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Assessing Optic Disc Drusen Using Optic Disc Drusen Studies Consortium Recommendations

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INTRODUCTION

Optic disc drusen (ODD) are often referred to as pseudopapilledema due to their physical characteristics of optic disc protrusion and blurred optic disc margins. Recent guidelines released by the Optic Disc Drusen Studies (ODDS) Consortium allow the optometrist to use optical coherence tomography (OCT) to diagnose and evaluate optic disc drusen. A series of case reports illustrates how the Consortium's OCT protocol was used to rule out papilledema and accurately diagnose ODD. Below are the OCT characteristics of ODD as referenced by the ODDS Consortium:

- Always located above the lamina cribrosa
- Always have a signal-poor core
- Often seen with hyper-reflective margin (most prominent superiorly)
- Sometimes seen as conglomerates of multiple ODD with internal reflectivity of the signal-poor core
- Hyper-reflective horizontal lines may be a precursor to ODD
- Peripapillary hyper-reflective ovoid mass-like structures (PHOMS) may represent bulging axons and should not be considered as ODD

FIGURE 1

CASE 1

A 33yo Hispanic female was referred for optic disc edema consult. She was asymptomatic with a best corrected visual acuity (BCVA) of 20/20 in each eye. OCT (Image 1) revealed intra-disc, ovoid structures with signal poor cores and hyper-reflective borders (white arrows) and horizontal hyper-reflective lines (green arrows). Peripapillary hyper-reflective ovoid mass-like structures (PHOMS) are visible at the nasal and temporal disc margins (red arrows). Also of note is an elevated disc with absence of the central cup.

CASE 2

A 29-yo African American female was referred for papilledema evaluation. She had a history of migraine headaches but was otherwise asymptomatic with a BCVA of 20/20 in each eye. Fundus photos (Images 2A & 2B) revealed blurred disc margins with visible optic disc drusen (red arrows). OCT (Images 2C & 2D) shows ovoid lesions with signal poor cores and hyper-reflective margins in both eyes (white arrows).

CASE 3

A 7-yo Hispanic male was referred for optic disc evaluation. He was asymptomatic with a BCVA of 20/20 in each eye. Fundus photos (Images 3A & 3B) revealed blurred disc margins with the absence of a central cup in both eyes. OCT (Images 3C & 3D) showed elevated discs with absence of central cups. There were multiple intra-disc, ovoid lesions with echo-poor cores (white arrows) and PHOMS (red arrow).

FIGURE 2A, 2B, 2C, AND 2D

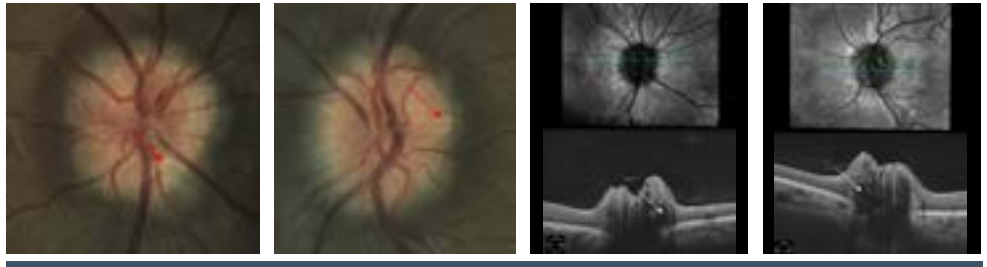

FIGURE 3A, 3B, 3C, AND 3D

DISCUSSION

Per the ODDS Consortium guidelines, lesions that are suspected ODD should be assessed to ensure they are above the lamina cribrosa and have a signal-poor core. Diagnosis can further be confirmed if the lesions have hyper-reflective margins, especially superiorly. Care should be taken not to mistakenly diagnose PHOMS as ODD; PHOMS are hyper-reflective and lack a hyporeflective core and sharp margin. Furthermore, hyper-reflective horizontal lines should not be considered ODD, though these lesions might represent a precursor to ODD. The Consortium also highlights optimal testing methods for obtaining optic nerve OCT, including using enhanced depth imaging (EDI) and scanning a 15 x 10° area over the optic disc.

CONCLUSION

The ability to differentiate ODD from true papilledema is essential to the practicing eye care provider, as true papilledema may be life threatening. In each of these cases, the ODDS Consortium protocol for diagnosing ODD with OCT was used, and ODD was accurately evaluated. The patients therefore avoided timely and costly emergency department visits and unnecessary diagnostic testing. Additionally, this protocol gives optometrists without access to a B-scan ultrasound the ability to diagnose and monitor ODD. These cases illustrate the benefit of obtaining optic nerve OCT and using this protocol to evaluate optic nerves that appear elevated on clinical examination.

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Focal choroidal excavation: conversion from conforming to non–conforming in a pregnant female

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INTRODUCTION

Focal choroidal excavation (FCE) is an excavation of the choroid detected by optical coherence tomography (OCT) that can be found in a congenital or acquired form and in a conforming (excavation occupied with outer retinal tissue) or non-conforming (excavation occupied with sub-retinal fluid) subtype. FCE is usually stable and asymptomatic with patients not requiring any treatment. Recently however, associations with pachychoroidal diseases such as polypoidal choroidal vasculopathy (PCV) and central serous chorioretinopathy (CSCR) have been recognized thus necessitating lifelong monitoring. This case highlights the conversion of conforming FCE to non-conforming FCE with spontaneous resolution in a young pregnant female.

RESULTS

A 27-year-old white female presented for a comprehensive eye exam with a history of stable and asymptomatic conforming FCE OD/OS that was diagnosed 1 year prior. The patient was 3 months pregnant with the medical history being otherwise unremarkable. Best corrected visual acuity was 20/20 OD and 20/20 OS. External examination, entrance testing, and slit lamp examination was unremarkable. IOP's were 14 mmHg OD/OS with Goldmann applanation tonometry. Dilated fundus examination revealed optic discs with 0.5/0.5 cup to disc ratio OD/OS. The maculas OD/OS revealed retinal pigmentary changes (Figure 1 and 2). SD-OCT through the pigmented changes revealed FCE OD with overlying fluid (Figure 3). FCE was also noted OS but was noted to be stable compared to her previous visit (Figure 4). OCT-A was unremarkable with no evidence of a CNVM. Based on the patient's age, OCT findings, and prior history, she was diagnosed with a non-conforming FCE OD secondary to pregnancy. The patient was monitored with her last visit showing complete fluid resolution OD with conversion back to a conforming FCE (Figure 3).

FIGURE 1
Fundus photo of the right eye showing mild pigmentary changes at the fovea.

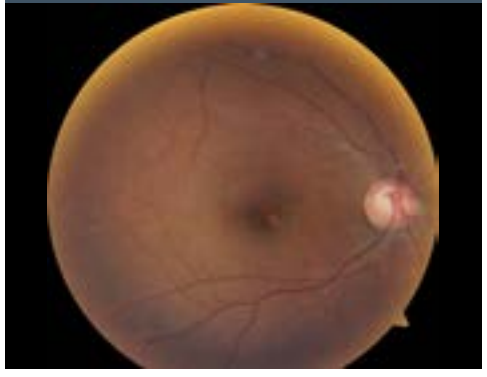


FIGURE 2
Fundus photo of the left eye showing mild pigmentary changes at the fovea.

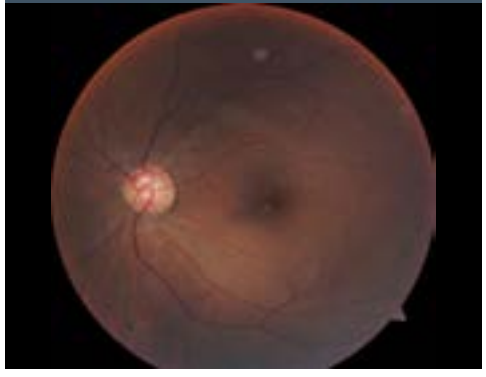


FIGURE 3
SD-OCT scan of the right eye showing a non conforming FCE under the fovea with adjacent RPE changes (top). The patient was monitored, and three weeks later the non conforming FCE reverted back to a conforming FCE (bottom).

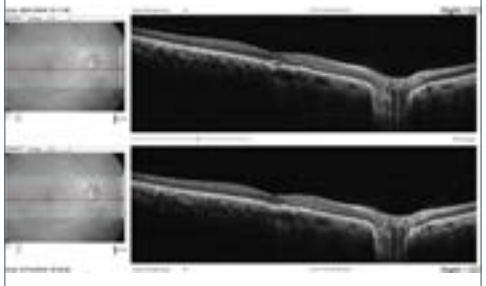
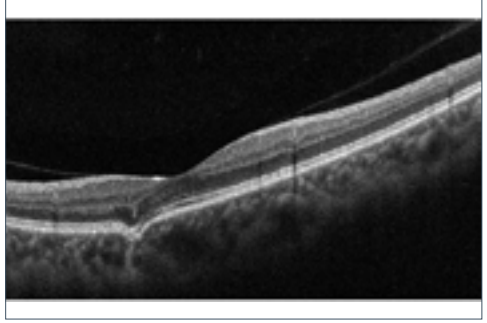


FIGURE 4
Stable conforming FCE of the left eye



CONCLUSION

FCE is a condition of unknown etiology that is classified as non-conforming (fluid between the photoreceptor layer and the retinal pigment epithelium) or conforming (fluid is lacking). Recently, cases in the literature have revealed increased choroidal thickness (pachychoroid) in patients with FCE putting it in the pachychoroid spectrum along with pachychoroid pigment epitheliopathy (PPE), CSCR, PCV, and choroidal neovascular membranes (CNVM). It is postulated that dilated large choroidal vessels (pachyvessels) compress the choriocapillaris causing ischemia and atrophy of the inner choroid leading to FCE. Further thickening then leads to RPE damage and the possible development of conditions such as CSCR. It is probable in this case that the patient's pregnancy, and her history of FCE, played a part in the development of her sub retinal fluid, and conversion from conforming to non-conforming FCE, as both are risk factors for CSCR. Treatment options for non-conforming FCE includes monitoring, photodynamic therapy, and anti-vegf injections however the data set is limited due to the rarity of the condition.

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Pachychoroid Pigment Epitheliopathy

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INTRODUCTION

Pachychoroid pigment epitheliopathy (PPE) is a rarely encountered macular condition that is part of a spectrum of conditions that are a result of diffuse or focal areas of increased choroidal thickness and dilated choroidal vessels (pachyvessels). Unfortunately, patients are frequently misdiagnosed, as the condition can resemble central serous chorioretinopahty (CSR), early age-related macular degeneration (AMD), pattern dystrophies, or inflammatory white dot conditions. This case highlights a patient who was ultimately diagnosed with PPE based on clinical findings, clinical course, and ancillary testing.

RESULTS

A 33 year old female presented for a comprehensive eye exam with a chief complaint of distance blur. Best corrected visual acuities were 20/20 OD and 20/20 OS. External examination, entrance testing, and slit lamp examination was unremarkable. IOP's were 11 mmHg OD/OS with Goldmann applanation tonometry. Dilated fundus examination revealed normal optic discs with 0.4/0.4 cup to disc ratio OD/OS. The retinal vasculature was also found to be normal OD/OS. Multiple cream colored lesions were noted temporal to the fovea OD (Figure 1) with OS being unremarkable (Figure 2). Fundus auto-fluorescence imaging (FAF) OD revealed mild hyper auto fluorescence of the lesions indicating RPE involvement (Figure 3) with OS being unremarkable (Figure 4). SD-OCT through the lesions revealed a thickened choroid with a large pachyvessel resulting in impingement of the RPE and thinning of the overlying photoreceptor integrity line (Figure 5). OCT-A was unremarkable with no evidence of a choroidal neovascular membrane (CNVM) (Figure 6). Differentials included PPE, AMD, CSR, and pattern dystrophy. However, based on the patient's age, unilateral presentation, lack of subretinal fluid, and multimodal imaging results, a final diagnosis of PPE was made with the patient being monitored yearly.

FIGURE 1

FIGURE 2

FIGURE 3

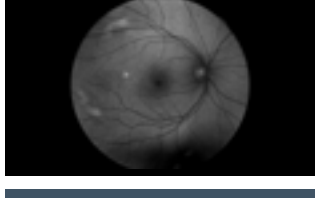


FIGURE 4

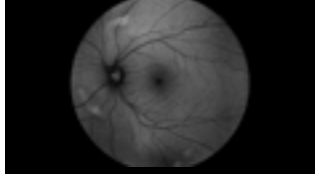


FIGURE 5

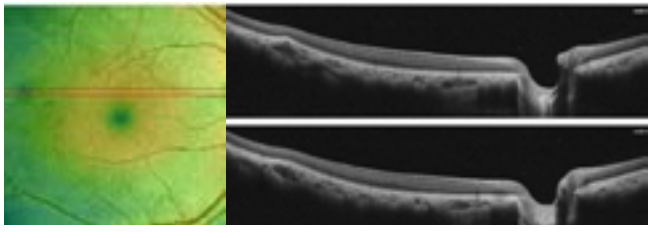
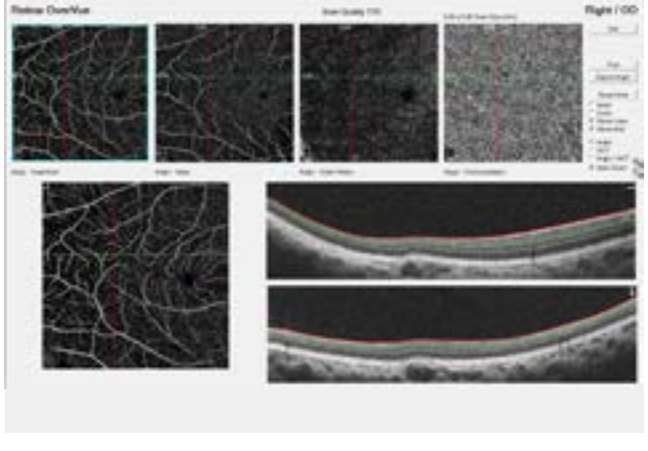


FIGURE 6



CONCLUSION

PPE is a relatively new and rare macular disorder that can be confused for other macular conditions. The condition is generally asymptomatic with signs that can include a thickened choroid, fundus tessellation, and RPE abnormalities. These findings are thought to be due to pachyvessels that run adjacent to the RPE/Bruch's membrane resulting in pigment disruption. Patients are diagnosed based on the clinical findings mentioned above as well as noninvasive tests such as OCT and FAF. Timely diagnosis is warranted to prevent unnecessary testing and intervention. Lifelong monitoring is warranted as long term disruption of the RPE can result in CNVM formation.

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Determination of risk of Keratoconus development in a population of possible at–risk children 7–18 years of age.

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PURPOSE

The original purpose of this pilot study was to collect tomography scans on children and adolescents from a large urban low-income community to determine whether this is a population at-risk for keratoconus. The scans were completed on as many patients seen for a comprehensive eye exam at the IEI at Princeton Clinic, Chicago. The study began in 2017 and as of April 2019, 4204 Pentacam scans have been attempted. The study goal is to determine which individuals are at-risk for keratoconus based on the Pentacam tomography analysis. The initial description of the study was presented at AAO 2018. The data contained herein represents the initial stages of review, the number of scans attempted and completed. In the original methodology, the process was to have two expert reviewers blindly interpret the scans with some basic information and categorize the risk of keratoconus. We will share the demographics of the subject pool.

METHODS

Each subject participated if they could complete the tomography scan. Subjects with significant corneal astigmatism were targeted. The tomography maps were reviewed and those that were considered valid were included in the analysis. Acceptable scans were considered at high-risk based on the criteria:

- Values of the Belin-Ambrosio A, B, or C > 1
- Final D >1.6.

The data collected included refractive error based on cycloplegic autorefraction.

In this initial part of the study, two blind reviewers who were considered experts in the field of keratoconus (one MD and one OD) provided feedback on groups of 8-10 scans at a time. They were provided with the following information along with the scans. All identifying information was removed prior to forwarding the data and scans to the reviewers.

The data that was included is as follows:

Subject Number	Pach Thin	Thin Pachy: (C)
Capture Diameter	Prog Index	IOP
BAD QS	Front E Thin	Sphere
Final D	Back E Thin	Cylinder
Asymmetry	ARC: (A)	Axis
ART-max	PRC: (B)	Best VA

The reviewers were requested to make a decision based on their knowledge and expertise and were not provided any specific guidelines for reviewing the data. We asked that they independently determine whether the subject scans were one of the following:

Normal
Abnormal not Keratoconus
Keratoconus Suspect
Keratoconus

Once the primary reviewers returned their decision, subjects on which the reviewers disagreed were sent to a third reviewer.

RESULTS

2,109 subjects had tomography scans attempted on both eyes of which 3861 total scans were valid, 14 had readable scans on only one eye. Subjects were 44.7% (942) male, 4-22 years of age (median 12 yrs), 61.6% Black, and 34.7% were Hispanic. For those that were readable, 7.2% (278) were identified as at- risk for keratoconus based on values A, B or C >1. 17.6% (687) had final D > 1.6 while 4.7% (182) showed both A, B, &C > 1 and final D>1.6. The data presented on the initial reviews covers the first 74 scans that were found to be readable.

Comparisons of the decisions by the 2 primary reviewers on the 74 subjects:

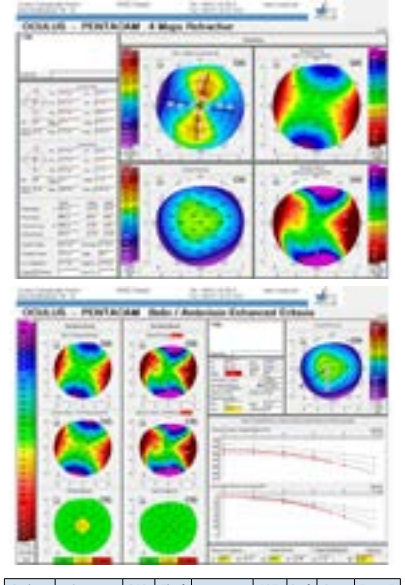
The reviewers agreed that 23 of the scans should be labeled as keraotconus and 14 should be keratoconus suspect. The reviewers did not agree on the remainder of the scans (37). The table below shows the decisions of the reviewers on all scans. The yellow cells represent agreement between the two primary reviewers.

	Reviewer 1			
Reviewer 2	Normal	Abnormal but not Keratoconus	Keratoconus Suspect	Keratoconus
Normal				1
Abnormal but not Keratoconus				
Keratoconus Suspect			14	11
Keratoconus	1		23	23

Review of the decisions of all three reviewers when Reviewer 1 & 2 did not agree on the risk of keratoconus.

Reviewer 1	Reviewer 2	Reviewer 3	# of subjects
Keratoconus Suspect	Keratoconus	Abnormal Not Keratoconus	1
Keratoconus Suspect	Keratoconus	Keratoconus	1
Keratoconus Suspect	Keratoconus	Keratoconus Suspect	13
Keratoconus Suspect	Keratoconus	Normal	7
Keratoconus Suspect	Normal	Normal	1
Normal	Keratoconus	Keratoconus Suspect	1

Example of a subjects that elicits variable interpretations:



Patient Number	Capture Diameter	BAD QS	Final D	Asymmetry	ART-max	Pach Thin	Prog Index	Front E Thin
1780	8.00/7.43	OK	1.63	10	341	555	1.15	4

Back E Thin	ARC: (A)	PRC: (B)	Thin Pachy: (C)	IOP	H/M	Sphere	Cylinder	Axis	Best VA
5	2.1	2.1	0.1	UTT	H	4.50	-6.75	166	50

CONCLUSION

The study has encountered several challenges. The reviewers found it difficult to interpret the data simply by the information that was provided as well as the time required was longer than expected yielding a slower response rate. With the conclusion of this first group of subjects, the reviewers will be provided additional information in an effort to allow the reviewers to increase the efficiency and feel that they have all the information needed to judge the scans accurately. With the additional guidance, we are hoping that we can arrive at a more consistent outcome for those subjects truly at-risk.

The population studied is predominantly African American and Hispanic, many with significant astigmatism. The results suggest these individuals may be at higher risk for developing keratoconus based on the Pentacam values of A, B, C and final D. The data suggests a higher than expected prevalence then suggested in the literature for children and adolescents. Longitudinal studies need to monitor the subjects over time to see how many will actually convert to the diagnosis of keratoconus and what factors will contribute to the disease.

ADDITIONAL COMMENTS

We would like to extend extreme thanks to to International Keratoconus Academy of Eye Care Professionals for their support, our readers, Dr. William Trattler, Dr. Jennifer Harthan and Dr. William Tullo and Oculus for the loan of equipment for this on-going study.

International Keratoconus Academy
Of Eye Care Professionals

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Referral Patterns for Laser Peripheral Iridotomy in Patients with Primary Angle Closure at The Illinois Eye Institute

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PURPOSE

This study was undertaken to determine the percentage of Illinois Eye Institute patients assessed gonioscopically by clinical optometric faculty to have occludable anterior chamber angles that underwent laser peripheral iridotomy (LPI) by a glaucoma ophthalmologist.

METHODS

A total of 199 patient records from August to November 2018 using the ICD -10 code of either H40.033 (anatomical narrow angles, bilateral) or H40.069 (primary angle closure suspect) were reviewed. 23 patients had had previous LPI and 19 had no gonioscopy recorded so were excluded. Of the qualifying 157 patients, ages ranged from 32-91 years old, with the average age of 62 years. 68% were female; 57% were African –American, 13% Hispanic, 4% Asian, 3% Caucasian, and the remaining 22% either declined to specify or was not recorded. The majority,103/157 (65.6%) were hyperopes.

Chart review showed that anterior chamber angles were initially assessed according to the Von Herick scale (1+ to 4+; 1+ indicating most narrow and 4+ indicating most open) and subsequently via 3 or 4-mirror gonioscopy, with the most posterior structure seen in each of the four quadrants documented. It was further noted if: the angles were determined to be narrow but not occludable and thus could be monitored; the patient was referred for laser peripheral iridotomy but the procedure was not performed (patient deferred or lost to follow up, doctor deferred, or cataract surgery was recommended or performed in lieu of LPI); or the patient was referred for and had the laser peripheral iridotomy performed. An occludable angle was defined as one with less than 180^0 of pigmented trabecular meshwork visible in at least two quadrants.

RESULTS

Of the 157 patients evaluated by optometrists with gonioscopy, the majority -73.9% - were deemed to have non-occludable angles and were not referred for further evaluation. 39/157 (24.8%) were found to have occludable angles and were referred for laser peripheral iridotomy; of those patients,18 (46.2%) underwent LPI; 11 (28.2%) were lost to follow up, 4 (10.3%) were lost to follow up after LPI was recommended by the ophthalmologist; 4 (10.3%) were deemed to not have occludable angles; and 2 (5%) opted for cataract surgery. Of the 18 people who had LPI, 72.2% were female, with 84.6% of those being hyperopic with an average age of 70 years. (FIGURE 1)

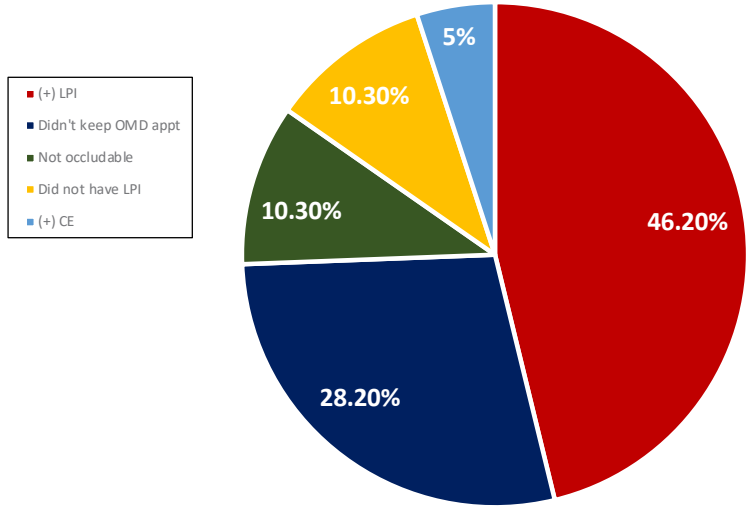
CONCLUSION

This study demonstrates that the clinical faculty at a large academic based optometric institution are appropriately referring primary angle closure suspects for treatment; more than four times as many patients received a prophylactic laser peripheral iridotomy than those who were deemed not at risk for angle closure and could be managed with annual comprehensive examinations including serial gonioscopy. The study also demonstrates that the preferred treatment in clinical practice for occludable narrow angles remains laser peripheral iriodotomy (not cataract extraction) and confirms that the patients more likely at risk are older, hyperopic females.

