DEQ-5 score stratified by OSDI severity

Participants (percentage) n=116	OSDI Score Categories[3]	DEQ-5 grading ± SD
Asymptomatic: 77 (66%)	Asymptomatic (0-12)	2.7 ± 2.6
Mild: 21 (18%)	Mild (13-22)	4.8 ± 3.8
Moderate: 7 (6%)	Moderate (23-32)	6.7 ± 3.4
Severe: 11 (10%)	Severe (33-100)	10.3 ± 3.1

- The AUC (area under curve) for the ROC for DEQ-5 was 0.79 (95% CI: 0.70-0.87) and was statistically significant (P<0.0001)
- A DEQ-5 threshold of 5.5 yielded maximum sensitivity (82.4%) and specificity (76.8%) to differentiate symptomatic from asymptomatic dry eye
- A statistically significant positive correlation was found between OSDI and DEQ-5 ($R_s = 0.52$, $p < 0.0001$)

FIGURE 1
Unadjusted receiver operating characteristic (ROC) curve analysis for DEQ-5. The unadjusted area under the curve (AUC) for the DEQ-5 is 0.79 (95% confidence interval: 0.70 - 0.87). The optimal cutoff value for DEQ-5 is 5.5 - at this point, sensitivity is 82.4% and specificity is 76.8%.

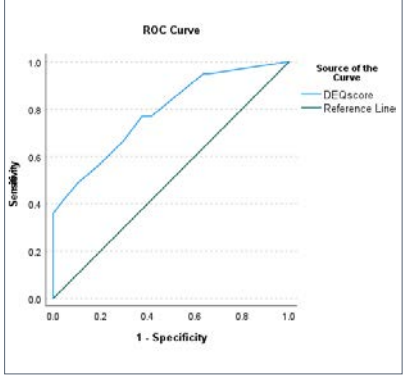

Figure 1: Unadjusted receiver operating characteristic (ROC) curve analysis for DEQ-5. The unadjusted area under the curve (AUC) for the DEQ-5 is 0.79 (95% confidence interval: 0.70 - 0.87). The optimal cutoff value for DEQ-5 is 5.5 - at this point, sensitivity is 82.4% and specificity is 76.8%.

DISCUSSION

The current diagnostic cut-off score for DEQ-5 in adults is >6[2]. Thus, the 5.5 threshold in the current study is comparable to the diagnostic cut-off value recommendation for DEQ-5 and similar to that obtained in other studies of children[3].

CONCLUSIONS

- **DEQ-5 is able to be delivered verbally to children between 5 and 18 years old**
- **DEQ-5 is a valid measurement of dry eye symptoms in children aged 5 to 18 years**
- The **DEQ-5 questionnaire was comparable to the modified OSDI questionnaire in this study for determining the presence of dry eye symptoms in pediatric population**
- A DEQ-5 cut-off score **of 5.5 demonstrates good sensitivity (82.4%) and specificity (76.8%) in differentiating symptomatic from asymptomatic** children

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Remission of IIH with Bariatric Intervention; a Disease Modifying Treatment

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INTRODUCTION

IIH (Idiopathic Intracranial Hypertension) is a condition in which high intracranial pressure can cause optic disc swelling and optic atrophy. IIH is often seen in young women with obesity as a major risk factor in the absence of other pathology contributing to the elevated intracranial pressure (ICP). This is a presentation to review treatment options for IIH with emphasis on conservative options and lifestyle modifications before administering pharmaceuticals or considering surgical intervention.

CASE PRESENTATION

28-year-old African American female presented to the primary care clinic with complaints of decreased vision up-close OU. Patient had associated symptoms of headaches but denied diplopia, tinnitus, nausea/vomiting or transient vision obscuration.

TABLE 1
Exam findings from initial visit

	OD	OS
VA	20/20	20/20
EOM	FROM	FROM
Pupils	WNL	WNL
CVF	FTFC	FTFC
IOP	13 mmHg	12 mmHg
BMI	40 kg/m2	

Ocular History: Unremarkable
Medical History: Unremarkable
Family History: Unremarkable
Medications: None
Anterior Segment: Unremarkable OU
DFE: pink ON with indistinct margins 360 and no hemes OD, OS
Optical Coherence Tomography (OCT): Spectral domain
OCT: Grade 1-2 papilledema OD, OS
HVF: HVF 24-2: Enlarged blind spots OD, OS
MRI: Empty Sella Turcica, optic nerve sheath distension, posterior globe flattening OD, OS. No signs of intracranial mass lesion, hydrocephalus, or cerebral venous sinus thrombosis.

FIGURE 1
Posterior Pole OD

FIGURE 2
Posterior Pole OS

FIGURE 3
ONH & RNFL Analysis OU: Initial (right) vs Post Treatment (left)

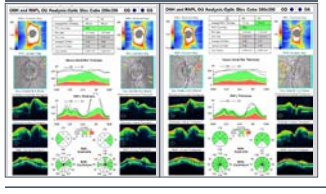


FIGURE 4
HVF OD, OS

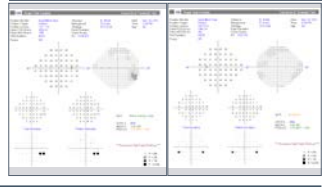


FIGURE 5a
MRI of Brain and Orbits (Axial plane): posterior scleral flattening and dilated optic nerve sheath complexes.

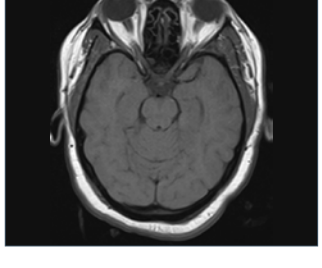
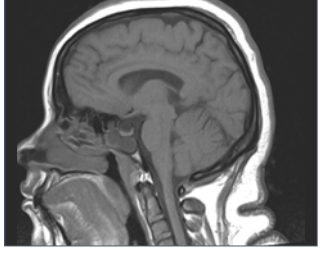


FIGURE 5b
MRI of Brain (Sagittal plane): partially empty sella, with flattening of the pituitary gland along the sellar floor.



TREATMENT AND MANAGEMENT

As the visual fields were relatively normal, and the headaches were manageable, acetazolamide was deferred. Instead, the patient was set up in a bariatric program, met with nutrition specialist, and weight management initiated. The OCTs from a 5-month period were analyzed and a marked improvement was noted (see figure 3). The patient continued the bariatric program.

DISCUSSION

This patient had an improved outcome post treatment with weight management. Following bariatric intervention, through a 5-month period, the patient returned with approximately 50% less disc swelling.

A study conducted by Weil et al. examined the efficacy of a telephone-based weight loss intervention in individuals with IIH. This approach was associated with a 5.9% mean loss of body weight after 6 months, consistent with the IIH literature suggesting that a 6.0% loss is associated with improvement of the condition.

TABLE 2
Summary of Current Treatment Options

Treatment	Mechanism of Action	Adverse Effects
Carbonic Anhydrase Inhibitors (CAI's)	Decrease CSF production by the choroid plexus	Digital and oral paresthesia, nausea, kidney stones, metabolic acidosis, electrolyte changes, malaise
Topiramate	Antiseizure medication that inhibits carbonic anhydrase activity	Nausea, diarrhea, depression, diplopia, menstrual changes, increased IOP
Weight Loss	Decreases intra-abdominal pressure, which decreases intrathoracic pressure and cerebral venous pressure	None
Optic Nerve Sheath Fenestration (ONSF)	The optic nerve sheath is identified, and a window is cut in this sheath to allow CSF to egress from the orbit	Occur in 40-45% of patients: Temporary diplopia, efferent pupillary dysfunction, infectious optic neuritis
Cerebrospinal Fluid Shunting	CSF is diverted through a ventriculoperitoneal shunt or lumboperitoneal shunt	Shunt failure, shunt infection, abdominal pain, over drainage
Venous Sinus Stenting	Stent is placed in the transverse venous sinus resulting in decreased venous sinus pressure and ICP	Stent stenosis, subdural hematoma, subarachnoid hemorrhage, intracerebral hemorrhage

Treatment can vary based on severity of condition. In most cases, patients are treated with oral carbonic anhydrase inhibitors (CAI's) along with bariatric intervention. CAI's present with a myriad of contraindications and side effects that could pose concerns for patients. Surgical intervention may also be indicated for IIH, and these procedures include optic nerve sheath fenestration (ONSF), neurosurgical cerebrospinal fluid (CSF) shunting, and venous sinus stenting - all of which are highly invasive. See summary of treatment options in table 2.

CONCLUSION

Bariatric intervention can be successful in the initial treatment recommendation for patients with Increased Intracranial Hypertension. This treatment approach promotes long-term healthy decisions and overall well-being. Additional research may be beneficial to determine the efficacy of non-surgical bariatric intervention.

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FINANCIAL SUPPORT

N/A

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A Complicated Presentation of Ocular Syphilis

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INTRODUCTION

Syphilis, known as "the great imitator or masquerader" due to its variable manifestations that can mimic many other inflammatory (infectious and autoimmune) diseases. (1) It is most commonly transmitted via sexual contact and is caused by the spirochaete, Treponema pallidum. (1) Syphilis causes a severe systemic inflammatory infection that can lead to death if left untreated. There are stages of the disease when left untreated, primary, secondary, and tertiary. Syphilis has many manifestations throughout the body, including the eye. It can present as a chancre or rash on the eye lid, interstitial keratitis in the cornea, uveitis, vitritis, chorioretinitis, papilledema/neuritis, or even ocular palsies. (1) Ocular syphilis is known to be present in 2-10% of patients with systemic syphilis and in a study by Klien, et al., they found that "ocular syphilis was found in one-quarter of the patients diagnosed with systemic syphilis and preceded the diagnosis of systemic disease in one-half of them" (1). This case presents a unique and challenging presentation of ocular syphilis preceding a systemic diagnosis of syphilis.

CASE

A 71-year-old African American type 2 diabetic male followed for glaucoma and bilateral posterior vitreous detachments (PVDs) complained of pain in the left eye (OS) and on the left side of the head that started a couple days prior (11/3/2021). He noticed an increase in flashes and floaters OS and a "black blob" in the center of his vision. Vision in the right eye (OD) remained stable at 20/20, but OS decreased to 20/600 from 20/20. A dilated fundus exam showed glaucomatous cupping, a stable PVD, with all other retinal findings unremarkable OD. OS showed vitreal pigment cells vs hemorrhage with restricted retinal views due to a vitreous hemorrhage (Figure 1). A Bscan confirmed no retinal detachment, but a large area of a viterous body-vitriris vs hemorrhage (Figure 2). The patient was referred immediately for a retinal consult and further medical work up.

A retinal specialist saw the patient the next day noting stable and unremarkable findings OD, but optic nerve head edema (Figure 2 and 3), sclerotic vessels and dot hemorrhages were noted OS (Figure 1A). The patient was diagnosed with ischemic optic neuropathy and vitreous hemorrhage OS (Figure 1A) and referred immediately for a stroke work up. A stroke work up came back negative, but an MRI confirmed optic neuritis OS and infectious lab work was ordered (TP-AB, RPR, herpes simplex 1 and 2) .

A week later the patient developed anterior and posterior uveitis OS with chorioretinitis (Figure 4) including Kyrieleis plaques (Figure 1A and 1B). The patient's lab work confirmed herpes simplex virus 1 (HSV1) and HSV2 and treated appropriately systemically and topically. The patient's vision decreased OS to count fingers two weeks later and he was diagnosed with a branched artery occlusion. Further blood work revealed the diagnosis of syphilis, and the patient was referred to the emergency room for immediate admission for the treatment of neurosyphilis with intravenous penicillin G.

The patient's HSV resolved with oral valacyclovir and his neurosyphilis improved after a 14-day treatment of intravenous penicillin G. The patient continues to show no further systemic manifestations and visual acuity improved to 20/30 OS.

FIGURE 1A
Photo from first exam (11/3/2021) blurred due to vitreous hemorrhage/vitritis, with an edematous optic nerve (red arrow) with retinal hemorrhages (purple arrow), Kyrieleis plaques (blue arrow), and macular edema in the left eye.

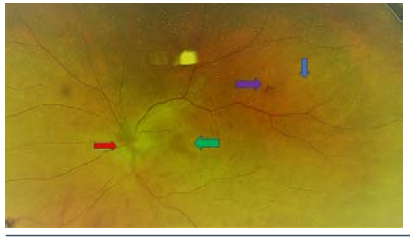


FIGURE 1B
Fundus photo showing 3 months after 1st episode showing retinal traction (green arrow) over the pale optic nerve and macula with retinal hemorrhages (purple arrow), Kyrieleis plaques (blue arrow) and sclerosed vessels superior temporal and inferiorly.

FIGURE 2
Bscan showing the vitreous hemorrhage vs severe vitritis at the first exam (11/3/2021).

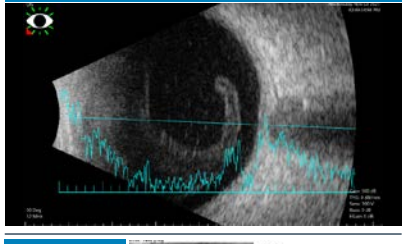


FIGURE 3
2nd day with retinal specialist confirm optic nerve head edema and chorioretinitis on Spectrialis OCT.

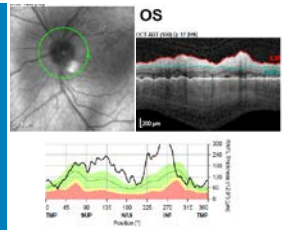
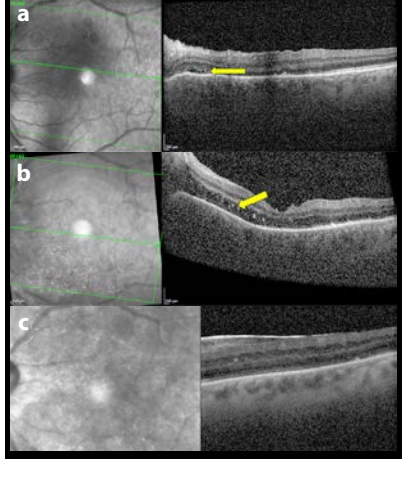


FIGURE 4
Spectralis OCT images of (a,b) retinitis (hyperreflective precipitates), chorioretinitis (yellow arrows) with sub-retinal fluid(b) from second exam through 6-month recovery(c).



CONCLUSION

The complexity of this case demonstrates how syphilis can masquerade many different ocular conditions. The patient in this case, presented first with a vitreous hemorrhage and optic neuropathy that could be easily mistaken because of his diabetes and/or hypertension. Since the eye is an extension of the brain, ocular syphilis affecting the optic nerve, retina and/or causing nerve palsies need to be treated the same as neurosyphilis. In this case, the quick diagnosis and treatment allowed the patient to have a better outcome ocularly as well as systemically. This is a great case to learn the many ocular manifestations of syphilis since during the last decade, the number of syphilis cases has been on the rise in developed western countries. (1)

REFERENCES

Available upon request

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An Atypical Clinical Presentation of Brown McLean Syndrome Progressing to Central Corneal Decompensation

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INTRODUCTION

A patient presents with chronic bilateral peripheral corneal edema secondary to Brown McLean Syndrome. Ocular examination reveals bilateral central corneal decompensation, which is atypical for this rare syndrome.

CASE HISTORY

Patient TC, a 73-year-old African American male, presented for a glaucoma follow-up and complained of mild blurry vision in the morning OU. His past ocular history is notable for congenital cataracts s/p CE in 1969 with resulting aphakia OU (performed at an outside office, reason for aphakia unclear), glaucoma secondary to longstanding aphakia with resulting angle abnormalities OU, Brown McLean syndrome OU (diagnosed 2019). His past medical history is notable for hypercholesterolemia and vitiligo. He is currently taking latanoprost qhs OU and dorzolamide-timolol bid OU.

OCULAR EXAMINATION

OD	Exam	OS
cc: 20/30+ OD, PH 20/25-	**VA**	cc: 20/50 OS, PH 20/30 OS
FTFC	**CVF**	FTFC
FROM	**EOMs**	FROM
longstanding fixed pupils with superior corectopia due to superior iridectomy	**Pupil**	longstanding fixed pupils with superior corectopia due to superior iridectomy
15 mmHg	**GAT**	11 mmHg
See Photos	**SLE**	See Photos
See Photos	**DFE**	See Photos

DIAGNOSIS AND DISCUSSION

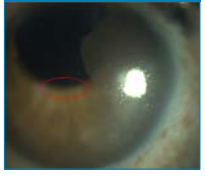
This patient was diagnosed with corneal decompensation secondary to Brown-Mclean Syndrome (BMS). BMS is a rare, static annular corneal edema that affects the peripheral 2-3mm of the cornea. It is typically seen many (6-16) years s/p cataract surgery in eyes left aphakic and occurs more commonly in eyes s/p intracapsular cataract extraction (ICCE). There is no associated corneal neovascularization or anterior chamber inflammation. Central involvement is rare, and when present is usually transient. Corneal decompensation (a change in corneal cellular morphology) is rare, but present in this case. There is a possible correlation with high myopia, but it is not well understood. The etiology of BMS is unknown, but initially was believed to be caused by underlying endothelial dystrophy or a possible genetic component. The pathophysiology of BMS is also unknown. Endothelial trauma is not necessary to induce BMS; non-surgical cases can be caused by lens subluxation, spontaneous lens resorption, endotheliitis, keratoconus, angle closure glaucoma, or myotonic dystrophy. Potential complications include bullous keratopathy due to persistent corneal edema and infectious corneal ulcerations secondary to ruptured bullae.

FIGURE 1a
Slit lamp examination OD shows 2+ microcystic edema (MCE) over inferior 60% of cornea, superotemporal iridectomy, aphakia.

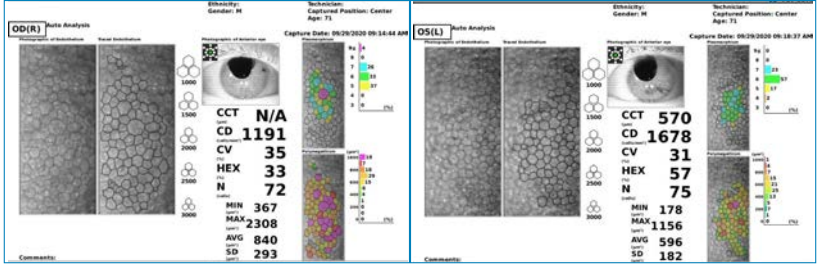
FIGURE 1b
Optic section of cornea OD shows stromal hyperreflectivity, indicating stromal edema.

FIGURE 2a
Slit lamp examination OS shows 1-2+ MCE from 3:00-9:00, large spot of endothelial pigment superotemporally, superonasal iridectomy, aphakia.

FIGURE 2b
Corneal guttata present centrally OS.



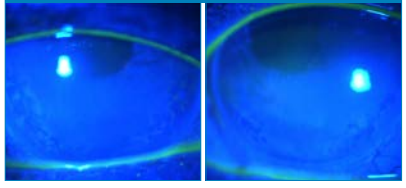
FIGURES 3a & 3b
Specular microscopy OU shows deceased cell density centrally (age norm 1800-2600 cells/mm2) with polymorphism and pleomorphism.



TREATMENT AND MANAGEMENT

Treatment with Muro 128 ung qhs OU was initiated to decrease blur in the morning. This patient's displaced pupils cause him to only have mild, transient symptoms since his visual axis is mostly spared. Symptoms will be monitored at follow up examinations (patient currently seen every 4-6 months for glaucoma monitoring) and specular microscopy will be repeated annually to monitor corneal decompensation. A further decrease in endothelial cell count or development of complications may warrant a corneal transplant (DSEK, DMEK, PK). Long term hypertonic use is warranted in some cases, but BMS can often remain untreated if the patient is asymptomatic and the central corneal endothelium is intact.

FIGURES 4a & 4b
At 4-week follow up examination, patient's symptoms resolved and NaFl staining shows resolved central corneal edema with persistent peripheral edema.



CONCLUSION

BMS is a rare corneal condition that does not typically lead to corneal decompensation. Due to ICCE falling out of favor in recent years, BMS is not commonly seen in the present day with the development of new cataract extraction methods such as phacoemulsification. Patients with BMS are usually asymptomatic and can be left untreated, but if symptoms develop the condition can be treated with over-the-counter hypertonic medications. However, it is important to counsel patients regarding transient visual symptoms and the possibility of developing complications (such as bullous keratopathy) that may warrant surgical intervention.

REFERENCES

References available upon request.

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Managing Acquired Vertical Diplopia from Right Inferior Rectus Palsy following Cerebral Ischemic Event

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INTRODUCTION

A geriatric patient presented with acquired constant bilateral vertical diplopia following leukemia treatment. This case highlights the management for an acquired strabismus caused by a rare etiology in a patient with complex comorbidities.