DISCUSSION

Primary angle closure suspect (PACS) is defined as an occludable anterior chamber angle with appositional closure, but without peripheral anterior synechia, increase in intraocular pressure or glaucomatous changes to the optic nerve. Laser peripheral iridotomy is often performed to widen the angle and decrease the risk of developing acute angle closure or primary angle closure glaucoma. Many eye care practitioners still routinely refer for, or perform LPI, from habit or fear. LPI's have a good safety profile, but can be cause transient iritis, increase in intraocular pressure, potential acceleration of cataract formation, and development of posterior synechia.

FIGURE 1
Patients referred for LPI



There has been increasing discourse in the literature that appears to dispute the need for its routine use. The Zhongshan Angle Closure Prevention, "ZAP", Trial, found that just 4% of the 889 PACS patients followed for 6 years developed angle closure. The authors concluded that the benefit of prophylactic LPI was limited, and therefore, widespread prophylactic LPI for primary angle-closure suspects was not recommended. The Effectiveness of Early Lens Extraction for the Treatment of Primary Angle-closure Glaucoma "EAGLE" study concluded that for their 419 patients, clear-lens extraction showed greater efficacy and was more cost-effective than laser peripheral iridotomy and should be considered as an option for first-line treatment. Cataract surgery as the first line of treatment also eliminates the risk of cataract development due to laser treatment.

Our study confirms that certain populations are at higher risk and that optometrists are appropriately diagnosing occludable angles; it also demonstrates that the majority of these patients can be properly educated and monitored yearly. However, optometrists and ophthalmologists alike should consider clear lens or cataract extraction as a viable alternative to the more traditional laser peripheral iridotomy when intervention is necessary.

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Challenges in Low Vision Management s/p Keratoprosthesis

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INTRODUCTION

Boston Keratoprosthesis (KPro) implantation has become a common therapeutic approach in the low vision population due to its effective treatment of corneal blindness, but it poses significant challenges in the postoperative management of visually impaired patients. This case demonstrates the clinical manifestations of such difficulties, including refractive challenges and ocular health concerns, and highlights systemic inflammatory comorbidities and the implications they have on KPro outcomes.

BACKGROUND

In studies of KPro Type 1, the most common pre-operative etiology is graft rejection or failure with an average of >2 prior corneal transplants, consistent with this case. Around three quarters of eyes postoperatively attain vision better than 20/200 and the majority maintain their vision on long term follow-up[1,4]. Postoperative care includes indefinite use of fourth generation fluoroquinolones, compounded vancomycin, a maintenance dose of topical steroid, and in some cases anti-fungal prophylaxis. Additionally, a bandage contact lens is used postoperatively to protect against evaporative damage of corneal tissue surrounding the implant[1]. Retroprosthetic membrane (RPM) growth is the most common non-surgical postoperative complication, and the majority are successfully treated with YAG[1,4]. In rare cases of recurrent or resistant membranes, surgical removal is required[3]. Endophthalmitis, while of concern due to poor prognosis, is low risk when appropriate postoperative therapy is adhered to[2].

CASE HISTORY

- 60-year-old female with a history of bilateral chronic uveitis, treated with topical, oral and local steroids x 25+ years
- SYSTEMIC HISTORY: Crohn's disease, inflammatory bowel disease, ankylosing spondylitis, multiple sclerosis, treated with systemic immunomodulators

RIGHT EYE	LEFT EYE
Corneal decompensation, band keratopathy, Descemet's folds, corneal edema, guttatae	History of multiple failed keratoplasties w/ hypotony
Hypotony secondary to ciliary body shutdown, treated with sub-tenon's kenalog	8/2013 - HM vision with thick opacified graft, extensive synechiae, aphakia
Persistent CME s/p Ozurdex x 2	12/2013 – Boston KPro Type 1 placement with PPV/SO removal/lens fragment removal/AFx, post-op VA 20/200
Aphakia	Recurrent visually significant RPMs, YAG x 2

- Presentation at Low Vision Examination:
  - Unhappy with current glasses; vision is better OS uncorrected than corrected
  - Bandage contact lens (BCL) fell out of OS 1 week ago and was unable to reinsert it
  - Difficulty with reading/near work

PERTINENT EXAM FINDINGS

	Right Eye	Left Eye
Unaided entering VA	10/1600	10/180
Aided entering VA	10/225	10/1200
Near VA	1.6M (20/80) at 10cm, unaided	
Dominant Eye	OD	
Habitual RX	+15.75 sph	+15.75 sph
Subjective Refraction	+19.50 sph (10/100)	-2.00 sph (10/140)
Slit Lamp	1-2+ diffuse corneal haze, band k, central guttatae, aphakia	KPro Type 1 with RPM, aphakia, no BCL present

DISCUSSION

While KPros have demonstrated potential for postoperative visual improvement, most patients maintain a level of visual impairment that complicates their postsurgical management[1,4]. In this particular case the patient faced refractive difficulties; while her right eye was her dominant eye, it demonstrated a worse BCVA than her surgical eye. Intolerable amounts of anisometropia resulted in the intentional blur of her surgical eye, despite its potential for better visual acuity.

Another significant challenge was poor near acuity inhibiting her ability to reinsert her BCL. This was a repeating complication in this case, occurring three times over the past year alone. Lack of a BCL is an independent risk factor for postoperative complications including dellen formation, epithelial defects, stromal thinning, and corneal melt[3,6]. An appropriate lens fit is imperative in long-term KPro maintenance.

Finally, the patient presented with recurrent RPMs affecting the visual axis, after having undergone two YAG treatments to address previous occurrences. Inflammatory comorbidities, in this case Crohn's disease, IBD, ankylosing spondylitis, and MS, can increase the risk of RPM development[5].

FIGURE 1
Type 1 Boston Keratoprosthesis. (Photo: Magalhaes et al., 2012)

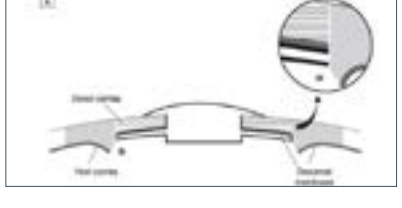
MANAGEMENT

A multi-disciplinary approach is essential in the management of these patients and should include input from low vision and contact lens practitioners, in addition to cornea and etiology-based specialties, in this case rheumatology and uveitis specialists.

The KPro is available in two forms: a standard plano for pseudophakes or a customized power based on axial length for aphakes. In this patient, an aphakic implant was chosen, correcting for the patient's refractive error in the surgical eye, but ultimately resulting in intolerable anisometropia. A team-based approach could have prevented this anisometropic outcome by keeping the patient in an aphakic refractive state and allowing for binocularity.

FIGURE 2
Type 1 Boston KPro, 1 year s/p implantation in a patient with appropriate anatomy and structure to support implantation. (Photo: Gao et al., 2018)

FIGURE 3
Representation of a Type 1 KPro with potential for RPM development due to swelling of the host cornea at the edge of the implant back plate. (Photo: Stacy et al., 2011)



A large diameter bandage contact lens is an important tool used in post-surgical management of KPros in order to prevent scleral thinning, protect the integrity or surrounding corneal tissue, and prevent PMN-induced surface inflammation[1]. A BCL can also be beneficial in the refractive management of low vision KPro patients. The challenge of inserting these large diameter CLs can be particularly difficult for patients with vision impairments, but aids such as magnifying mirrors, handling tints, and lighted applicators can be helpful. In some cases, modified spectacles containing only one lens can be used when correction is necessary in order to insert contact lenses. It is important to remember that low vision patients may require additional training and thorough education regarding safe and proper insertion and removal techniques.

Postoperative long-term topical therapies place a significant medication burden on the patient, which can be exacerbated by systemic comorbidities as they relate to ocular health. However, compliance with these therapies is imperative to the long-term postoperative outcome. Providers should ensure medication compliance and confirm proficiency with drop administration. In low vision, drop dispensing aids are often recommended.

Additionally, this patient demonstrated recurrent RPMs, for which surgical treatment may be considered in the future. In uncomplicated patients, follow up every 3 months with the corneal surgeon is recommended.

CONCLUSION

Residual visual impairment can create challenges in the management of postoperative KPro patients, but a multi-disciplinary approach can greatly improve management. It can be efficient for low vision providers to utilize the already-required BCL in the refractive management of these patients, and the low vision provider should be equipped to address the challenges associated with contact lens insertion and removal in the visually impaired population. Finally, the low vision practitioner should be able to identify when complications associated with systemic comorbidities, such as a RPMs, are interfering with visual function and make the appropriate referral.

REFERENCES

Available upon request.

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Quantifying the Clinical Experience of Volunteer Optometry Clinic Trips

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INTRODUCTION

There is a moderate amount of literature documenting the benefits and lasting impact of humanitarian medical mission trips and medical volunteerism for medical physicians, students and residents [1-2]. Surveys indicate that over 25% of US medical school graduates participate in a global health experience, indicating that this type of service is playing an increasing role in medical education [3-4]. While this trend also appears to be occurring in optometry, fewer studies investigate the specific clinical and personal gains that optometrists, optometry students and residents receive during these endeavors [5-6]. The aim of this study was to investigate the clinical experience and the professional bearing that it has on optometrists.

METHODS

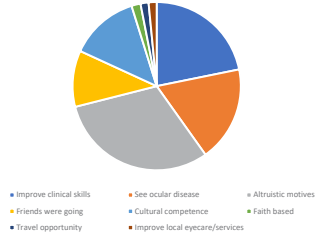
An IRB approved anonymous survey regarding volunteer optometric clinics was developed and distributed to current optometry students, residents, and practicing or retired optometrists. The 26 question survey was distributed online through professional optometric channels including local and national associations and network groups. Statistical analysis was performed to look for trends in survey responses.

RESULTS

Of the 194 survey respondents, 73% did their first volunteer optometry clinic as an optometry student. The leading reason for participating was altruistic motives (79%), followed by a desire to improve clinical skills (57%) and see ocular disease (49%) [*Figure 1].* The majority of the trips were 4-5 days (66%). Of those surveyed 57% felt that the amount of clinical training on the trip was equivalent to one or more clinical quarter/semester in optometry school *[Figure 2].* Of the survey participants who were current optometry students, 27% noted an improvement in grades after the trip, with the majority commenting that it is too early to tell. The total number of patients examined on the first volunteer clinic trip were 1000 or over for 52% and 250-999 for 40% *[Figure 3].* The volume of individual efforts included 36% of survey takers examined up to 100 patients, 31% examined between 100 and 200 patients and 33% examined over 200 patients *[Figure 4].* The top five conditions seen for the first time on a trip were Pterygium/pinguecula (33%), Blindness (29%), Cataract (24%), Visual Impairment (23%), and Diabetic Retinopathy (22%) *[Figure 5].* The five most prevalent conditions encountered on the first trip were refractive error (97%), Cataract (91%), Glaucoma (80%), Amblyopia (80%), and Strabismus (79%). Survey respondents' self-evaluated changes in 10 clinical skills; the most significant improvement in skills after a trip was retinoscopy, direct ophthalmoscopy, subjective refraction, prescription of glasses, and identification of disease *[Figure 6].* Many surveyed noted a concrete increase in confidence in performing certain skills. For retinoscopy, 154 participants noted an improvement in confidence in their skill with 66 of those would rate the improvement as 50% or better. Confidence in direct ophthalmoscopy improved 50% or better for 89 of the 149 survey participants who noticed some improvement. Of those surveyed, 93% went on to do or offer some sort of volunteer examination *[Figure 7].*

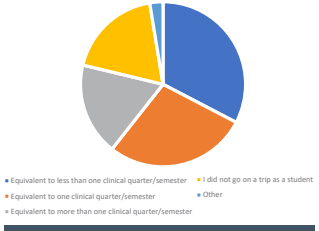
GRAPH 1

Why did you decied to participate on your first volunteer optometry clinic trip?



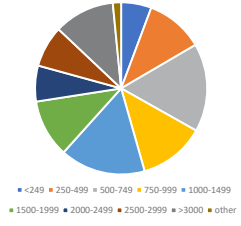
GRAPH 2

Estimate the amount of clinical training that you feel you received on the trip in comparison to clinical training at your optometry school?



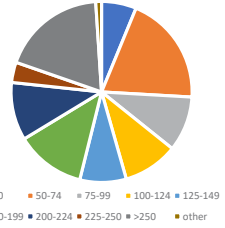
GRAPH 3

Estimate the total number of patients your team examined during your first volunteer optometry clinic trip.



GRAPH 4

Estimate the total number of patients you personally examined on your first volunteer optometry clinic trip.

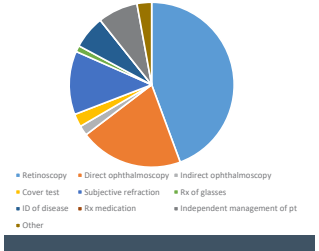


GRAPH 5

What did you see for the first time clinically on your trip?

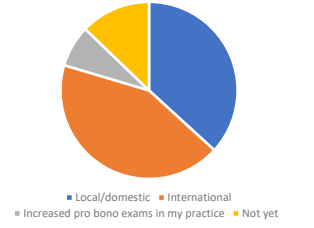
GRAPH 6

What improved the most during your first clinical trip?



GRAPH 7

Since your first volunteer optometry clinic trip have you pariicipated in more volunteer clinics?



CONCLUSION

All respondents believed that participation in a volunteer optometry clinic has had some positive impact on their overall clinical comfort and competence. The intense clinical optometric experience on these types of trips in terms of disease exposure, patient volume, and clinical skill development are arguably unparalleled. The fact that the vast majority of respondents continued on with volunteerism after their first trip demonstrates a heightened understanding of health disparities & their own civic responsibilities. It may be argued that these experiences create more benevolent doctors overall.

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To participate in this study, scan the QR code below with you camera phone or email the authors.

1) Open up the camera app on your iPhone or Android device hold the camera so the QR code is clearly visible.
2) Your device will recognize the code, and show you a notification.
3) Tap the notification to be taken to the survey.

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A Prospective Study of Orthokeratology on Controlling Myopia and Axial Elongation in Young Adults: Final 24–month Results

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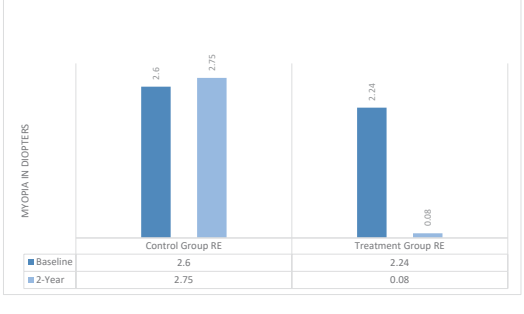
PURPOSE

The high prevalence of myopia – especially in Asian countries – is well documented, as are the sight-threatening complications of high or degenerative myopia. Retinal detachment, glaucoma, vitreal degeneration and focal retinal changes occur secondary to the progressive axial elongation of the eye with age. There is a high correlation between myopia progression and axial elongation, and both have been shown to occur in young adults with high near demands, such as medical and optometry students. To our knowledge, however, there is minimal research on axial length changes in this patient population, and no studies examining the effect of orthokeratology (ortho-k) lenses on this axial elongation. The purpose of this study was to investigate the efficacy of orthokeratology (ortho-k) lenses on controlling myopia and axial elongation in optometry students.

METHODS

First year optometry students (age range: 21 to 30 years) with myopia between -0.50 and -4.50 diopters (D) and astigmatism not more than 1.25D were recruited into the study. Subjects were randomized into ortho-K or control (spectacle correction) groups. The following measurements were collected during the baseline, 6-month, 1- and 2-year examinations: logMAR acuity, subjective manifest refraction and autorefraction (with cycloplegia), anterior segment evaluation, corneal topography (including pupil measurement), IOLMaster measurement of axial length (AL) and ultrasound pachymetry. Spherical equivalent (SE) was calculated to assess refractive error. Right eye data were used for separate statistical analysis. Paired t-test was performed to compare the change in AL and SE from the baseline in the ortho-K group to those in the control group.

FIGURE 1
Myopic Refractive Error (RE) at Baseline and 2-Year



RESULTS

Thirty-eight subjects completed 24-months visit (15 in ortho-K group and 23 in control group). Mean RE of the right eyes in the control group changed from -2.60 D at the enrollment visit to -2.75 D at 24-month visit (p=0.12). Mean RE in the ortho-K group changed from -2.24 D (enrollment visit) to -0.08 D (24-month visit) (P <0.001). AL elongated from 24.61mm to 24.68mm in the control group over the 24-month period (change of 0.07 mm, p=0.07) vs. shortening from 24.46mm to 24.42mm in the ortho-K group (change of -0.04 mm, p=0.13). When comparing the control to the ortho k group, the change in axial length is statistically significant with a P=0.004.

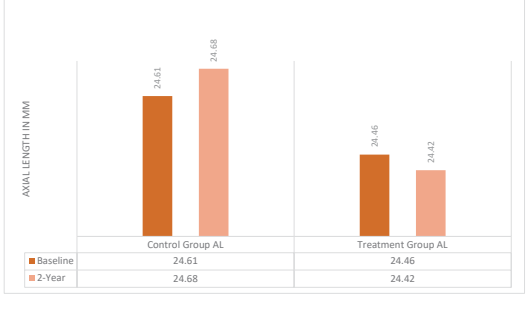
DISCUSSION

Ortho-k, when used for partial or full correction of myopia, has been shown to slow myopic progression in children by an unweighted average of 43% as compared to their spectacle or contact-lens wearing peers. This effect is achieved by limiting the axial elongation of the eye, which is of particular concern in high myopia (>6.00D) and children. As early intervention is considered beneficial if not essential, ortho-k as a treatment modality for diminishing myopic progression has, to our knowledge, only been studied in children. Myopic progression, however, is not limited to this population, and studies have documented increased magnitude of myopia in young adults with high near demands, such as those in undergraduate and graduate studies.

While these increases in myopia in young adult populations have been noted, there had been a shared belief that axial elongation slows to a halt before age twenty in all but high/progressive myopia populations. Our results agree with some recent COMET findings, however, that there is modest but statistically significant axial elongation well past this age. This data points to a role for myopia management – be it orthokeratology or otherwise – for a longer time-course than previously prescribed. This result is especially important to populations with high myopia, where axial elongation is known to be a lifelong process and the consequences sight-threatening.

Axial elongation and myopic progression with high near demands is likely a multifactorial process which our research has indicated continues well past adolescence. In our study, ortho-k lenses were effective in decreasing the axial elongation in optometry students. Myopia control in this population thus warrants further investigation, as do follow-up questions such as efficacy and rebound effects in this novel group. Understanding how these trends resemble or differ from those of childhood may help to elucidate some of the mechanisms underlying the process of axial elongation and myopia progression, and ultimately lead to more effective management.

FIGURE 2
Axial Length (AL) at Baseline and 2-Year



CONCLUSION

Young adults with high educational demands demonstrated a small degree of myopia progression over a 24-month period. Ortho-K significantly reduced refractive error in young adults. A concurrent and statistically significant change in axial length was noted, warranting investigation into the need for myopia control in this minimally studied age group.

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Acute Oculomotor Dysfunction as Presenting Sign of Thiamine Deficiency

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INTRODUCTION

- Thiamine
  - Necessary cofactor to convert carbohydrates to energy
  - Required for aerobic glycolysis and amino acid metabolism
- Deficiency = dysfunction of organs with high metabolic demand
- Deficiency leads to anaerobic glycolysis and lactic acidosis
- Dietary sources: cereals, pork products, legumes

Causes of Deficiency

- Alcoholism
  - Decreased thiamine absorption via active transport in the small intestine and decreased activation and storage of thiamine in the liver
- Malabsorption
  - Patients with a history of GI or bariatric surgery
- Malnutrition
  - Anorexia/bulimia, hyperemesis (pregnancy), fasting

CASE DETAILS

44 y.o. established AAM called the on-call phone with complaints of acute binocular horizontal diplopia and dizziness starting three days ago.

- HPI:
  - Accompanied by a family member due to gait disturbance
  - Question of true oscillopsia
  - Flu-like illness with frequent vomiting for 2 weeks prior
  - Extreme drowsiness
- PMHx/POHx: unremarkable
- Social Hx: 6 pack of beer q2-3days and 1 pint of alcohol/week

PERTINENT FINDINGS

- BCVA: 20/20 OD,OS
- EOM's: FROM with new horizontal gaze-evoked nystagmus OU [Video]
- Cover test: 8 pd constant right esotropia at distance & near [Video]
- Saccades: jerky, poor fixation, no glissades
- Pupils: PERRL (-) RAPD
- Slit lamp: unremarkable OU
- IOPs: 10, 11 mmHg via GAT
- BP: 117/71 mmHg
- No signs of retinopathy or disc edema OU via undilated 90

DIFFERENTIAL DX

- Acquired horizontal gaze-evoked nystagmus
- Early concomitant CN VI Palsy

FIGURE 1
Common presentations of nystagmus leading to the top differential of acquired horizontal gaze-evoked nystagmus

TABLE 1
Common Etiologies for Acquired Horizontal Gaze-Evoked Nystagmus

Brain disorders • Cerebellar or vestibular disease [space occupying lesion, demyelination, ischemic event] • CNS infection • Head trauma
Toxic • Anti-convulsants, sedatives, hypnotics • Alcoholic delirium
Metabolic dysfunction • Electrolyte disturbances • Vitamin deficiencies (Vitamin B)

CASE MANAGEMENT

Immediate Ophthalmology/ER referral

- CT of head/orbits unremarkable
- MRI of head/orbits unremarkable
- Immediate blood work was normal, with pending B1 levels
- CT of abdomen revealed thickening suggestive of gastritis and moderate fatty liver

Diagnosis/Treatment

Based off the patient's clinical presentation, social history and unremarkable imaging and blood work, the patient was presumed to have a diagnosis of acute thiamine deficiency secondary to alcoholic gastritis.

The patient was treated with 500 mg IV thiamine q8h x3 days, hospital records show that symptoms responded well to treatment. The patient only noticing diplopia at distance and had only a minor residual horizontal nystagmus. Upon discharge, the patient was supplemented with 100 mg thiamine po QD.

3-Week Follow Up

- BCVA: 20/20 OD, OS
- EOM: FROM with minimal horizontal nystagmus in extreme horizontal gaze [Video]
- Cover test: Ortho at distance, 4 XP' [Video]
- No residual balance or gait abnormality

FIGURE 2
Unremarkable axial cut of CT without contrast

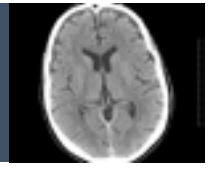
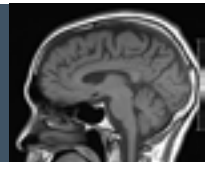


FIGURE 3
Unremarkable sagittal cut of T1 MRI



WERNIKE ENCEPHALOPATHY

Acute Thiamine Deficiency

Clinical triad:

- *Mental Confusion (82%)
- *Gait Ataxia (23%)
- Abnormal eye movements (29%)
  - *Acquired horizontal gaze-evoked nystagmus
    - Most common ocular abnormality
  - *Lateral rectus palsy
  - Ptosis
  - Retinal hemorrhaging
  - Papilledema
  - Conjugate gaze palsy
  - INO
  - Unequal pupils
  - Non-reactive or LND pupil

* - Seen in my patient's clinical presentation

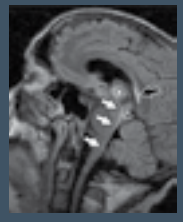
Clinical Investigation and Treatment

1. Blood Work --> confirmation often delayed and Wernike Encephalopathy (WE) requires prompt treatment for best chance of complete resolution.

2. Imaging --> used to rule out differentials vs. confirm a diagnosis of WE
   - o Late in the disease, MRI imaging can show symmetrical lesions on the structures surrounding the 3rd and 4th ventricles

3. Clinical Suspicion
   Clinical diagnosis is made based off how patient responds to IV thiamine treatment; symptoms typically ablate within 24 hours of treatment. Timely treatment is critical so patients suspected of thiamine deficiency are often treated before any confirmatory blood work returns. Thiamine is inexpensive and there are no well-established toxic effects from consumption of excess thiamine.
   - o 200 mg IV Thiamine TID x3-5 days
   - o History of alcoholism: 500 mg IV Thiamine TID x3-5 days
   - o Supplemented with 100 mg thiamine po QD-TID

FIGURE 4



62-year-old woman admitted to hospital for altered consciousness after 2 weeks of nausea, vomiting, and diarrhea. Sagittal FLAIR image shows extensive signal intensity alteration of mesencephalon, central gray matter, and posterior medulla (white arrows). Signal intensity alterations of thalamus (white asterisk), tectal plate (black asterisk), and corpus callosum (black arrow) are seen.