CASE HISTORY

An 80-year-old Black female presented with chief complaint of constant bilateral vertical diplopia that began six years ago shortly after chemotherapy for leukemia. Ocular and medical history included senile ectropion OU, hemifacial spasm OS s/p Botox injection, cataract surgery OU, drusen OU, leukemia s/p chemotherapy, arthritis, and patient denied trauma to eyes, face, or head area. The patient was taking the following medications: Aspirin, Mysoline, Levothyroxine, Artificial Tears. She was referred from an ophthalmologist, where Fresnel prism trial one month ago was unsuccessful due to blurry vision. The patient had been on long-term levothyroxine dosage with no abnormal EOM enlargement/orbital tumor per MRI. Patient reported she noticed vertical diplopia more prominently ever since cataract surgery.

PERTINENT FINDINGS

TABLE 1
Pertinent testing

	OD	OS
Distance VA cc	20/20	20/20
Pupils	PERRLA (-)APD	PERRLA (-)APD
EOMs	Full 3+	Full 3+
Stereoacuity	60" Wirt circles	
Physical observations	R head turn, slight R tilt	
Cover Test	Noncomitant Right Hypertropia, Exophoria (see figures for quantified deviation in nine positions of gaze)	
W4D	fusion with 6^BD OD	
Associated Phoria	5^ BD OD	
RSupra, RInfra ranges	1/0, 15/8	
Parks 3-step	1. Right 2. Right 3. Left	
MRI	Punctate scattered enhancements throughout	

DIAGNOSIS AND DISCUSSION

Upon conducting a Parks Three Step analysis, the right eye was hyper deviated in primary gaze, the vertical deviation was greater in right gaze, and greater with left head tilt, isolating the right inferior rectus to be the paretic muscle. Leading diagnosis: Right inferior rectus (RIR) palsy secondary to ischemic partial inferior division oculomotor nucleus or supranuclear connections. An acquired sudden onset isolated RIR palsy after chemotherapy is a unique presentation. There was high suspicion for an ischemic event post-chemotherapy based on MRI conducted four months after initiation of symptoms. Refractive management is shown to be successful in managing vertical diplopia in recent onset diplopia with long-standing strabismus. Differential diagnoses of this acquired diplopia include thyroid eye disease, myasthenia gravis, vascular infarction, post-cataract surgery retrobulbar/peribulbar anesthesia complication.

MANAGEMENT

Surgical correction was deferred by the patient. The vertical associated phoria was measured to be five prism diopters base-down over the right eye, while six prism diopters base-down over the right eye promoted fusion on the Worth Four Dot test. Patient walked around with five prism diopters split between both eyes in a trial frame at distance and near. Patient reported clear and comfortable single vision with this prescription in-office. Ground-in vertical prism was chosen as the treatment modality due to patient experiencing blur with Fresnel prism previously.

FIGURE 1
10^RHT 12^XP

FIGURE 2
8^RHT/8^XP

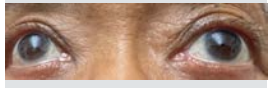

FIGURE 3
6^RHT 6^XP

FIGURE 4
10^RHT/12^XP

FIGURE 5
10^RHT and 14^ XP at near,
8^ RHT and 4^ XP at distance

FIGURE 6
6^RHT/4^XP

FIGURE 7
6^RHT 6^XP

FIGURE 8
6^RHT/4^XP

FIGURE 9
8^RHT 12^XP

Final spectacle Rx dispensed:

OD	OS
+0.75 -0.75 x 50 +2.50ADD 2.5pd BD	+0.50 -0.50 x 140 +2.50ADD 2.5pd BU

At the one month follow-up visit, the patient reported sustained single and clear vision with no diplopia with the updated prism prescription.

CONCLUSION

This case proposes a rare etiology for acquired vertical diplopia in a patient with comorbidities. Accurate diagnosis and underlying cause for a RIR palsy is crucial for specialized management plans. This unique case includes different modalities of prism trialing to successfully alleviate constant and noncomitant diplopia in an acquired strabismus in a geriatric patient.

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The Rapidity of Glaucomatous Damage in Pseudophakic Secondary Pupillary Block

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INTRODUCTION

Pupillary block is a rare complication of cataract extraction with posterior chamber intraocular lens implantation and can occur as late as five years following surgery. A common mechanism that leads to acute angle-closure glaucoma, pupillary block occurs when aqueous humor flow from the posterior chamber to the anterior chamber is obstructed by a functional block between the pupillary portion of the iris and the lens. This patient underwent successful cataract extraction with Nd:YAG and experienced elevated intraocular pressure and pupillary block secondary to an anteriorly displaced intraocular lens implant.

CLINICAL FINDINGS

An 81-year-old African American female presented complaining of constantly dim vision OD over 5 weeks. She had a history of uncomplicated cataract extraction two years prior with successful Nd:YAG laser capsulotomy in that eye the previous year.

Clinical Exam:

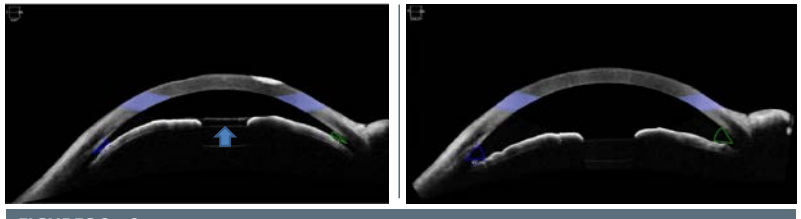
BCVA: 20/100 PHNI OD
Pupil Testing: PERRL 1+APD OD
Slit Lamp: Van Herick grade 1 angle N/T OD
Intraocular Pressure: 28 mmHg (elevated)
All findings OS were unremarkable

Anterior segment optical coherence tomography (AS-OCT) noted an anteriorly displaced intraocular lens with pupillary block and acutely shallow anterior chamber depth (13º nasal and temporal); see Figure 1.

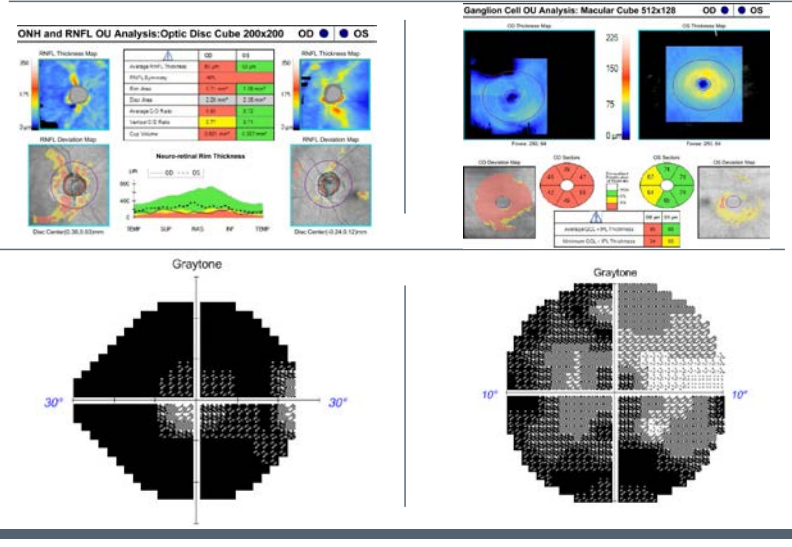
The patient was referred to an ophthalmologist who treated her with Nd:YAG laser peripheral iridotomy and topical Alphagan P® 0.1% BID OD. At follow-up one week later, visual acuity was further reduced and the APD worsened in the right eye, but intraocular pressure improved to 12mmHg with a patent LPI noted. Updated AS-OCT was remarkable for pupillary block and much deeper anterior chamber (49º nasal, 45º temporal); see Figure 2. Optic nerve assessment showed glaucomatous cupping progressed from the previous year with chronic severe angle closure glaucoma; see Figures 3 and 4.

Humphrey Visual Field testing showed significant constriction OD with both 24-2 SITA FAST (see Figure 5) and 10-2 SITA FAST (see Figure 6), demonstrating severe glaucomatous vision loss.

FIGURES 1 AND 2
LEFT: Anterior segment optical coherence tomography (AS-OCT) at initial visit noted an anteriorly displaced intraocular lens (blue arrow) with pupillary block and acutely shallow anterior chamber depth of 13° nasally and temporally. RIGHT: AS-OCT one week following Nd:YAG laser peripheral iridotomy noted a deeper anterior chamber depth 49° nasally, 45° temporally.



FIGURES 3 - 6
ABOVE: Cirrus ONH and RNFL Analysis, and Ganglion Cell Analysis at the time of diagnosis. Glaucomatous cupping with diffuse RNFL loss and diffuse GCA loss was noted in the right eye, with mild suspicion for glaucoma in the left eye. BELOW: HVF 24-2 and 10-2 SITA FAST show significant visual field loss in the affected eye.



DIAGNOSIS AND DISCUSSION

Pupillary block occurs when aqueous flow from the posterior chamber and the irido-corneal angle is blocked by the strong apposition of the pupillary margin with adjacent structures. It may be caused by excessive postoperative inflammation, aqueous accumulation between the posterior capsule and the anterior face of the vitreous, changes in the anatomy of the anterior chamber angle, or incorrect apposition of the IOL. Peripheral Nd:YAG laser iridotomy is a commonly reported procedure to treat pseudophakic pupillary block. Iridotomies may need to be repeated due to a tendency for occlusion, specifically in individuals with darker irises.

Persistent elevation of IOP after Nd:YAG laser posterior capsulotomy can occur up to several years following the procedure; glaucoma patients are more likely to require initial or added glaucoma mediations for IOP control after capsulotomy.

CONCLUSION

Pupillary block should be included as a differential diagnosis in cases of acutely elevated intraocular pressure following cataract extraction and treated with peripheral Nd:YAG laser iridotomy to relieve the block. It is important to observe patients with short-term increase in IOP more closely for longer periods of time to prevent optic nerve damage from persistent IOP elevation. While pupillary block following cataract extraction is a rare occurrence, eye care providers should be aware of the risk of acute angle closure that remains after cataract surgery.

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Available upon request.

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Chronic Granulomatous Panuveitis with ANCA Positive Testing

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INTRODUCTION

ANCA-associated vasculitis (AAV) is a group of disorders optometrists do not often encounter, but knowing their clinical manifestations and diagnosis is critical for patient care. This case report outlines a rare ocular manifestation of AAV.

CLINICAL FINDINGS

Case history: 30 y/o AA male lost to follow-up with complaint of blurred vision and photophobia OU for multiple years

- **OcHx**
  1. Chronic bilateral granulomatous panuveitis OU
     -s/p sub-tenons Kenalog OS and methotrexate treatment
     -MPO+(PR3-) GPA w/o other systemic involvement
  2. Glaucoma suspect OU with h/o steroid response
  3. Pseudophakia OU; s/p YAG OS; PCO OD

- **MHx**
  1. Depression
  2. LBP, chronic knee pain
  3. Recent negative STD screen
  4. Medications: none

Exam	OD	OS
BCVA	20/25	20/25
Pupils/EOMs/CVF	NL	NL
IOP	15	15
L/L	NL	NL
Conjunctiva	NL	NL
Cornea	CE scar, Poor TF	CE scar, Poor TF
AC	1 isolated WBC, (-) flare	NL
Iris	Dyscoria, temp atrophy	Dyscoria
Lens	PCIOL; 2+ central PCO	PCIOL; s/p YAG OS
ONH	0.60v/0.55h	0.45v/0.45h
Macula	NL	NL
Vitreous	tr-1+ cell	+snowballs
Vessels	Early focal venous sheathing along ST/I arcades	Early focal venous sheathing along ST/I arcades
Periphery	CR scarring	CR scarring

FIGURE 1
Fundus Photo OD

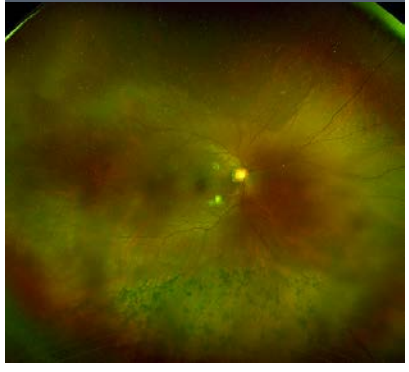
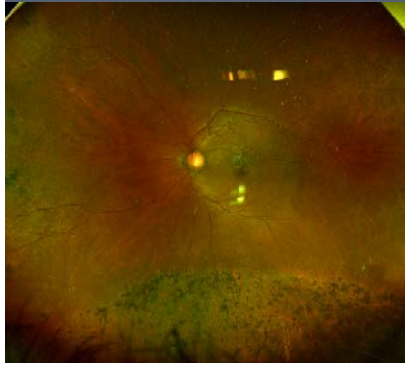
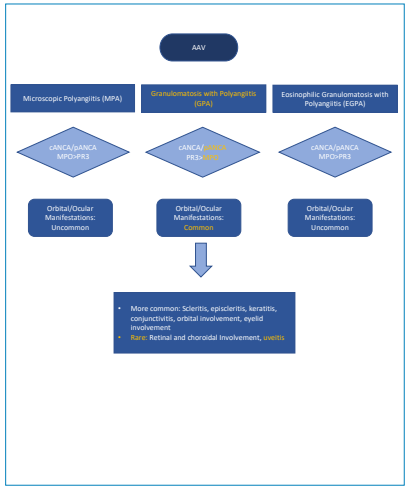


FIGURE 2
Fundus Photo OS



Imaging	OD	OS
ONH OCT	NL	NL
Macula OCT	NL	NL
24-2 HVF	Full	Full
Gonioscopy	No structures sup (+) PAS, CB T/I/N	No structures S/N (+) PAS, CB T/I
B-scan	Retina intact w/ vitreal debris	Retina intact w/ vitreal debris
FANG	No vasculitis	No vasculitis

Lab/Radiology Study	Result
ANA, RPR/MHATP, HLA-B27, Quant TB, Lyme screen	Negative
RF, ACE, Lysozyme, CRP, ESR	NL
cANCA	Negative
pANCA	Positive
PR3	Negtive
MPO	Positive
Chest X-ray, SI Joint X-ray, Spine X-ray	NL



DISCUSSION

- This patient was diagnosed with a recurrent panuveitis from MPO(+) GPA AAV.
- AAV is a group of rare autoimmune disorders that affect small blood vessels.
- ANCA or anti-neutrophil cytoplasm autoantibodies target proteins inside neutrophils and release toxic substances which damage blood vessel walls and cause inflammation.
- AAV can affect any part of the body but most commonly affects kidneys, lungs, joints, ears, nose, and nerves.
- Ocular complications can occur in every structure in the eye and orbit.
- Ocular disease is often the dominant presentation with GPA.
- Granulomatous pan-uveitis is a rare yet documented ocular manifestation of GPA, occurring in up to 10% of patients, and is extremely rare amongst African-Americans.
- This case shows how ANCA testing is valuable with uveitis when other uveitic testing is normal.

MANAGEMENT

- There is no cure for AAV.
- With ocular manifestations of GPA, treatment is aimed at the systemic disorder itself.
- Treatment options include glucocorticoids, immune suppression, and maintenance therapies.
- This patient was referred to rheumatology for continued systemic treatment.

CONCLUSION

- AAV is rare and life threatening as it affects vital organs.
- Early detection and treatment are key to prevent long-term complications.
- Co-management is essential for patients to receive appropriate therapy for best possible visual and systemic outcome.

BIBLIOGRAPHY

Available upon request

CONTACT

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Educator Awareness of and Adherence to ISO Standards for Multipatient Use Diagnostic Contact Lens Disinfection

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The Ohio State University College of Optometry, Columbus, OH[1]; Illinois College of Optometry, Chicago, IL[2]; Southern California College of Optometry at Marshall B. Ketchum University, Fullerton, CA[3]; Herbert Wertheim School of Optometry and Vision Science at University of California Berkeley, Berkeley, CA[4]

With the support of the Gas Permeable Lens Institute, Omaha, NE

BACKGROUND

Specialty contact lenses, such as corneal gas permeable, scleral, hybrid, and specialty soft lenses, are often fit diagnostically in didactic, clinical, or laboratory settings in optometry. Proper cleaning and disinfection of these lenses is essential to minimize the risk of potentially sight-threatening infections.[1] The 2020 technical report "Guideline for Handling of Multipatient Contact Lenses in the Clinical Setting" was a joint publication by the American Academy of Optometry Section on Cornea, Contact Lenses, and Refractive Technologies and The American Optometric Association Contact Lens and Cornea Section.[2] The report was based on recommendations from the 2018 International Organization for Standardization (ISO) 19979:2018(E) publication. An infographic (Figure 1) summarizing the steps of multipatient contact lens handling was published in the technical report.

PURPOSE

The purpose of this study was to assess the current practice patterns for the cleaning and disinfection of multipatient use contact lenses at the North American schools and colleges of optometry and compare these practices to the published guidelines.

METHODS

A survey link was distributed via email to contact lens, cornea, and dry eye educators at the institutions listed with the Association of Schools and Colleges of Optometry. Snowball sampling was permitted. The survey completion window was from January 23 – February 26, 2022. Descriptive statistics were used to analyze the data.

Key definitions provided to survey participants:

- clean = digital rubbing to aid in mechanical removal of surface debris
- rinse = solution used to rinse the surface of the lens
- disinfect = bacteriostatic/bactericidal chemical process to destroy, inactivate, or significantly reduce the concentration of pathogenic agents.

TABLE 1
Respondents who handle multipatient diagnostic lenses on a regular basis

Lens Type	% of Participants
Specialty Soft	15.92
Gas Permeable	32.65
Hybrid	19.59
Scleral	31.84

FIGURE 1
Technical report infographic

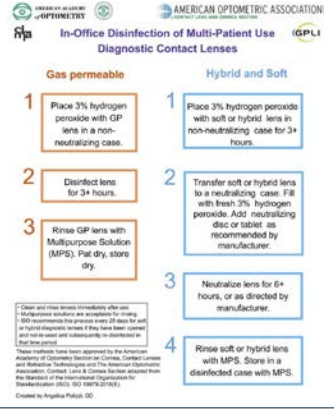


FIGURE 2
Reported glove use during handling

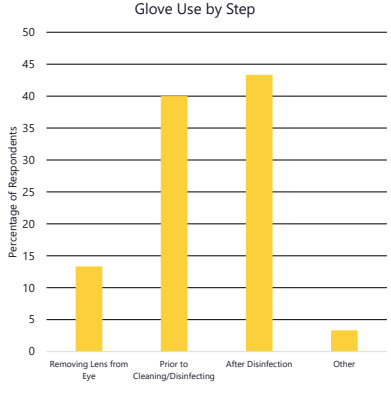


FIGURE 3
Preferred cleaning product by lens type

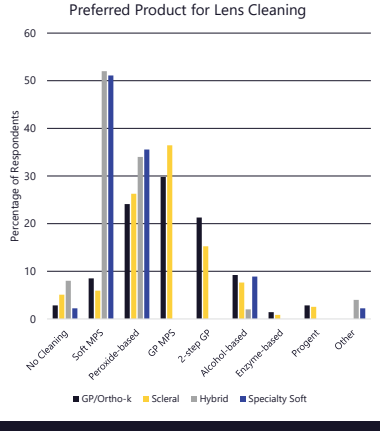
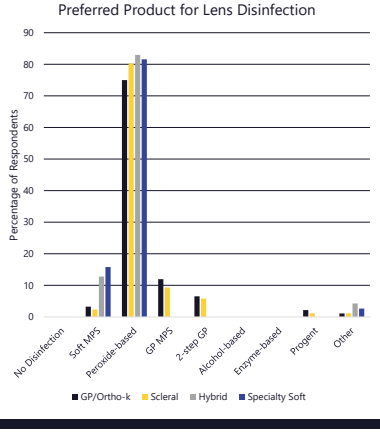


FIGURE 4
Preferred disinfection product by lens type



RESULTS

- 91 educators initiated the survey
- Every North American school and college of optometry represented
- Most frequently reported role was clinical faculty in a contact lens service (21.5% of participants)
- Gas permeable and scleral lenses were the most commonly handled specialty lenses, with 32.6% and 31.8% of respondents reporting regular encounters, respectively
- Most participants reported performing a cleaning step before disinfection (97% GP, 95% scleral, 92% hybrid, 98% specialty soft), but not necessarily by following ISO standard recommendations
- Peroxide-based solutions most frequently used to disinfect all lens types
- No participants reported using tap water to rinse soft or hybrid lenses, but 4.1% and 2.6% reported using tap water to rinse GP and scleral lenses, respectively
- Of this sample of educators, 14.5% reported being unaware of the ISO standards for in-office disinfection of multipatient use diagnostic contact lenses

CONCLUSION

In this sample of contact lens educators, some inconsistencies exist in implementing best practices for cleaning and disinfecting multipatient use diagnostic contact lenses. The infographic from the technical report does not present specific instructions regarding the initial cleaning and rinsing steps recommended in the ISO standard. Based on the results of this study, the infographic may benefit from clarifying this step and adding it to the current numbered steps. Additionally, some educators are still unaware of the updated standards for appropriate in-office contact lens handling, suggesting that these guidelines may not be consistently taught to optometry students.

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Success Rate with Free-Form Scleral Lenses for Patients with Corneal Irregularity

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SCOPE
Scleral Lenses in Current Ophthalmic Practice Evaluation

INTRODUCTION

The development of cornea-scleral profilometers provides detailed measurements of the cornea and scleral surfaces, allowing for customization of scleral lenses. One of the goals of profilometry is to custom design scleral lenses from measurements without diagnostic lens fitting, thus saving chair time for both the patient and practitioner.

PURPOSE

The purpose of this study was to determine how successful scleral lenses designed by profilometry were for patients with advanced corneal irregularity.

METHODS

- Patients with corneal irregularity (keratoconus) who presented for scleral lens evaluation were asked to participate in this single visit study, which was reviewed and approved by the University of Illinois at Chicago IRB.
- Following the imaging, a diagnostic scleral lens was applied to the eye to determine the appropriate power and base curve (BC) for free-form scleral lenses to be ordered.
- All data was sent to the manufacturer and a free-form scleral lens was designed.
- Number of scans and data regarding initial scleral lens fit are reported.

FIGURE 1
Example of a profilometry scan showing adequate amount of data that was acquired on a patient with keratoconus.

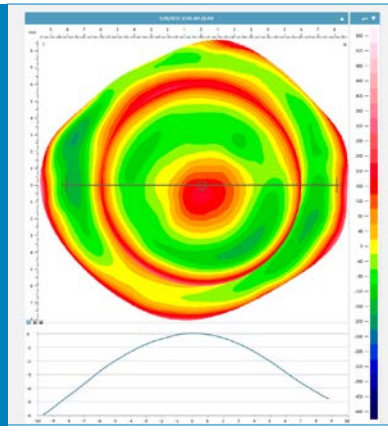


FIGURE 2
AS-OCT of a first scleral lens order showing adequate central corneal vault after a full day of wear.

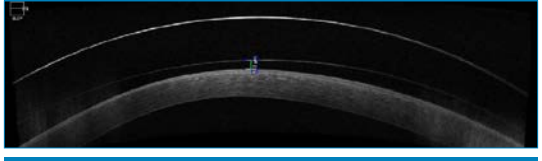


FIGURE 3
AS-OCT of a first scleral lens demonstrating central corneal touch after 4 hours of wear.

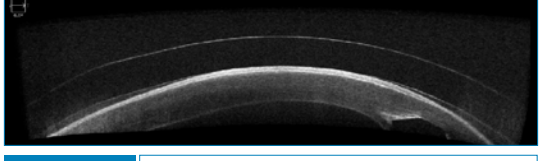
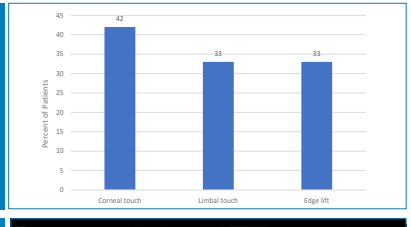
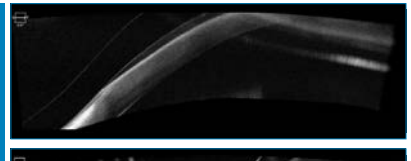


FIGURE 4
Percentage of Initial Scleral Lenses with Corneal Touch, Limbal Touch, Edge Lift



FIGURES 5 & 6
AS-OCTs of first scleral lenses for patients exhibiting limbal touch and edge lift after 4 hours of wear.



RESULTS

- Cornea-scleral profilometry images were obtained on 6 patients, 12 eyes. (Figure 1)
- An average of 3 images per eye (range 2-7) were acquired to ensure enough data could be extrapolated.
- 4 patients had to return to the office for additional image acquisition due to inadequate image quality of the sclera.
- Only 25% (3 of 12) of the initial scleral lenses ordered were able to be dispensed due to adequate fit. (Figure 2)
- All 3 of these SLs had to be re-ordered with an added over-refraction.
- 33% (4 of 12) of the first SL ordered exhibited corneal touch within 30 minutes to 4 hours of lens settling and patients experienced redness and irritation with SL wear. (Figures 3 and 4)
- 42% (5 of 12) of the first SL ordered exhibited limbal touch and 33% (4 of 12) had edge lift. (Figures 5 & 6)
- 2 patients discontinued free-form SL design due to inadequate fit after multiple re-orders.

DISCUSSION

- The majority of scleral lenses are fit in-office using diagnostic fitting sets.
- Cornea-scleral profilometers can measure both the cornea and scleral surfaces, allowing practitioners to custom design scleral lenses from these measurements.
- Adequate tear film, eyelid control, proper fixation, and user familiarity with the profilometer are critical to obtain quality measurements for scleral lenses to be designed.

CONCLUSION

- While cornea-scleral profilometry can provide details about the ocular surface, the number of scans needed to produce sufficient data slowed our clinic's flow and several patients had to return for subsequent image acquisition.
- The patients in this cohort had moderate to severe keratoconus. While this technology provides the practitioner with valuable data, it may be more successful for patients with milder corneal irregularities.

SUPPORT

NKCF
National Keratoconus Foundation

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Blue Light Blocking Filters and Antireflective Coatings for Digital Reading: Does the Effect Differ for Low vs. High Eye Strain Symptoms

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PURPOSE

With increasing time spent on digital devices, there is rising awareness and interest in the use of blue blocking (BB) filters and antireflective (AR) coatings on lenses to reduce symptoms of digital eye strain (DES). Since these filters and coatings are available and being marketed, studies need to be done to outline what effect, if any, they have.

Because study designs, parameters, and measurements largely vary, current research is inconclusive about the effects BB and/or AR coats can have on DES. This study looks to expand on emerging data. We conducted an experiment to identify and evaluate the possible effects of BB and/or AR coatings relative to a coating-free control lens in participants with low and relatively higher DES symptoms. Outcomes assessed were pursuits, saccades, fixation, reading rate, and subjective assessment of DES symptoms.

METHODS

Twenty-eight emmetropic/contact lens corrected subjects (ages 22-31 years old; 10 male, 18 female) completed study. Participants had no previous dx of accommodative/ BV issues, congenital color deficiency, or dry eye; and denied routine use of artificial tears with digital device use. Subjects wore clear BB, AR, BB/AR, and control (coating-free) lenses in a randomized order and completed the following for each set of lenses: pursuit, saccade and fixation assessments via RightEye® testing, a 20-minute digital reading task, and a symptom questionnaire (See Table 1).

Based on total questionnaire score with control lenses, 14 subjects were grouped into low symptom score group (total score 0-8) and 14 subjects in the higher symptom group (total score 10-44).

Total and individual question symptom scores as well as saccade, pursuit, fixation, and reading rate measurements were compared for the high/low symptom groups while were wearing the BB, AR/BB, AR lenses. Mixed analysis of variance tests, pairwise T test comparisons were used for statistical analysis.

SAMPLE LENSES

FIGURE 1
Average % change in Reading Rate vs. Lenses

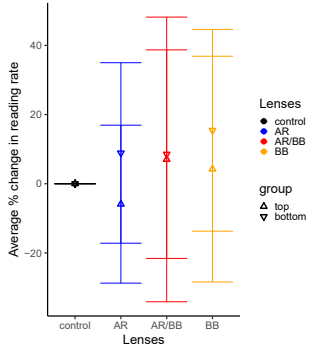

FIGURE 2
Average % change in Pursuits vs. Lenses

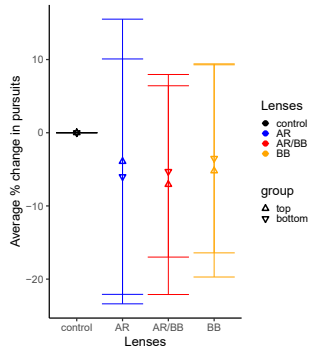

FIGURE 3
Average % change in Saccades vs. Lenses

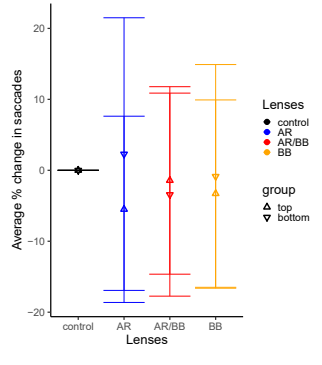

FIGURE 4
Average % change in Fixation vs. Lenses

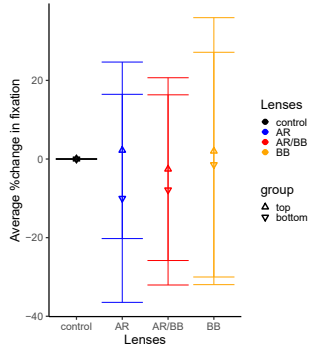

TABLE 1: p-value table

Survey Question	Group p-value	Lenses p-value	Group:Lenses p-value
Blurred vision while viewing the text	0.460	0.343	0.920
Blurred vision when looking in the distance at the end of the near task	0.272	0.376	**0.017***
Difficulty or slowness in refocusing eyes from one distance to another	1.000	0.917	0.278
Irritated or burning eyes	0.359	0.517	0.070
Dry eyes	0.199	0.693	0.687
Eye strain	0.022*	0.918	0.144
Headache	0.924	0.455	0.865
Tired eyes	0.062	0.411	**0.031***
Sensitivity to bright lights	0.503	0.509	0.696
Discomfort in your eyes	0.086	0.707	0.152
Total	0.075	0.896	0.259

RESULTS

No statistically significant difference between the low/high symptom groups, lenses (BB, AR, AR/BB, control), and combined group/lens interactions for reading rate, pursuits, saccades, and fixation was found. See Figures 1-4.

No statistical significance difference between the groups, lenses, and group/lens interactions for the total score or survey questions except for statistical significance with the group/lens (BB/AR) interactions for 'blurred vision when looking in the distance at the end of the near task' as well as 'tired eyes' and between the groups for 'eye strain'. See Table 1.

CONCLUSION

BB and/or AR coats have no significant impact on objective measures such pursuits, saccades, fixation, and reading rate regardless of symptom level. More symptomatic people may experience subjective lessening of some eye strain symptoms with BB/AR coats

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The effect of flicker adaptation on contrast sensitivity in the inferred magnocellular visual pathway in glaucoma patients

Xiaohua Zhuang, PhD, FAAO; Doris Jin, OD; Daniel K. Roberts, OD, PhD, FAAO

1. INTRODUCTION

Contrast sensitivity deficits in the inferred magnocellular visual pathway have been reported in glaucoma patients [1]. Studies have also showed temporal desensitization (i.e., reduction of contrast sensitivity) in the magnocellular pathway from flicker adaptation [2, 3].

PURPOSE: To investigates whether flicker adaptation would cause a larger temporal desensitization effect in glaucoma patients as compared to visually normal subiects.

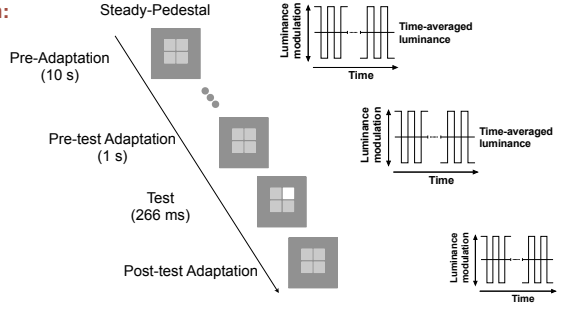
2. METHODS

Observers: Two groups of subjects, a glaucoma patient group and an age-matched control group with 9 subjects in each, were tested.

Stimuli: The steady-pedestal paradigm was used [4]. A pedestal of four 1°x1° squares with a predefined luminance (15.0, 16.86, 18.88, 21.19, or 23.77 cd/m^2) in a background at 15.0 cd/m^2.

Apparatus: An apple computer and a 21" NEC CRT monitor.

Paradigm:



Task and Threshold Estimation: To identify the test square that differs from the other three in a 4AFC double-random staircase procedure, with the average of last six reversals taken as the estimate of contrast threshold.

Adaptation Conditions:

- **Non-flicker:** Steadily present pedestal at a predefined luminance (15.0, 16.9, 18.9, 21.2, or 23.8 cd/m^2).
- **Flicker:** 7.5 Hz square-wave luminance modulated pedestal at time-averaging luminance of 15.0 cd/m^2 and 50% contrast.

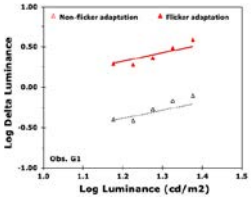
3. RESULTS

Analysis:

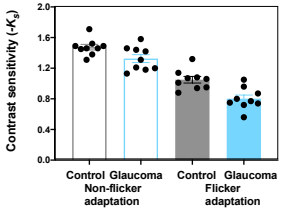
(1) Steady-pedestal model based on primate physiology findings [4, 5] :

- $\log(\Delta I) = K_s + \log(I)$
- $-K_s$: the log sensitivity of the MC-pathway

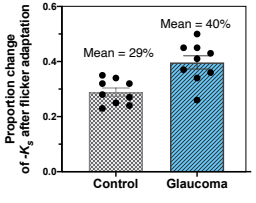
(2) Linear mixed model was used to analyze the effects of patient group, visual adaptation condition, and their interaction on contrast sensitivity in the magnocellular pathway.



Example of an individual's results: shows the main effect of adaptation



Contrast sensitivity by group by adapting conditions



Desensitization effect by subject group

Results:

(1) significant main effect of adaptation condition (p<0.005), indicating reduction of contrast sensitivity from flicker adaptation; and

(2) significant main effect of patient group (p=0.003), indicating contrast sensitivity in the glaucoma group is significantly lower than in the control group; and

(3) significant interaction effect (p=0.017), showing a larger desensitization effect from flicker adaptation in the glaucoma patient group than in the control group.

4. CONCLUSION

The study showed significant reduction of contrast sensitivity in the magnocellular pathway for glaucoma patients. Furthermore, flicker adaptation leads to larger temporal desensitization in the magnocellular pathway in glaucoma patients when compared to age-matched control subjects. These results suggest that flicker adaptation may be a tool to temporally amplify the contrast sensitivity loss in glaucoma patients, which might help facilitating early detection of glaucoma.

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ICO

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2 ICO PRESENTATIONS

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Use of Genetic Testing to Confirm Late-Onset Stargardt Disease

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Click images to enlarge

INTRODUCTION

Stargardt disease is an autosomal recessive inherited retinal dystrophy caused by ABCA4 gene mutations. It is characterized by retinal yellow or white flecks and RPE atrophy. Symptoms traditionally occur during the first two decades of life, leading to gradual central vision loss. However, a less common and late-onset subtype of Stargardt can also occur. It typically presents in the fourth or fifth decades of life, is usually not as severe and less progressive; therefore, it may be confused for other maculopathies making genetic testing a vital test in confirming the diagnosis.

CASE REPORT

A 68-year-old Black female presented to the clinic with the chief complaint of floaters OU. Her systemic history was significant for osteoarthritis, hyperlipidemia, and hypertension, which were controlled with medications. Her best-corrected acuities were 20/20- in each eye. Dilated examination confirmed vitreous syneresis OD and a complete PVD OS, consistent with her chief complaint. Incidental findings included macular pigmentary changes in a parafoveal bullseye pattern OU (Image 1a) and additional testing was ordered.

IMAGE 1A
Optos fundus photography displays parafoveal macular pigmentary changes in the right and left eye.

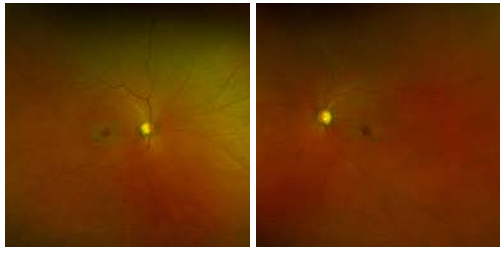


IMAGE 1B
Fundus autofluorescence of the right and left eye shows parafoveal hyper and hypo autofluorescence corresponding to areas of retinal involvement (flecks) and RPE atrophy respectively.

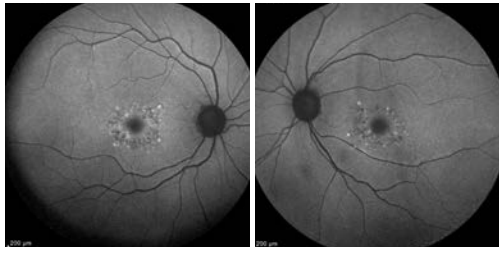


IMAGE 2
High definition 5-line raster macular OCT images of the right and left eye reveal disruption of the IS-OS junction of the photoreceptors, sparing the fovea. The external limiting membrane is subtly enhanced in both eyes.

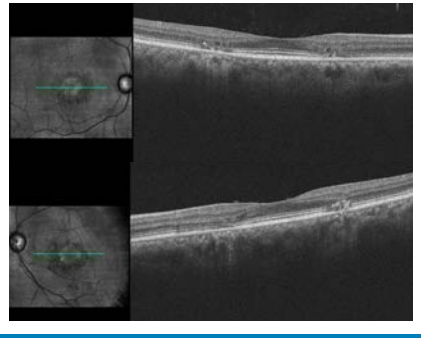
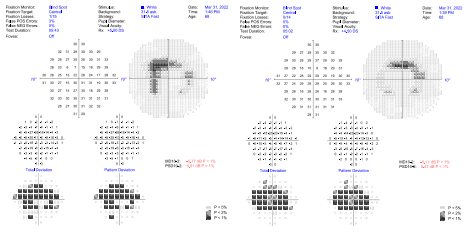


IMAGE 3
HVF 10-2 SITA Fast testing demonstrates bilateral paracentral relative scotomas, corresponding to the parafoveal lesions.



RESULTS

Optical coherence tomography (OCT) testing revealed parafoveal disruption of the inner segment-outer segment (IS-OS) junction of the photoreceptors, sparing the fovea OU (Image 2). Fundus autofluorescence (FAF) showed hyper and hypo autofluorescence corresponding to areas of retinal involvement and RPE atrophy respectively (Image 1b). Baseline Humphrey Visual Field (HVF) 10-2 testing resulted in a central ring scotoma in each eye (Image 3). She denied hydroxychloroquine use. Due to these findings, the patient was scheduled for genetic testing (Invitae, ID your IRD program) which confirmed an ABCA4 mutation (c.6079C>T). She was diagnosed with late-onset Stargardt disease and genetic counseling was provided.

CONCLUSION

Late-onset Stargardt disease usually presents with a milder decrease in visual acuity and more subtle retinal findings when compared to traditional Stargardt disease. This report highlights an example of incidental diagnosis during routine eye examination for an asymptomatic patient. Genetic testing (Invitae, ID your IRD program) supported the diagnosis. In this case, progressive vision loss is unlikely but regular follow up examinations with OCT and FAF will be useful to monitor the disease.

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Lambertus S, Lindner M, Bax NM, et al. Progression of Late-Onset Stargardt Disease. Invest Ophthalmol Vis Sci. 2016;57(13):5186-5191. doi:10.1167/iovs.16-19833

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Progressive Optic Atrophy in the Presence of an Anterior Chiasmal Syndrome Secondary to Rathke's Cleft Cyst

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INTRODUCTION

Rathke's Cleft Cyst (RCC) is a benign, cystic tumor arising from the embryological remnants of Rathke's pouch within the pars intermedia of the pituitary gland. The condition is most commonly identified in females and within the 4th and 5th decades of life. Persistent headaches are the most often reported symptom while endocrine dysfunction and visual field loss/defects are common clinical findings.

CASE PRESENTATION

A 78-year-old African American male presents for a neuro-optometric consultation for progressive vision loss in the left eye over the course of several years. The patient has a present ocular history of pseudophakia, cystic macular edema, and unspecified optic atrophy. The patient's medical history includes Type II Diabetes Mellitus, hypertension, hypercholesterolemia, and long-standing headaches. See Table 1 for clinical testing results.

TABLE 1
Clinical testing results

OD		OS
20/20 -3	**Visual Acuity (Snellen)**	20/60 -1 PHNI
ERRL (-)RAPD	**Pupils**	ERRL (-)RAPD
FTFC	**Confrontation Visual Field**	Inferonasal defect
FROM	**Extraocular Muscles**	FROM
13 mmHg	**Tonometry (Goldmann)**	13 mmHg
• ONH is round, flat with distinct margins • C/D 0.25/0.25 • Arteriolar narrowing • Peripheral drusen	**Dilated Fundus Exam**	• ONH is round with diffuse pallor most prominent temporally • C/D 0.55/0.65 • Arteriolar narrowing • Peripheral drusen

FIGURE 1
Optical Coherence Tomography (OCT) imaging reveals temporal thinning of the left neuro-retinal rim and asymmetry in the RNFL tissue.

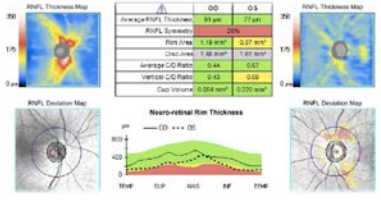


FIGURE 2
OCT imaging shows irregular temporal/ inferotemporal thinning of the left macula.