[Zuccolio G, Piptone N. Neuroimaging Findings in Acute Wernicke's Encephalopathy: Review of the Literature. American Journal of Roentgenology. 2009;192: 501-508. 10.2214/AJR.07.3959]

CONCLUSION

It's important to consider metabolic dysfunction in patients that present with symmetric acute oculomotor dysfunction. Wernike Encephalopathy is a reversible condition with the treatment of IV thiamine and with appropriate and timely referral, patients can make a complete, or near-complete, resolution.

REFERENCES

Available upon request

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Managing Complications After Combined Cataract Surgery and Trabeculectomy

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INTRODUCTION

The leading causes of blindness worldwide are cataracts and glaucoma. Combined cataract surgery and trabeculectomy is selected for those with a visually significant cataract and glaucoma that is uncontrolled despite maximum medical therapy. Patients undergoing combined surgery are at risk of developing post-operative complications including persistent postoperative inflammation, scarring, endophthalmitis, bleak leak, and over-filtration. Recognizing complications and initiating proper treatment allows for increased resolution with improved visual outcomes. This case investigates an infrequent postoperative complication of persistent postoperative inflammation leading to hypotony after combined cataract extraction and trabeculectomy.

CASE

A 64yo African American female presented with a painful, photophobic, red right eye for the past 5 days. The patient's ocular history included primary open angle glaucoma of both eyes as well as cataract extraction with trabeculectomy in the right eye 7 months prior. Medications included prednisolone acetate QD OD only and in the left eye brimonidine BID, latanoprost qhs, and timolol BID. Patient had reported stopping use of medications 2 weeks prior.

Pertinent Initial Presentation		
	OD	**OS**
Visually Acuity (cc)	20/80 PH 20/50	20/25
Conjunctiva	3+ injection, superior shallow vascular bleb; (-) Seidel's sign	wnl
Cornea	CE incision temporal; (-) Seidel's sign	clear
Anterior Chamber	deep, 1+ white blood cells, (-) flare	deep and quiet
IOP	5 mmHg	12 mmHg
Lens	PCIOL centered	cortical cataract
Fundus	(-) vitritis (+) glaucomatous cupping (+) macular choroidal folds without choroidal effusion – **OCT macula Figure 1**	(+) glaucomatous cupping wnl macula and periphery
Initial Treatment	prednisolone acetate 1% 6x/day cyclopentolate 1% TID	Resume glaucoma medication OS only: latanoprost QHS timolol BID brimonidine BID

Visit	Pertinent Clinical Findings OD – Follow up	IOP OD	Treatment OD
Day 5	**VA:** 20/70-2, PH 20/50 **Conjunctiva:** 1+ injection, superior bleb (-)Seidel sign **A/C:** deep, 1+ white blood cells, (-)flare **OCT:** Figure 2: choroidal folds with intact foveal contour	5 mmHg	Continue: pred acetate 6x/day cyclopentolate TID
Day 12	**VA:** 20/40-2, PH 20/30 **Conjunctiva:** 1+ injection, superior bleb (-)Seidel sign **A/C:** deep, 1+ white blood cells, (-)flare **OCT:** Figure 3: Improving choroidal folds	5 mmHg	Continue: pred acetate 6x/day Discontinue: cyclopentolate
Day 19	**VA:** 20/40+2, PH 20/30 +1 **Conjunctiva:** 1+ injection, superior bleb (-)Seidel sign **A/C:** deep, 0.5+ pigmented cells, (-)flare & WBC **OCT:** Figure 4: Improved choroidal folds.	5 mmHg	Taper: pred acetate QID
Day 26	**VA:** 20/40+2, PH 20/30 +1 **Conjunctiva:** 1+ injection, superior bleb (-)Seidel sign **A/C:** deep, 0.5+ pigmented cells, (-) flare &WBC **OCT:** Figure 5: Choroidal folds resolved. **Anterior seg photos:** Figure 6 & 7	6 mmHg	Continue: pred acetate QID

FIGURE 1

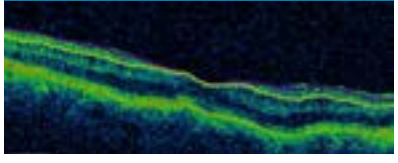


FIGURE 2

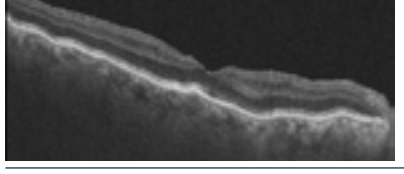


FIGURE 3

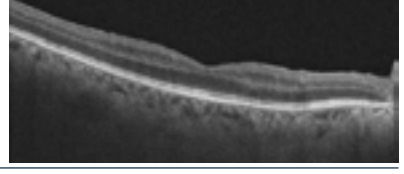


FIGURE 4

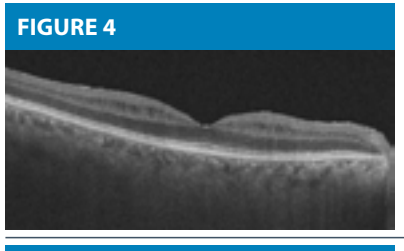


FIGURE 5

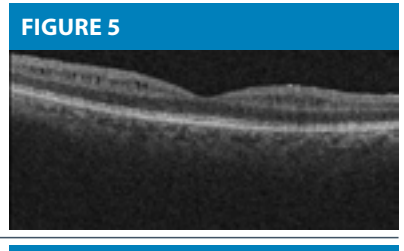
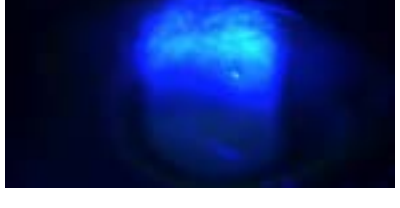


FIGURE 6

FIGURE 7



DIAGNOSIS

There are many early and late onset complications that may occur following combined cataract surgery and trabeculectomy. The most common complication after combined cataract surgery and trabeculectomy is scarring of the bleb. Scarring would lead to increased IOP secondary to reduced outflow of aqueous humor. Endophthalmitis is a sight-threating complication that may occur within days to 20 years post-surgery and would present with a milky white bleb, a hypopyon and/or a vitreous reaction. The patient would complain of blurred vision, pain, tearing, and discharge. Bleb leaks, which may occur early or late in the post-operative course, would have a positive Seidel sign. Over-filtration would lead to a diffuse, elevated, avascular bleb with a negative Seidel sign and no anterior chamber inflammation.

DISCUSSION

The patient in this case had presented with persistent postoperative inflammation leading to hypotony. Persistent postoperative inflammation occurs commonly due to poor compliance with topical corticosteroids or rapid tapering of corticosteroids. Hypotony following trabeculectomy with no associated bleb over-filtration or bleb leak occurs in only 10%. Hypotony secondary to persistent postoperative inflammation is treated with anti-inflammatory therapy and typically resolves in 2-3 months.

CONCLUSION

Patient education must involve the patient understanding the chronicity of the condition and chronicity of treatment. Early recognition and effective treatment of persistent ocular inflammation associated with combined cataract and trabeculectomy surgery allows for a faster resolution of hypotony maculopathy and improved visual outcomes.

REFERENCES

Available upon request.

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Densitometric Analysis of Point–of–care Adenoviral Chromatographic Immunoassays (AdenoPlus™) in Individuals with Acute Conjunctivitis

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PURPOSE

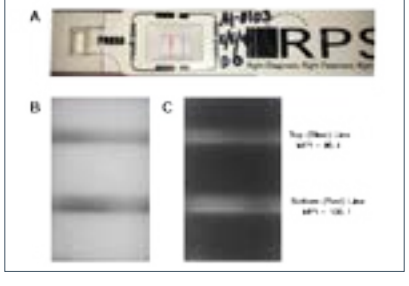
- To improve the predictive accuracy of the AdenoPlus test, a point-of-care rapid chromatographic immunoassay for the detection of adenoviral conjunctivitis (Ad-Cs).
- To use densitometry to improve positive predictive accuracy by comparing the intensity of the AdenoPlus test line result of individuals with/without PCR- confirmed adenovirus.

METHODS

- Patients with presumed Ad-Cs, age ≥ 18 and symptom onset ≤ 4 days were screened at 9 centers for eligibility for inclusion in the Reducing Adenoviral Patient Infected Days (RAPID) study.
- The AdenoPlus test was performed on anesthetized eyes of 212 participants by clinical examiners.
- 142 of the AdenoPlus tests were photographed by examiners within 4 hours of the visit and mean pixel brightness intensity of the test result lines in these images were quantified in Photoshop (Adobe, San Jose, CA) by two masked graders.
- The densitometry ratio of the red test line to the blue control line was calculated for each test, with a value of 1.0 signifying that the red line had the same pixel intensity as the blue line.
- Conjunctival swab samples were analyzed using an adenovirus-specific primer set and an Integrated qPCR Cycler (DiaSorin Molecular, Cypress CA).

FIGURE 1

Densitometry of immunoassay bands.
A) Valid AdenoPlus test positive for adenovirus. B) Result window converted to grayscale. C) Grayscale inverted in brightness and the densitometry ratio calculated (Bottom Red Line/Top Blue Line, mean pixel brightness intensity).



RESULTS

- The median densitometry ratio was 0.85 (25%=0.70; 75%=1.43) for positive Ad-Cs immunoassays that were confirmed by PCR to be Ad-Cs (n=26).
- The median densitometry ratio was 0.84 (25%=0.67; 75%=0.92) for positive Ad-Cs immunoassays (n=16) that were negative for Ad-Cs by PCR.
- The difference between AdenoPlus+ tests that were/were not confirmed for Ad-Cs by PCR was not significantly different (P=1.0).
- Densitometry ratios for eyes testing AdenoPlus+ were significantly (P<0.05) higher than those for eyes (n=82) that tested negative for Ad-Cs by immunoassay and by PCR (median=0.68; 25%=0.51; 75%=0.82).

FIGURE 2

Densitometry ratios for images of positive and negative AdenoPlus tests by whether PCR was positive or negative for Ad-Cs.

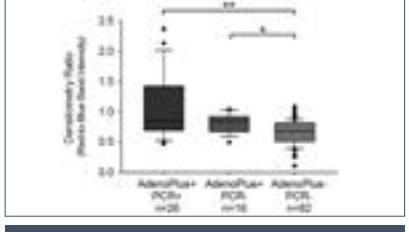


FIGURE 3

There was a significant positive correlation (P=0.002; R2=0.32) between densitometry ratios and adenoviral titers in eyes that tested positive for Ad-Cs by both the immunoassay and PCR.

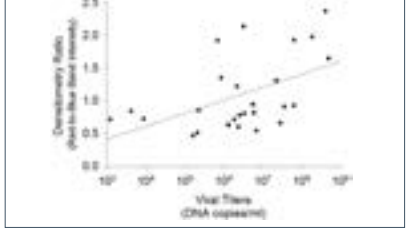


FIGURE 4

Receiver-operating characteristic (ROC) curve for red-to-blue band densitometry ratios for the diagnosis of Ad-Cs. Area under the curve was 0.71 with p=0.001. For ratio = 1.0, sensitivity = 0.35 and specificity = 0.95. For ratio = 0.9, sensitivity = 0.46 and specificity = 0.89.

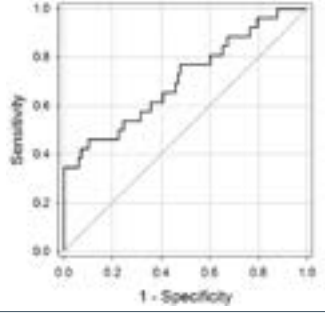
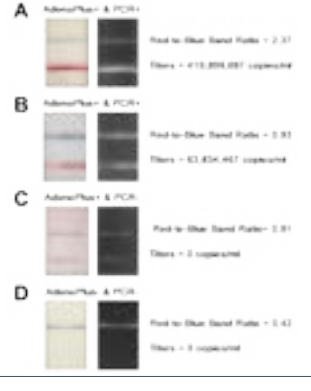


FIGURE 5

Representative images, with corresponding densitometry ratios (red-to-blue band signal intensities) and adenoviral titers (DNA copies per ml), of AdenoPlus test results A, B) AdenoPlus+ and qPCR+, C) AdenoPlus+ and qPCR-, and D) AdenoPlus- and qPCR-



CONCLUSIONS

- Although brighter intensities of the red test line on the AdenoPlus correlated to higher PCR adenoviral titers in tears, there was no significant difference in the line intensities between the true positive and false positive groups.
- We found the AdenoPlus to have near-perfect negative predictive power, with negative tests indicating eyes did not have Ad-Cs.
- However, it had 50% positive predictive power for Ad-Cs detection using the manufacturer-recommended criteria of a just-detectable red line to signify a positive test.
- Our densitometry analyses indicated that the specificity of this immunoassay can be improved using comparisons of the intensity of the red result band to the blue control band.
- These results highlight the challenge for clinicians in identifying true Ad-Cs at the initial visit, even with the use of point-of-care chromatographic immunoassay testing.

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FINANCIAL SUPPORT

- This work was supported by a National Eye Institute Center R34 Grant (EY023633-01A1), a National Eye Institute Center Core Grant (P30EY002687) and an unrestricted grant to the Department of Ophthalmology and Visual Sciences from Research to Prevent Blindness.
- DiaSorin Molecular LLC (Cypress, CA) for providing technical support (instrument and reaents) for the qPCR analysis.
- Clinical Trial Registration: https://clinicaltrials.gov/ct2/show/NCT02472223

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Economic Burden of Conjunctivitis: Reducing Adenoviral Patient Infected Days (RAPID) Study

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Introduction

- Adenoviral conjunctivitis (Ad-Cs) is a highly contagious eye infection that can quickly spread through homes, schools and workplaces and has a considerable economic impact on society.
- In the US, an estimated $800 million per year is spent on conjunctivitis treatment. This does not include the indirect costs from loss of productivity due to days missed from work, school, and visits to the doctor. Nor does it include costs related to antibiotic resistance and disease spread.[1,2]

Purpose

- The Reducing Adenoviral Patient Infected Days (RAPID) study is a double-masked randomized pilot study examining the safety and efficacy of a single administration of ophthalmic 5% Povidone-Iodine (PVP-I) for the treatment of Ad-Cs.
- Here, we report patient days missed from work/school, as well as patient exposures to others with "pink eye" and upper respiratory infection symptoms.

Methods

- 56 patients with red eye symptoms ≤4 days and a positive point-of-care adenoviral immunoassay were randomized to treatment with 5% PVP-I or artificial tears.
- Demographics and self-reported exposures to others with symptoms consistent with Ad-Cs were recorded.
- Work excuse requests and the number of days missed from work/school were recorded for participants with at least 7 days of follow up.

Results

Figure 1: Percentage of participants that missed work or school due to conjunctivitis

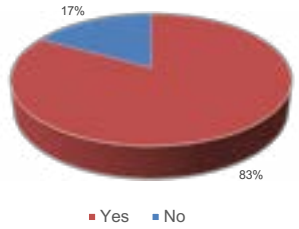


Figure 2: Percentage of participants that requested written work excuse

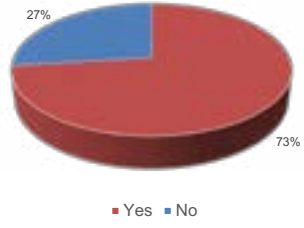
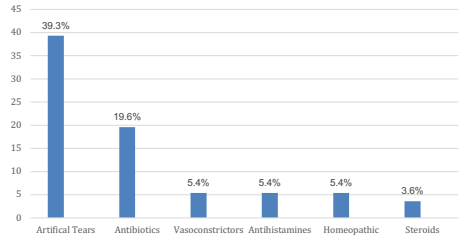


Figure 3: Eyedrops used at the initial visit



- Participants missed an average of 3.3 ± 3.8 days of work/school.
- Other individuals in the patient's residence missed a reported 1.3 ± 2.8 days of work/school due to the patient's conjunctivitis.
- The average work excuse was 5 days; the length of work excuse ranged from 1 to 14 days (n=28).
- Individuals who requested a written work excuse (n=28) reported missing significantly ($p<0.001$) more days (5.0 ± 3.9) days versus that reported (0.6 ± 1.0) by individuals who did not request that documentation (n=18).
- 52% of patients reported exposure to another individual with cough, fever, sore throat or runny nose in their place of residence in the prior 2 weeks.
- 43% percent of patients reported exposure to another individual with suspected 'pink eye' in the previous month.
- At initial study visit, 75.0% of patients presented using at least one ophthalmic medication and 19.6% reported using more than one ophthalmic medication (Figure 3).

Conclusions

- The number of missed school/work days, along with the frequency of excused work absence requests, illustrates the substantial economic burden associated with Ad-Cs.
- In this study, 83% of participants reported missing school or work and 73% of participants requested a work excuse.
- Most participants in this study received a work excuse for 5 days, although most participants returned to work/school sooner.
- Despite the self-limiting nature of Ad-Cs, its socio-economic burden is compounded by rapid spread of this highly contagious pathogen demonstrated by the high proportion of patients exposed to others with pink eye or upper respiratory infection symptoms.

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2. Udeh BL, Schneider JE, Ohsfeldt RL. Cost effectiveness of a point-of-care test for adenoviral conjunctivitis. Am J Medical Sci. 2008;Sep;336(3):254-264.

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Assessment of Treatment Masking: The Reducing Adenoviral Patient Infected Days (RAPID) Study

Meredith M. Whiteside[1] Ellen S. Shorter[2], Mathew Margolis[3], Fatima Alvi[3], Christina E. Morettin[4], Jennifer S. Harthan[4], Tammy P. Than[5], Mae O. Gordon[3], Andrew T. Hartwick[6], Mary Migneco[3], Spencer D. Johnson[7], Julie Huecker[3], Crystal Rosemann[8]

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Purpose

- The Reducing Adenoviral Patient Infected Days (RAPID) study is a multi-center, double-masked randomized pilot trial of the safety and efficacy of a one-time administration of ophthalmic 5% Povidone-Iodine (PVP-I) treatment.
- Efficacy was assessed with viral load measured by quantitative PCR, patient-reported symptoms and clinician assessment of signs.
- Patients and clinicians could become unmasked due to the yellow color and potential stinging and burning associated with ophthalmic 5% PVP-I. Unmasking could cause bias in patient-reported symptoms and clinician assessment of signs.
- We report on the success of masking in the RAPID study.

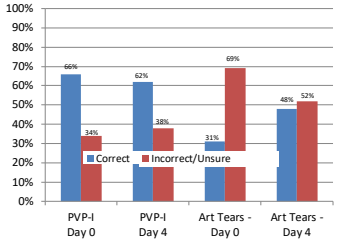
Methods

- Adults (> 18 years old) presenting with a red eye for < 4 days and a positive point of care immunoassay test for adenovirus were enrolled.
- Participants were randomized to receive a one-time instillation of 4-5 drops of PVP-I or artificial tears (ATs) post-instillation of 1 drop of proparacaine 0.5%.
- Two minutes after administration, the ocular surface and eyelids were lavaged with a sterile saline irrigation solution.
- All follow-up visits were conducted by clinicians masked to randomization.
- At day 0 (immediately post-lavage) and at day 4, participants were asked to guess whether they received PVP-I, ATs, or were unsure. Masked clinicians were asked the same question at follow-up days 1, 7 and 14.
- The Bang index (BI) of masking, which quantifies success in masking was calculated.

Results

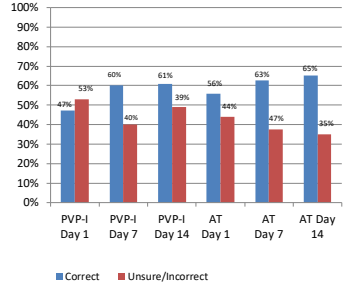
The Bang Index (BI) is an index of the success of masking beyond random guessing. It has a range from -1 to 1 for each randomization group. If all guesses are "correct", the BI=1. If all guesses are "not correct", the BI= −1. If 50% of guesses were from each respective pool, then the BI=0. +In this study, guesses of "unsure" were grouped with "not correct".

Figure 1: Participant Guess of Treatment: Day 0 & Day 4
The overall correct guess rate was 49% (27/55) on Day 0 and 55% (23/42) on Day 4 for masked participants.



Masked Clinician Guesses: Bang Index			
	Day 1 (± 1)	Day 7 (± 1)	Day 14 (± 3)
Correct Guess: Povidone Iodine	BI = -0.05 (p=0.59)	BI = 0.2 (p=0.21)	BI = 0.2 (p=0.61)
Correct Guess: Artificial Tears	BI* = 0.125 (p=0.31)	BI* = 0.25 (p=0.15)	BI* = 0.3 (p=0.10)

Figure 2: Clinician Guess of Treatment: Day 1, 7 & 14
The overall correct guess rate was 51% (18/35) on Day 1 and increased to 63% (22/25) on Day 14 for masked clinicians.



Masked Participant Guesses: Bang Index		
	Immediate post-lavage (Day 0)	Day 4 (± 1)
Correct Guess: Povidone Iodine (PVP-I)	BI = 0.31 (p=0.04)	BI = 0.24 (p=0.13)
Correct Guess: Artificial Tears (AT)	BI* = -0.38 (p = 0.98)	BI* = -0.05 (p=0.58)

Conclusions

- Despite the known ocular discoloration and potential irritation with PVP-I, masking of both participants and clinicians in this double-masked trial was fair in both the 5% PVP-I and artificial tear treatment groups.
- Although most participants receiving the PVP-I treatment correctly identified being in the treatment group, most people receiving ATs were unsure or incorrect in guessing treatment, and overall correct guess-rate for the study was nearly 50%.
- The success of masking indicates that participant and clinician reported outcomes were likely not substantially biased due to treatment unmasking.
- Assessment of masking is rarely reported in ophthalmic studies. We recommend the assessment and reporting of masking success in clinical trials utilizing subjective outcomes.

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Acknowledgements and Financial Support

- This work was supported by a National Eye Institute Center R34 Grant (EY023633-01A1), a National Eye Institute Center Core Grant (P30EY002687) and an unrestricted grant to the Department of Ophthalmology and Visual Sciences from Research to Prevent Blindness.
- DiaSorin Molecular LLC (Cypress, CA) for loaning the study a Liaison MDX Instrument and donating reagents for qPCR analysis.
- Clinical Trial Registration: https://clinicaltrials.gov/ct2/show/NCT0247222

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OCT findings with macular contusion: correlation between structural findings and visual function

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INTRODUCTION

Macular commotio retinae is a commonly encountered visual complication of closed globe blunt ocular trauma. It is reported that retinal opacification and visual function typically resolve within 3-4 weeks, but cases of severe visual loss and permanent retinal damage are less frequently discussed. This case describes a young, male patient with significant vision loss after sustaining blunt ocular trauma from a motor vehicle accident. The OCT findings are typical of those seen with macular contusion with poor visual prognosis.

CASE PRESENTATION

A 31-year-old AA male presented with significantly decreased central vision after he was involved in a motor vehicle accident one month prior. The patient was in a coma for two days after the accident and reported all CT scans completed in the hospital were normal.

Medical History: None

Clinical Exam:

BCVA: OD 20/40, PHNI
OS HM, PHNI

PUPIL TESTING: PERRL (-) APD

EOM: FROM without diplopia OD, OS

CVF: FTFC OD, OS

SLIT LAMP OD: unremarkable
OS: periorbital bruising above left upper eyelid, trace diffuse conjunctival injection, and an inferior stromal scar not within Vax

IOP (Goldmann): OD 16 mmHg
OS 18 mmHg

POSTERIOR OD: unremarkable
OS: central macular RPE disruption, flat and sharp ONH with no pallor, and a large, de-hemoglobinized vitreous hemorrhage inferiorly

FIGURE 1
Wide field fundus photo OD - unremarkable

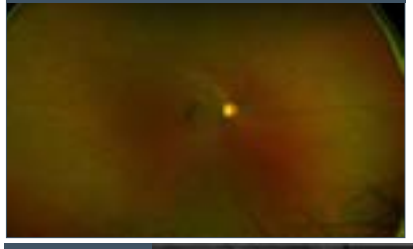


FIGURE 2
Macula OCT OD - Foveal thickness 249 microns

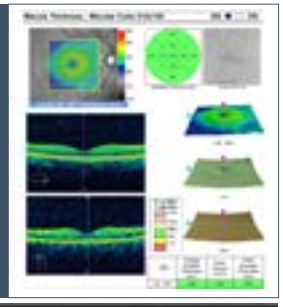


FIGURE 3
Macula OCT OD - unremarkable

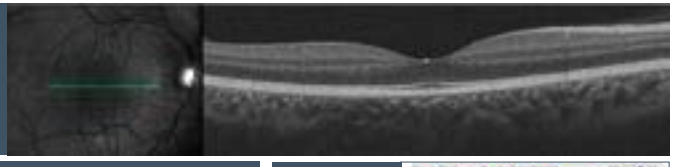


FIGURE 4
Wide field fundus photo OS – deHb vitreous hemorrhage inferior

FIGURE 5
Macula OCT OS - Foveal thickness 126 microns

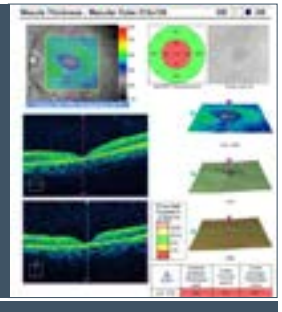
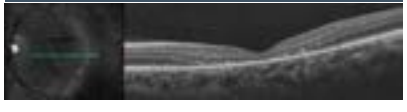


FIGURE 6
Macula OCT OS - extensive loss of the outer retinal layers: IS/OS junction (or ellipsoid zone), external limiting membrane, and outer nuclear layer

FIGURE 7
Macula OCT OS - intraretinal hyper-reflective aggregates with overlying outer retinal attenuation



DIAGNOSIS & DISCUSSION

This case demonstrates a patient with macular contusion due to closed globe blunt trauma with poor visual prognosis. Macula OCT imaging shows extensive loss of the outer retinal bands within the fovea, most notably the IS/OS junction (also known as the ellipsoid zone), external limiting membrane (ELM) and outer nuclear layer (ONL). Deep, intraretinal hyper-reflective aggregates are present with overlying retinal attenuation. These findings represent severe damage to photoreceptors and consist of RPE cells migrating into areas of atrophic retina. Visual prognosis is poor in this patient's case given the amount of retinal loss and the presence of hyper-reflective intraretinal aggregates.

CONCLUSION

Damage to the photoreceptor layers (IS-OS junction, ELM and ONL) and thinner foveal thickness are indicators for poorer visual prognosis in macular contusion. More severely affected areas develop intraretinal hyper-reflective aggregates which represent RPE migration into areas of atrophic neurosensory retina. These findings do not resolve as do some of the milder cases of commotio retinae and leave the patient with permanent anatomical damage and resultant visual loss. Macular contusion should be evaluated with OCT imaging to determine which retinal layers are affected and best predict visual outcome.

REFERENCES

Available upon request

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Papilledema or Pseudopapilledema . . . Yes!

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INTRODUCTION

Initial presentation of indistinct optic disc margins may be accompanied with symptoms of headaches, transient vision loss, and mild decrease in visual acuity. In other cases, the patient may be asymptomatic and diagnosed upon a dilated fundus exam. The case report highlights an atypical appearance of buried optic disc drusen after resolution of papilledema in a symptomatic patient.

CASE HISTORY

20-year-old Caucasian female presents for papilledema consult with reported symptoms of frontal headaches and pulsatile tinnitus in the ears. Reported no visual or ocular symptoms. Uses Tylenol medication for headaches. Medical history is noncontributory. Denied any use of birth control pills and is not pregnant. Initial presentation:

- BCVA 20/20 OD, OS
- BMI: 37.97kg/m
- BP: 132/84
- Declined lumbar puncture

SUMMARY OF PERTINENT FINDINGS

	Visit 1 & 2	*Visit 3 to 7*	*Visit 8*	*Visit 9*
Optic Nerve	Elevated disc margins, partial obstruction of vessels	Elevated disc margins with buried drusen	Trace optic disc edema with buried drusen	Mild optic disc edema with buried drusen
HVF 24-2	Unremarkable	-	Unremarkable	-
OCT	NFL thickening, RPE deflection	Normal NFL thickness, slight inward deflection of RPE complex	Normal NFL thickness, slight inward deflection of RPE complex	Slight increase in NFL thickening and inward deflection of RPE complex
Diagnosis	Stage 2 papilledema, suspected IIH	Anomalous disc secondary to buried drusen OD > OS, with stage 1 papilledema secondary to IIH	Anomalous disc secondary to buried drusen OD > OS, with resolved papilledema	Anomalous disc secondary to buried drusen OD > OS, with stage 1 papilledema secondary to IIH
Treatment & Plan	Diamox 250mg bid. Encouraged weight loss	Continue Diamox	D/C Diamox	Resume Diamox and weight loss

DIFFERENTIAL DIAGNOSIS

Differential diagnoses include optic nerve head drusen, hypertensive optic neuropathy, space-occupying lesions, infectious etiology, obstructive hydrocephalus, and venous obstructive disease.

FIGURE 1
Representative fundus photo of the optic nerve head, OD, showing stage 2 papilledema with partial blood vessel obscuration on initial visit (A) and improvement with treatment on visit 5 (B).

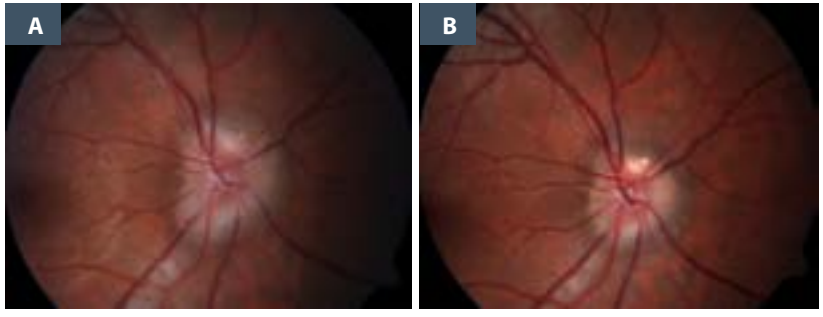


FIGURE 2
Representative HD 5-Line Raster over ONH showing RNFL thickening with RPE deflection.

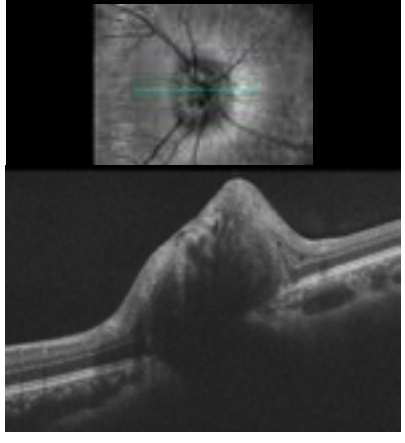
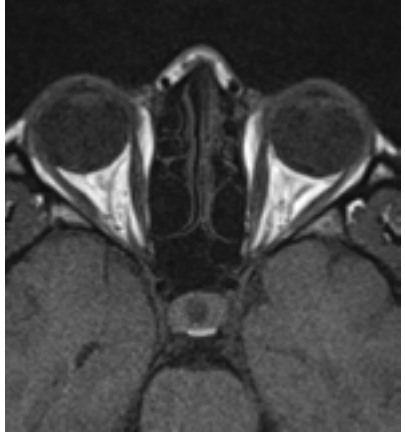


FIGURE 3
MRI Axial T1 scans of the ocular orbits show bilateral posterior scleral flattening.



DISCUSSION / TREATMENT AND MANAGEMENT

Papilledema secondary to IIH is a diagnosis of exclusion without a known etiology of raised intracranial pressure [1]. Studies have reported a positive correlation with incidence of IIH as obesity increases [2, 3]. Typically, young, obese female patients with a BMI > 25 have an increased risk of developing IIH [1]. Patients may be asymptomatic, or experience symptoms of headaches, transient vision loss, pulsatile tinnitus, nausea, and double vision [3].

Ancillary testing, including HVF, OCT, MRI/MRV, and lumbar puncture, must be done to rule out other underlying etiology. Because the patient declined for lumbar puncture due to concerns of side effects, empirical treatment with Diamox was initiated. Anomalous appearance of the nerves suggest optic disc drusen was long-standing prior to the onset of papilledema.

Initial treatment includes Diamox, along with encouragement for a healthy weight loss diet and exercise routine. Patients should be monitored every 3-4 months, depending on degree of VF loss. Diamox can be discontinued if patient has adapted to a healthier lifestyle with weight loss. However, surgical intervention, such as optic nerve sheath decompression, may be indicated if treatment is ineffective.

CONCLUSION

- Increased incidence of papilledema secondary to IIH is correlated with increase in obesity
- Patients with anomalous optic discs, with or without disc drusen, can also develop papilledema

REFERENCES

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A Case of Fungal Keratitis After Failed Treatment for Complications Relating to Hybrid Contact Lens Wear

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INTRODUCTION

Fungal keratitis (keratomycosis) is a rare, but important cause of microbial keratitis. While trauma with vegetative matter was usually thought to be the most common cause, contact lenses are now the most common etiology in developed countries[1]. Differentiating each type of microbial keratitis from one another can present a challenge for eye care providers due to rapid progression, variable presentation, and often similar symptoms. Fungal keratitis is difficult to treat and has a higher probability for adverse outcomes such as the need for a corneal transplant[2].

CASE PRESENTATION

A 53-year-old white male presented with pain, irritation and decreased vision in his left eye. He had been treated by a previous provider for one month for non-healing corneal epithelial defects with underlying stromal edema secondary to hybrid contact lens wear. His previous ocular history included hybrid contact lens wear for the last 5 months, irregular astigmatism and superior limbic keratoconjunctivitis in both eyes. The patient's medical history included type 2 diabetes mellitus. He was previously treated with Maxitrol solution four times daily for one month and ofloxacin every two hours for three days. Entering spectacle visual acuity was 20/25 in the right eye and 20/350 in the left eye. Pinhole acuity was 20/200 in the left eye. Slit lamp examination showed a 2.3mm dense central corneal infiltrate with overlying 1.3mm round full thickness epithelial defect, moderate stromal edema and surrounding foci of tiny satellite lesions (Figure 1/1a).

TREATMENT AND MANAGEMENT

Corneal scrapings were taken at the initial visit. Before the results of scraping had been obtained the patient was started on a 3-day course of moxifloxacin every 2 hours and Maxitrol solution was discontinued. The corneal scrapings came back positive for *Fusarium proliferatum,* a species of yeast belonging to the fungus kingdom. (Table 1). For pain management he was prescribed oxycodone-acetaminophen 2.5-325mg tablets every 6 hours.

TABLE 1

		Clinical Findings
Initial treatment after positive culture	-Start amphotericin B 0.15% Q1H for 2 days and then Q2H until day 5. - Moxifloxacin QID for bacterial coverage	See Figure 1
Day 5	-Amphotericin B 0.15% Q3H	-Infiltrate slightly decreased in size with epithelial defect still present
Day 10	-Stop amphotericin B 0.15% -Start natamycin 0.5% and voriconazole 1% 3QH	-Infiltrate continued to decrease in size with epithelial defect still present -1st repeat of corneal scrapings showed no growth
Day 14	-Same as above	-Infiltrate remained the same size and epithelial defect and stromal edema improving
Day 30	-Therapeutic penetrating keratoplasty was recommended	-Infiltrate continues to shrink and epithelial growth along edges of defect is present. -2nd repeat of corneal scrapings- few *Fusarium proliferatum*

FIGURE 1

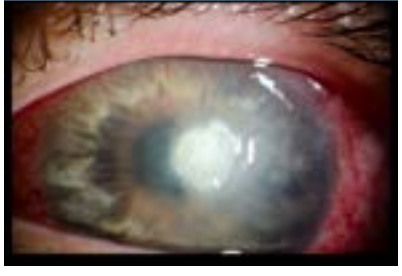
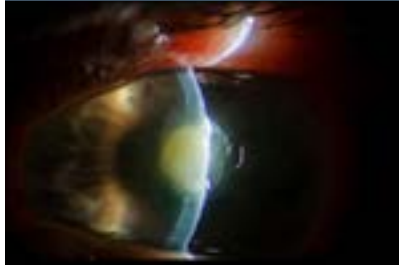


FIGURE 1A

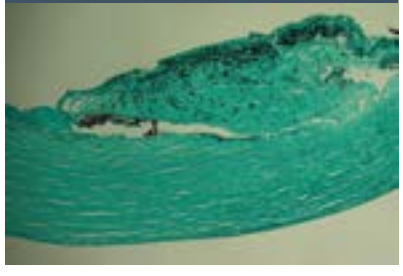


RESULTS

After a second positive culture despite topical anti-fungal treatment for more than 30 days and due to the central location of the infiltrate, which would leave a severely visually impacting scar, a therapeutic penetrating keratoplasty was recommended. The patient underwent corneal transplantation of the left eye without complications. There were no signs of rejection or infection at the one-month post-operative visit and a pinhole acuity of 20/50 (See Figure 2). A histological cross-section of the patient's cornea ulcer shows the infiltrate of *Fusarium proliferatum.* (Figure 3) After his penetrating keratoplasty the patient was put on voriconazole 200mg PO BID for 3 months as a systemic anti-fungal medication to prevent any intraocular infection.

FIGURE 2

FIGURE 3



DISCUSSION

Although fungal keratitis is considered to be a rare corneal infection, it must be considered due the patient's history of epithelial defects, chronic ocular surface disease, use of topical corticosteroids and contact lens wear[1]. Furthermore, due to the medical history of uncontrolled type 2 diabetes mellitus, there was an increased risk of infectious keratopathy[4]. The role of *Fusarium proliferatum* in fungal keratitis has not been well investigated, but in vitro antifungal susceptibility testing has revealed F. *proliferatum* strains were sensitive to natamycin and voriconazole, but resistant to amphotericin B[5].

CONCLUSION

In the setting of multiple risk factors for microbial keratitis, eye care providers should be cautious with the use of topical steroids and contact lens wear. Educating patients on the risks and complications of any type of contact lenses is important, even if certain risks are low.

ACKNOWLEDGMENTS

Christopher R. Croasdale, M.D., Andrew Kornaus O.D., and Madeleine Hacker O.D. for their involvement in managing this case.

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Resolution of a Case of Nodular Anterior Scleritis with an Untraditional Treatment Protocol

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INTRODUCTION

Anterior scleritis is an inflammatory condition that commonly presents with severe pain, redness, and photophobia. Scleritis as a whole is relatively rare with an incidence of 4.1 per 100,000 people. Anterior scleritis is divided into sub-categories, including diffuse, nodular, and necrotizing with or without inflammation. This case demonstrates how nodular anterior scleritis can resolve with an untraditional treatment protocol and the importance of proper co-management in patients with significant medical histories.

CASE PRESENTATION

71-year-old African American female presented with a red eye OS for 1 week with dull severe pain and light sensitivity. She also reported a severe headache 4 days prior to presentation.

Ocular History: Ischemic CRVO OS
POAG treated with latanoprost QHS OU
Dry eye disease OU

Medical History: Type 2 diabetes
Hypertension
Gout
Thyroid disease
History of severe GI ulcers

EXAM FINDINGS

Visual Acuity: OD 20/40, PH 20/25
OS CF@4ft, PH NI

Pupils: PERRL, 1+ APD OS

IOP (Goldmann): OD 9 mmHg
OS 8 mmHg

Labs Ordered: CBC with differential
RF
ACE
RPR/VRDL + FTA-ABS

FIGURE 1
2+ conjunctival and scleral injection OS

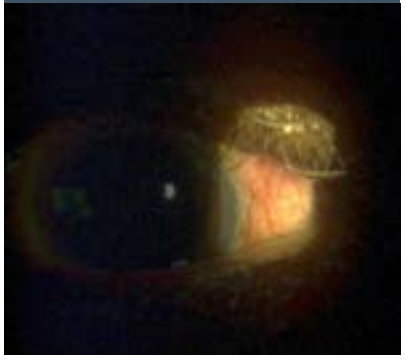


FIGURE 2
2+ conjunctival and scleral injection with nodule superior temporal OS, did not blanch with 2.5% phenylephrine

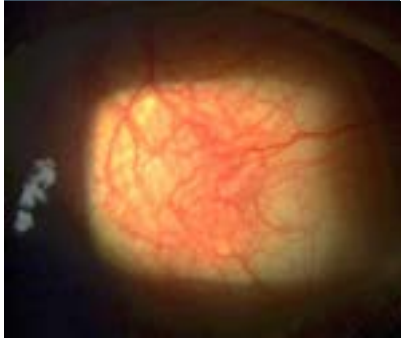


FIGURE 3
1 week follow up: Trace conjunctival and scleral injection with resolving nodule OS

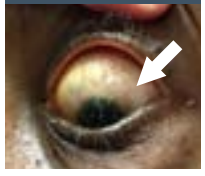


FIGURE 4
3 week follow up: Resolved nodular anterior scleritis OS

FIGURE 5
Fundus photo OD: Retina unremarkable

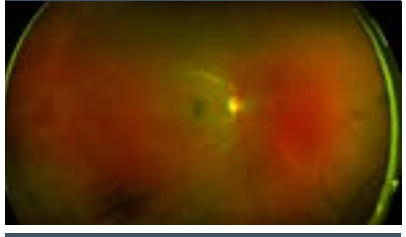
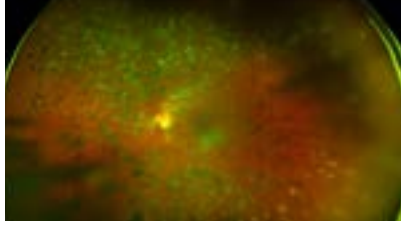


FIGURE 6
Fundus photo OS: Full PRP s/p ischemic CRVO, (-) choroidal folds



DISCUSSION

This patient presented with a case of nodular anterior scleritis, characterized by deep scleral injection with an associated nodule. About half of patients diagnosed with scleritis are found to have an underlying systemic condition. Although uncommon, this patient's gout may be the underlying cause of her scleritis. Labs were ordered to rule out other systemic conditions.

The treatment for nodular anterior scleritis is typically oral NSAIDs. Due to the patient's history of GI ulcers and bleeding, NSAIDs were contraindicated. With the patient's extensive medical history and medication list, it was decided that prescription of oral steroids should be coordinated with the patient's PCP, who prescribed prednisone 10mg/day for 2 weeks. The typical dosage of prednisone for anterior scleritis is 1mg/kg/day, which turns out to be 40-60mg/day. Although the patient was prescribed an incorrect lower dose of prednisone than typically recommended, the signs and symptoms improved dramatically over one week and resolved by her 3-week follow-up.

CONCLUSION

When oral NSAIDs are contraindicated, oral steroids are the next line of treatment for anterior scleritis. Although co-management with other physicians should lead to better care for the patient, sometimes it leads to incorrect management of ocular diseases. Even when this happens, improvement in the condition can still occur. This case demonstrates the importance of informing the PCP of the typical dose when coordinating care.

REFERENCES

Available upon request.

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Use of a Quadrant Specific Scleral Lens Design to Treat Limbal Stem Cell Deficiency in Patient with Scleral Buckle

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INTRODUCTION

Limbal stem cell deficiency (LSCD) is a condition caused by dysfunction and/or destruction of corneal epithelial stem cells, leading to a disruption of normal homeostasis.[1] Patients with LSCD often report symptoms of irritation, photophobia, redness and decreased vision due to corneal opacification and irregular astigmatism.[2] Acquired LSCD can be caused by iatrogenic factors such as ocular surgery and toxicity from chronic topical medications.[3] Non-surgical treatments for LSCD include lubricating eye drops, autologous serum tears, therapeutic soft contact lens and therapeutic scleral lens.[4] Scleral lenses may successfully treat LSCD by hydrating the ocular surface and protecting the limbus and epithelium from shear forces of the eyelids during blinking.[5] Alignment of the scleral lens haptics is necessary to provide an ideal fit for corneal rehabilitation. This may be a challenge in a patient with an asymmetric sclera status post scleral buckle surgery.

CASE REPORT

A 61-year-old Caucasian male was referred for specialty contact lens evaluation and fitting OD due to iatrogenic limbal stem cell deficiency (LSCD) given a significant ocular surgical history and chronic topical medications. He did not develop LSCD OS. Pertinent slit lamp examination findings included superior whorl-like epithelial opacities that stained with fluorescein, measuring 4.5mm, approaching the visual axis OD.

Ocular History
- Cataract extraction s/p PCIOL, OU (01/2015)
- Retinal detachment surgery with scleral buckle, OU (3/2015 OS, 10/2015 OD)
- Cystoid macular edema, treated with dexamethasone intravitreal implant (Ozurdex), OS (09/2015)
- Steroid-induced glaucoma, OU. Developed sensitivities to topical ophthalmic drops, managed with oral Diamox.

Previously failed treatment for LSCD OD
- Preservative-free lubricating eye drops
- Therapeutic bandage contact lens
- 50% autologous serum tears q2h

BCVA with spectacles
- OD: 20/60, due to LSCD
- OS: 20/150, due to persistent macular edema

FIGURE 1
Horizontal scleral lens haptics aligned but asymmetric superior and inferior impingement with toric scleral lens design.

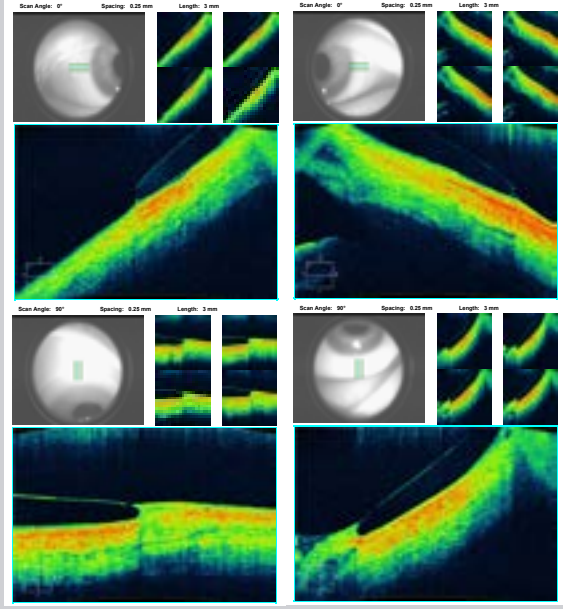
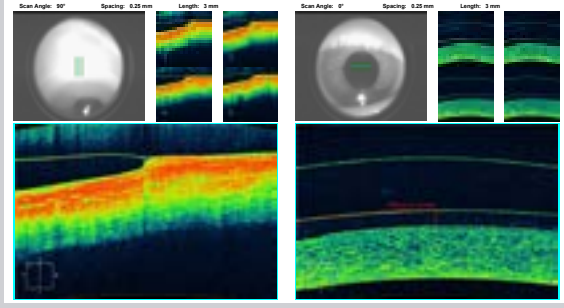


FIGURE 2
Superior scleral lens haptic aligned properly with quadrant specific design (similar appearance of inferior haptic not shown.) Appropriate central clearance of 186um at 6 hours of wear (average wear time 10-12 hours.)



RESULTS

Initially, a toric scleral lens design that aligned well in the horizontal meridian was fit OD. However, there was asymmetric impingement of the conjunctiva and sclera in the vertical meridian due to the patient's scleral buckle (See Figure 1.) A quadrant specific design with a standard horizontal scleral haptic, 7 steps flat (210um) at 90 degrees and 10 steps flat (300um) at 270 degrees provided optimal fit and comfort (See Figure 2.) The final lens prescribed was Alden Zenlens: Oblate design, 17.0mm diameter, +7.25 sphere power, 9.7mm base curve, 4.8mm sagittal depth, +80um limbal clearance, horizontal standard APS, flat 7 at 90, flat 10 at 270 in Boston XO material. His vision improved over three months of daily scleral lens wear to 20/25 OD, allowing him to drive safely at night and continue other activities of daily living. The epithelial appearance improved and measured 3.5mm over 17 months of daily scleral lens wear, with the visual acuity holding stable.