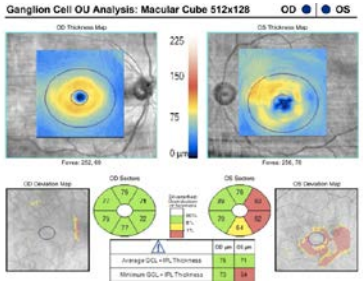


FIGURE 3
Raster imaging on OCT reveals microcystic/ microvacuolar edema changes predominantly involving the inner retinal layers.

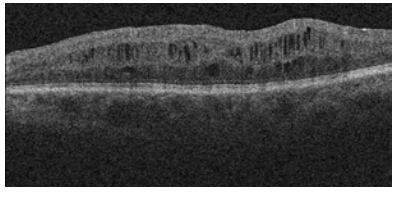
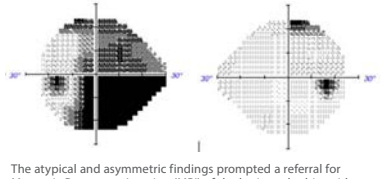


FIGURE 4
Humphrey Visual Field (24-2 SITA-Standard, Size III Stimulus) testing resulted in a right hemifield defect involving fixation in the left eye and a peripheral superior temporal defect in the right eye which is best described as a junctional syndrome.



The atypical and asymmetric findings prompted a referral for Magnetic Resonance Imaging (MRI) of the brain and orbits without contrast. Imaging revealed a cystic-appearing mass with a mural nodule within the pituitary gland (Figure 5). A secondary MRI of the sella further showed a cyst measuring 1.63cm with a suprasellar extension in close proximity to the left optic chiasm (Figure 6). The patient was diagnosed with a Rathke's Cleft Cyst with an associated compression of the left anterior chiasm.

FIGURE 5
MRI of the brain without contrast depicts a cystic-appearing mass containing a mural nodule and expanding the floor of the sella.

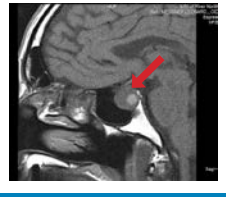
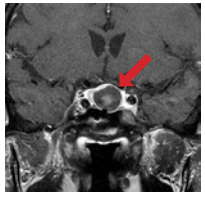


FIGURE 6
MRI of the sella without contrast reveals a suprasellar extension of the lesion with close approximation to the left aspect of the optic chiasm, highlighted by the red arrow.



TREATMENT AND MANAGEMENT

Current treatment for a small RCC without clinical sequela includes regular monitoring with neurology and perimetric testing. Larger lesions with significant clinical manifestations can be drained through a trans-sphenoidal approach or removed via extirpation. It should be noted that complete removal of the Rathke's pouch epithelium raises the risk of a poorly functioning pituitary gland which may then lead to severe endocrine dysfunction. If the epithelium remains intact, the risk of tumor recurrence is high. Despite the severity of the present case, the patient opted to continue monitoring the condition.

DISCUSSION

A lesion involving the pituitary gland must initially be differentiated as benign or malignant in nature. A nonthreatening tumor must be further classified as confined/stagnant or with the potential of disrupting adjacent neurological structures. A RCC is most often differentiated from other benign lesions such as a craniopharyngioma and a pituitary adenoma. MRI allows for further discrimination between these lesions based on size, signal intensity, and where on the pituitary gland the growth takes place.

In cadaveric studies, small RCCs are present in 13-22% of specimens but only 2-9% of cases exert sufficient mass effect on surrounding tissues. There is variability in the location of the cyst in relation to the sella turcica in which the pituitary gland resides. This can lead to compression of the surrounding structures including the optic chiasm which may result in visual field loss/defects. Compressive optic neuropathy has been linked to the process of retrograde maculopathy which is the culmination of a problematic axonal flow. The microvacuolar changes are caused by impaired fluid clearance secondary to ion imbalance and aquaporin dysfunction within Mueller cells.

CONCLUSION

Despite a benign nature and high prevalence, RCC can provoke significant clinical sequelae. The prognosis is highly variable and depends on the time between presentation and treatment. In cases of visual field loss, the severity and duration of the visual loss, disc atrophy, recurrence, and geographic expansion of the mass influence the overall outcome. Since the recovery of the vision is correlated with the length of time to decompress, prompt diagnosis is crucial. Retrograde maculopathy secondary to compressive optic neuropathy is a complication that is often confused for a different etiology and can thus aid in painting the full clinical picture.

REFERENCES

Available upon request.

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ARVO

4 ICO PRESENTATIONS

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Effect of Low-Dose Atropine on Binocular Vision in Children Aged 6 to 17 Years

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PURPOSE

To determine the effect of 0.01%, 0.03%, and 0.05% atropine on pupil size and binocular vision function in children aged 6 to 17 years.

METHODS

Forty-six children (28 girls and 18 boys) aged 6 to 17 years were randomized into 4 groups: placebo (n=10), or 0.01% (n=13), 0.03% (n=11), 0.05% (n=12) atropine. One drop of atropine was administered into each eye. The following measurements were collected before drop instillation and 30 minutes, 60 minutes, and 24 hours following application of atropine: pupil size in bright and dim illumination, associated phoria by cover test at distance and near, near point of convergence (NPC) break and recovery, 5 times repeat of NPC (stamina), NPC through red and green glasses (fragility), negative fusional vergence at near, and positive fusional vergence at near. Repeated measures ANOVA was performed to determine the effect of 0.01%, 0.03%, and 0.05% atropine eye drops on binocular vision measurement at each time point . Cycloplegic refractive error was collected from each participant's last exam at the Illinois Eye Institute within the last two years. The spherical equivalents of cycloplegic refractive error means OD, OS for each atropine concentration group are presented in Figure 1.

FIGURE 1

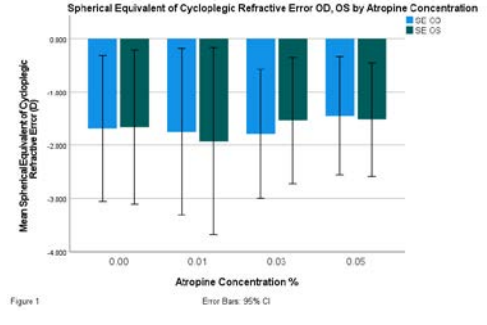


FIGURE 2

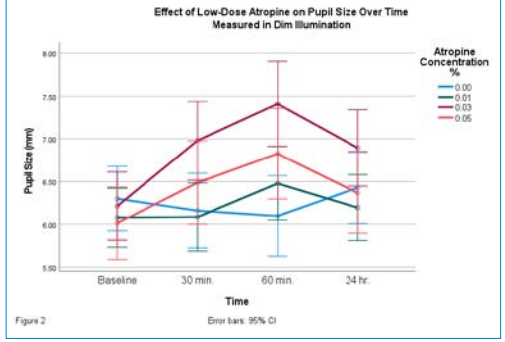


FIGURE 3

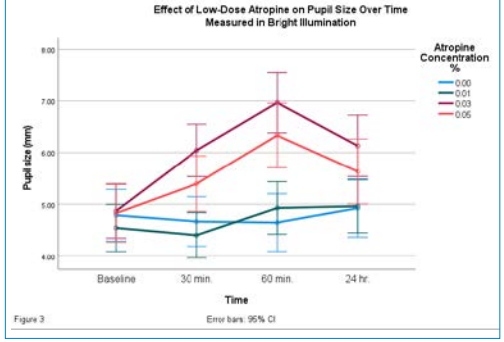


FIGURE 4

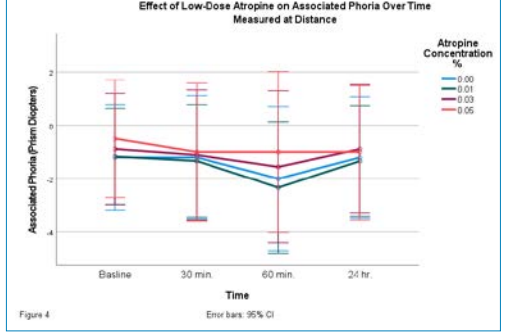
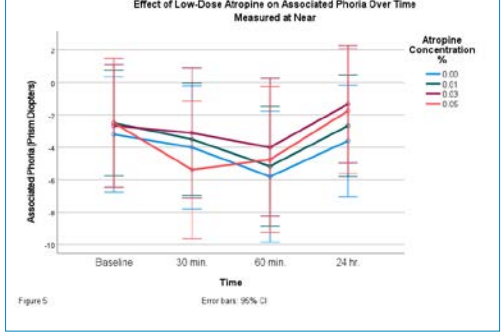


FIGURE 5



RESULTS

The mean age of participants was 10.7 ±3.0 years. Average spherical equivalent refractive error by cycloplegic refraction was -1.70 ± 1.98 D and -1.72 ± 2.10 D (range = +1.50 to -8.75 D and +0.50 to -6.38 D), OD and OS, respectively. Difference in pupil diameters in bright and dim illumination was statistically significant when comparing all 3 atropine groups to placebo group over time (P< 0.001). Atropine eye drops had the most effect on pupil diameter 60 mins after instillation (Ps<0.05). After 24 hours, pupil diameters had return to baseline levels (P>0.05) for the 0.01% and 0.05% groups, but statistically significant differences persisted for the 0.3% group (P=0.002) (see Figure 2 and Figure 3). There was no significant difference in binocular vision measurements including associated phoria , NPC, NPC stamina and fragility, negative fusional vergence, and positive fusional vergence (all Ps >0.05). Figure 4 and Figure 5 depict associated phoria at distance and at near, with positive values indicating esophoria and negative values indicating exophoria.

CONCLUSIONS

Pupil size was significantly enlarged by 0.01%, 0.03%, and 0.05% atropine in both dim and bright illumination with greatest effect at 60 minutes after application. However, low-dose atropine eye drops had no significant effect on associated phoria by cover test at distance and near, near point of convergence (NPC) break and recovery, 5 times repeat of NPC (stamina), NPC through red and green glasses (fragility), negative fusional vergence at near, or positive fusional vergence at near. These results suggest that low-dose atropine can be safely used to treat myopia progression in children aged 6 to 17 years, without having significant untoward effects on binocular vision function.

DISCUSSION

Some of the strengths presented in our study include the testing of several atropine concentrations (0.01%, 0.03%, and 0.05%), the variety of tests performed at each time point, and the objectivity of the tests selected. Our study was limited primarily by sample size, as well as study drop-out at the 24-hour time point of 6 participants (13.04%). Further investigation must be conducted to explore the effect of low-dose atropine on binocular vision function.

CONTACT

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High Contrast Visual Acuity and Fogging in Established Scleral Lens Wearers

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[4]Korb and Associates, Boston, MA, United States, [5]The Ohio State University, Columbus, OH, United States

SCOPE
Scleral Lenses in Current Ophthalmic Practice Evaluation

INTRODUCTION

Patients may be fit with scleral lenses (SLs) for indications such as ocular surface disease or irregular corneal astigmatism. Patients wearing SLs often report improved vision and comfort, but some experience mid-day fogging, which may require removal and reapplication of their SLs due to blurry or hazy vision.

The purpose of the present study was to document high contrast visual acuity pre- and post-scleral lens removal in patients with (foggers) and without (non-foggers) subjective mid-day fogging.

METHODS

- Scleral lens wearers who had worn SLs for a minimum of six months were recruited from five clinical sites
  - Any indication for SL wear was acceptable for enrollment.
- Subjects who wore SLs for at least 2 hours prior to follow-up examinations were asked to participate
- Informed consent was obtained prior to clinical measurements
- The following information was collected:
  - Patient demographics
  - Subjective complaint of mid-day fogging
  - High contrast Freiburg Visual Acuity and Contrast Test (FrACT) pre- scleral lens removal
  - High contrast Freiburg Visual Acuity and Contrast Test (FrACT) post- scleral lens removal
- Descriptive statistics are reported. Comparisons were made by t-test

RESULTS

- Thirty established scleral lens wearers (53 eyes) participated in this study
- The mean age of study participants was 46 ± 14.6 years (range 24-76 years)
- Subjects reported a mean SL wear time of 12.5 + 3.2 hours per day (range: 5-17 hours)
- Subjects reported a mean SL wear time of 6.5 + 0.8 days per week (range: 4-7 days)

FIGURE 1
57% (17/30) of Subjects Reported Mid-Day Fogging

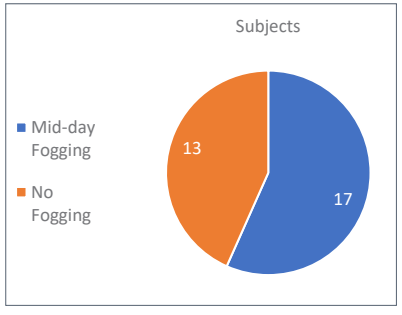

FIGURE 2 & 3
Anterior Segment Images of Subjects' Scleral Lenses and Posterior Fluid Reservoir Who Reported Mid-Day Fogging

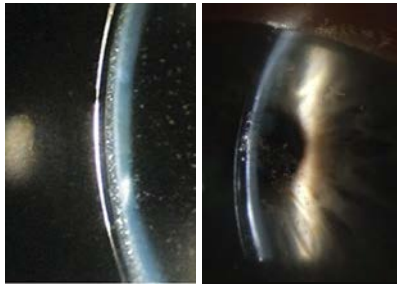

TABLE 1
Indication for Scleral Lens Wear

	Foggers	Non-Foggers
Corneal Irregularity	6	9
Ocular Surface Disease	10	2
Refractive error	1	2

TABLE 2
Mean FrACT Acuity Pre- and Post- Scleral Lens Removal in Foggers and Non-Foggers

	2 or more hours of lens wear	After re-application of lens	P
Foggers; logMAR Mean ± SD (Range)			
Right Eye	0.23 ± 0.3 (-0.09 to 0.94) n=13	0.14 ± 0.2 (-0.11 to 0.5) n=12	0.5
Left Eye	0.08 ± 0.2 (-0.23 to 0.32) n=15	0.14 ± 0.2 (-0.06 to 0.6) n=12	0.3
Non-Foggers; logMAR Mean ± SD (Range)			
Right Eye	-0.06 ± 0.3 (-0.98 to 0.44) n=11	-0.05 ± 0.3 (-0.9 to 0.42) n=12	0.6
Left Eye	-0.04 ± 0.3 (-0.81 to 0.34) n=11	-0.05 ± 0.3 (0.81 to 0.34) n=11	0.8

- Mean FrACT acuity in foggers was 0.23 + 0.3 logMAR (range: -0.09-0.94 logMAR, n=13) for right eyes and 0.08 + 0.2 (range: -0.23-0.32 logMAR, n=12) for left eyes
- There was no statistically significant difference in FrACT acuity pre- or post-scleral lens removal in foggers for the right (p=0.5) or left (p=0.3) eyes

TABLE 3
Difference in FrACT Acuity Between Foggers and Non-Foggers With At Least 2 Hours of Scleral Lens Wear

	Foggers	Non-Foggers	P
With at least 2 hours of lens wear; logMAR Mean ± SD (Range)			
Right Eye	0.23 ± 0.3 (-0.09 to 0.94) n=13	-0.06 ± 0.3 (-0.98 to 0.44) n=11	0.05
Left Eye	0.08 ± 0.2 (-0.23 to 0.32) n=15	-0.04 ± 0.3 (-0.81 to 0.34) n=11	0.3
After re-application of lens;logMAR Mean ± SD (Range)			
Right Eye	0.14 ± 0.2 (-0.11 to 0.5) n=12	-0.05 ± 0.3 (-0.9 to 0.42) n=12	0.1
Left Eye	0.14 ± 0.2 (-0.06 to 0.6) n=12	-0.05 ± 0.3 (0.81 to 0.34) n=11	0.1

- There was a barely significant difference in FrACT acuity between foggers and non-foggers in the right eye (p=0.05) but not in the left (p=0.3) eye with over two hours of lens wear

DISCUSSION

The patient-reported phenomenon of mid-day 'fogging' occurs in 20-33% of scleral lens wearers. [1] The term 'fogging' may encompass patients who are symptomatic due to increased front-surface non-wettability and/or post-lens fluid reservoir debris. Both can be observed on slit lamp examination and AS-OCT imaging, but there needs to be improved differentiation between anterior (front surface non-wetting) and posterior (fluid reservoir debris) causes of patients' symptoms for improved management.

Several factors may contribute to fogging including increased lipids and/or inflammatory molecules (MMP 9 and MMP 10) in the fluid reservoir, greater presence of leukocytes, and/or a non-optimal SL fitting relationship. Management includes addition of novel surface treatments to the SL, change in fill and disinfecting solutions, aggressive management of dry eye disease, and optimization of the SL fit. [1-5]

CONCLUSION

Over half of the subjects in this study reported mid-day fogging but there was no difference in high contrast visual acuity pre-and post-scleral lens wear and minimal to no difference between foggers and non-foggers.

Further analysis may provide more insight into the correlation between the subjective complaint of mid-day fogging and clinician observed findings.

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4. Mickles C, Harthan J, Barnett M. Assessment of a novel lens surface treatment for scleral lens wearers with dry eye. Eye Contact Lens. 2021 May 1;47(5):308-313.

DISCLOSURES

None (C. Nau, M. Schornack, and A. Nau)
J. Harthan: (F) Baush and Lomb, Kala Pharmaceuticals, Ocular Terapeutix, Metro Optics.; (C) Allergan, Essilor, Euclid Systems, International Keratoconus Academy, Metro Optics, SynergEyes, Visioneering Technologies Inc.
E.Shorter: (F) Johnson & Johnson, BostonSight, Contamac, Art Optical, SynergEyes
J. Fogt: (C) Alcon and Contamac; (F) Alcon, Contamac, EyeNovia, Innovega, Nevakar

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Research to Prevent Blindness

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Prevalence of abnormal corneas in the United States based on Scheimpflug tomography analytics of a pediatric population

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[1]Illinois College of Optometry; [2]Oculus, Inc; [3]Cornea and Laser Eye Institute; [4]Walter Reed National Military Medical Center, Bethesda, MD; [5]North Suburban Vision Consultants

INTRODUCTION

The prevalence of keratoconus (KC) has traditionally been reported as 1 in 2,000 individuals [1]. A more recent study from the Netherlands, reports the prevalence to be 1 in 375 individuals [2]. There is limited reference to the prevalence of KC as determined by tomography in children, and none in a US based population.

PURPOSE

The goal of this study was to determine the prevalence of abnormal corneas in pediatric subjects in the US.

SUBJECTS

Subjects were recruited from the general population of an urban school-based vision clinic located on the south side of Chicago and was part of the Chicago Public School system. The clinic was run by the Illinois College of Optometry and served children within the Chicago school systems. The subjects were being seen because they were referred by the school or parents, failed a vision screening, needed replacement glasses, annual exams or were being considered by special education services which required a comprehensive eye exam. The majority of the of subjects (>90%) were receiving free lunches based on the family income. Services were provided regardless of ability to pay or insurance coverage. All subjects had a consent signed by their parent or guardian. The Illinois College of Optometry IRB approved the study.

METHODS

- Children aged 3-18 years seeking comprehensive eyecare at a school-based vision clinic located within the Chicago School systems were enrolled in a prospective, observational, single center (Illinois Eye Institute at Princeton, Chicago) study.
- The study was reviewed and approved by the Institutional Review Board at the Illinois College of Optometry.
- Scheimpflug tomography (Pentacam HR, OCULUS Optikgrate GmbH, Germany) was acquired on each eye during comprehensive exams after obtaining consent.
- Automated multimetric analysis (Belin/Ambrosio Enhanced Ectasia BAD3, OCULUS Optikgrate GmbH, Germany) was run on each scan and the BAD Final D (Final D) was derived.
- The prevalence of KC from the generation 2 Raine Study is 1.2% (1 in 84) using a Final D score of >2.6 (derived from Scheimpflug imaging) [3].
- The BAD3 was designed to separate normal from abnormal corneas using a Final D > 1.99.
- Maps with a Final D of > 3.00 are flagged red and are considered abnormal, likely due to ectasia and/or keratoconus.
- A Final D of ≥ 3.00 was used to calculate prevalence of abnormal corneas for this study.
- The following criteria were used to differentiate normal from suspicious corneas from abnormal corneas (Table 1):
  - Normal, Final D < 2.00 in both eyes
  - KC Suspect, Final D = or > 2.00 - 2.99 in at least one eye
  - Abnormal, likely due to ectasia and/or KC, Final D = or > 3.00 in at least one eye
- Statistical analysis was performed with SPSS version 25.0 (IBM Corp., Armonk, NY, USA).

RESULTS

- 2212 subjects were screened for this analysis.
- Subjects > 18 yrs of age or subjects missing data on the Final D measurements were excluded.
- Among those included, 96.3% (n=2131) were identified as Black or LatinX (61.9% (n=1369) were Black and 34.4% (n=762) LatinX).
- Of the total subjects screened, 8.3% (n=184) had a Final D ranging between 2.00-2.99 in at least one eye putting them in the category of keratoconus suspect. In looking at the racial/ethinic difference: 9.4% (n=129) of the Black and 6.7% (n=50) of the LatinX subjects had a Final D between 2.00 – 2.99 in at least one eye and assumed to be keratoconus suspect.
- A review of the outcomes for those that fall into the category of keratoconus: 1.4% (n=31) of the total subjects which represents 1.4% (n=19) of the Black and 0.9% (n=7) of the LatinX population had a Final D of at least 3.00 in at least one eye and were considered keratoconic.

TABLE 1
Pentacam Final D Results: Normal, Keratoconus Suspect, Keratoconus for Black and LatinX Pediatric Population

	Total	Normal Final D <2.00 Both Eyes	KC Suspect Final D 2.00-2.99 In at least 1 Eye	KC Final D ≥ 3.00 In at least 1 Eye
Total N (%)	2212 (100%)	1997 (90.3%)	184 (8.3%)	31 (1.4%)
Black N (%)	1369 (100%)	1221 (89.2%)	129 (9.4%)	19 (1.4%)
LatinX N (%)	762 (100%)	705 (92.5%)	50 (6.7%)	7 (0.9%)

CONCLUSIONS

In a primarily Black and LatinX pediatric cohort the prevalence of KC was found to be 1.4% (1 in 71), higher than what has been reported. The results of our analysis suggests that there are likely a higher prevalence of pediatric patients who either identify as Black or LatinX who may be at risk for KC.

Those patients who are considered keratoconus suspect are important to screen and identify early as they require close monitoring. Corneal tomography may be a vital component of pediatric eye exams for early diagnosis and treatment of keratoconus.

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DISCLOSURES

Sandra Block, None; Jennifer Harthan, Illinois College of Optometry (E); Xiaohua Zhuang, None; William Tullo, Oculus, Inc (E); John Gelles, Corneal and Laser Eye Institute (E); Andrew Morgenstern, Washington Eye Physicians (E); Barry Eiden, North Suburban Vision Consultants (E)

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The Effect of Ophthalmic Blue Blocker Filters and Anti-Reflective Coats on Digital Reading Efficiency and Comfort

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INTRODUCTION

With increasing time spent on devices, there is rising interest in the use of blue light blocking (BB) filters and antireflective (AR) coats on lenses to reduce symptoms of digital eye strain. Since AR coats and BB filters both separately and combined are widely available from professional and nonprofessional sources, guidance about their benefits is needed.

Current research is inconclusive about the possible positive effect of BB filters on digital eyestrain. Due to differences in variables measured and their results, benefits of these filters on eye strain are unclear. Clinical research is about the effect of AR coats alone and in combination with BB filters on digital eyestrain is limited. This study looks to expand the emerging data on BB filters .

TABLE 1
Symptoms and p_Value

Symptom	p_value
Blurred Vision while viewing the text	0.45
Blurred vision when looking in the distance at the end of the near task	0.49
Difficulty or slowness in refocusing eyes from one distance to another	0.96
Irritated or burning eyes	0.71
Dry eyes	0.78
Eye strain	0.94
Headache	0.65
Tired eyes	0.56
Sensitivity to bright lights	0.65
Discomfort in your eyes	0.74

PURPOSE

We conducted an experiment to identify and evaluate the possible effects of commercially available BB and/or AR coatings compared to coating-free control lenses. Outcomes assessed were pursuit and saccade eye movements, fixation, reading rate, and subjective assessments of digital eye strain symptoms.

METHODS

- Twenty-eight emmetropic or contact lens corrected subjects (ages 22-31 years old; 10 male, 18 female) completed study.
  - o No previous dx of accommodative/ BV issues, congenital color deficiency or dry eye
  - o Denied routine use of artificial tears with digital device use
- Subjects wore clear, un-tinted BB, AR, BB/AR, and control (coating-free) lenses in a randomized order and completed the following
  - o Pursuit, saccade and fixation assessments via RightEye® testing
  - o A 20-minute reading task while wearing each of the lenses
  - o A questionnaire regarding their eye strain symptoms See Table 1
- Analysis of variance tests were used for statistical analysis.

FIGURE 1
Change in Fixation

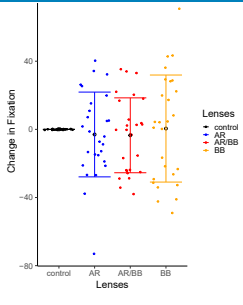


FIGURE 2
% Change in Reading Rate

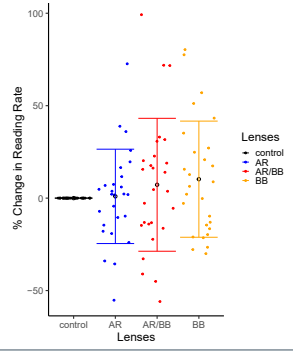


FIGURE 3
Change in Pursuits

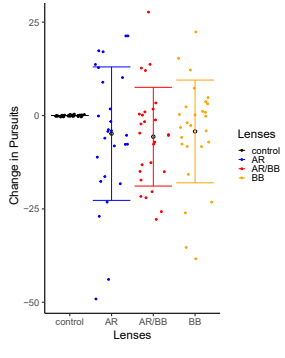


FIGURE 4
Change in Saccades

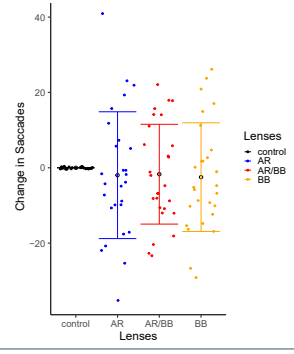
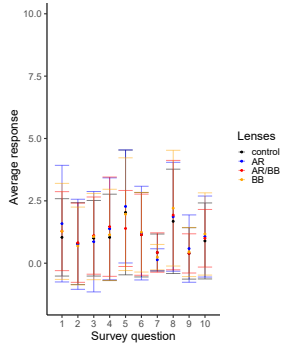


FIGURE 5
Average Survey Response



RESULTS

- See Table 1 and Figure 1-5

DISCUSSION

- These finds are consistent with previous research using eyestrain questionnaires that indicated no reduction in symptomology with a BB filter. However overall symptoms scores were low in this population.
- These findings are not consistent with previous research on reading rate with BB filters however methods differ in control of reading text and filter color.

CONCLUSION

We find no statistical evidence to support claims that BB filters with or without AR coat or with AR coat alone will improve digital eye strain symptoms. This finding is consistent with other studies using the same symptom questionnaire. Additionally, we find no support for these filters and coatings to alter eye movements or change reading rate significantly.

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4 ICO PRESENTATIONS

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An Overview of the Illinois College of Optometry, Vision Therapy and Vision Rehabilitation Residency Program

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HISTORY OF THE PROGRAM

The ICO Binocular Vision & Pediatric Residency Program began in 1990. Dr. Janice Scharre served as the first Program Coordinator and held that position until 1995. Dr. Susan Cotter held the position of Program Coordinator from 1995-97, and then Dr. Valerie Kattouf held the position until 2003. Dr. Christine Allison began the position in 2003 and is the current program coordinator. Sixty residents have completed the program, with two residents currently participating in the program.

The program's Mission Statement is:

Offering advanced competency in pediatrics and binocular vision management through education, scholarship, and patient care.

THE PROGRAM

The Program begins on July 1 and runs for 53 weeks.

The resident's will be provided advanced clinical education in the areas of binocular vision, perception, pediatric optometry, and developmental disabilities. The resident's provide direct care to patients in the Binocular Vision/Pediatric Optometry Clinic and the Developmental Disabilities Clinic at ICO. The patients' range in age from infants to adults, with a large variety of conditions. Residents perform comprehensive eye examinations, visual efficiency evaluations, strabismus/amblyopia evaluations, developmental disability examinations, visual perceptual evaluations, and vision therapy on a routine basis.

In order to keep their therapeutic skills fresh, the residents spend one session per week for the entire length of the program in the Urgent Care Service of the Center for Advanced Ophthalmic Care at ICO. This is an urgent care clinic where the residents will be seeing a variety of anterior segment and posterior segment emergency patients.

The residents teach in one 3rd year laboratory per quarter for the Fall, Winter, and Spring quarters. The labs that they teach are the Treatment of Binocular Vision Disorders Lab (VT procedures), the Strabismus/Amblyopia Lab (strabismus testing procedures), and the Infant/Child Development and Management Lab (visual-perceptual testing procedures). The residents also start precepting students in the Binocular Vision and Pediatric Clinic beginning in the Winter quarter.

To develop skills in the area of Pediatric Low Vision, the residents take two trips to the Illinois School for the Visually Impaired, where they examine pediatric low vision patients and provide them with low vision devices provided by the Lions Clubs. They also have the opportunity to work with one of our Pediatric Low Vision Specialists in the Pediatric department on campus. The residents also participate at two Special Olympics Lions Club International Opening Eyes Screening events. One called Medfest, is held in the Fall each year at the United Center, and the other is during the summer at the Illinois State Summer Special Olympics Games.

The residents are required to give three Grand Rounds presentations to the 4th year students and the faculty based on cases that they see at ICO. Each presentation is to be given in a power point format and lasts approximately 15 minutes.

In order to provide flexibility in the program, the residents can select to work one session in another service at ICO, outside of the pediatric service. For instance, they may choose to work one session in the Cornea/Contact Lens Service, the Neuro Service, the Glaucoma Service, the Primary Care Clinic, or the Low Vision Service.

Tables 1-2 show the teaching, and research responsibilities required for the program.

Figures 1-4 show an example of one of the previous resident's schedules for the year.

Why Do a Residency Program?
- Increased competency with all examination techniques
- Increased experience with challenging cases
- Increased ability to examine infants and toddlers
- Increased experience with public speaking
- Increased marketability for the future
- Increased ability to work in education or hospital-based optometry
- Increased confidence in your own skills and knowledge

TABLE 1
Teaching Responsibilities

1. Provide clinical consultation to optometry student interns, under the supervision of experienced clinical faculty.
2. Participate in clinical grand rounds for fourth year optometry students, other residents, and optometric faculty.
3. Provide didactic or laboratory instruction to students in courses pertaining to binocular vision and vision perception.
4. Provide didactic instruction and lead discussion groups for optometry students in the Binocular Vision & Pediatric Seminar groups.
5. Opportunities to provide continuing education to optometrists or other health care professionals through grand rounds and other presentations.

TABLE 2
Research Responsibilities

1. Required (one or the other): a. A completed research project of publishable quality. b. Literature review or case report of publishable quality.
2. Recommended: Presentation of research or patient case report at state, regional, national, or international meetings.

FIGURE 1
Example of a Starting Summer Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
AM	DAY	Visual Perceptual Lab TA	Direct Care Peds Patients	Development Time and Peds Resident Conferences	Vision Therapy 9:00-1:00	
PM	OFF	Peds Pts with Peds MD on campus	Direct Care Peds Patients	Urgent Care Service	Faculty Conference Series & Resident's Conference	
EVE		Vision Therapy	Direct CarePeds Patients			

FIGURE 2
Example of a Fall Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
AM	DAY	Vision Therapy Lab TA	Direct Care of Peds Patients	Direct Care Peds Patients	Development Time and Peds Resident Conferences	Vision Therapy 9:00-1:00
PM	OFF	Peds Pts with MD on campus or Peds Low Vision		Urgent Care Service	Faculty Conference Series & Resident's Conference	
EVE		Vision Therapy	Direct Care of Peds Pts			

FIGURE 3
Example of a Winter Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
AM	DAY	Cornea/ Contact Lens Resident selected session		Strabismus Testing Lab TA	Development Time and Peds Resident Conferences	Vision Therapy 9:00-1:00
PM	OFF	Peds Pts with MD on campus or Peds Low Vision	Peds Clinic Precept Students	Urgent Care Service	Faculty Conference Series & Resident's Conference	
EVE		Vision Therapy	Direct care of patients			

FIGURE 4
Example of a Spring Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
AM	DAY	Primary Care Resident selected session	Direct care of Peds Patients	Peds Clinic Precept Students	Development Time and Peds Resident Conferences	Vision Therapy 9:00-1:00
PM	OFF	Peds Pts with MD on campus or Peds Low Vision		Urgent Care Service	Faculty Conference Series & Resident's Conference	
EVE		Vision Therapy	Direct care of patients			

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Management of Long-standing Esotropia with Hypertropia in an Adult Patient

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INTRODUCTION

Large angle esotropias and hypertropias are often discovered in early childhood due to cosmetic concerns and symptoms. Symptoms of large angle strabismus can present themself in many ways including lack of stereopsis, diplopia, and suppression, along with head tilts/turns and difficulty with schoolwork and sports. Esotropia is most often associated with moderate to high hyperopia. It is unusual for an adult myopic patient to present with these conditions undiagnosed.

CASE HISTORY

A 24-year-old female 2nd year optometry student presented to the clinic for her yearly eye exam with complaints of decreased binocularity and lack of depth perception while learning slit lamp and binocular indirect ophthalmoscopy techniques. Refraction revealed moderate myopia in both eyes, with slight overcorrection in her previous glasses. The patient was currently wearing, -5.75 -1.00 x 004 OD and -5.75 -1.25 x 179 OS. A 35 pd constant alternating esotropia at distance with a 40 pd constant alternating esotropia at near, and a 10 pd constant right hypertropia with a slight head tilt were measured. The patient displayed a lack of stereopsis, seeing zero forms with alternating right and left suppression. Worth 4 Dot revealed deep suppression of the right eye at all distances. Anomalous Correspondence was revealed with amblyoscope testing but no eccentric fixation or amblyopia exists. At near, 25 pd base out prism was needed to eliminate the suppression but the esotropia and hypertropia were still present. At distance, 40 pd BO were needed to eliminate the patient's suppression. The patient did not know she had an eye turn until having a comprehensive exam during her first year of optometry school, despite having worn glasses for many years prior to this exam. See Table 1 for Pertinent Exam Findings.

TABLE 1
Pertinent Exam Findings

Distance Visual Acuity	20/20 OD, OS
Near Visual Acuity	20/20 OD, OS
OD Refraction	-5.75 -1.00 x 004
OS Refraction	-5.75 -1.25 x 179
Cycloplegic Retinoscopy OD	-4.75 -1.00 X 005
Cycloplegic Retinoscopy OS	-4.75 -1.00 X 165
Distance Cover Test	35 pd CAET with 10 pd CRHypertropia
Near Cover Test	40 pd CAEt With 10 pd CRHypertropia
Randot Stereoacuity	Negative
Worth 4 Dot Testing	OD suppression all distances, dark & light
Amblyoscope Testing	(+) for Anomalous Correspondence
Hering-Bielschosky After Image Test	UTT alternating suppression
Minus Lens Amps	10.25 OD, 13.75 OS
MEM	Lead -0.50/-0.50 OD, OS
Prism added to W4D to eliminate suppression	25 BO at near, 35 BO at interm, 40 BO Dist

MANAGEMENT

Proper binocularity, fusion, and depth perception are important functions for many careers. Symptoms of large angle deviations can lead to visual limitations, affecting possible career options for the patient. In this patient, she was unable to properly use optometry equipment to fully perform her job as a future optometrist. Treatment options for a large angle strabismus involve vision therapy, glasses, prism, and/or surgery. Our patient was not interested in surgery since overall cosmesis was good. Vertical prism using Fresnel prisms was implemented but the patient felt no difference with or without the prism. The value of horizontal prism needed was to large at this time to be practical or effective. Thus, our patient decided to try a course of Vision Therapy with the primary focus of improving her vergence ranges and decreasing her suppression. Therapy with the amblyoscope has been implemented to work on horizontal ranges in the amblyoscope while accounting for the vertical deviation. Positive results regarding the patient's suppression and vergence flexibility have been occurring with weekly Vision Therapy sessions as can be seen in Table 2. Use of Fresnel prisms both horizontally and vertically will be used to prevent diplopia as therapy continues. The patient understands the slow progress of the therapy and is very motivated to continue as evidenced in her own words in Table 3.

CONCLUSION

Binocular testing should be performed on all patients, regardless of cosmesis. Long-standing strabismus may be improved with vision therapy and the use of prisms to make the patient more comfortable and functional. Age should not be a limiting factor in initiating treatment including vision therapy and prism. In this case, vision therapy was the most appealing treatment method for our patient. Long-standing strabismus can be improved with proper techniques. Binocular vision testing is essential in enabling patients to achieve clear and comfortable vision.

TABLE 2
Amblyoscope Starting Results and Best Results With Varying Targets Over the Course of 12 sessions of VT (3 pd of vertical prism was dialed in at all times while using the instrument and the flashing light for suppression was often used.)

VT Session	Target Used	Base In Results(pd)	Base Out Results
Starting	**Large Spider/Web**	**11/0**	12/0
Best to Date		**20/10**	14/4
Starting	**Medium Lion/Cage**	**26/20**	20/8
Best to Date		**30/22**	20/8
Starting	**Rabbit w flower/tail**	**12/6**	15/3
Best to Date		**14/6**	16/4

TABLE 3
Patient Commentary

"Growing up I never categorized my eyes as 'strange' or 'abnormal'. Yes, I experienced the occasional blurry vision at distance, but this was met with some more minus lenses in my glasses and an education piece of "come back in two years or sooner if anything changes." I also never experienced the effects of 3D movies or the emersion of simulation rides/experiences but just assumed that was me not knowing how the glasses worked or that the effect of my glasses negated the 3D ones."

"My first year at ICO in the optometry lab would introduce the idea that maybe my eyes weren't as 'normal' as I thought. My poor lab partner's introduction to performing a cover test was with a large constant alternating esotropia and I couldn't assist because I, myself, was shocked. As the year progressed more skills were geared towards binocular vision such as vergences, phorias, AC/A ratio, etc. Many of these tests I realized I could not experience fully myself, and it became difficult to explain how the tests worked when I could not experience what was 'normal' such as the screens splitting into two and coming back into one on Risley prism vergences. While all these circumstances were categorized as strange overall, I still had no signs or symptoms, so I went about my time at school."

"Second-year changed the story and with the introduction of skills such as slit lamp, tonometry, and BIO the reality of being a strab hit hard. My frustrations grew with constant suppression on the skills as well as a lack of depth perception and stereo. I learned that I had to perform skills differently and adjust. With this realization, vision therapy was recommended. As my time in VT has progressed, I have slowly noticed more and more signs such as my eyes drifting as I hold a conversation with someone, tilting my head to the side as I write, or even small things like how it takes me a couple of attempts to put a knife in a knife holder. When I mention I am in VT to colleagues, upperclassmen, and professors many are shocked at how asymptomatic I am for such a high horizontal and vertical deviation. I have also had many individuals ask for my goals in VT along with my doctor Dr. Allison. Answering this question is difficult since coming into VT I never expected to have goals, I mainly just wanted answers. I'd like to say my goal is just to see 'normally' or as normal as I can but seeing as how I have never experienced 'normal' vision that would be hard to imagine or strive for. I also believe this goal is unrealistic at least for now. As of right now, I am enjoying the experience of learning new things as well as increasing my knowledge and I am happy just seeing how far VT will take me and how/if I can improve."

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Management of Anisometropia, Esotropia and Amblyopia in a Teenager Shows Optometry's Unique Role in Vision Care

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INTRODUCTION

In the presence of strabismus and amblyopia, patients are often referred to ophthalmology for management. However, an optometrist's knowledge of the entire visual system uniquely equips our profession to create a comprehensive treatment plan for these functional vision disorders, which can supplement a medical approach to care.

INITIAL COMPREHENSIVE EXAMINATION

A 13-year-old boy presented for second opinion regarding treatment options for left esotropia and strabismic amblyopia, which was previously managed by ophthalmology who determined that no improvements to his vision were possible with a traditional medical approach. Past treatments included non-compliant patching and inconsistent spectacle wear. The patient's primary concern was reduced tracking, catching and reaction time as a baseball player.

Examination revealed a constant left esotropia and anisometropic hyperopia in the left eye. The patient was habitually uncorrected with no stereopsis or flat fusion and BCVA of 20/40+ OS (see Table 1). Given his anisometropia and history of poor compliance with spectacle wear, it was recommended that the patient be fit in a daily disposable contact lens in the left eye and begin treatment with in-office vision therapy.

TABLE 1
Initial Manifest Refraction with BCVA

	Refraction	Visual Acuity
Right Eye	+0.50 -0.50 x180	20/20
Left Eye	+2.75 -0.50 x150	20/40+

VISUAL EFFICIENCY EXAMINATION

After successfully fitting the patient in a daily disposable contact lens in the left eye (Table 5), a visual efficiency exam was completed. The pertinent results of this exam are shown in Table 2.

TABLE 2
Visual Efficiency Exam Findings

Cover Test		Prism Bar BI Vergences	
Distance	**Near**	**Distance**	**Near**
4$^{\Delta}$ eP	10$^{\Delta}$ ILET' (50%)	x/8/2	x/10/0
Monocular Facility		**Minus Lens Amps**	
4 cpm OD	0 cpm OS	11.75 OD	7.75 OS
Stereo	(+)500" Forms, (-)250" Forms		
W4D	Peripheral fusion; deep central OS suppression		

DIAGNOSES

- Intermittent left esotropia
- Refractive vs. strabismic amblyopia OS
- Accommodative excess OD

RESULTS OF VISION THERAPY

Progress evaluations were completed every 8 weeks during the vision therapy program. Improvements to the patient's visual efficiency skills found during these evaluations are shown in Tables 3 and 4. Additionally, Table 5 shows improvements to his visual acuity over time. Note that his contact lens prescription was adjusted based on his ability to accept more plus.