CONCLUSION

Scleral lens therapy has been shown to successfully treat limbal stem cell deficiency.[5] However, for a patient status post scleral buckle surgery, resulting in increased toricity of the sclera, a scleral lens with the ability to specify different edge parameters in each quadrant may be necessary. Quadrant specific designs allow for even alignment of the scleral haptics to the asymmetric sclera, providing optimal therapeutic benefits to rehabilitate the ocular surface.

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The use of Low Vision Contact Lens Simulators as Teaching Tools in Optometry

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INTRODUCTION

Many Vision Rehabilitation courses at optometry schools provide opportunities for students to experience visual impairment via goggle simulators. For the simulators to provide a more accurate experience, the optical axes of the goggle simulators must always align with the visual axes of the eyes of the students. If those axes do not align, it is easy to circumvent the visual defects of the goggles. Contact lenses align the optical axis with visual axis of the eye even with eye movement, thus defects present on the contact lens simulators cannot be circumvented. The importance of having a more accurate experience for optometry students could provide an unmatched learning experience, deepening empathy for patients who are visually impaired.

METHODS

Low Vision Contact Lens Simulators (LVCL Simulators) were designed by author JAJ to imitate four separate visual impairments: central scotoma, constricted field, hemianopia, and decreased contrast. The designs are reflected in figure 1. 53 students participated in the study. The study included wearing the LVCL simulators for the following activities: visual acuity, contrast, pre-survey, a session of Activities of Daily Living (ADLs) and post-survey. The surveys were designed to evaluate the LVCL Simulators as an optometric teaching tools including vision rehabilitation and empathy.

RESULTS

Subjects responded to a Likert scale in the surveys and overall responded positively, demonstrating LVCL Simulators do provide a positive educational experience. Subjects responded that they felt more prepared to handle patients with visual impairment. At the end of each post-survey, students were asked to rate the effectiveness of the LVCL Simulator as a teaching tool on a scale from 1-10, with 10 representing the most effective and 1 representing the least. These results are reflected in Figure 1. 98% of subjects rated it being equal or greater than 6, 43% of the students rated the effectiveness of the LVCL Simulators as either 8 or 9 and 34% of the students rated the effectiveness of the LVCL Simulators as 10. Some comments included: 'surreal experience gave them a more palpable perspective of the vision loss related to macular degeneration that their family members were experiencing', 'saddened and shocked that they couldn't recognize their friends in the hallway until they were in very close', 'being overall quite frustrating of how difficult simple tasks could be'. Figures 3-6 detail subject's responses to their ability to do ADLs.

FIGURE 1
Designs of LVCL Simulators

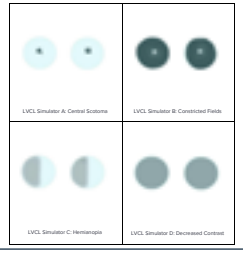


FIGURE 2
Effectiveness of LVCL Simulator on scale from 1 to 10

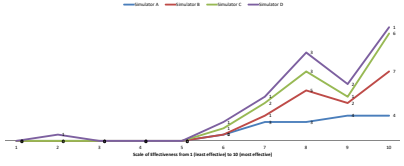


FIGURE 3
Central Scotoma – Likert Analysis on ADLs

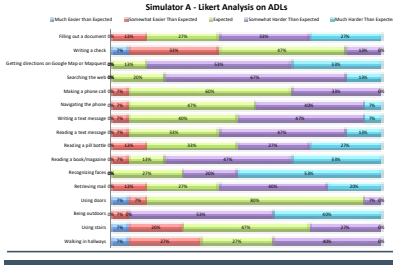


FIGURE 4
Constricted Fields – Likert Analysis of ADLs

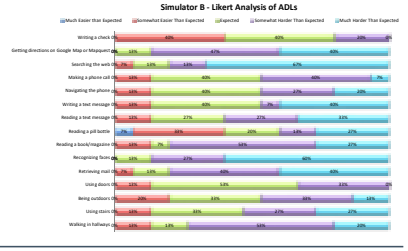


FIGURE 5
Hemianopia– Likert Analysis of ADLs

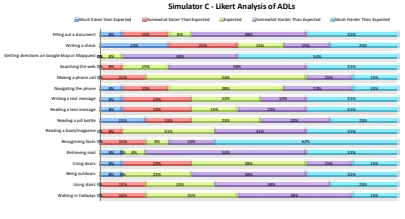
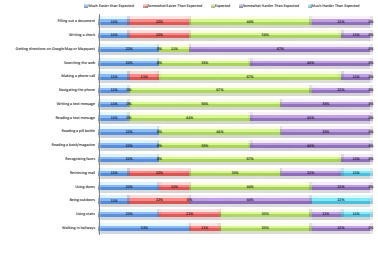


FIGURE 6
Decreased Contrast – Likert Analysis of ADLs



DISCUSSION

The effectiveness of the LVCL simulators had a significant impact. The LVCL Simulators provided a realistic experience for students that would give insight on how visual deficiencies or defects could affect one's self esteem, self-perception, challenges when interacting with the outside world. Also, because the contact lenses are not noticeable to other students, many subjects remarked that they felt abnormally self-conscious of how they were being perceived by their peers. This is an added educational tool in this study.

There were some challenges with the LVCL simulators in this study. The opacity of the central scotoma and the decreased contrast did not reach a level of visual impairment that was anticipated. Also, the Hemianopsia simulator did rotate on some students. Better lens design and testing including increased blur and prism ballast would help to make the visual impairment simulation more effective.

CONCLUSION

After wearing the LVCL Simulators, most subjects felt a significant impact on their perspective of how a visual impairment affects a patient's life. Students felt greater empathy towards patients with whose ADLs are affected by their visual status. Optometry students would benefit from the incorporation of a Low Vision Contact Lens Simulator experience into their optometry curriculum.

References available upon request

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High School Students' Understanding of Optometry as a Profession

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PURPOSE

The purpose of this study is to assess the current understanding of Optometry as a profession among students in a suburban high school setting. As these students graduate and attend undergraduate institutions, some will end up pursuing professional education within the healthcare field. As such, they represent potential members of the applicant pool to Optometry. Evidence indicates that outreach programs promoting careers in health care can be effective when planned appropriately. Most current literature is focused on health care programs in general, and to the authors' knowledge, no perspective has been offered specifically on educating high school students about Optometry since Harris et. al. in 2005.

METHODS

This IRB approved study surveyed students attending a high school (Grades 9-12) in a suburban community outside Chicago, IL, USA. In addition to demographic data, questions were asked to assess participants' past exposure to Optometry (e.g. whether participants had previously seen an optometrist as a patient and whether they knew a friend or relative who was an optometrist). Beyond those items, a series of knowledge questions were asked to assess participants' understanding of Optometry as a profession (e.g. educational requirements, salary, scope of practice, etc.).

FIGURE 1
What does an optometrist do?

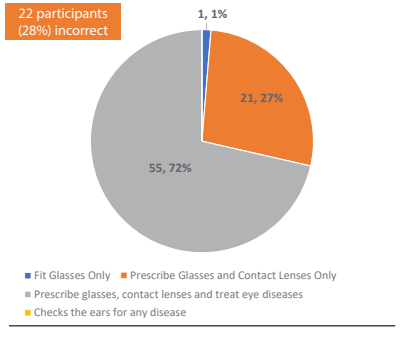


FIGURE 2
Can optometrists prescribe medications?

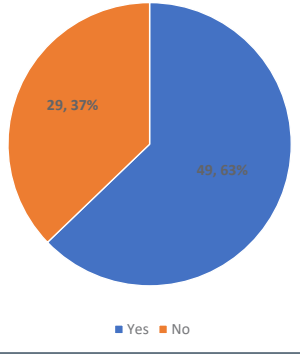


FIGURE 3
How long is optometry school after college?

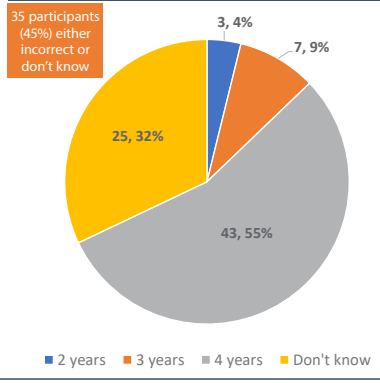


FIGURE 4
How much on average/approximately do you think an optometrist makes per year?

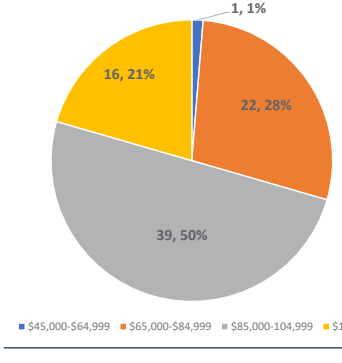
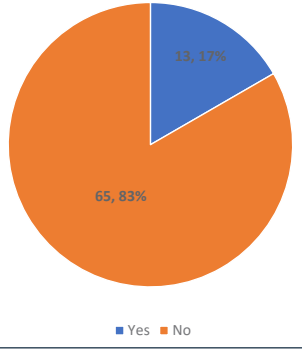


FIGURE 5
Would you consider becoming an optometrist?



RESULTS

78 high school students participated in the survey. All grades 9-12 were represented in the sample, with 10th grade representing the majority (n=50, 64%). The majority of participants saw an optometrist as a patient at some point in their lives (n=63, 81%), with many having an office visit within the past two years (n=48, 62%). Most participants in the sample did not have a friend or relative who was an optometrist (n=55, 71%).

55 participants (72%) correctly answered that optometrists prescribe glasses & contact lenses and treat eye disease, while the remaining 22 (28%) indicated that optometrists fit glasses only or prescribe glasses & contact lenses only. 29 participants (37%) responded that optometrists cannot prescribe medications. 35 participants (45%) were either incorrect or responded that they didn't know how many years Optometry school took to complete. 62 participants (79%) underestimated the average salary of an optometrist in the United States. Most participants (n=65, 83%) said they would not consider becoming an optometrist.

CONCLUSION

These data provide valuable insight regarding the future of Optometry's applicant pool. The results suggest that there is room for improvement in outreach at the high school level to educate students about the profession. Our results are limited in that our sample is from a single suburban high school. Testing across different geographic areas and socioeconomic backgrounds could help identify trends that lead to development of targeted outreach strategies.

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Krukenberg's Spindles Strongly Suggest Long Anterior Zonule Associated Pigment Dispersion in Older Patients

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INTRODUCTION

Krukenberg's spindles (KS) are well-known relative to "classic" or primary pigment dispersion syndrome,[1-6] but are less well-known in association with the long anterior zonule (LAZ) trait, which may be an important etiology of this clinical sign.[7-10] The LAZ trait is characterized by zonular fibers that extend more central than usual on the anterior lens capsule and are seen as radially-oriented fine lines, which often become pigmented due to rubbing against the posterior iris pigment epithelium (Figure 1).[10-12] Related pigment liberation may result in other pigment dispersal signs, including KS formation and trabecular meshwork pigmentation. Previous analysis has suggested that KS presentation may be a "tip-off" sign of LAZ-associated pigment dispersion,[8] and more recent study has enabled an in-depth assessment of the KS-LAZ relationship.[13] Since the LAZ trait has been shown to have association with higher intraocular pressure and since it remains understudied as a potential risk factor for glaucoma,[13] further investigation was warranted.

METHODS

As part of an ongoing investigation,[13] six practitioners in an urban, academic eye care facility in Chicago, IL, USA examined their patients for presence of the LAZ trait from October, 2011 through November, 2018, and data were collected on ocular/systemic health, lifestyle, and demographic variables. In addition to data collected from physical testing on the day of examination and from the medical record, a written questionnaire was also used to supplement demographic and lifestyle information. Subjects were included if they had their pupils dilated, were >18 years of age, and provided written informed consent. During examination, the investigators noted the presence or absence of KS, defined as fine pigment dusting on the central aspect of the posterior cornea (Figure 2). We did not consider larger pigment clump deposition that was isolated or scattered as evidence of KS. Multivariate logistic regression was used to evaluate the relationship of KS to LAZ and numerous other variables.

RESULTS

The recruitment of subjects is summarized in Figure 3. Final analysis included 3,501 total subjects with mean age of 51 ± 15 years (18-98 years; 65% female; 84% African American). Among right eyes, 62 (2%) had a KS. The KS group had a mean age of 61 ± 13 years (25-86 years; 76% female; 84% African American). There were 119 subjects with right eye LAZ, who had a mean age of 64 ± 11 years (36-91 years; 77% female; 92% African American). There were 18 subjects with both KS and LAZ in the same eye, who had a mean age of 67 ± 10 years (52-86 years; 83% female; 94% African American). For the analysis, we first checked unadjusted associations between the KS presence and all potential variables of interest (Tables 1, 2). This showed a strong association between LAZ and KS (P<0.0001), as well as between KS and several other potential confounding variables (P<0.05). To help assess potential confounders and to check for collinearity, we also assessed the unadjusted associations between LAZ and the other variables. This showed several statistically significant associations (P<0.05) (Tables 3, 4). Finally, using multivariate logistic regression to explore the data and control for other factors, the LAZ trait (OR=9.9, 95% CI=5.3 to 18.5, P<0.0001) and advancing age (OR=1.6 per decade; 95% CI=1.3 to 1.9, P<0.001) had the strongest relationship to the presence of a KS (Table 5).

TABLE 1
Distribution of subject characteristics among those with and without Krukenberg's Spindled

Variable	KS PRESENT N=62[2]	KS ABSENT N=3,437	P-value[2]
Long anterior zonule (LAZ) trait	29% (N=18)	3% (N=101)	**<0.0001**
Gender, Female	76%	65%	0.07
Race			
African American	84%	84%	
Asian	0%	2%	
Hispanic	5%	7%	0.50[1]
White	8%	6%	
Other	3%	2%	
Education >high school	58%	62%	0.54
Diabetes	27%	22%	0.30
Hypertension	68%	48%	**0.007**
Body mass index (overweight or obese)[1,4]	73%	74%	
Underweight (<18.5)	2%	4%	
Normal weight (18.5 - 24.9)	26%	23%	0.75[1]
Overweight (25.0 - 29.9)	29%	29%	
Obese (≥30)	44%	45%	
Cancer history - any site	8%	4%	0.19
Cholesterol med – current (per record)	29%	16%	**0.008**
Cholesterol med – ever (per survey)	44%	29%	**0.01**
Alcohol use			
Current	45%	49%	0.50
Ever	60%	60%	0.92
Smoking			
Current	27%	30%	0.67
Ever	52%	47%	0.51
Smoking in home when child	47%	44%	0.71

Abbreviations: KS, Krukenberg's spindle; LAZ, long anterior zonule trait; N, number of subjects; [1]Statistical comparison is African American vs. non-African American; overweight/obese vs. underweight/normal weight
[2]Bolded p-values significant at α=0.05 level
[3]Right eyes used in analysis

TABLE 2
Unadjusted relationship to KS - continuous variables

Variable	KS Present N=62[3]	KS Absent N=3,437	P-value[2]
Age (years)	61.1 ± 13.1	50.4 ± 15.4	**<0.0001**
Refractive Error (SE, diopters)	-1.02 ± 3.57	-0.90 ± 2/90	0.78
Body mass index (kg/m)	29.8 ± 7.0	30.6 ± 7.8	0.40
Systolic blood pressure (mm Hg)	135.6 ± 17.0	128.8 ± 18.1	**0.004**
Diastolic blood pressure (mm Hg)	79.9 ± 9.4	79.2 ± 11.2	0.64
Pack years smoking	11.7 ± 21.8	10.1 ± 27.2	0.9

Abbreviations: Kg/m², kilograms per meter-squared; KS, Krukenberg's spindle; mm Hg, millimeters of mercury; SE, spherical equivalent;
[2]Bolded p-values significant at α=0.05 level
[3]Right eyes used in analysis

TABLE 3
Distribution of subject characteristics among those with and without LAZ

Variable	LAZ Present N=119[3]	LAZ Absent N=3,382	P-value[2]
Gender, Female	77%	65%	**0.002**
Race			
African American	92%	83%	
Asian	0%	2%	
Hispanic	5%	7%	**0.007**[1]
White	2%	6%	
Other	2%	2%	
Education >high school	58%	62%	0.49
Diabetes	32%	22%	**0.008**
Hypertension	73%	47%	**<0.0001**
Body mass index (overweight or obese)	81%	73%	
Underweight (<18.5)	3%	4%	
Normal weight (18.5 - 24.9)	16%	23%	0.08[1]
Overweight (25.0 - 29.9)	31%	29%	
Obese (≥30)	45%	45%	
Cancer history - any site	8%	4%	0.08
Cholesterol med – current (per record)	28%	16%	**<0.001**
Cholesterol med – ever (per survey)	44%	29%	**<0.001**
Alcohol use			
Current	47%	49%	0.62
Ever	61%	60%	0.94
Smoking			
Current	27%	30%	0.48
Ever	53%	47%	0.22
Smoking in home when child	50%	44%	0.19

Abbreviations: LAZ, long anterior zonule trait; N, number of subjects;
[1]Statistical comparison is African American vs. non-African American; overweight/obese vs. underweight/normal weight
[2]Bolded p-values significant at α=0.05 level
[3]Right eyes used in analysis

TABLE 4
Unadjusted relationships to LAZ - continuous variables

Variable	LAZ Present (N=119)[3]	LAZ Absent (N=3,382)	P-value[2]
Age (years)	63.4 ± 10.7	50.2 ± 15.4	**<0.0001**
Refractive Error (SE, diopters)	0.59 ± 2.11	-0.96 ± 2.93	**<0.0001**
Body mass index (kg/m²)	31.1 ± 7.3	30.6 ± 7.9	0.52
Systolic blood pressure (mm Hg)	135.4 ± 20.5	128.7 ± 18.0	**<0.001**
Diastolic blood pressure (mm Hg)	79.3 ± 11.1	79.2 ± 11.2	0.91
Pack years smoking	14.6 ± 21.4	10.0 ± 27.2	**0.03**

Abbreviations: Kg/m², kilograms per meter-squared; LAZ, long anterior zonules; mm Hg, millimeters of mercury; SE, spherical equivalent;
[2]Bolded p-values significant at α=0.05 level
[3]Right eyes used in analysis

TABLE 5
Multivariate analysis of KS as a function of presence / absence of LAZ, adjusting for other variables

Variable	Coefficient β	Standard Error	Wald X²	P-value[1]	Odds Ratio	95% CI
Intercept	-6.87	0.63	119.77			
LAZ trait present	2.30	0.32	52.30	**<0.0001**	9.95	5.34 to 18.54
Refractive error (SE, per diopter)	-0.11	0.04	7.89	**0.005**	1.11	1.03 to 1.19
Age, per decade	0.44	0.10	19.13	**<0.0001**	1.56	1.28 to 1.90

Abbreviations: KS, Krukenberg's spindle; LAZ, long anterior zonule trait; SE, spherical equivalent;
[1]Variables included only if significant at P<0.05 level except for main effects of interaction terms
[2]Right eyes used in analysis

FIGURE 1
Example images showing a normal eye with a typical, well-delineated zonule insertion zone (upper left image), long anterior zonules that are positioned well beyond the typical zonule insertion zone (lower left image), and pigmented long anterior zonules shown in direct illumination (right image).

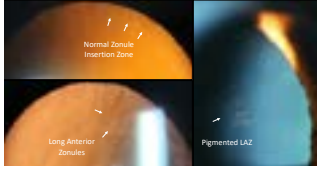


FIGURE 2
Example image of fine corneal endothelial pigment dusting associated with Krukenberg's spindle formation.

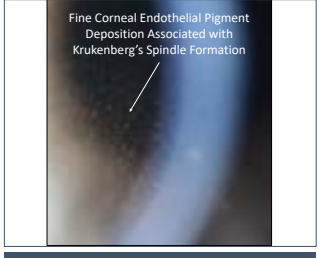
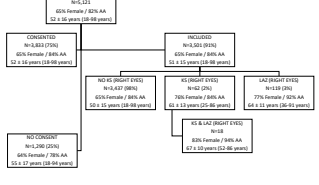


FIGURE 3
Flow diagram illustrating subject recruitment for this investigation.



DISCUSSION

This analysis showed that eyes with a KS were about 10x more likely to have LAZ as compared to eyes that did not have a KS. This highlights the importance of checking for the LAZ trait among patients who exhibit a KS, which will improve the likelihood of correctly explaining the reason for the KS presence. This is important since KS presence has received so much attention as an indicator of "classic" pigment dispersion syndrome, yet so little attention as an indicator of LAZ-associated pigment dispersion. Given the potential prevalence of the LAZ trait is 2%,[7] we surmise that the true reason for KS presence among many patients goes unrecognized. We further suggest that improved awareness of the association between KS and LAZ could lead to more precise clinical diagnosis and help identify LAZ, which could be a risk factor for glaucoma.[13] This current analysis further suggests that any patient with a KS, especially when they are in the 6th decade of life or older, should be carefully examined for LAZ following pupillary dilation.

CONCLUSION

KS presence is strongly associated with the LAZ trait and it is an indicator of LAZ-associated pigment dispersion. People who exhibit a KS should be carefully examined for the LAZ trait.

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Scleral Lens Fitting on a Patient with a History of Penetrating Corneal Injury from a Nail Gun

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INTRODUCTION

When trauma occurs to the eye, we tend to focus on the immediate care of the patient and forget about the long term consequences associated with the trauma. Penetrating wound injuries almost always cause some form of ectasia and scarring that will eventually lead to irregular astigmatism.[1] Taking care of the penetrating wound injury in hand certainly takes precedent over anything else, however we must remember to treat the aftermath of trauma even long after the incident has occurred.[2]

CASE PRESENTATION

A 35-year-old Caucasian male presents with blurry vision and discomfort with his existing rigid gas permeable (GP) lens in the left eye (OS). Patient's ocular history reveals a penetrating trauma OS caused by a nail gun work accident 2 years prior. He had a resulting traumatic cataract, surgical intervention and is aphakic OS. He elected not to have another surgical procedure and was left aphakic OS. He has a history of wearing a GP lens OS for the past one year. His medical history is remarkable for a seizure disorder for which he takes Depacon. He is not on any ocular medications and has no known drug allergies.
The patients entering uncorrected visual acuities are 20/20 in the right eye (OD) and 20/500 OS. With his GP lens OS vision improves to 20/50 with no improvement on pinhole. Entrance testing is normal OD and OS with the exception of corectopia OS with a minimal reaction to light. Slit lamp examination OD is unremarkable, while examination OS reveals an oval shaped superior nasal stromal scar, a nasally displaced pupil, and aphakia. Pentacam topography performed prior to fitting is within normal limits OD and reveals irregular astigmatism OS with simulated-keratometry values of 42.70 @ 057 / 44.30 @ 147.

TREATMENT AND MANAGEMENT

The patient was fit diagnostically with the Zenlens RC scleral lens OS. Best corrected visual acuity through the scleral lens was 20/20. The patient reported a dramatic increase in comfort and clarity of vision. The patient returned for a dispense visit with initial application showing 251um of central clearance, adequate limbal clearance and aligned edges. Wear and care regimen was reviewed and insertion and removal training completed, and the patient was sent home with the lenses. The patient was advised to return for a progress check wearing the lenses to ensure optimal fit, vision and corneal health.

FIGURE 1
Anterior segment photos of the left eye showing a) corneal scarring and corectopia of the pupil and b) retro-illumination of the cornea highlighting the irregularity.

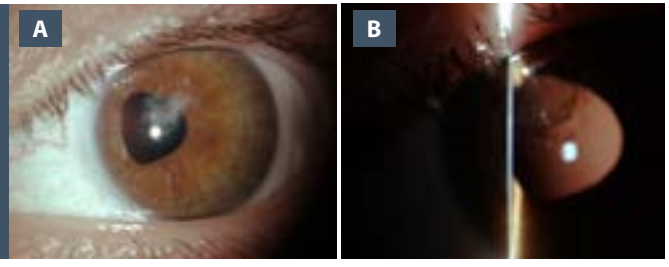


FIGURE 2
Pentacam scan Holladay Report of the left eye.

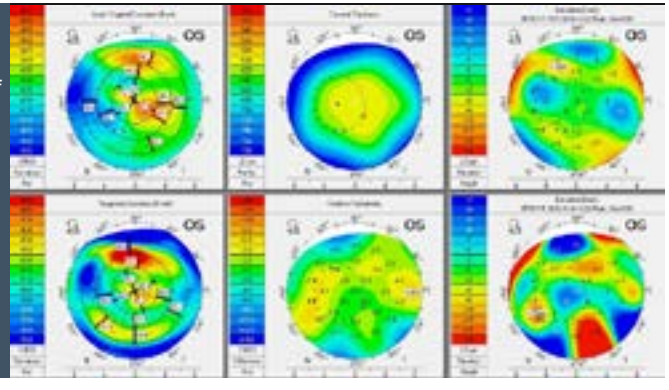
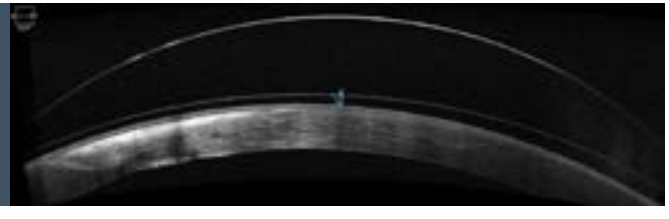


FIGURE 3
Anterior Segment OCT at 2 week follow-up.



DISCUSSION

Many patients who have a penetrating corneal injury end up with some form of corneal ectasia and irregular astigmatism due to disruption of the stromal lamellae during corneal healing.[3,4] GP lenses are an effective treatment option to manage this irregular astigmatism, however some patients are intolerant to wearing small-diameter corneal GPs.[5] In these cases, other lenses in our proverbial toolbox may better satisfy the goals of the patients. Scleral lenses presented as an optimal solution for this patient, addressing his issues with comfort, feeling the lens with a blink and constant shifting of the lens as he looks around. The lens completely vaults the cornea and has minimal movement, providing him with improved comfort and a stable improvement in vision. Given that the patient only needs one lens in his eyes, using a scleral lens is ideal as comfort of the lenses become paramount in order to minimize awareness differences.

CONCLUSION

There are a variety of ways specialty contact lenses can help with corneal ectasia and scarring, but there is not a one size fit all method. Every patient is unique and the appropriate selection must be tailored to the patient's individual goals and needs. If one design of lenses is not working for the patient, it may be beneficial to switch designs to provide the patient with the best possible comfort and vision.

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Doxycycline Used to Treat Ocular Surface Disease Lowers IOP in Patient with Glaucoma

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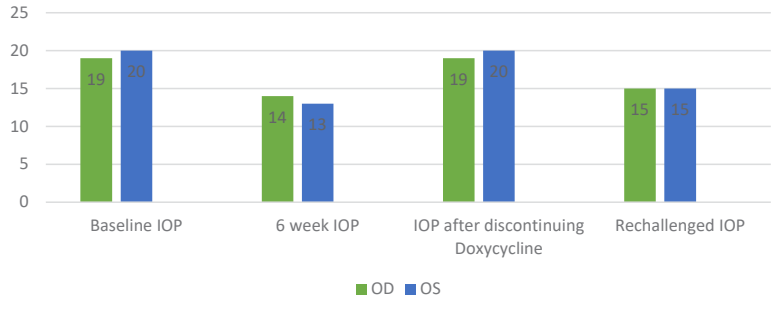
PURPOSE

Multiple glaucoma medications are often required to manage IOP in patients with glaucoma, but these topical glaucoma medications may cause or exacerbate ocular surface disease (OSD). The symptoms associated with OSD can lead to poor adherence to prescribed medication which is a risk for irreversible progression of glaucoma. Oral doxycycline is used to treat OSD, but its effect on IOP in glaucoma patients is not well documented. We present a patient whose IOP was better controlled while taking oral doxycycline.

CASE REPORT

A 69 year-old Caucasian male had pre-treatment maximal IOP of 32mmHg OD, 34mmHg OS. Both latanoprost 0.001% and bimatoprost 0.1% was poorly tolerated causing increased redness, dryness and irritation. Brinzolamide 1.0% and brimonidine-timolol 0.2%/0.5% every 12 hours lowered the IOP to 19 OD, 20 OS and was better tolerated. Oral doxycycline hyclate 50mg once daily was initiated to treat OSD caused from meibomian gland dysfunction. After 6 weeks, OSD improved and IOP lowered to 14 OD, 13 OS and remained between 13-15mmHg OU. After 2 years, doxycycline was discontinued. Within 6 months OSD symptoms recurred and IOP was 19-20mmHg on multiple visits. After re-challenged with another course of doxycycline, IOP reduced to 15 OD, OS and remained stable (Table 1).

TABLE 1 - EFFECT OF DOXYCYCLINE ON IOP



The IOP change with addition of doxycycline 50mg daily resulted in a 26-35% IOP reduction. Topical glaucoma medications remained unchanged.

FIGURE 1

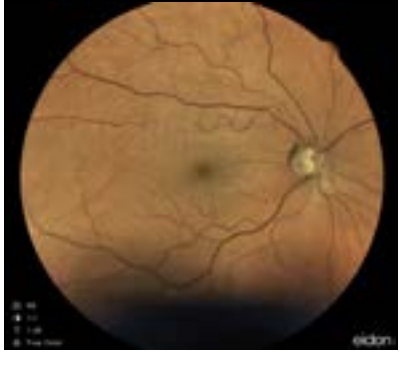


FIGURE 2

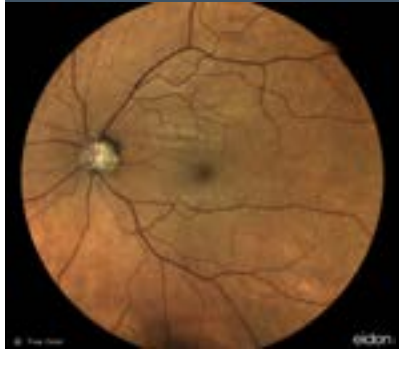


FIGURE 3

CONCLUSIONS

Ocular hypertension in primary open angle glaucoma is thought to occur from resistant to outflow through the trabecular meshwork (TM). Multiple factors contribute to this resistance to outflow including inflammation of the TM. OSD may contribute to or exacerbate inflammation of the TM. The addition of doxycycline hyclate 50mg daily to this patient suffering from both POAG and OSD offered an additional 26-35% IOP reduction in addition to reducing symptoms associated with OSD. Doxycycline, a broad-spectrum antibiotic, exhibits anti-inflammatory properties by inhibition of T-cell activation and chemotaxis, the downregulation of proinflammatory cytokines, including tumor necrosis factor-α and interleukin-1β, and inhibition of matrix metalloproteinases that have been pathologically activated.[1] Doxycycline may also kill migratory keratocytes or fibroblasts responsible for the formation of scar tissue.[2] These anti-inflammatory properties of doxycycline may reduce TM inflammation by alleviating outflow resistance within the TM and contribute to IOP lowering. Previous case reports demonstrated IOP reduction after switching topical ocular hypotensive medications to preservative free anti-glaucoma medications with another also adding daily dose of 50mg doxycycline.[3,4] The presented case-maintained the patient's preserved topical anti-glaucoma medications while initiating daily dose of 50mg doxycycline. This is the first reported case that rechallenging the patient with doxycycline. A large-scale study is needed to determine the effect of doxycycline in the treatment of IOP in POAG patients.

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Repeatability of an Automated ETDRS Contrast Threshold Measurement

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PURPOSE

The purpose of this study was to determine the repeatability of an automated ETDRS contrast thershold (ETDRS-CT) measurement in subjects with normal vision as well as in subjects with reduced visual acuity (VA).

METHODS

Forty subjects were tested (ages 22-75 years), including 21 subjects with normal vision (VA of 20/25 or better) and 19 subjects with reduced vision (VA from 20/30 to 20/100). The contrast threshold of one eye from each subject was measured at 3 meters with the automated ETDRS-CT by M&S Technologies. All subjects were started to be tested at 10% contrast level with letter size of 20/100. The contrast decreased at 0.1 log of contrast level. The lowest contrast level could be tested was 0.4%. Subjects were retested using the same protocol at a second visit one hour (± 30 minutes) later. Test-retest reliability of the automated ETDRS-CT was evaluated using the Bland-Altman 95% limits of agreement (LoA) method.

TABLE 1
Demographic characteristics of the subjects (n = 40).

	Number of Subjects (%)
Visual Acuity	
20/25 or better	21 (52.5)
20/30 to 20/100	19 (47.5)
Gender	
Female	32 (80)
Male	8 (20)
Race	
Black	22 (55)
Hispanic	7 (17.5)
White	8 (20)
Asian	3 (7.5)
Age (years)	
Range	22.2-75.0
Mean (SD)	47.6 (13.8)

FIGURE 1
Automated ETDRS contrast threshold measurement viewed by the subjects on the computer (A, B) and the examiner on the tablet (C, D).

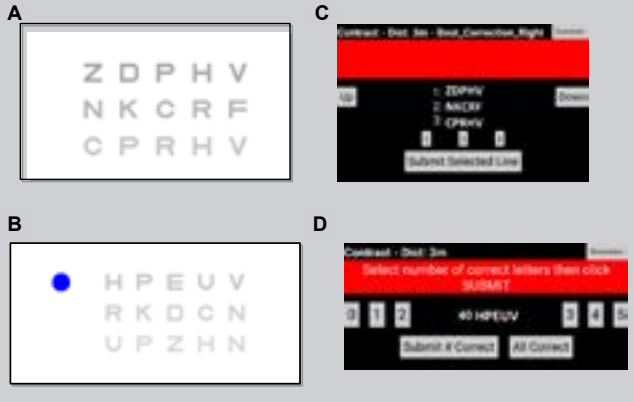
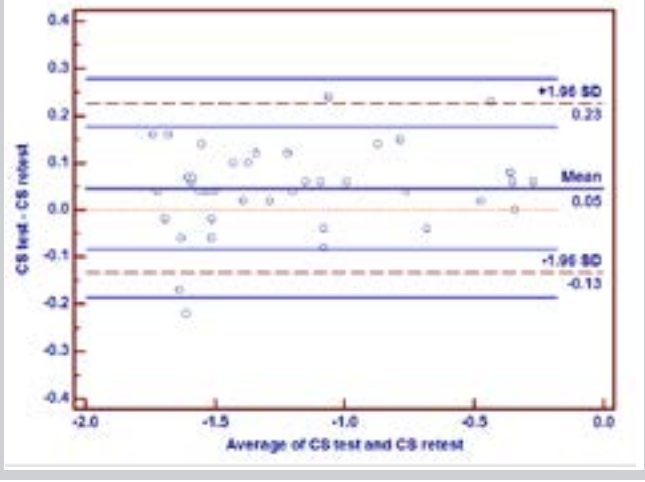


FIGURE 2
Repeatability between test and retest.



RESULTS

The mean (± SD) difference between the two measurements was -0.05 (± 0.09) logMAR score (2.5 letters) with statistically significant different (paired t-test, p=0.003). The 95% LoA between test and retest was ± 0.17 logMAR.

CONCLUSION

- The automated ETDRS-CT measurement shows good repeatability between two administrations.
- Measurement at the second visit was slightly better (2.5 letters) than the first measurement, which could be due to learning effect of subjects.

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Gradual vision loss in a patient with congenital vision impairment

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This case reports on subacute vision resulting from sub-foveal fluid in a patient with optic nerve and choroidal colobomas.

CASE HISTORY

- 49-year-old white male c/o gradual decrease in vision over 6 months
- Outside records document historical vision 20/40 right eye, with stable HM vision left eye
- History of optic nerve colobomas OS>OD, hypertension, acne vulgaris and prostate cancer
- Taking Lisinopril, Eszopiclone as needed and a daily multivitamin
- History of discontinued Sildenafil citrate (Viagra) use at 100mg P.O. Q.D. following a prostatectomy, and discontinued Isotretinoin and topical Triamcinolone for acne vulgaris

PERTINENT FINDINGS

- Entering acuities: 10/40 (20/80 equivalent) right eye and HM left eye
- PERRL
- Fundoscopy revealed bilateral inferior choroidal and optic nerve colobomas with subretinal fluid inferior to the macula in the right eye and a nevus superotemporal to the macula in the right eye
- OCT showed shallow areas of subretinal fluid inferior to the macula with an adjacent PED (Figure 1) not associated with either coloboma (Figure 3) or nevus (Figure 4).
- IVFA showed no connection from either nevus or coloboma (Figure 5)

DIFFERENTIAL DIAGNOSIS

- Central serous chorioretinopathy (CSCR)
- Serous retinal detachment

FIGURE 1
OCT of right eye macula

FIGURE 2
OCT of left eye macula

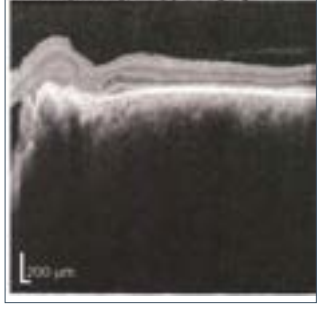

FIGURE 3
OCT of right eye optic nerve coloboma

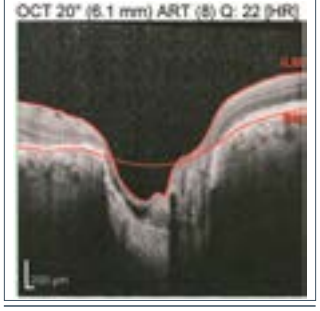

FIGURE 4
OCT of right eye nevus

FIGURE 5
IVFA of right eye fundus

DIAGNOSIS AND DISCUSSION

- Colobomas occur in 0.7 cases per 10,000 live births[1] and result from the incomplete closure of the optic fissure at the 6th week of gestation.[2]
- Retinal detachments (RD) are one of the most common complications of colobomas with previous estimated prevalence 20-40% range over the lifetime of the patient. Modern estimates place this prevalence closer to 6-8%.[3,4] This discrepancy has been attributed to referral bias in previous studies.[3], Nevertheless the prevalence of RD in patients with congenital malformations of the eye is higher than the general population. This is believed to be due to the accumulation of subretinal fluid from the coloboma from either the vitreous cavity or cerebrospinal fluid.[5]
- CSCR is a common cause of subacute vision loss that most commonly affecting middle-aged males.[6] The exact mechanism remains unknown; however, it is associated with hypercortisolism, Type A personalities and high stress levels. The reported association between CSCR and Sildenafil use at therapeutic doses is controversial[7,8]
- Our patient, an attorney, works in a high-stress environment, reports increased stress after his diagnosis of prostate cancer and prostatectomy, and has historically used topical steroid creams and high dose Sildenafil.
- The focal PED with adjacent subretinal fluid on OCT is hallmark for CSCR.[9] In our case, none of the subretinal fluid could be traced to communication with either the nevus, nerve coloboma or choroidal coloboma. These findings make CSCR the most likely diagnosis.

TREATMENT, MANAGEMENT

- Many cases of CSCR are self-limiting and are therefore managed with monitoring and no intervention.
- Nonsurgical management may include anti-corticoid therapy such as Rifampin and/ or intraocular Avastin injection, however Avastin has not been found to reduce fluid or increase BCVA.[10]
- Surgical management may include thermal laser photocoagulation or photodynamic therapy, with the later having better surgical outcomes.
- Laser photocoagulation in our patient should be avoided due to the CSCR occurring in the better seeing eye.
- Treatment was performed in this case due to the patient's symptomology and monocular status affecting his ADL's
- PDT was performed with a one-year course of Rifampin, and vision stabilized at 10/20 (20/40 equivalent) with no recurrence to date.

CONCLUSION

- CSCR should be a differential for individuals with central vision loss resulting from sub-foveal fluid. The level of suspicion should be raised for high-stressed individuals, particularly middle-aged males, even if other ocular comorbidities places them at higher risk of other conditions. Most first-incidence CSCR cases do not receive treatment, however no two patients are the same, and management should take into account other factors such as effect on ADLs and vision in the fellow eye.

REFERENCES

Available upon request

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Papilledema vs. Pseudopapilledema: A Case of Concurrent Papilledema and Optic Disc Drusen

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INTRODUCTION

Optic disc edema is a critical ocular finding that can be related to increased intracranial pressure, inflammatory, infiltrative, or compressive disease. Prompt diagnosis and management are crucial as these conditions may lead to permanent vision loss, neurological complications, or death. Optic disc drusen (ODD) is normally a benign condition that is characterized by calcified deposits in the optic nerve head. ODD can give the appearance of optic nerve elevation and present a diagnostic challenge, especially in the case of mild optic disc edema. This case details the diagnosis and treatment of papilledema secondary to idiopathic intracranial hypertension (IIH). Resolution of the papilledema reveals anomalous nerves with ODD.

CASE PRESENTATION

A 21-year-old, Hispanic, female presented for a comprehensive eye exam. She complained of headaches that worsened after extended near work and occasional synchronous pulsatile tinnitus.

Medical History: Unremarkable

Clinical Exam:

	OD	OS
VA (cc)	$20/20^{-1}$	$20/20^{-1}$
PUPILS	PERRL (-)APD	PERRL (-)APD
CVF	FTFC	FTC
EOM	FROM	FROM
Anterior Segment	Unremarkable	Unremarkable

FIGURE 1A AND 1B - ONH photos- optic disc edema OD,OS

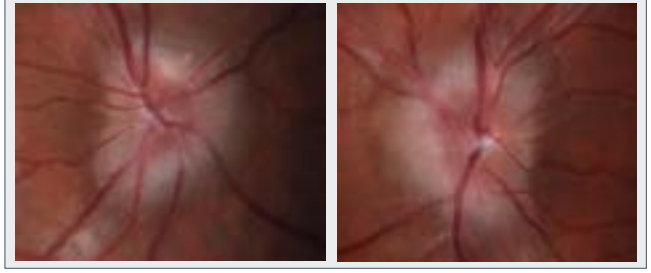


FIGURE 2 - ONH and RNFL analysis OU- thickened RNFL OD,OS

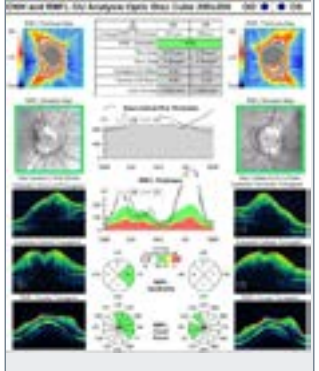


FIGURE 3 - Resolution of disc edema reveals ODD (green arrow)

FIGURE 4A - ONH 5-line raster OD pre-treatment- disc edema

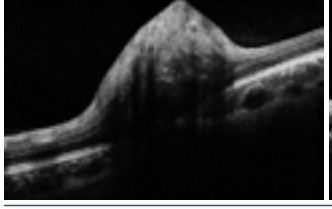


FIGURE 4B - ONH 5-line raster OD post-treatment- resolved disc edema reveals ODD (green arrows)

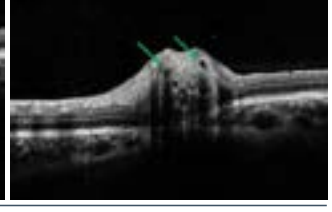
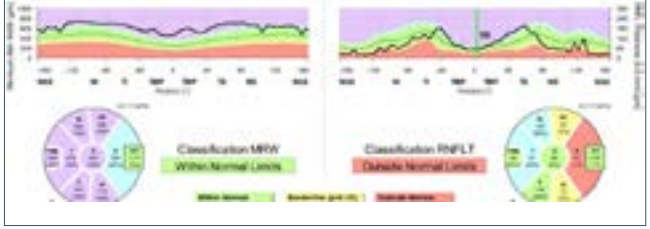


FIGURE 5 - Spectralis ONH OCT OD- Minimum rim width (MRW) shows thickening vs. RNFL scan shows thinning



MANAGEMENT

Due to the patient's symptoms, bilateral disc edema, and body mass index of 38.5, there was a high suspicion for IIH. She was sent out for a lumbar puncture and MRI/MRV with gadolinium of the brain and orbits, which confirmed our diagnosis. Treatment was initiated with acetazolamide 250mg bid and weight loss was recommended. The patient showed improvement of clinical signs and symptoms over a series of follow up visits. Resolution of her papilledema revealed bilateral ODD with anomalous nerves on fundus examination. OCT confirmed ODD and anomalous nerves.

DISCUSSION

IIH is identified by increased intracranial pressure in the absence of identifiable brain pathology and normal cerebrospinal fluid composition. Headache, pulsatile tinnitus, and visual disturbances are common symptoms that aide in the clinical diagnosis of IIH. The hallmark sign of IIH is papilledema. An anomalous optic nerve with ODD presents a unique challenge in the early detection of papilledema as it may delay diagnosis. Conversely, papilledema may be overdiagnosed in patients with anomalous nerves and ODD. Case history, clinical findings, and appropriate ancillary testing are essential in the appropriate diagnosis and management of both conditions. Non-invasive OCT imaging in differentiating these two conditions proves to be beneficial in aiding the primary eye care provider in managing these conditions and avoiding costly referrals and unnecessary diagnostic testing.

REFERENCES

Available upon request.

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Spontaneous Periorbital Emphysema

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INTRODUCTION

Orbital emphysema is an uncommon condition associated with a forceful injection of air that becomes trapped in the loose subcutaneous tissue surrounding the orbit. This condition is most often seen following a history of ocular or facial trauma and orbital fracture, but has also been reported in conjunction with complications from surgery, infection, and in cases of sinusitis. Though benign, the condition can lead to vision threatening complications. We discuss the etiology, diagnosis, and management of this unique condition.

CASE

A 41-year old Caucasian male presented on a referral from a local ER. He complained of right eyelid swelling immediately after sneezing the previous night. He noted mild pain and tearing, but no changes to vision or diplopia. The patient denied history of ocular trauma, but reported wrestling as a youth.

Pertinent Initial Presentation		
	OD	**OS**
Visually Acuity (cc)	20/80 PH NI	20/20
Pupils	PERRLA (-)APD	PERRLA (-)APD
EOM	mild restriction in upgaze	wnl
CVF	FTFC	FTFC
Adnexa	2+ UL emphysema 4+ LL emphysema trace erythema	wnl
Anterior Segment	wnl	wnl
IOP	18 mmHg	15 mmHg
Fundus	wnl clear, flat, intact 360 degrees	wnl clear, flat, intact 360 degrees
Imaging	External photos: Figures 1A-C CT: Fracture of right inferior orbital wall Subcutaneous gas in periorbital soft tissues and poststepal retrobulbar fat Diffuse paranasal sinus disease	

The patient was diagnosed with periorbital emphysema post sneezing associated with an orbital fracture of uncertain chronicity. He was prescribed a course of oral Keflex 500mg TID prophylactically and instructed to avoid heavy sneezing, coughing, and exercise. The patient was monitored closely until resolution, which occurred within 1 week (Figures 2A-C). At that time, the patient was advised on long term follow up to address both the sequelae associated with a history of ocular trauma and his residual, but improved, right eye restriction in upgaze.

FIGURE 1A

FIGURE 1B

FIGURE 1C

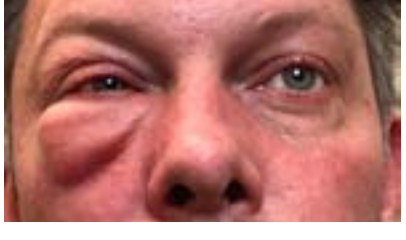


FIGURE 2A

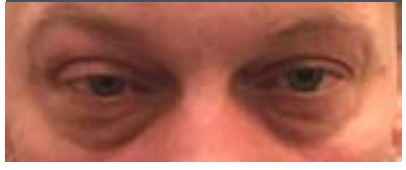


FIGURE 2B

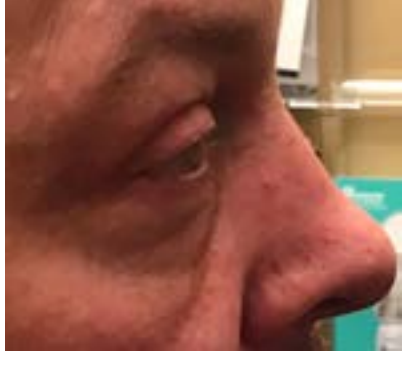
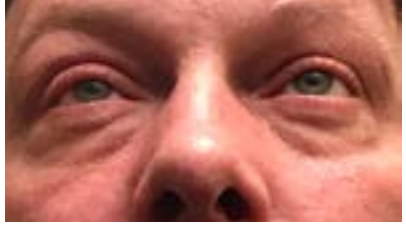


FIGURE 2C



DISCUSSION

Orbital emphysema is most frequently associated with trauma, though can present spontaneously. Often a break in an orbital bone leaves the area susceptible to a forceful injection of air, as may occur during sneezing or nose blowing. This air becomes trapped in the loose subcutaneous tissue surrounding the orbit. Diagnosis and management of this uncommon condition is primarily reliant on clinical evaluation and imaging studies. Usually benign, the condition often resolves within a few weeks time. However, emergent decompression via needle aspiration, canthotomy, or cantholysis is indicated if signs of orbital compartment syndrome develop. A prophylactic oral antibiotic course may be indicated in the presence of concurrent sinus disease or immunocompromised state; however, this remains an area of debate.