TABLE 3
Vision Therapy Progress Eval After 8 Sessions

Cover Test		Prism Bar BI Vergences	
Distance	**Near**	**Distance**	**Near**
Ortho	6$^{\Delta}$ ILET' (10%)	x/8/6	x/10/8
Monocular Facility		**Minus Lens Amps**	
16 cpm OD	9 cpm OS	12.50 OD	10.50 OS
Stereo	(+)500" Forms, (-)250" Forms		
W4D	Peripheral fusion; shallow central OS suppression		

TABLE 4
Vision Therapy Progress Eval After 16 Sessions

Cover Test		Prism Bar BI Vergences	
Distance	**Near**	**Distance**	**Near**
Ortho	6$^{\Delta}$ eP'	x/10/8	x/14/10
Monocular Facility		**Minus Lens Amps**	
16 cpm OD	12 cpm OS	13.00 OD	11.50 OS
Stereo	(+) Forms, 30" Randot circles		
W4D	Peripheral and central fusion		

TABLE 5
Visual Acuity OS Over Time

Initial Exam	Manifest Rx	20/40+
VEE	+2.50 cls	20/30-
After 8 Sessions	+2.75 cls	20/30
After 16 Sessions	+2.75 cls	20/25

DISCUSSION

After 16 weeks of in-office vision therapy, the patient graduated with a low esophoria at near, excellent base-in vergence ranges and improved accommodative skills in both eyes. His visual acuity in the left eye improved from 20/40 to 20/25 and he demonstrated stereopsis in addition to peripheral and central flat fusion for the first time in his life. These outcomes were the result of full-time correction with a contact lens to reduce the visual effects of anisometropia in addition to weekly in-office vision therapy with daily assigned home activities. Despite the patient's age, diagnoses, and failure with previous treatments, he made tremendous improvements over a relatively short period of time. Most importantly to him, however, was his improved on the baseball field.

CONCLUSION

This case demonstrates optometry's crucial role in managing functional vision concerns. This patient was told that no improvements to his vision could be made after he failed to improve his visual acuity with traditional treatments such as full-time spectacle wear and occlusion therapy. However, an optometric evaluation considers the patient's specific, situational complaints as they relate to the entire visual system. In this case, visually significant anisometropia was resolved with contact lens wear, and the patient's overall visual skills, particularly as they related to his performance in sports, were improved with vision therapy. By introducing new treatment options, the optometric functional vision assessment resulted in resolution of the patient's symptoms and concerns.

REFERENCES

Available upon request.

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Fresnel Prism for a Patient with a Scleral Lens

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BACKGROUND

A 41-year-old male was previously diagnosed with keratoconus, and after a corneal transplant OD in 2011 and scleral lens fitting OS in 2021 achieved visual acuities of 20/40 OD (no correction, pinhole to 20/25) and 20/40 (corrected, no improvement with pinhole). He was happy with his vision overall, particularly considering that his vision was 20/600 at 6 feet when he first transferred to our clinic in 2021.

Despite his excitement over such great improvement in his vision, there was one issue: he was experiencing intermittent diplopia now that vision was relatively equal between eyes. A constant left exotropia had been noted since his first appointment for the scleral lens fitting, however he had always suppressed the eye due to the poor vision. Now that the vision was improved, he was symptomatic.

CASE PRESENTATION - VISIT #1

The patient reported that his diplopia was primarily horizontal, and upon further questioning revealed he was most symptomatic while watching TV in the evening.

TABLE 1: Visual Efficiency Exam Summary

Distance VA	OD - 20/40-2 sc	OS - 20/40-2 cc
Distance Cover Test	30 CLXT, 4RHyperP – control score 2, comitant	
Near Cover Test	18XP', 4 RHyperP'	
Stereo	No stereopsis (Randot local or global)	
Worth 4-Dot	Shallow diplopia at near Shallow intermittent suppression at distance	
Pertinent Anterior Segment Findings	OD: junctional haze secondary to PKP transplant, 2+ pigment inferiorly; (-) sutures	
	OS: apical thinning, trace apical scar, (+) Fleischer's ring, Vogt striae	
Over-refraction (DVA) (OU 20/25+1)	OD: pl-0.50x045 (20/40)	OS: -0.25-0.75x030 (20/30)

CASE MANAGEMENT

The patient's circumstances did not allow for vision therapy at the time, so prism options were explored. Fresnel prism was considered first, as the intermittent and fluctuating nature of the patient's binocularity meant that the amount of prism that would best suit the patient may vary from what he accepted in-office. A spectacle prescription was released with his small over-refraction, allowing insurance to contribute to a pair of glasses to which prism could be applied.

TABLE 2: Visits

Visit 1	Visit 2	Telehealth 1	Visit 3	Telehealth 2
VEE + ORx spec Rx released	In-office prism trial, 10pd Fresnel applied OS	Symptoms persist, patient asks to increase prism	10pd removed, 15pd applied OS	Patient happy with 15pd OS

VISIT #2

Once he had his glasses, the patient appreciated 10pd BI Fresnel applied in-office. He preferred monocular 10BI over smaller amounts of binocular prism. The Fresnel prism and instructions for care were dispensed with the understanding that the prism could be increased if the patient became more symptomatic outside of the office. The patient understood that the prism did not need to be worn full-time, only when he was symptomatic.

VISIT #3

Three weeks later, the patient reported he was still experiencing double vision with the prism glasses, mostly at night, and that he had to work hard to make the image single. He returned to the clinic for additional prism trialing, at which time the prism was increased to 15pd BI. One week later the patient reported he still had occasional diplopia but was able to fuse with effort and overall felt more comfortable with 15pd than 10pd.

CONCLUSIONS

Improving a patient's visual acuity with management of their ocular disease can be life-changing, however it may also reveal previously undiagnosed or asymptomatic binocular or functional vision concerns. Whether or not vision therapy is a viable option, Fresnel prisms can be a great resource for patients as they create an opportunity to provide immediate relief of debilitating symptoms, with a more flexible trial period and reduced wait time compared with ground-in prism.

TABLE 3: Working with Fresnel Prisms

PROS	CONS	TIPS
- Easily removed or adjusted - Can be used for temporary or permanent purposes - Lightweight - ~17 steps, ranging from 1 to 40pd - May adjust size, shape to fit individual needs	- VA typically degraded with >20pd - Risk of being lost - Cosmesis - Prone to becoming dirty	- Instruct patients on proper care - Discuss impact on vision, clarity - Split high amounts between eyes

Example of BO prism OS, as was used in our patient. Ideally, the prism would be fit so that the prism fills the entire lens.

REFERENCES

Available upon request.

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GLOBAL SPECIALTY LENS SYMPOSIUM

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When Quality Outweighs Quantity: Scleral Lens Considerations for Post-Refractive Keratotomy Patients

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BACKGROUND

It is well established that there is a wide range of indications for scleral lens prescription. One of the most common indications is for fitting patients with corneal irregularities.[1] These corneal irregularities may arise from several contributing factors, including refractive procedures such as radial keratotomy (RK). RK is a refractive surgical procedure used to correct myopia by creating radial incisions in the cornea.[2] Complications also include:

- Disruption of corneal irregularity leading to ectasia, visual fluctuations, and astigmatism
- Dry eyes, scarring, visual aberrations, and decreased contrast sensitivity.[3]

These patients may be successfully managed with scleral lenses.2 With the advancement in other refractive surgery options i.e., Laser Assisted In Situ Keratomileuses (LASIK), and small incision lenticule extraction (SMILE), RK has fallen significantly out of favor.[3]

CASE DESCRIPTION

A 54-year-old Caucasian male was referred for a specialty contact lens fitting for both eyes. His ocular history was remarkable for two RK procedures on the right cornea, and one RK procedure on the left cornea in late 1980's. He had a history of a vitreous hemorrhage OS six years prior, which was managed by a retinal specialist.

- VAcc: 20/60- OD PHNI, and 20/100 OS PHNI (spectacle correction)
- Cornea: RK incisions extending into the visual axis for both corneas, with relaxing incision scars within the RK scars OD
- Lens: PSC OS, and NS OU contributing to the overall reduction in visual acuity

He opted to proceed with contact lens fitting after being educated on visual expectations secondary to cataracts and ocular history of vitreous hemorrhage. He was fit with scleral lenses OU, achieving visual acuity of 20/50+ OD and 20/100 OS. Although the patient's acuity did not improve drastically, there was a significant improvement in quality of vision, a factor that can often be overlooked.

FIGURE 1: Tomography OD

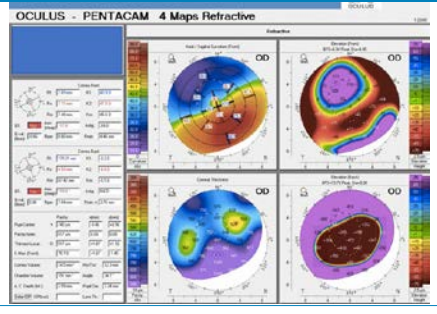


FIGURE 2: Tomography OS

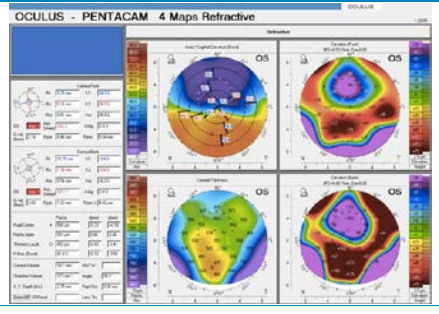


FIGURE 3: RK Incisions OD

FIGURE 4: RK Incisions OS

FIGURE 5: Scleral lens OD

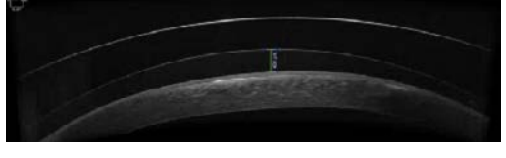
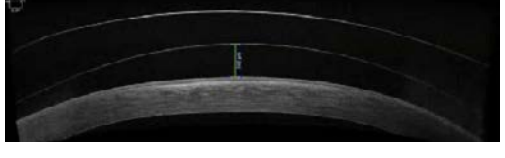


FIGURE 6: Scleral lens OS



DISCUSSION

Scleral lenses (SL) are large diameter rigid lenses that vault over the cornea and rest on the sclera. The fluid reservoir created between the SL and the cornea results in oxygenation and lubrication, which contributes to improved comfort.[4] SLs increase subjective tolerance and reduce the likelihood of erosion and vascular growth as compared to conventional corneal gas permeable (GP) lenses, due to the lack of contact with old incisions and the irregular corneal surface.[5] Corneal GP lenses are typically too unstable making it poorly tolerated for patients.[5] The subjective impact of SLs make them an excellent therapeutic option for patients with RK complications such as scarring or dry eyes. In patients who have undergone RK, improving quality of vision in this way may also significantly improve quality of life.

CONCLUSIONS

Conventional contact lens correction may not be suitable for patients with corneal irregularities, particularly from RK as they may enhance scarring and neovascularization.5 Management of patients with corneal irregularities with scleral lenses is typically aimed at improving visual acuity. Perhaps a more important consideration, however, is the patient's quality of vision.[6]

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Comparison of Two FDA-Approved Buffered Scleral Contact Lens Filling Solutions

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INTRODUCTION

Scleral contact lenses (SL) have several indications including vision rehabilitation and ocular surface disease. Ocular comfort and lens wear time are important factors contributing to successful contact lens wear. SL are often filled with preservative-free sterile saline solution, either buffered or non-buffered. There are currently two FDA-approved buffered SL filling solutions on the market: ScleralFil™ (Bausch+Lomb) and Nutrifill™ (Contamac). ScleralFil™ contains boric acid, sodium borate, and sodium chloride. Nutrifill™ is the only filling solution that contains the essential ions potassium, sodium, calcium, and magnesium buffered with phosphate, which are naturally found in tears. In a study comparing ScleralFil™ to Addipak (Teleflex), it was suggested that buffered filling solutions may improve SL comfort and dry eye symptoms compared to non-buffered solutions. This study aims to compare SL comfort between the two available buffered filling solutions, specifically examining if the added electrolytes in Nutrifill™ increase SL comfort, quantified by lens wear time.

METHODS

Established SL wearers who were either students, residents, or faculty members at the Illinois College of Optometry (ICO) were recruited. Participants were randomized to use either Nutrifill™ (Filling solution A) or ScleralFil™ (Filling solution B) daily for one week. After one week, they were given the other filling solution to use daily for one week. The subjects were blind to the solutions given (Figure 1). At the end of each week, the participants filled out an Ocular Surface Disease Index (OSDI) questionnaire and a comfort survey noting average daily SL wear time. The study protocol was approved by the ICO Institutional Review Board.

RESULTS

Six participants completed the study; no one withdrew. Statistical analysis with a paired t-test (p=0.68) and Wilcoxon signed-rank test (p=0.46) showed no significant difference between OSDI scores when using Nutrifill™ versus ScleralFil™. Table 1 shows the OSDI scores for each participant. Comparison of average daily wear time between the two solutions was not statistically significant (p=0.35 with paired t-test, p=0.46 with Wilcoxon signed-rank test). Table 2 shows the average daily wear time for each participant.

TABLE 1

	Nutrifill™ OSDI Scores (Filling solution A)	ScleralFil™ OSDI Scores (Filling solution B)
Participant #1	4	20
Participant #2	0	2
Participant #3	4	6
Participant #4	0	10
Participant #5	13	2
Participant #6	18	10

OSDI SCORES KEY

Normal	0-12
Mild	12-22
Moderate	23-32
Severe	33-100

TABLE 2

	Nutrifill™ (Filling solution A) Average daily wear time (hours)	ScleralFil™ (Filling solution B) Average daily wear time (hours)
Participant #1	13	8
Participant #2	12.85	11.85
Participant #3	7.85	9
Participant #4	15.42	14.14
Participant #5	7.72	9.43
Participant #6	6	4.43

DISCUSSION

Due to decreased patient volume related to the COVID-19 pandemic at the time of the study, the protocol limited participants to ICO staff, faculty, students, and residents. To minimize exposure time, dry eye testing was not studied. This resulted in a small number of participants and limited the analysis of additional objective data. To further investigate this research question, the participant sample size should be expanded by opening the study to the public and dry eye testing such as corneal staining, tear break up time (TBUT) and osmolarity testing should be considered.

How filling solutions were masked may have also affected study outcomes. All identifiers on each vial of filling solution were masked (Figure 1), except for their shape. Nutrifill™ (Filling solution A) is rectangular and ScleralFil™ (Filling solution B) is cylindrical. Therefore, if study participants used either filling solution prior, they may have recognized the vial shape, potentially creating a bias in their comfort survey.

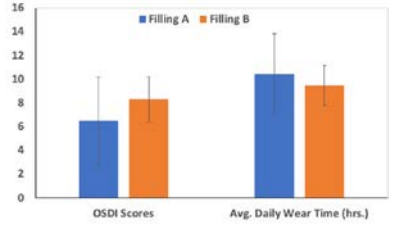
Figure 2 shows more participants with higher OSDI scores using ScleralFil™ and more participants with greater daily wear time when using Nutrifill™. However, statistical analysis with a paired t-test and Wilcoxon signed-rank test both showed no significant difference between OSDI scores or lens daily wear time.

FIGURE 1

Image of blinded solutions A and B given to subjects throughout the study.

FIGURE 2

Graph displays OSDI scores and average lens daily wear time using Nutrifill™ (Filling solution A) compared to ScleralFil™ (filling solution B) for one week each.



CONCLUSION

Buffered SL filling solutions have been shown to be beneficial in improving patient comfort and reducing dry eye symptoms versus non-buffered solutions. A direct comparison between the two FDA-approved buffered SL filling solutions has not been previously studied. This report suggests that both ScleralFil™ and Nutrifill™ are good options for SL patients. The added electrolytes in Nutrifill™ did not result in a statistically significant difference in SL comfort quantified by lens wear time, nor was there a statistically significant difference in OSDI scores. Further investigation with a larger sample size could be conducted to confirm the findings of the current study.

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Available upon request

ACKNOWLEDGEMENTS

Contamac donated Nutrifill™ filling solution vials

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Posterior Segment Findings in Sickle Cell Retinopathy

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INTRODUCTION

Sickle cell disease (SCD) spectrum is an inherited group of hemoglobinopathies commonly found in patients of African descent. A single nucleotide mutation substitutes glutamic acid for valine, changing the inert structural function of hemoglobin. Patients may be heterozygous for this mutation and have sickle cell trait (SCT) or homozygous and have sickle cell disease (SCD). Screening for sickle cell is routinely done on every newborn blood test in the United States. Testing may also be done on children and adults as well.

The eponymic name arises from the sickled shape of red blood cells as opposed to normal oval shaped. These abnormally shaped cells are rigid and do not transfer oxygen as efficiently as normal red blood cells, leading to a hypoxic environment and eventual occlusion. Sickle cell retinopathy is the ocular manifestation of sickle cell disease in the posterior segment. Retinopathy may be proliferative and non-proliferative. Retinal vascular occlusion leads to characteristic changes in the retina and will be discussed in this case.

CASE HISTORY

A 46-year-old African American male presents to Urgent Care Clinic for new onset floaters and flashes, OS>OD, starting 2 weeks prior. The patient denied any curtain or veil over his vision, pain, redness or any other ocular or visual symptoms OU. Patient has a known history of sickle cell retinopathy OU with non-resolving vitreous debris from past vitreous hemorrhaging. He was treated for peripheral neovascular retinopathy with panretinal photocoagulation laser OU. Patient also has a history of untreated low-tension glaucoma, OU. He was diagnosed with sickle cell disease at birth. Pertinent exam findings

FIGURE 1
Dense vitreous debris with refractile deposits greatest inferotemporal, attenuated vessels, black sunbursts temporal, and inferior temporal

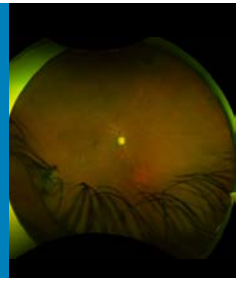

FIGURE 2
Black sunbursts nasal and superior nasal

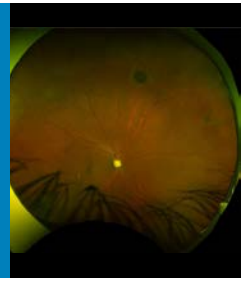

FIGURE 3
Dense vitreous debris with refractile deposits greatest inferotemporal overlying inferotemporal salmon patch hemorrhage.

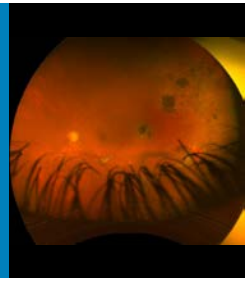

FIGURE 4
Black sunbursts nasal, superior, and greatest temporal. Scattered hemorrhaging seen in peripheral retina

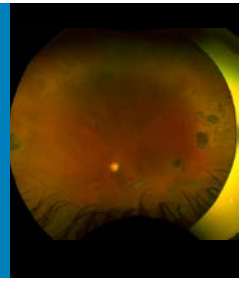

TABLE 1
Exam Pertinent Findings

Exam Pertinent Findings		
OD	Eye	OS
20/20	VA	20/20
PERRL (-) APD	Pupils	PERRL (-) APD
FTFC	CVF	FTFC
FROM	EOMs	FROM
(-) Iris neovascularization, (-) comma shaped conjunctival vessels	Slit Lamp Exam	(-) Iris neovascularization, (-) comma shaped conjunctival vessels
See Figures 1 and 2	Fundus Examination	See Figures 3 and 4

TABLE 2
Sickle Cell Disease Ocular Manifestations

Ocular Manifestations of Sickle Cell Disease	
Eyelid	Lid edema
Conjunctiva	Comma shaped vessel
Iris	Iris atrophy, iris neovascularization
Retina	Non-proliferative changes: salmon patch hemorrhage, iridescent spot, black sunburst lesion Proliferative: see table 3 for staging and signs
Choroid	Angioid streaks, choroidal vasculature occlusion

TREATMENT AND MANAGEMENT

Due to new onset floaters and flashes, the patient was referred to a retinal specialist for continued treatment and management. Treatment is determined based on level and staging of retinopathy. Non-proliferative retinopathy has no treatment at present. Proliferative retinopathy treatment varies based on staging. Options for Stage 3 are aimed at preventing bleeding and stopping progression to later stages. Treatment may include anti-VEGF injections, laser PRP, and surgical intervention for Stages 4-5 retinopathies. These look to regress neovascularization.

DIAGNOSIS AND DISCUSSION

The leading diagnosis was sickle-cell retinopathy, OU with differential diagnoses including diabetic retinopathy and retinal vein occlusion. The diagnosis was made based on known history of sickle cell disease and posterior segment findings. SCD may have ocular manifestations that can affect the eyes in many ways as detailed in Table 2.

Sickle cell retinopathy is divided into non-proliferative and proliferative. Non-proliferative retinopathy results from areas of ischemia and small vessel occlusion via sickled red blood cells. Signs of sickle cell retinopathy include salmon patch hemorrhages and black sunbursts, as seen in this case. Proliferative retinopathy has 5 stages. Imaging with spectral domain Ocular Coherence Tomography has also been used to show diffuse retinal thinning in patients with sickle cell disease both with and without retinopathy.

Based on fundus findings, the patient exhibited non-proliferative sickle cell retinopathy at the time of examination. Retinal vascular occlusion causes hemorrhaging leading to characteristic salmon patches. The patches appear red initially, however they become pink or orangish in appearance from lysed red blood cells. As the hemorrhage reabsorbs, it may leave refractile deposits in the vitreous like those seen in this case. Black sunbursts appear as pigment migration and proliferation from the retinal pigmented epithelium occurring in response to retinal hemorrhaging.

TABLE 3
Stages of Proliferative Sickle Cell Retinopathy

Stage	Proliferative Posterior Segment Findings
Stage 1	Peripheral arterial/capillary nonperfusion
Stage 2	Peripheral arteriovenous anastomoses at areas of perfused vs nonperfused retina
Stage 3	Neovascular and fibrous "sea fan" proliferation occurring at the borders of retinal nonperfusion
Stage 4	Vitreous hemorrhage
Stage 5	Tractional retinal detachment

CONCLUSION

Sickle cell retinopathy is an ocular manifestation of sickle cell disease and may present as either non-proliferative or proliferative. Understanding the clinical findings allows eye care providers to classify and stage the retinopathy thus aiding in appropriate treatment and management for patients.

REFERENCES:

Available upon request.

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A Case of Isolated Pre-Ganglionic Horner Syndrome Secondary to Lipoma of Carotid Space

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INTRODUCTION

Horner Syndrome (HS) is a condition resulting from damage along the oculo-sympathetic pathway. This pathway provides sympathetic innervation to the eye through three orders of neurons located 1) central in the hypothalamus, 2) pre-ganglionic in the thoracic spinal cord, and 3) post-ganglionic in the superior cervical ganglion. This disruption of sympathetic innervation results in a classic triad of ipsilateral ptosis, miosis, and anhidrosis. This case reviews the clinical presentation of an isolated pre-ganglionic HS owing to a lipoma of the carotid space.

CASE PRESENTATION

A 56-year-old African American male presents to the primary eye care clinic for a routine comprehensive eye examination. Past ocular history was unremarkable, and past medical history was significant for hypertension in which he was being treated with hydrochlorothiazide. Clinical examination revealed notable right upper eyelid ptosis, miosis, anhidrosis, and dilation lag.

TREATMENT AND MANAGEMENT

Magnetic resonance imaging (MRI) was obtained of his head, neck, and upper chest to determine the etiology of his HS. Imaging revealed a diagnosis of a 14 x 6 x 9 mm lipoma of the carotid space. Based on the location of the lesion and HS being the only sequelae in this asymptomatic patient, no treatment was indicated. The condition will continue to be monitored regularly, including re-evaluation of lacrimation, and initiating a dry eye treatment regimen if indicated.

FIGURE 1: Examination Pertinent Findings

OD		OS
20/20-2	VA(sc)	20/20-3
3mm (bright), 4mm (dim) (+)dilation lag RRL, no RAPD	Pupils	4mm (bright), 6mm (dim) RRL, no RAPD
FTFC	EOMs	FTFC
FROM	CVF	FROM
upper eyelid ptosis	Adnexa	unremarkable

FIGURE 2: Pharmacological Testing with 0.5% Apraclonidine

OD		OS
BEFORE 0.5% APRACLONIDINE		
MRD1 = 2 mm MRD2 = 8 mm	MRD	MRD1 = 4 mm MRD2 = 8mm
3 mm (bright) 4 mm (dim)	Pupils	4 mm (bright) 6 mm (dim)
45 MINUTES AFTER 0.5% APRACLONIDINE OD		
MRD1 = 4 mm MRD2 = 7mm	MRD	MRD1 = 4 mm MRD2 = 8mm
2.5 mm (bright) 5.5 mm (dim)	Pupils	3.5 mm (bright) 6.5 mm (dim)

FIGURE 3: Pupil Appearance Before and After 0.5% Apraclonidine Instilled OU

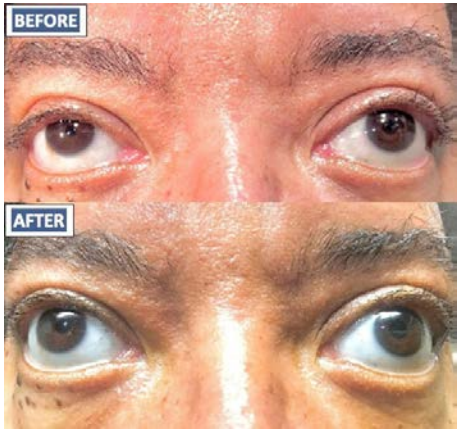
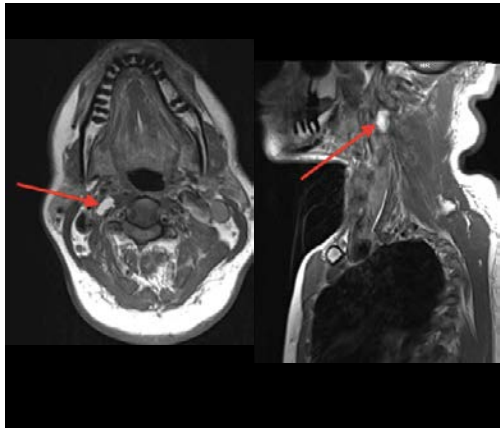


FIGURE 4: MRI Indicating Lipoma in Carotid Space



DISCUSSION

Causes of acquired HS include trauma, tumor, stroke, carotid artery anomalies, surgery in the region of the oculo-sympathetic pathway, or idiopathic occurrence to name a few. Findings consist of ipsilateral upper eyelid ptosis due to paresis of Muller's muscle, ipsilateral facial anhidrosis, and anisocoria greater in dim due to paresis of the iris dilator. Iris dilator paresis also causes impaired movement during dilation, a finding called dilation lag. HS may also be congenital where iris hypochromia may be a clinical feature. Pharmacological testing can aid in diagnosis and localization of HS. Use of apraclonidine 0.5-1% will not dilate a normal pupil but will dilate a HS pupil regardless of first, second, or third order neuron disruption. Upon instillation of apraclonidine, reversal of anisocoria is observed where the affected pupil dilates due to the up-regulation of alpha-1 receptors in HS. This elicits an exaggerated response of the iris dilators due to denervation supersensitivity to this agonist agent.

CONCLUSION

There are several etiologies resulting in Horner Syndrome, some of which are life-threatening. Pharmacological testing along with imaging of the oculo-sympathetic pathway are essential to determine the location of a potential lesion, which thereby directs further treatment and management. This case highlights the importance of Horner Syndrome identification, which was valuable in leading to the diagnosis of a tumor in the carotid space.

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An Atypical Case of Thygeson's

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INTRODUCTION

Thygeson's superficial punctate keratopathy is characterized by scattered, discrete intraepithelial lesions that lie close to the visual axis. These corneal opacities stain with sodium fluorescein and are typically bilateral, but asymmetric, in nature. Thygeson's typically affects patients 20 to 30 years of age, and the etiology remains unknown, although viral, bacterial, and immunologic causes have been previously proposed. This case demonstrates an atypical case of Thygeson's: a unilateral presentation affecting a male who is older than the typical demographic age.

CASE PRESENTATION

A 50-year-old African American male presented to the Illinois Eye Institute complaining of redness and sharp pain of the left eye that began one day prior. He reported a similar occurrence of symptoms in the left eye and right eye, at separate times, 3-4 months prior that improved after his primary care provider prescribed an unknown antibiotic drop. He was a contact lens wearer with poor lens hygiene, sleeping in his colored contacts nightly and replacing every 2-3 months.

TABLE 1
Entrance testing at initial presentation

	OD	OS
VA	cc: 20/20-	sc: 20/50^{-2}, PH 20/30^{+2}
CVF	FTFC	FTFC
EOMs	FROM	FROM
Pupils	PERRL, (-) APD	PERRL, (-) APD

Upon slit lamp examination, the right eye presented with corneal neovascularization superiorly, from presumed contact lens overwear. The left eye showed 1-2+ diffuse injection with similar cornea neovascularization superiorly. His left cornea also showed many scattered intraepithelial opacities that stained with sodium fluorescein (Figure 1, 2).

FIGURE 1
Optic section of the left cornea at initial presentation. A) An optic section of one of the intraepithelial opacities using white light. B) An optic section of the same intraepithelial opacity using the cobalt blue filter.

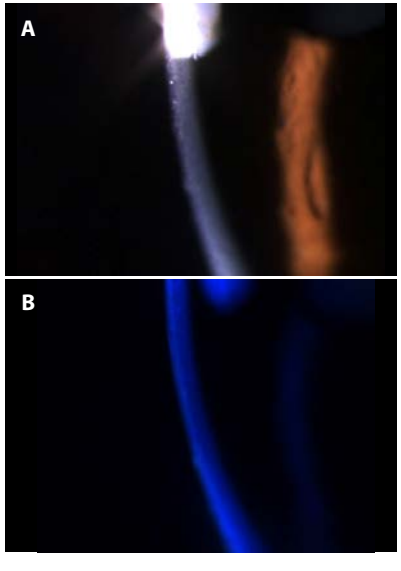


FIGURE 2
Corneal presentation of the left eye at initial visit. The patient's 360 degrees of scattered, intraepithelial opacities can be seen here as grayish lesions under cobalt blue light. These lesions stained positively with sodium fluorescein.

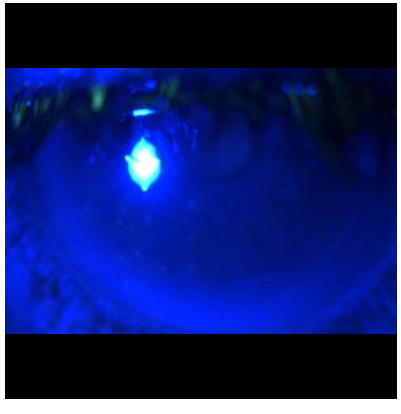
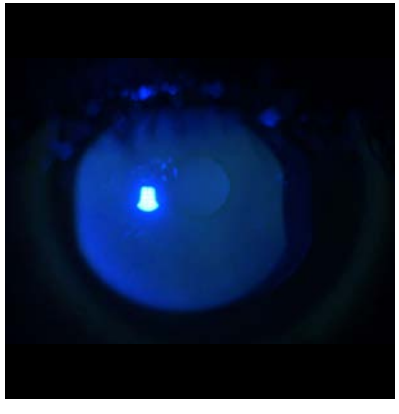


FIGURE 3
Corneal presentation of the left eye at 6-day follow-up using cobalt blue filter. The patient's corneal findings were fully resolved with no stain, and he denied any current symptoms.



TREATMENT AND MANAGEMENT

After ruling out other causes of keratitis, the patient was diagnosed with Thygeson's superficial punctate keratitis. He was prescribed neomycin-polymyxin b-dexamethasone four times daily into the left eye and was instructed to discontinue all contact lens wear. At six-day follow-up, our patient's symptoms were completely resolved (Figure 3), his vision was correctable to 20/20 in the left eye and his intraocular pressure remained within normal limits in both the right and left eye. The patient was educated on the common exacerbations and remissions associated with this condition and on the proper replacement schedule and lens hygiene of his contact lenses. He was told to taper the antibiotic-steroid combination drop to twice a day for 10 days, then stop the medication. The patient completed the tapering of medication without reoccurrence of the condition.

DISCUSSION

Thygeson's is generally treated with topical steroids during exacerbations of the condition. However, our patient's poor contact lens hygiene was taken into consideration during his treatment, and we decided to treat him with an antibiotic-steroid combination to prevent a secondary bacterial infection due to contact lens overwear.

Other topical treatments for Thygeson's include:

- tacrolimus 0.02% studied at the dosage of twice daily
- trifluridine 1% studied at the dosage of every two hours
- cyclosporin A 2% studied, however, commonly prescribed as Restasis (cyclosporin 0.05%) or Cequa (cyclosporin 0.09%)
- Therapeutic contact lenses for symptomatic relief
- Artificial tears for adequate ocular surface lubrication

CONCLUSION

Although Thygeson's typically presents as a bilateral condition in younger adults, this case represents a unique unilateral case in a middle-aged male. While it can be helpful to use demographics and typical clinical findings to finalize a diagnosis, our patients do not always present in the "typical" way. Clinicians have used topical steroids as the mainstay of treatment for Thygeson's for decades, but other topical treatments should be considered if a patient is refractory to topical steroids or needing chronic treatment for the condition.

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Available upon request.

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Macular toxicity secondary to long-term use of Pentosan Polysulfate Sodium (Elmiron)

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INTRODUCTION

Pentosan Polysulfate Sodium (PPS) is the only FDA approved oral treatment for bladder pain associated with interstitial cystitis (IC) since 1996. IC is a condition that affects over 1 million people in the US alone with a strong female predilection. Although rare, recent studies have shown macular toxicity due to the prolonged use of PPS. Toxic effects of PPS include blurry vision, prolonged dark adaptation, decrease in contrast sensitivity, subjective color vision defects, and central scotomas. PPS maculopathy is often misdiagnosed as age related macular degeneration (AMD) or pattern dystrophies due to similar looking fundus appearance on fundus examination of paracentral pigment clumps with yellow orange subretinal deposits. This case highlights a patient who was diagnosed with PPS maculopathy secondary to chronic use of PPS for IC.

CASE REPORT

A 67-year-old Caucasian female presented for a new low vision exam. Her chief complaint was blurry distorted vision at distance and near, difficulty seeing specific colors, light to dark adaptation and nausea when using the computer for more than 20 minutes. Medical history was remarkable for asthma, migraines, fibromyalgia, and IC for which the patient was taking PPS since 2010; the total cumulative dose was unknown as she self-discontinued PPS in 2020. Other medications included: Bupivacaine 0.25%, Tizanidine HCL, Fluticasone-Salmeterol, Atenolol, Amitriptyline, Docusate, Estradiol, Aspirin, Hyophen, Probiotics, Bilberry, Vitamin D, Fesoterdine Fumarate, Phenazopyridine, Marshmallow root, Dexilant, and Restasis. Ocular history was remarkable for optic disc anomaly with longstanding decreased vision OD, dry eyes OU, and previously diagnosed (2017) pattern dystrophy OU. Patient family history was remarkable for Glaucoma (father). Allergies: Opioids, shellfish, sulfas, animal dander and IV contrast.

OCT findings commonly show:

Pertinent Findings			
BCVA @ D	OD: 5/160 (20/640) OS: 20/25 OU: 20/25	**BCVA @ N:**	**EOM's:** FULL OU
Trial Frame Refraction	OD: +4.75 -4.00 x055 OS: +4.25 -3.75x056 ADD: +2.50	**Pupils:** ERRLA OU **CF:** FTFC OU	**Contrast tested with MARS:** OD: 0.16 - Profound CS loss OS: 1.28 - Moderate CS loss
Anterior Segment Findings: 1+ Cortical cataract/1+ NS cataract OU			

Posterior Segment Findings		
OD	DFE Findings	OS
PVD	Vitreous	Clear
severe inferior tilt of disc	Optic Nerve	flat, sharp, good color. (-) pallor
difficult to assess due to staphyloma	C/D	.4/.4
central pigment mottling of macula with extensive inferior atrophy, no drusen, CNVM, or hemes	Macula	**pigmentary macular changes with reticular pattern like subretinal yellow lesion, no drusen, CNVM, or hemes**
Normal vessels	Vessels	Normal vessels
peripheral ST operculum like opacity w/o associated tear/detachment	Periphery	pigmentary changes inf & sup temp

- Hyper-reflective nodules at the level of the RPE that colocalize with macular pigment clumps noted on DFE
- RPE lesions that are distinct from typical drusen and subretinal drusenoid deposits and project a shadow to the underlying choroid
- Loss of definition of the interdigitation zone or a merging of interdigitation zone and ellipsoid zone bands in diseased areas.

OCT:
OD blunted foveal reflex with patchy GA, RPE irregularities, (-) fluid. (-) drusen;
OS: blunted foveal reflex with patchy outer retinal loss, RPE irregularities, (-) fluid. (-) drusen
FAF was deferred due to concerns about migraines.

FIGURE 3A & 3B

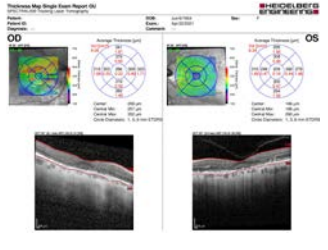

FIGURE 1A & 1B

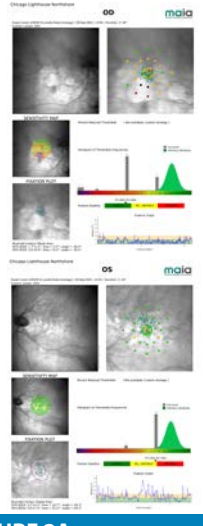

FIGURE 2A

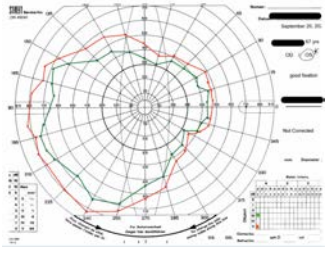

FIGURE 2B

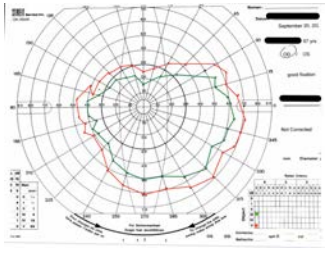

FIGURE 4A

- Funduscopic findings: Paracentral hyperpigmented spots often with interspersed pale-yellow or orange deposits. Patchy para central RPE atrophy. Parafoveal geographic atrophy that ultimately encroaches on the fovea in more advanced cases. Absence of typical macular drusen.

DIFFERENTIAL DIAGNOSIS

1.Pattern Dystrophy
2. Age-related macular degeneration
3. Maternal inherited diabetes and deafness syndrome (MIDD)
4. Pachychoroid disease.

DIAGNOSIS

1. Pentosan Polysulfate Maculopathy (dx in 2020)
2. Optic nerve anomaly - reduced vision OD
3. Bilateral central scotomas
4. Impaired contrast sensitivity

TREATMENT AND MANAGEMENT

1. Discussed the different methods of patching OD when doing near work to relieve discomfort d/t difference in VA/CSF between eyes. Educated patient on cloth patches, taping OD lens, Band-Aids.
2. Continue use of current PAL's.
3. Prescribed 1.5x ruler line reader for enhanced near magnification
4. Patient purchased check book cut out line guide to help with isolating numbers while working.
5. Emailed patient options for anti-glare screen for iPad and computer
6. Continue care with managing providers as directed

DISCUSSION

PPS maculopathy is unique and is strongly associated with chronic PPS exposure and not IC itself. Studies show that PPS exposure emerged as the sole statistically significant predictor of this maculopathy. The mean duration of PPS intake among patients that were affected was 18.3 years, but maculopathy has been shown in patients on PPS in as little as three years. PPS exposed patients were found to have significantly increased risk of being diagnosed with a new macular disease at 7 years. Despite the uncertainty of the mechanism in which PPS maculopathy occurs, PPS maculopathy progresses even after cessation of use may implicate retained toxic compounds, or that the process once began triggers relentlessly progressive retinal degeneration. Multi-modal imaging with color fundus photography, FAF and OCT have been shown to help aid in the diagnosis of PPS.

CONCLUSION

Given the emerging evidence of PPS induced macular toxicity, it is imperative that clinicians are diligent in about acquiring a thorough medication history and specifically question patients about PPS use when maculopathy is present to differentiate between other maculopathies. A baseline spectral domain optical coherence tomography and fundus autofluorescence should be performed on patients when initializing treatment of PPS for IC. Additionally, once PPS induced macular toxicity has been confirmed as the diagnosis, a prompt referral to the prescribing physician should be made to consider alternate therapies for IC. Unfortunately, PPS maculopathy is permanent and can progress despite the discontinuation of the drug.

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Chronic Progressive External Ophthalmoplegia Secondary to Kearns Sayre Syndrome

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INTRODUCTION

Kearns Sayre Syndrome (KSS) is a mitochondrial myopathy with ocular signs of chronic progressive external ophthalmoplegia, ptosis, pigmentary retinopathy, and strabismus. Patients with Kearns Sayre Syndrome are at an elevated risk for cardiac conduction abnormalities which can be as severe at atrioventricular (AV) block. Cardiac abnormalities occur in 50% of patients with KSS and is the leading cause of death in this population. Ocular findings in KSS can precede cardiac abnormalities. This case covers the signs and symptoms of Kearns Sayre Syndrome, systemic abnormalities and treatment and management options.