CONCLUSION

Despite expectations of resolution, orbital emphysema warrants close observation during the disease course due to potential sight threatening complications, including compressive optic neuropathy and central retinal artery occlusion. Sequelae associated with blunt force trauma, when it is the causative etiology, also require evaluation and management. While uncommon, orbital emphysema is benign.

REFERENCES

Available upon request.

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Para-Ophthalmic Aneurysm with a Unique Finding of Transient Monocular Vision Loss

Abigail Strauss OD

Jesse Brown VAMC & Hines VA • Chicago, IL

ABSTRACT

A patient presents with an isolated episode of transient monocular vision loss (TMVL). Imaging reveals a para-ophthalmic aneurysm of the internal carotid artery consistent with clinical presentation.

INTRODUCTION

Chief Complaint
- 65 year old AAM reported an isolated episode described as a curtain over the top half of his vision OD lasting 5-10 minutes two weeks prior.

Ocular History
- Dry Eye Syndrome
- Recurrent episcleritis x2 w/ negative workup

Medical History
- HTN
- Prostate CA s/p RRP
- (+) PPD; completed Isoniazid treatment
- OSA; on CPAP

Medications
- Tadalafil
- Nifedipine
- Lisinopril

Denies smoking, illicit drug use, or drinking alcohol

FIGURE 1

Testing	OD	OS
Visual Acuity	20/30	20/30
Pupils/EOM/CVF	NL	NL
SR lamp	NL	NL
IOP (GAT)	14mmHg	15mmHg
Ishihara	14/14	14/14
Red Cap Desat.	100%	100%
GVF	Full	Superior constriction
C/D Ratio	0.5/0.45 (-) pallor	0.45/0.45 (-) pallor
Macula	NL	NL
Vessels	NL (-) emboli	NL (-) emboli
Vitreous	NL	NL
Periphery	NL	NL

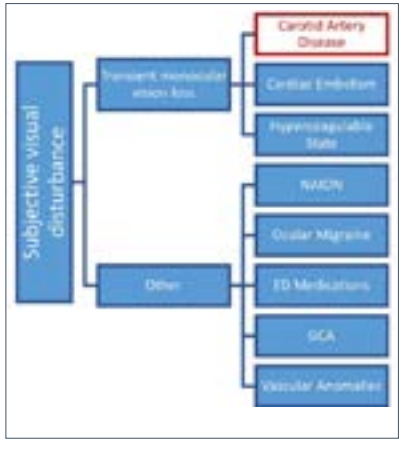
ADDITIONAL TESTING

Physical
- Denies: headache, aphasia, dysphagia, paresthesia, weakness, confusion or GCA symptoms
- BP 142/74

Laboratory studies
- ESR/CRP/CBC/INR all NL

Radiology Studies
- Carotid duplex: no hemodynamically significant stenosis of right or left side
- MRI: mild generalized cerebral volume loss and minimal small vessel ischemic change
- MRA: focal atherosclerotic plaque of proximal right ICA with stenosis of 30%. 4mm para-ophthalmic aneurysm of right ICA
  - Tortuosity of vertebrobasilar arteries

FIGURE 2



RESULTS

Diagnosis : 4 mm right sided para-ophthalmic aneurysm with an induced TMVL

Pathophysiology: Likely a thromboembolic event secondary to turbulent blood flow due to the aneurysm.

Treatment : The patient had a neurology and neurosurgery consultation and is currently being treated with anticoagulation and watchful monitoring.

FIGURE 3

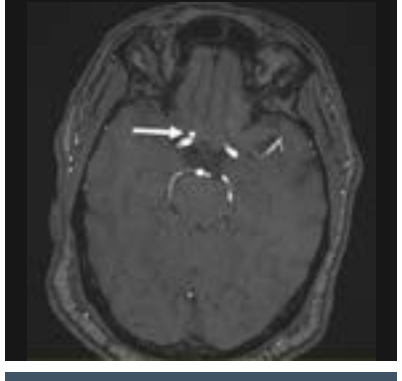
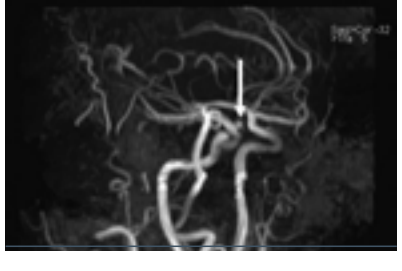


FIGURE 4



DISCUSSION

- Other Treatments
  - Surgical or endovascular treatment
    - Surgical treatment mortality 25%, endovascular treatment mortality 9%
    - Asymptomatic aneurysm <7mm manage with a conservative approach
- Additional factors to consider
  - 3 types of ophthalmic artery aneurysm
    - Intracranial , Intracanalicular, Intraorbital
    - Ophthalmic artery aneurysms account for approximately 11% of all intracranial aneurysm
  - Pathophysiology of ocular symptoms secondary to ophthalmic artery aneurysm
    - Compression or Thromboembolic event
  - The pattern of TMVL is associated with cause
    - Carotid disorder is often associated with altitudinal or longitudinal pattern
  - Patients with ophthalmic artery aneurysm are at risk for ocular morbidity such as CRAO
  - Patients with suspected new onset TMVL should be sent urgently to a stroke center for a through workup due to increased risk for stroke.
    - TMVL should be managed as urgently as BRAO, and CRAO
    - Risk for stroke peaks within a few days of symptoms

CONCLUSION

TMVL is often the harbinger of potentially life threatening pathology. Patients should have a thorough work up including labs, carotid evaluation, cardiac echo, MRI/MRA. Para-ophthalmic aneurysms are a rare entity but is also important to consider in the differential diagnosis of TMVL.

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Brown Syndrome: Not just for kids

Nhung Tran, OD

Jesse Brown VAMC, Chicago, IL • Edward Hines JR VAH, Hines, IL

ABSTRACT

Brown syndrome is generally considered a congenital condition; however, can present as an acquired condition secondary to trauma, sinusitis, or systemic inflammatory disease. Full systemic evaluation is highlighted in this acquired Brown syndrome case report.

CASE REPORT

HISTORY OF PRESENT ILLNESS:
- A 63-year-old African American male complains of intermittent binocular vertical diplopia for 3-4 weeks, greatest in superior left gaze

OCULAR HISTORY:
- Advanced Normal Tension Glaucoma OU
  - o Treatment: Simbrinza BID OU and Latanoprost QHS OU
- H/o right facial trauma (-) ocular sequelae 2014

MEDICAL HISTORY:
- Chronic Sinusitis
- Left Vallecula tongue mass – biopsy results pending
- Pulmonary Nodules – stable on CT images
- Chronic Gastritis
- Renal Cysts
- Benign Prostate Hypertrophy
- Degenerative Joint Disease
- Anemia
- Hepatitis C Virus
- h/o cocaine and heroine use

MEDICATION:
- No pertinent medications to this case

CLINICAL EXAMINATION: Figure 1
EOMS: Figure 2
VERTICAL CT IN 9 FIELDS of GAZE: Figure 3
ADDITIONAL TESTING: Figure 4
DIFFERENTIAL DIAGNOSIS:
- Acquired Brown Syndrome
- CN IV Palsy
- Orbital Fracture with entrapment of inferior oblique muscle
- Thyroid Ophthalmopathy
- Orbital Mass
- Orbital Mucocele

LEADING DIAGNOSIS:
- Acquired Brown Syndrome secondary to Rheumatoid Arthritis

TREATMENT and MANAGEMENT:
- Indomethacin 25mg TID PO
- Per Rheumatology consult, start Methotrexate and Folic Acid

FOLLOW-UP: Figure 5

FIGURE 1

CLINICAL EXAMINATION		
	OD	OS
BCVA	20/20	20/25
PUPILS	(+) Direct and consensual (-) APD	(+) Direct and consensual (-) APD
VERSIONS	restriction in left upgaze (+) vertical diplopia (+) pain on eye movement	FROM
DUCTIONS	restriction in left upgaze (+) pain on eye movement	FROM
CVF	FTFC	FTFC
SLIT LAMP EXAMINATION	NL	NL
IOP	15 mmHg	14 mmHg
C/D RATIO	0.95V / 0.90H	0.95V / 0.95H
MACULA	NL	NL
VITREOUS	PVD	NL
VESSELS	NL	NL
PERIPHERAL RETINA	Equatorial drusen	Equatorial drusen

FIGURE 2

EOMS

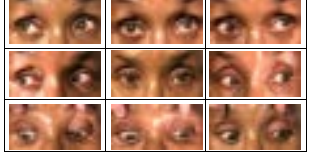


FIGURE 3

VERTICAL COVER TEST in 9 FIELDS OF GAZE		
ORTHO	5 BU OS	8 BU OS
ORTHO	ORTHO	ORTHO
ORTHO	ORTHO	ORTHO

FIGURE 4

ADDITIONAL TESTING	
ADNEXA	Positive tenderness of trochlear upon palpation OD NL OS
PARK'S 3-STEP TESTING	Unable to isolate EOM
FORCED DUCTION TESTING	Positive in left up gaze OD
CRANIAL NERVE TESTING	CN II-III and CN V-XII: intact and symmetric bilaterally CN IV: restricted OD, intact OS
LABORATORY TESTS	RF (95), ACE (87) and anti-CCP (159.92): elevated CBC w/ diff, ANA, Anti-SSA, Anti-SSB, CRP, Syphilis, Thyroid Panel: NL
RADIOLOGIC STUDIES	CT had and orbits: NL MRI w/ and w/out contrast of head and orbits: NL X-ray of hands: bilateral joint erosion

BROWN SYNDROME

Brown Syndrome is characterized by an elevation deficit in adduction secondary to restriction of the superior oblique tendon – trochlear complex.

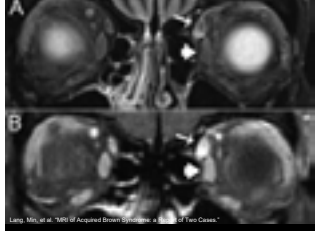
EPIDEMIOLOGY:
- 1 in 400 – 450 of all strabismic cases
- 6 reported cases of inflammatory Brown Syndrome [1]

CLINICAL CHARACTERISTIC:[5]
- Elevation deficit in adduction
- Less elevation deficit in midline
- Minimal or no elevation deficit in abduction
- Divergence in up gaze
- Positive forced duction testing
- Downshoot in adduction
- Widened palpebral fissure on adduction
- Anomalous head posture
- Primary position hypotropia

FIGURE 5

FOLLOW –UP AFTER INITIATION OF TREATMENT		
	PERTINENT EXAM FINDINGS	TREAMENT
1 WEEK	Stable Cover Test (+) tenderness of trochlea on palpation OD	Indomethacin 25mg TID PO
2 WEEKS	Stable Cover Test NO tenderness of trochlea on palpation OD	Indomethacin 25mg TID PO
4 WEEKS	Stable Cover Test NO tenderness of trochlea on palpation OD	Indomethacin 25mg TID PO

FIGURE 6
MRI



ETIOLOGY OF ACQUIRED:
- Systemic Inflammatory conditions
  - o rheumatoid arthritis
  - o juvenile rheumatoid arthritis
  - o systemic lupus erythematous
  - o Sjogrens's syndrome
- Sinusitis
- Iatrogenic
- Trauma
- Idiopathic

DISCUSSION

Acquired Brown syndrome requires additional testing and full systemic evaluation to determine underlying etiology as outlined in this case.

INFLAMMATORY ETIOLOGY MAY BE ASSOCIATED WITH:
- pain on palpation of the trochlea
- pain on eye movement
- enhancement of superior oblique tendon-trochlear complex on MRI or CT
- Figure 6 - MRI

RHEUMATOID ARTHRITIS

Rheumatoid arthritis is an inflammatory systemic condition that affects the joints of unknown etiology.

DIAGNOSIS:
- number of joints involved
- elevated rheumatoid factor
- positive anti-cyclic citrullinated peptide antibody
- elevated c-reactive protein
- elevated erythrocyte sedimentation rate

MOST COMMON OCULAR MANIFESTATIONS:
- Keratoconjunctivitis Sicca
- Episcleritis
- Scleritis
- Keratitis
- Retinal Vasculitis

TREATMENT AND MANAGEMENT

Acquired Brown syndrome from inflammation treatment options
- Observation
- Oral NSAID or Steroid
- Intra-trochlear injection of NSAID or Steroid
- Surgery

CONCLUSION

Acquired Brown syndrome is a rare condition in the adult population and can be associated with underlying systemic disease. If acquired Brown syndrome is suspected, it is important to consider and evaluate for possible underlying systemic conditions.

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Use of Smartphones and Vision Accessibility Features by Non–Visually Impaired Patients 60 and Older Attending an Urban Eye Clinic

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INTRODUCTION

Aspects of functional vision such as **contrast sensitivity**, **glare perception**, **glare recovery** and **color vision**, can be reduced in older people regardless of visual acuity (VA) and ocular disease.

The % of adults with a smartphone have steadily increased from 2011. Information is increasingly being shared electronically and being accessed through a smartphone. Smartphones have vision accessibility features that to allow text to be enhanced. Many people may not be aware these features are incorporated into their smartphone. See Table 1

Patients were surveyed about the use of smartphones and vision accessibility features.

METHODS

A convenient group attending a geriatric based clinic whose VA ≥ 20/40 were surveyed. Visual acuity and presence of ocular disease were verified from medical record by JW/DP. The survey queried patients for demographic information, smartphone brand, smartphone use, and information about accessibility feature use.

TABLE 1

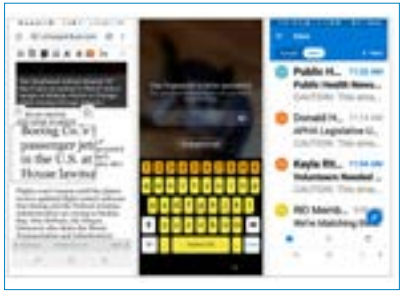

FIGURE 1
Smartphone Brand

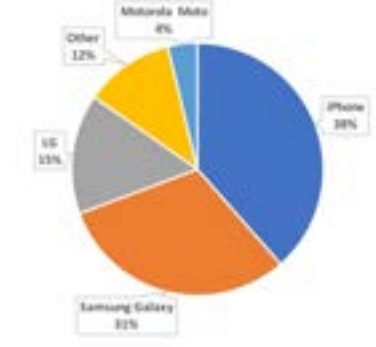

FIGURE 2
% Smartphone Use

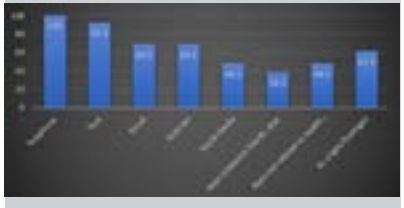

FIGURE 3
Knowledge/use of Vision Accessibility Features

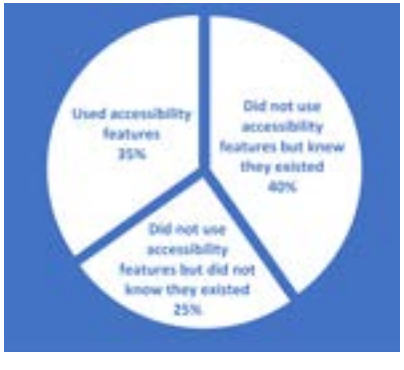

FIGURE 4
Accessibility Features Used

RESULTS

- Of the 52 patients surveyed, 50% were 60-69 yrs. and 50% were ≥ 70 yrs. The majority (92%) were African-American. The majority were female (59%).
- See Figure 1 and 2. – Smartphone brand, Smartphone use
- The majority (82%) reported using the phone for everything they wanted.
- See Figure 3 and 4.-Knowledge/use of vision accessibility features, Features used
- Settings were changed by the patient (44%), friend/ family (44%) or phone store employee (11%).
- Despite VA, 67% were diagnosed with glaucoma, diabetic retinopathy, cataract or dry eye.
- There was no correlation between age or presence of ocular disease and utilization vision accessibility features.

CONCLUSION

The majority were not utilizing the visual accessibility features, and many did not know these features existed despite using the smartphone for many tasks. Few used accessibility features other than enlarged font size. None of the patients had an eye care provider/staff modify features. Because of their understanding of functional vision loss, eye care providers suggestions about optimal smartphone settings could be tailored to patients' vision.

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A Case of Bilateral Iris and Chorioretinal Coloboma with Microstrabismus

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BACKGROUND

There are a variety of ocular and systemic manifestations that are associated with coloboma, including strabismus, amblyopia, abnormal development and CHARGE syndrome. Coloboma is due to an incomplete closure of the embryonic fissure that can lead to a disruption at any point along the optic stalk, the extension from the brain that leads to the formation of each eye. A coloboma can affect one eye or both and can be continuous or have skip lesions, depending on the areas that were left unclosed. Colobomas can impair the visual pathway and lead to inadequate visual experience. If the brain is unable to obtain a clear image, especially during the critical period of a child's life, the essential processing skills may be underdeveloped and amblyopia can occur. Amblyopia may be caused by strabismus, anisometropia, or a combination of both. We present a case of a 7-year-old female with bilateral iris and chorioretinal colobomas and strabismic amblyopia in the right eye.

CASE

- 7 year old African American female
- Ocular history: Iris and chorioretinal coloboma inferior OU
- Medical history: Normal birth (39 weeks; 7lbs 5oz) and development, no developmental delays, no IEP at school
- Medications/Allergies: none

FIGURE 1A & 1B

1A: Inferior coloboma OD; 1B: Inferior coloboma OS

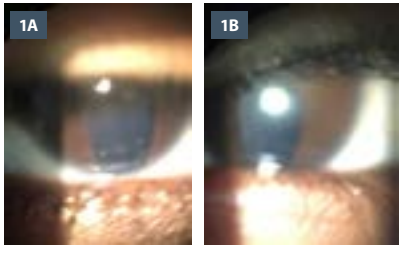
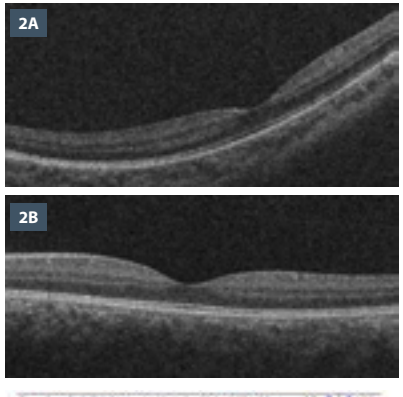


FIGURE 2A, 2B & 2C

2A: Macula OCT OD, tilted due to eccentric fixation;
2B: Macula OCT OS; 2C: Ganglion Cell Analysis OU



FINDINGS

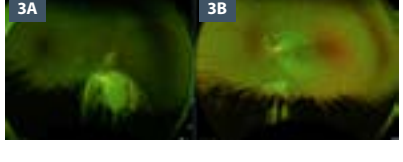
- Visual acuity: best corrected visual acuity (BCVA)
  - OD: 20/200+
  - OS: 20/25
  - OU: 20/30-
- Current spectacle RX:
  - OD: -1.00-2.00 x 180
  - OS: +1.00-3.00 x 180
- Binocularity:
  - Stereopsis: (-) fly, (-) forms, (-) Wirt circles
  - Cover test (cc): Ortho at distance, 4pd XP at near
- Slit lamp: bilateral keyhole irises were observed (see photos)
- Cycloplegic refraction:
  - OD: 3.00-2.00 x 005, VA 20/200+
  - OS: +3.50-3.00 x 175, VA 20/25
  - BCVA was not improved with additional minus lens OD or plus lens OD
- Fundus examination: bilateral inferior chorioretinal colobomas; not affecting macula (see photos)
- Additional testing:
- OCT macula: unremarkable (see photos)
- Visuoscopy: 5pd nasal EF OD, unsteady

DIAGNOSIS AND DISCUSSION

- Bilateral inferior iris and chorioretinal coloboma, non macula involving
- Strabismic amblyopia OD, due to microstrabismus

FIGURE 3A & 3B

Optos OD/OS of inferior chorioretinal coloboma, non macula involving



TREATMENT AND MANAGEMENT

- Updated optical correction and patching to attempt to improve vision OD (with guarded prognosis)
- Sunglasses or tinted contact lenses for photophobia
- Baseline imaging, like macula and optic nerve OCT and fundus photos
- Possible visual electrical potential in the future to determine the maximum visual potential in the right eye.
- Work with the patient's pediatrician to monitor for cardiovascular conditions that can affect the patient in the future.

CONCLUSION

Children can develop a variety of ocular disorders that correlate with colobomas, including amblyopia. Therefore, it is important to correctly evaluate for and diagnose amblyopia as soon as possible to maximize visual potential, especially when no physical cause of decreased vision has been established. We present an interesting case where a severe unilateral decrease in vision existed OD in the presence of equally large macula-sparing colobomas. Further testing revealed microstrabismus OD and strabismic amblyopia was diagnosed. Additionally, practitioners must be aware of increased risk of other ocular conditions, such as retinal detachment, patients with larger colobomas being at higher risk. Establishing relationships with the patient, parents or guardians, and pediatrician will help with the awareness and possible prevention of both ocular and systemic manifestations of this condition.

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Colorimetric Analysis of a Commonly Used Color Vision Vision Test in China

Xiaohua Zhuang, PhD; Qiong Li, MD; David Lee, OD, PhD

1. INTRODUCTION

HRR and Ishihara are the commonly used color vision test books for color vision screening in the western countries. These books have been validated by many research [1-3]. In contrast, a different color vision test book, "COLOR VISION EXAMINATION PLATES" is used in China. However, no known published validation data for this test book was found.

PURPOSE: The aim here is to evaluate the "COLOR VISION EXAMINATION PLATES" objectively using colorimetric analysis.

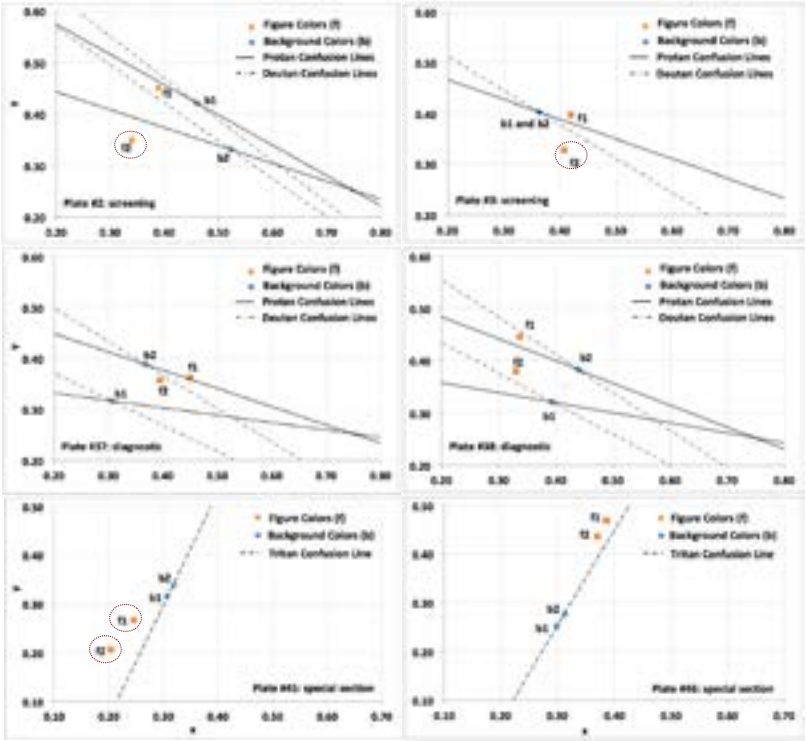
2. METHODS

Equipment: PR-670 SpectraScan Spectroradiometer.

Color vision test book:The latest edition (6th edition), produced in 2017, was evaluated.

- The book has 43 plates in three major sections: screening, diagnostic, and a special section for acquired color vision deficiency (CVD). Plate #2 is showed as an example here.
- Two plates from each section were evaluated.
- In each plate, the background and figure, each is made of two colors. Two representative dots from each color were selected for CIE chromaticity measurement.
- Averages across measurements for the same color were plotted in the CIE chromaticity diagrams for colorimetric analysis.