CASE PRESENTATION

A 43-year-old African American female presents to clinic with the complaint of slow, progressive loss of eye movement OU over the past 5 years and ptosis OU. She has a past ocular history pertinent for normal tension glaucoma OU and a longstanding exotropia OS. Her past medical history is pertinent for type 2 diabetes and an unknown mitochondrial myopathy.

TABLE 1

	OD	OS
VAcc	20/30 PH 20/25	20/40-2 PHNI
CVF	FTFC	FTFC
EOM	no movement in any field of gaze	no movement in any field of gaze
Pupils	ERRLA, (-)RAPD	ERRLA, (-)RAPD

DIAGNOSIS

The diagnosis for our patient is Kearns Sayre Syndrome. An electroretinogram (ERG) was performed on our patient's right eye to rule out other pigmentary dystrophies. The ERG was within normal limits. KSS is caused by mitochondrial DNA deletions or mutations. These abnormalities can be sporadic, autosomal dominant, or autosomal recessive. The extraocular muscles have an increased metabolic demand and therefore have an increased number of mitochondria causing extraocular muscle abnormalities such as chronic progressive external ophthalmoplegia, ptosis, and strabismus. There have also been reports of optic atrophy and corneal clouding. Systemic manifestations of KSS include: cardiac abnormalities, sensorineural hearing loss, ataxia, non-ocular muscle weakness, neuropathy, impaired intellectual function, and endocrine disorders. This disorder is diagnosed by clinical findings including the typical triad of progressive external ophthalmoplegia, pigmentary retinopathy, and onset before the age of 20 with one of the following additional signs: cardiac block, cerebellar symptoms, or elevated cerebrospinal fluid protein levels above 100 mg/dl. KSS can also be diagnosed with genetic testing and muscle biopsies. Skeletal muscle biopsies are preferred as the ragged red patten are clearly seen.

TABLE 2

	OD	OS
Adnexa	Normal	Normal
Lids/Lashes	Ptosis OD<OS	Ptosis OD<OS MRD1: -0.5mm MRD2: 2mm
Conjunctiva	White and quiet	White and quiet
Sclera	White and quiet	White and quiet
Cornea	Normal endothelium, epithelium, stroma, and tear film	Normal endothelium, epithelium, stroma, and tear film
Angles	3-4+ nasal and temporal	3-4+ nasal and temporal
Anterior Chamber	Deep and quiet	Deep and quiet
Iris	Normal	Normal
Lens	Clear lens capsule, cortex, and nucleus	Clear lens capsule, cortex, and nucleus

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

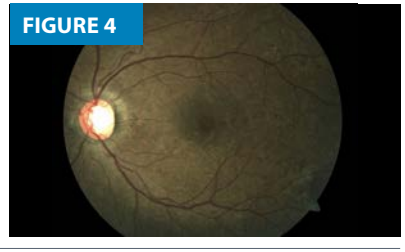


FIGURE 5

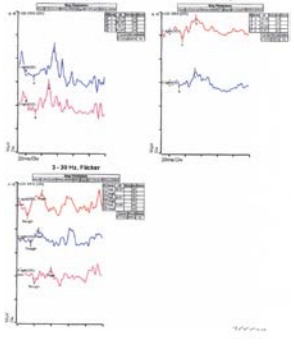
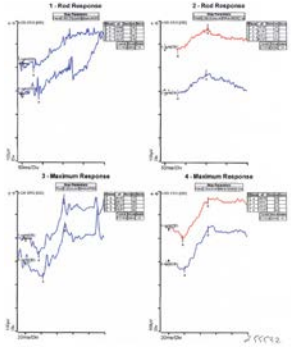


FIGURE 6



DISCUSSION

Ocular manifestations of KSS are managed primally with supportive therapy. Ptosis and strabismus surgery can be performed but the symptoms may progress after surgery. Cardiac abnormalities, typically conduction deficits, are present in 50% of patients with KSS and cause sudden death in 20% of patients. Syncope may be the first sign of cardiac involvement. Patients with KSS should be under the care of a cardiologist and receive electrocardiogram testing annually. Pacemakers may be placed at the first sign of cardiac involvement. 87% of patients with KSS had ptosis and ophthalmoplegia prior to cardiac abnormalities.

CONCLUSION

Ocular manifestations can be the presenting signs of KSS. If KSS is suspected, refer the patient to a cardiologist for regular monitoring as well as to a primary care physician to consider a muscle biopsy to confirm the diagnosis. As optometrists, we can monitor the patient for progression and treat patient symptoms with supportive therapy.

REFERENCES

Available upon request

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NEUROSCIENCE

1 ICO PRESENTATION

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Horner eponyms

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INTRODUCTION

The eponym: Horner is commonly used for several terms in the health sciences, but they are not honorifics for the same person. Also, some of the terms should probably be for other people since one of the doctors Horner was not always the original person to publish about them.

SYNDROME

Probably the best-known eponym is Horner syndrome. This term is generally understood to refer to the clinical presentation of oculosympathoparesis, which usually presents with the triad of symptoms: miosis, ptosis/enophthalmos, and impaired vasomotor/sudomotor activity in the face and neck.[1] It is caused by an interruption of the sympathetic supply of the head/face anywhere along the pathway. This syndrome was first described as early as 1727 by François Pourfour du Petit (1664-1741) by cutting the intercostal nerves in dogs.[2, 3] The first clinical description of this problem was by Edward Hare (1812-1838) in 1838.[4, 5] He described a 40-year old man with a rapidly growing neck tumor that was compressing his brachial plexus. Hare noted that the man also had miosis and ptosis, which he found perplexing since no cranial nerves were affected. In 1852, Claude Bernard (1813-1878) accurately described the clinical presentation in dogs in which different portions of the sympathetic nervous system were sectioned.[6] Since he gave a full account of the problem, it is common in France (and Italy) to refer to the condition as Bernard-Horner syndrome or even just Bernard syndrome. Silas Weir Mitchell (1829-1914) described in 1863 a case of an American Civil War soldier with a bullet wound to the neck that eventually developed slight ptosis, miosis, enophthalmos, reddened conjunctiva of the right eye, and an oval deformity of the right pupil.[7] It was not until 1869 that Johann Friedrich Horner (1831-1886)[8] gave a careful and very descriptive account of a woman with long-standing headaches that eventually developed ptosis and miosis along with hyperemia and anhydrosis of the side of her face.[9] Dr. JF Horner was actually the first to recognize that a man with red-green color blindness (known as Daltonism) transmitted this anomaly to his male grandchildren through his daughter who was not color blind.[10]

Johann Friedrich

His description included:
No female is color-blind. … Color-blind fathers have color-normal daughters. …
The color-blind sons always descend from color-normal mothers. … The sons of the daughters, whose fathers are color-blind, have the highest risk of being color-blind.

This pattern is sometimes known as Horner law and was eventually recognized as sex-linked genetic transmission.

MUSCLE

The musculus orbicularis oculi pars lacrimalis is commonly referred to as the Horner muscle. It was actually discovered by Jacques-François-Marie Duverney (1661-1748).[11, 12] The first published description of this muscle appeared in 1730 in a dissertation by one of Duverney's students, Johann Caspar Schobinger, who clearly credited Duverney with priority for the discovery.[13] Duverney's own published description did not appear until 1745.[14] 1n 1805, Johann Christian Rosenmüller (1771-1820) published an atlas that included illustration of what he called the Muskel des Thränensackes or musculus sacci lacrymalis, which appears to be the same muscle.[15] William Edmonds Horner (1793-1853)[16, 17] wrote about his findings of the attachments of the orbicularis oculi muscle in 1822.[18] In this report he described a small muscle located on the posterior part of the lachrymal ducts, which he later called the tensor tarsi muscle.[19] In 1824, Horner recapitulated his findings and reviewed several other published authorities.[20]

William Edmonds

SIGN

On April 28, 1922, Alfred Baker Spalding (1874-1942) presented a paper to the Society of the Alumni of the Sloane Hospital for Women in which he described that overlapping of fetal skull bones as seen on plain film x-ray was a pathognomonic sign of intra-uterine death.[21] This paper was published later that same year which led to the commonly used eponym: Spalding sign. On December 16, 1921, David Alfred Horner (1884-1945)[22, 23] presented a paper to the Chicago Gynaecological Society in which he also described the phenomenon of overriding of the skull bones visible on plain film x-ray being a sign of intra-uterine death.[24] This paper was also published in the same journal as Spalding's manuscript but a month later. Even though the term Spalding sign is usually used, especially more recently as an ultrasonography finding, the, maybe more appropriate, eponym Horner sign can occasionally be found.[25]

David Alfred

CONCLUSION

The stories behind the various Horner eponyms show that history does not quite always remember the "right" person.

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THE TEACHING PROFESSOR CONFERENCE

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Student Preferences: Favored Elements of Traditional, Blended and Online Learning

PRESENTER:
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BACKGROUND: With increased use of distance learning, instructors need a better understanding of which remote instruction elements should be used to promote learning and student satisfaction, creating a successful environment for all types of learners.

METHODS

Sixty-one first-year optometry students completed a survey on their preferred **didactic course formats** after 8 months of remote learning (IRB#20015).

- **Traditional**—all lectures are in-person at a set time and place.
- **Online**—all course content is accessed online, professor interactions are all by electronic means, and there are never official meetings.
- **Blended**—variation from traditional lecture with incorporation of online-based course activities, with some official remote and/or in-person meetings.

RESULTS

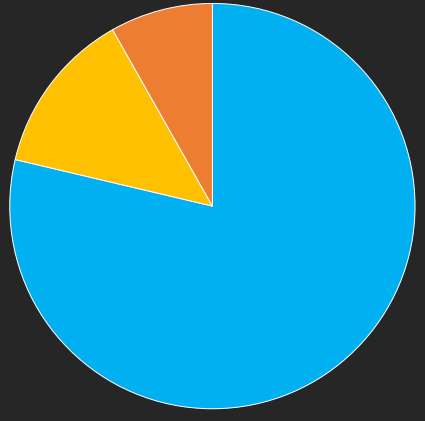
Students also indicated the most important features of their preferred format.

Traditional Format (n = 8):
- Provides a focused learning environment
- Forms a learning community
- Allows questions & immediate feedback

Online Format (n = 5):
- Increased retention of material
- Offers more efficient use of time
- Provides flexibility of lecture viewing schedule

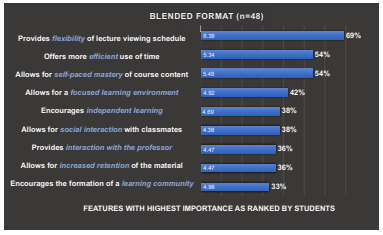
Blended Format (n = 48):
- Provides flexibility of lecture viewing schedule
- Offers more efficient use of time
- Allows for self-paced mastery of content

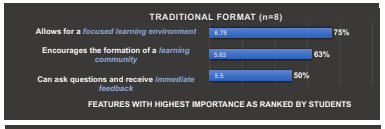
The future of higher education is blended due to flexibility, self-paced learning, and efficient use of time.

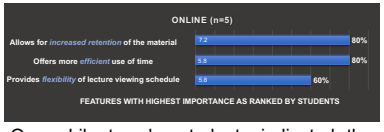


Students prefer a **blended** (79%) didactic course design compared to **traditional** (13%) or **online** (8%) formats.

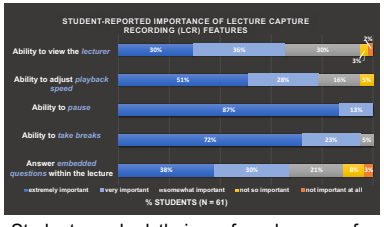
Students ranked features associated with their preferred course format from 9-most to 1-least important. Results below show the mean ranking and percentage of students who ranked the element within their top 4 preferred features.



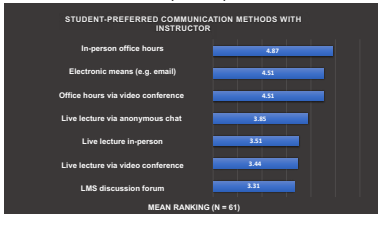




On a Likert-scale, students indicated the importance of various lecture-capture recording (LCR) system features (below).



Students ranked their preferred means for asking the professor questions related to the course content (below).



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Students Evaluate Customized Instructional Videos for Successful Learning

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Introduction

As part of a remote learning ocular anatomy (OA) course, customized instructional videos with active-learning strategies were created to deliver the course content. Using basic editing software and a video streaming platform, the instructor-created videos incorporated supplemental features including clinical images and videos, interactive applications, instructor-led drawings, self-assessment questions, pop-up text emphasis, break-away images for review, and free-hand annotations to enhance student understanding and engagement. This study examined the perspectives of students who completed OA using the videos and examines the specific video features that best supported successful learning.

Methods

This study examines the perspectives of first-year optometry students who completed OA in Winter quarter 2020-21 using the asynchronous instructional videos and examines the specific supplemental video features that best supported successful learning. One hundred seventeen first-year optometry students were invited to participate in a survey study. The survey questions addressed the overall format of instructional video format and the preferred features that promote successful learning. (Figure 1) The anonymous survey was administered in person, privately, using Survey Monkey®, and most question responses used a Likert scale, ranking, or rating of choices.

SCAN ME

FIGURE 1
Use the QR code to view actual survey questions posed to the first-year students.

Results

Out of 117 possible participants, 61 first-year students participated in the anonymous survey. On a 5-point Likert-scale, 90% and 87% of students strongly agreed or agreed that the instructional videos were engaging and efficient, respectively. Ninety percent of students affirmed that the instructional videos allowed for successful learning of the course material, with 88% reporting a satisfactory learning experience (strongly agreed or agreed). Lastly, 84% of students strongly agreed or agreed that the instructional video format should be used to deliver OA course content in the future.

Instructional video features that support successful learning:

- Instructor annotations
- Pop-up text emphasis
- Supplemental images/videos
- Embedded review images
- Self-assessment questions

SCAN ME

Scan the QR code for a full version of the poster.

The top 5 features of the instructional videos rated as either extremely or very important for enhanced understanding were the lecturer's annotations (95%), clinical images (87%), pop-up text emphasis (84%), featured images from previous material (82%), and self-assessment questions (75%). Although interactive video tasks such as instructor-led drawings were not monitored or graded, students reported they completed the majority of these activities (mean 79%, median 90%), suggesting successful student engagement. (Figure 2)

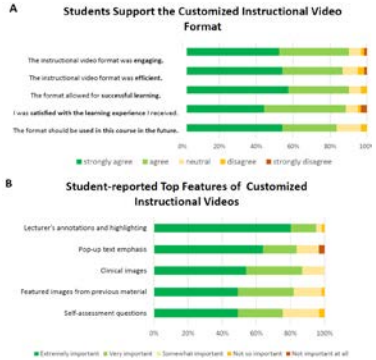

Figure 2. Students (n=61) demonstrate support for customized instructional videos and assess their most important features for successful mastery of the course content. Support for the instructor-created videos was determined using a 5-point Likert scale from strongly agree to strongly disagree, assessing the engagement, efficiency, success, and overall satisfaction with the video format (A). Supplemental features of the videos were assessed on a 5-point Likert scale from extremely important to not important at all. The top 5 features are shown (B).

Conclusion

The overwhelmingly positive response to the customized instructional video lecture format suggests it can be used successfully in higher education. The most important supplemental features identified by the students can guide instructors in creating engaging instructional videos that efficiently deliver course content remotely for enhanced understanding. Instructional videos can support nontraditional lecture methodologies such as those used in blended course design, courses taught by instructors from outside institutions, and those designed to meet the needs of fully remote students.

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WCO

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Moving Optometry forward to accept the changing approach to myopia from correcting refractive error only to looking at myopia as a disease entity: World Council of Optometry's role

Sandra S Block[1], Elizabeth Lumb[2], Peter Hendicott[1], Susan Cooper[1]
[1]World Council of Optometrists, St. Louis, MO, USA, [2]CooperVision, UK

Introduction/Purpose

The mission of the World Council of Optometry (WCO) is to facilitate the development of optometry around the world and support eyecare professionals (ECPs) in promoting ocular health and vision care as a human right through advocacy, education, policy development and humanitarian outreach. In the past decade, the emergence of myopia has been seen as a growing public health epidemic.[1]

The expansion of research on myopia as a disease entity demonstrates that myopia can lead to vision threatening conditions.[2] Improved techniques and methods to monitor myopia progression have been documented and clinically useful, evidence-based interventions to help delay the onset of, and slow the progression of myopia are becoming increasingly available.[3-5] For these reasons WCO is working to actively advocate for updated and expanded diagnosis and treatment of childhood myopia.

Methods

WCO teamed with CooperVision, Inc. (CVI), a leader in the field of vision care, to spread the message of myopia as a disease entity and the knowledge, skills and tools to manage myopia based on quality scientific research.

The WCO released the recommendations within a resolution titled "Standard of Care for Myopia Management by Optometrists" (2021).[6] The purpose of the resolution was to shift the profession of optometry from the concept of simply correcting myopia to understanding how to mitigate, measure and manage the disease and provide patients with the most up to date and evidence-based advice and treatment recommendations.

A global committee representing both WCO & CVI reviewed evidence on the myopia epidemic. Some of the issues highlighted were:

- For years, myopia has been considered a simple refractive error, addressed with corrective optical devices
- Evidence shows that myopia is complex, including the possibility of ocular health complications not seen until years after myopia develops[2]
- Many studies have outlined risk factors, protective behaviors, and management that may impact the onset and progression and therefore the long-term effects of myopia[3-5]

Results

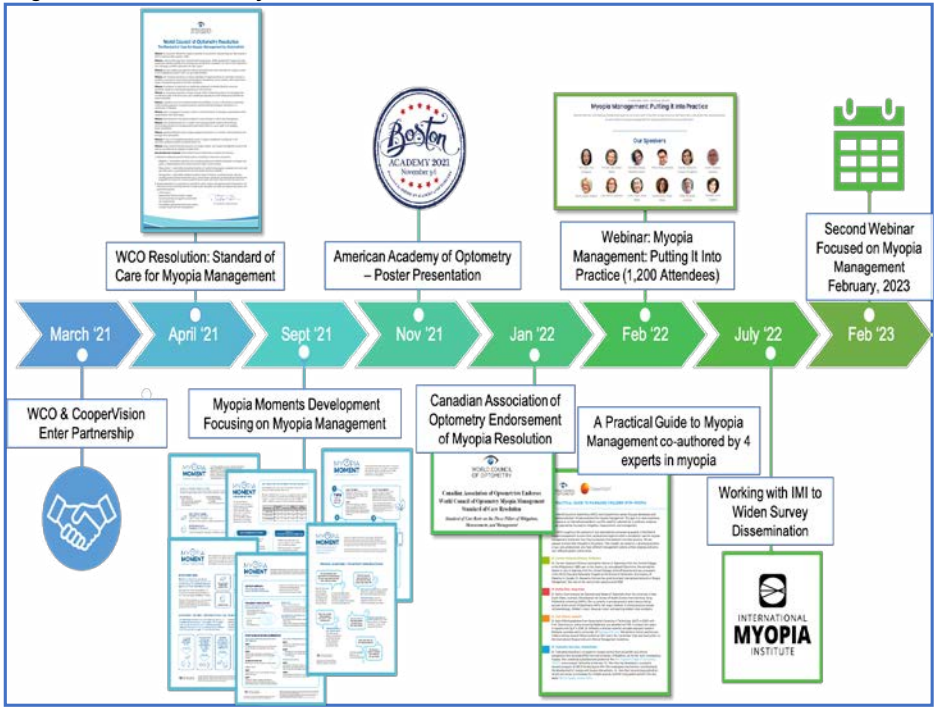
As stated WCO board approved & signed the 'Resolution for the Standard of Care for Myopia Management', on April 13th 2021. From there, a cascade of activity followed built on the foundations of the 3 main components of the Standard of Care:

Mitigation: Optometrists educating and counseling parents and children, during early and regular eye examinations, on lifestyle and other factors to prevent or delay the onset of myopia.

Measurement: Optometrists evaluating the status of a patient during regular comprehensive vision and eye health examinations, such as measuring refractive error and axial length whenever possible.

Management: Optometrists addressing patients' needs of today by correcting myopia, while also simultaneously prescribing evidence-based interventions (e.g., contact lenses, spectacles, pharmaceuticals) that slow the progression of myopia, for improved quality of life and better eye health today and into the future.

Figure 1: Timeline of activity [6,7] **(all resources available at the WCO website)**



Conclusion

Many ECPs do not have the time to search myopia management research that is rapidly changing.

The partnership between the WCO and CVI is helping to drive providing evidence-based science that ECP's need to best serve their young, myopic patients through virtual presentations, published articles and a website with documents that provide succinct guidance to mitigate, measure and manage their myopic patients with current interventions.

WCO is a global optometric organization committed to help ECP's stay abreast of the best evidence-based research in order for the optometric practice to provide quality, affordable and equitable care for their patients and remain committed to working towards making myopia management a standard of care.

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