3. RESULTS



- In five out of the six plates (except for plate #3), the chromaticities of the two background colors (or the two figure colors) in the same plate are considerably different.
- In screening plate #2, the two background colors are on different protan or deutan confusion lines. Proximity of the background colors to the same confusion lines is critical for screening plates.
- Misalignments between some of the figure colors (e.g., the circled ones) and the confusion lines are large, which could reduce the effectiveness of the plates.
- Finally, the luminances of some figure colors are notably lower than the background colors. As a result, the figure could be seen by CVD subjects based on luminance.

4. CONCLUSIONS

Overall, the design of this color vision test book is different from other commonly used color vision tests, such as Ishihara or HRR. The present colorimetric data can be used to predict the effectiveness of this book and serve as a reference for improvement in future edition. However, study on human subjects is needed to eventually validate the efficacy of this test.

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Evaluation of Dynamic Amsler for Estimation of Visual Field in Low Vision

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INTRODUCTION

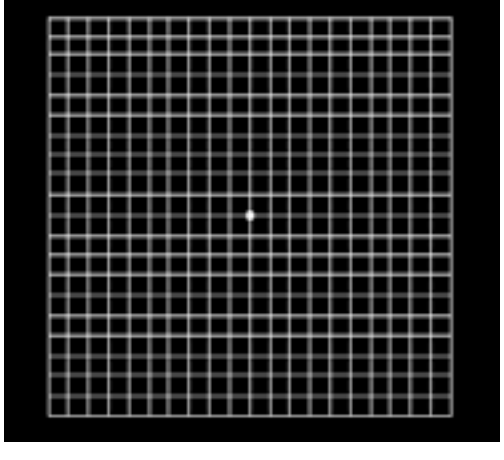
The Dynamic Amsler technique has been used by low vision optometrists in assessing constricted visual fields for decades without published comparison to other well-established field tests. We hypothesized that Dynamic Amsler is non-inferior to Tangent Screen, Octopus perimetry, and Humphrey visual analyzer in testing patients with a central visual field of 20 degrees or less. We conducted a prospective, randomized pilot study of nine patients to evaluate Dynamic Amsler in comparison with these well-known methods, with Octopus perimeter as our standard.

METHODS

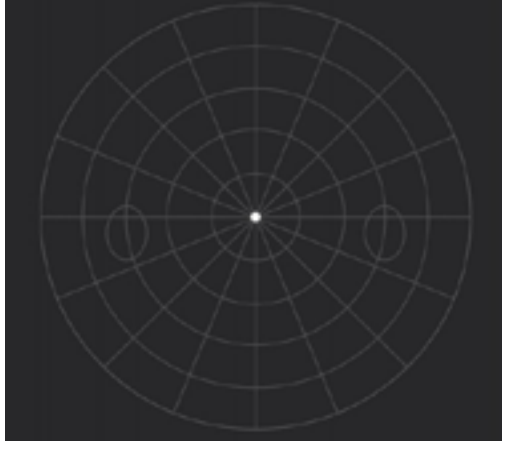
- **Inclusion Criteria:**
  - Patients with a comprehensive eye exam since November 2017
  - Visual acuity of 20/70 or better
  - Documented visual field of 20 degrees or less
- **Exclusion Criteria:**
  - Central scotoma
  - Visual acuity of 20/80 or worse
  - Visual field greater than 20 degrees in diameter
  - Inability to accurately perform visual field testing
  - No comprehensive eye exam since November 2017
- Verify eligibility with distance visual acuity through most recent prescription.
- Dynamic Amsler: 30 cm, 2mm^2 white target on black and white grid moving 4 deg/sec at 12 vectors
- Tangent Screen: 1m, 4mm^2 white target on black and white grid moving 4 deg/sec at 12 vectors
- Octopus perimeter 30cm, III4e target white target on white background moving 4 deg/sec at 28 vectors
- Humphrey Visual Field 30-2 Standard Full Threshold
- Total area of field for each test result was calculated in degrees squared. Results from tests were analyzed as a percentage of the area measured by the Octopus perimeter.

Octopus Perimetry

Dynamic Ansler 1



Dynamic Ansler 2



RESULTS

Octopus perimetry found an average area of field 88.6+/-28.5^{02}. Humphrey visual field 30-2 identified an average field of 26+/-23.8^{02} with an average percentage of 10.7+/-8.3%. Tangent screen testing had an average area of 15.9+/-6^{02} and average percentage of 31.7+/-19.6%. Dynamic Amsler testing showed an average 36.7+/-12.7^{02} with average percentage 58+/-25.5%.

CONCLUSION

Data from this pilot study indicates inferior ability of Dynamic Amsler, Humphrey visual analyzer 30-2, Tangent Screen to replicate field area identified by Octopus perimetry in this patient population. The Dynamic Amsler performed statistically higher than Tangent Screen in average area but not percentage, and higher than Humphrey in percentage but not average area. Further testing in a larger sample is desirable to confirm these results.

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Role of Natural Supplements in Exacerbation of Central Serous Chorioretinopathy

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INTRODUCTION

This case report will overview potential causes and management strategies to central serous chorioretinopathy. All the reviewed supplements are available over the counter which may have caused them to be overlooked when managing central serous retinopathy.

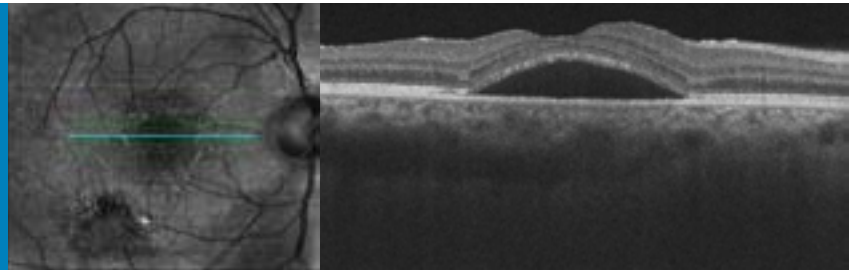
CASE HISTORY

A 44 year old, Asian man presents to retinal clinic with a complaint of metamorphopsia in the right eye for the past week. He has a history of "fluid" in the left eye from three years prior. He reports beginning Creatine and B12 supplements at an unknown dose before working out for the past month.

CLINICAL FINDINGS

	OD	OS
VA sc	20/25	20/20
Pupils	Equal and reactive	Equal and reactive
EOMs	Smooth and full	Smooth and full
CVF	FTFC	FTFC
SLE	Unremarkable	Unremarkable
DFE	Central serous chorioretinopathy, inferior temporal chorioretinal scar	Unremarkable

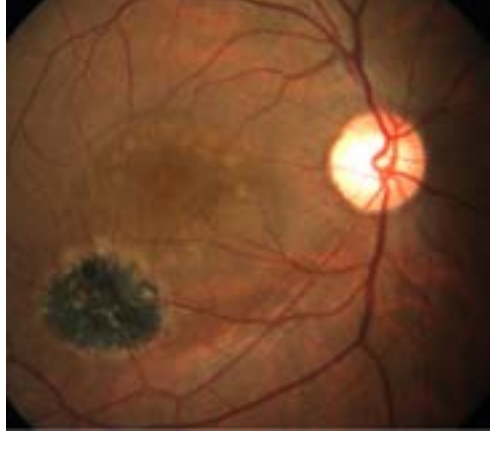
Figure A
OCT with
5 line rasta
showing central neurosensory retinal detachment



DISCUSSION

While central serous chorioretinopathy is a multifactorial condition there are known associations such as stress, type A personality, and depression. It is also linked to oral and topical corticosteroids use. A change in exogenous or endogenous hormones specifically testosterone has also been indicated. The most common demographic for the occurrence of CSCR are Type A men under stressful situations as well as pregnant women. In both of these cases an imbalance in hormones may be the driving factor. It is not unreasonable to believe that other causes of hormone imbalance can lead to CSCR. Current, literature reviews association with Deer Antler Spray and Ephedra, two work out supplements that increase testosterone and IGF-1. Creatine intake is also known to increase testosterone and IGF-1 (1). The increase in testosterone alone is enough to raise cortisol in the body which can inevitably lead to CSCR. Sudden changes in hormones may elicit central serous in individuals who are already susceptible to the condition. Ephedra has also been documented in the literature to cause mydriasis and blurry vison

Figure B
Fundus photo showing pigmentary changes around the macula and inferior temporal chorioretinal scar



CONCLUSIONS

The classic "type A male under stress" presentation of CSCR may actually be due to increase cortisol in the body which in turn leads to disruption of RPE. Many forms of edema within the retina are facilitated by inflammation. This is not the case with CSCR since steroids may cause or exacerbate CSCR. Creatine is a widely popular over the counter supplement for body builders to ingest after working out. More specific questioning can assist in pinpointing factors that can lead to development of CSCR in patients. Many clinicians pay attention to the known supplements that can cause retinal side effects while patients don't think to mention their current supplement regimen. Also, despite specific questioning the patient may never fully disclose all supplements they intake. There may be a future role in the implementation of melatonin in treatment of CSCR due to its retinal protective nature and safe profile. Over the counter supplements have played a large role in the treatment of AMD and dry eye disease. In the future, further studies are needed to determine the association between common over the counter supplements and the retina. Supplements should not be prescribed or taken without considering overall health

REFERENCES

Available upon request

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8 ICO PRESENTATIONS

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How do states compare on children's vision testing? Investigating data the in 2016–2017 National Survey of Children's Health (NSCH)

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PURPOSE

The purpose was to explore state-level data from the 2016-2017 NSCH (2-step cross-sectional survey) on visual acuity (VA) testing. The question asked if VA testing had been done and, if yes, site of test. This analysis looked at the relationship of VA testing to access to vision care, and interaction with SES status (income, insurance and adequacy of health care access). Understanding that data and related disparities provides opportunities to implement public health interventions to increase detection of vision problems known to impair development and learning readiness in young children if left untreated.

METHODS

The NSCH is administered by the US Census Bureau to US families focusing on children birth-17 yrs of age. Demographics for the 2016 and 2017 administration were reviewed and found to have no significant difference between the 2016 and the 2017 administration, therefore the data was combined to increase the number of responses on the state level. The NSCH is publicly available data and Institutional Review Board approval was not required for this study.

This analysis looked at the association of VA testing with age, SES, and child health status by state-level breakdown. The analysis reviewed the results from the following question administered within the survey:

DURING THE PAST 12 MONTHS, has this child had his or her vision tested, such as with pictures, shapes, or letters?

If yes, where was this child's vision tested?
(Mark (X) ALL that apply.)
Eye doctor or eye specialist (ophthalmologist, optometrist) office
Pediatrician or other general doctor's office
Clinic or health center
School
Other, specify:

RESULTS

Surveys Completed: 2016 50,212 (69.9%) *
2017 21,599 (30.1%) *
(* represented all states and DC.)
One child/household was randomly chosen as the focus for the survey questions.

Subjects of the survey: 51.1% male, mean age 9.4 years ± 5.27 years

Number of respondents reporting positively that the child's vision was tested in the past 2 years (population estimate of 73.1 million) was 51,929 (69.7%).

States with lowest likelihood of VA tests by age group were:
- 0-5yrs – ID, NV, FL;
- 6-11yrs- NV, KY, ID,
- 12-17yrs- ID, HI, LA.

VA testing outcomes based on questions related to socioeconomic status of the family:

States with lowest rates of VA testing based on federal poverty level:
- <100%-ID, OK, NM,
- <200%-NE, NV, IA,
- <400%-AR, NV, ID.

States with the lowest rates of VA testing when assessing adequacy of health care-KY, NV, HI.

States with lowest rates of VA testing based on public insurance-ID, OK, MO.

Question from NSCH:

Is this child currently covered by health insurance or health coverage plan?

		Vision Tested		
		Yes	No	Total
Currently insured (does not include Indian Health Service or religious health share)	Count	50175	18576	68751
	% within Health Insurance Coverage - Currently Covered	**73.0%**	**27.0%**	100.0%
	% within Vision Tested	96.9%	94.9%	96.3%
Currently uninsured or only insured through Indian Health Service or religious health share	Count	1611	995	2606
	% within Health Insurance Coverage - Currently Covered	**61.8%**	**38.2%**	100.0%
	% within Vision Tested	3.1%	5.1%	3.7%
Total	Count	51786	19571	71357
	% within Health Insurance Coverage - Currently Covered	72.6%	27.4%	100.0%
	% within Vision Tested	100.0%	100.0%	100.0%

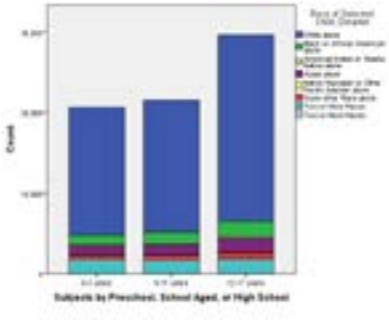
At any time during the past 12 months, even for one month, did anyone in your family receive Food Stamps or Supplemental Nutrition Assistance Program benefits (SNAP)?

		Yes	No	
Food stamps within past 12 months	Count	4953	2165	7118
	% within Food Stamps - Past 12 Months	**69.6%**	**30.4%**	100.0%
	% within Vision Tested	9.8%	11.3%	10.2%
No food stamps within past 12 months	Count	45806	17003	62809
	% within Food Stamps - Past 12 Months	**72.9%**	**27.1%**	100.0%
	% within Vision Tested	90.2%	88.7%	89.8%
Total	Count	50759	19168	69927
	% within Food Stamps - Past 12 Months	72.6%	27.4%	100.0%
	% within Vision Tested	100.0%	100.0%	100.0%

At any time during the past 12 months, even for one month, did anyone in your family receive benefits from the Woman, Infants, and Children (WIC) Program?

		Vision Tested		
		Yes	No	Total
WIC benefits within past 12 months	Count	2105	2186	4291
	% within WIC Benefits - Past 12 Months	**49.1%**	**50.9%**	100.0%
	% within Vision Tested	4.1%	11.4%	6.1%
No WIC benefits within past 12 months	Count	48708	17012	65720
	% within WIC Benefits - Past 12 Months	**74.1%**	**25.9%**	100.0%
	% within Vision Tested	95.9%	88.6%	93.9%
Total	Count	50813	19198	70011
	% within WIC Benefits - Past 12 Months	72.6%	27.4%	100.0%
	% within Vision Tested	100.0%	100.0%	100.0%

What is this child's race/ethnicity?



CONCLUSIONS

Analysis of 2016-2017 NSCH data showed several factor with poor access to VA testing. Reduced likelihood of VA testing and early identification of vision problems may be due to lower SES status, but also related to insurance access, dependency on food stamps or WIC. We do expect that there are other factors that impact access to services including provider availability and transportation to name a couple but further research is needed to investigate these in more depth. The survey is not able to answer these questions. As the epidemic of myopia approaches, we need to consider how states can improve vision screenings and access to eye care services knowing that poor vision can impact child health and academic success. On-going data collection will be critical to provide surveillance that will guide programmatic interventions, revisions to health policy and coverage, and improved access to clinical services to promote uniformly improved vision health for children in the U.S.

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Presentation # 2340

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Effects of Lumega–Z and PreserVision on Visual Function in a Young Population

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BACKGROUND

Studies suggest that macular pigment (MP) may play a protective role against the damaging effects of blue light while reduced levels may increase risk for developing age-related macular degeneration (AMD), open angle glaucoma and other conditions. Further, the development of AMD may be associated with having reduced macular pigment (1-3) while increasing the macular pigment density could be important as a means of providing protection of the retina against vision loss associated with AMD (4-9). The purpose of this study is to determine the efficacy of a medical food provided in a micronized liquid formulation, Lumega-Z, relative to dietary supplement, PreserVision. Both products contain macular carotenoids and are formulated to improve the health of the human eye. Based on previous studies, we expect that 24 weeks of supplementation with the products should be sufficient to produce changes in most subjects. Their efficacy was determined by measuring retinal levels of macular pigment, visual acuity, and contrast sensitivity. These measurements could be integral in determining if increasing the macular pigment density is important as a means of providing protection of the retina against the damaging effects of blue light.

METHODS

Fifteen healthy optometry students (11 female, 4 male) aged 21-31 years were recruited from the Illinois College of Optometry. Subjects took PreserVision (soft gel capsule) or Lumega-Z (liquid) for 6 months as recommended by the manufacturer. The subjects had the following measurements taken from the right eye at baseline, 3 months, and 6 months: Macular pigment optical density (MPOD) using the MapcatSF, visual acuity (VA), and contrast sensitivity (CS) (photopic, mesopic, mesopic/glare) using the CSV-1000HGT. Data were collected from each subject over these 3 visits spanning 6 months. A single operator collected the data. Subjects recorded their compliance on a calendar that was returned to the investigator along with unused formulation at the end of the study. Repeated measures ANOVA was used to evaluate and identify any statistically significant changes over the course of the study.

TABLE 1
PreserVision Treatment Results

A One-Way ANOVA analysis was performed and included all of the study measurements (MPOD, VA, CS). This table emphasizes the mesopic and mesopic with glare conditions for the contrast sensitivity measurements. *Mean VA and CS are from logMAR scale.

Treatment	Visit	Lighting	Sp Freq	Subjects	Mean_CS*	Mean_MPOD	Mean_VA*	pValue_CS	pValue_MPOD	pValue_VA
P	Baseline	Meso Glr	3	7	1.49	0.41	-0.071	0.22	0.94	1.00
P	3 month	Meso Glr	3	7	1.61	0.42	-0.071			
P	6 month	Meso Glr	3	7	1.57	0.41	-0.071			
P	Baseline	Meso Glr	6	7	1.54	0.41	-0.071	0.78	0.94	1.00
P	3 month	Meso Glr	6	7	1.59	0.42	-0.071			
P	6 month	Meso Glr	6	7	1.60	0.41	-0.071			
P	Baseline	Meso Glr	12	7	1.02	0.41	-0.071	0.09	0.94	1.00
P	3 month	Meso Glr	12	7	1.11	0.42	-0.071			
P	6 month	Meso Glr	12	7	0.95	0.41	-0.071			
P	Baseline	Meso Glr	18	7	0.64	0.41	-0.071	0.68	0.94	1.00
P	3 month	Meso Glr	18	7	0.71	0.42	-0.071			
P	6 month	Meso Glr	18	7	0.66	0.41	-0.071			
P	Baseline	Meso	3	7	1.67	0.41	-0.071	0.88	0.94	1.00
P	3 month	Meso	3	7	1.63	0.42	-0.071			
P	6 month	Meso	3	7	1.63	0.41	-0.071			
P	Baseline	Meso	6	7	1.50	0.41	-0.071	0.97	0.94	1.00
P	3 month	Meso	6	7	1.49	0.42	-0.071			
P	6 month	Meso	6	7	1.52	0.41	-0.071			
P	Baseline	Meso	12	7	0.97	0.41	-0.071	0.09	0.94	1.00
P	3 month	Meso	12	7	0.88	0.42	-0.071			
P	6 month	Meso	12	7	1.11	0.41	-0.071			
P	Baseline	Meso	18	7	0.60	0.41	-0.071	0.89	0.94	1.00
P	3 month	Meso	18	7	0.55	0.42	-0.071			
P	6 month	Meso	18	7	0.59	0.41	-0.071			

TABLE 2
Lumega-Z Treatment Results

A One-Way ANOVA analysis was performed and included all of the study measurements (MPOD, VA, CS). This table emphasizes the mesopic and mesopic with glare conditions for the contrast sensitivity measurements. *Mean VA and CS are from logMAR scale. A One-Way ANOVA analysis was performed and included all of the study measurements (MPOD, VA, CS). This table emphasizes the mesopic and mesopic with glare conditions for the contrast sensitivity measurements. *Mean VA and CS are from logMAR scale.

Treatment	Visit	Lighting	Sp Freq	Subjects	Mean_CS	Mean_MPOD	Mean_VA*	pValue_CS	pValue_MPOD	pValue_VA
L	Baseline	Meso Glr	3	8	1.58	0.48	-0.038	0.65	0.78	0.09
L	3 month	Meso Glr	3	8	1.66	0.47	-0.050			
L	6 month	Meso Glr	3	8	1.57	0.47	-0.100			
L	Baseline	Meso Glr	6	8	0.79	0.48	-0.038	0.65	0.78	0.09
L	3 month	Meso Glr	6	8	1.02	0.47	-0.050			
L	6 month	Meso Glr	6	8	0.83	0.47	-0.100			
L	Baseline	Meso Glr	12	8	0.48	0.48	-0.038	0.08	0.78	0.09
L	3 month	Meso Glr	12	8	0.58	0.47	-0.050			
L	6 month	Meso Glr	12	8	0.50	0.47	-0.100			
L	Baseline	Meso Glr	18	8	1.50	0.48	-0.038	0.69	0.78	0.09
L	3 month	Meso Glr	18	8	1.50	0.47	-0.050			
L	6 month	Meso Glr	18	8	1.52	0.47	-0.100			
L	Baseline	Meso	3	8	1.60	0.48	-0.038	0.89	0.78	0.09
L	3 month	Meso	3	8	1.44	0.47	-0.050			
L	6 month	Meso	3	8	1.56	0.47	-0.100			
L	Baseline	Meso	6	8	0.91	0.48	-0.038	0.46	0.78	0.09
L	3 month	Meso	6	8	0.88	0.47	-0.050			
L	6 month	Meso	6	8	0.88	0.47	-0.100			
L	Baseline	Meso	12	8	0.50	0.48	-0.038	0.96	0.78	0.09
L	3 month	Meso	12	8	0.46	0.47	-0.050			
L	6 month	Meso	12	8	0.29	0.47	-0.100			
L	Baseline	Meso	18	8	1.58	0.48	-0.038	0.23	0.78	0.09
L	3 month	Meso	18	8	1.66	0.47	-0.050			
L	6 month	Meso	18	8	1.57	0.47	-0.100			

TABLE 3
Reported Side Effects

Formulation	Side Effect/s Reported
PreserVision	3 subjects reported Gastrointestinal Distress, reduced with food consumption
PreserVision	2 subjects reported Gastrointestinal Distress
Lumega-Z	1 subject reported Gastrointestinal Distress, reduced with food consumption

Listing of side effects reported by all study subjects over the 6 month treatment time frame.

TABLE 4
Subject Compliance

Formulation	Reported days when formulation was not taken
PreserVision	26.3 +/- 21
Lumega-Z	12.3 +/- 6.3

Number of days of treatment missed as reported by subjects. Each subject was given a calendar at the start of the treatment with instructions to mark the days when they took or forgot to take the formulation over the duration of the study. Calendar and unused formulation were returned to the investigator at the close of the study.

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RESULTS

- CS at 12 cycles per degree (cpd) demonstrated a marginally significant improvement with both PreserVision and Lumega-Z ($p<0.09$). Although marginally significant, the changes trend in the right direction and agree with previous CS studies with glaucoma and diabetic patients showing the sensitivity of 12 cpd to changes in disease state or treatment (**Tables 1 & 2**).
- The mesopic and mesopic/glare measures appear to be more sensitive than measures taken under the photopic condition, which is used in most studies (**Tables 1 & 2**).
- There appears to be a mildly significant effect of Lumega-Z on VA over the 6 months ($p<0.09$) (**Table 2**).
- The vision testing results of this study in young, healthy adults is congruent with the results of Lem et al (ARVO Poster #A0110, Session 104) that was conducted in older adults with drusen.
- There were fewer side effects reported with Lumega-Z compared to PreserVision (**Table 3**).
- Subjects reported periodically missing daily intake of both compounds, but compliance with Lumega-Z was better than compliance with PreserVision (**Table 4**).

CONCLUSIONS

- This is one of the first carotenoid studies to utilize mesopic and mesopic/glare CS testing conditions as previous studies have all used photopic testing levels.
- The overall effect of carotenoid treatment on CS and VA, though not statistically significant in this small sample size of healthy normal subjects, is encouraging. These results may be important as carotenoid formulas have been suggested as a potential tool to help adults with vision-intensive occupations, such as athletes, see more clearly under low contrast or glare conditions. This first study in young adults, showing high levels of safety with no side effects, along with the data showing a trend toward improvement in visual performance, suggests this liquid-based carotenoid formula can potentially provide vision performance benefits in adults who participate in vision-intensive activities. Further testing is needed in larger sample sizes to confirm the vision performance benefits.

CONTACT AND DISCLOSURE INFORMATION

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Robert Donati is a member of the Guardion Health Sciences Scientific Advisory Board: Commercial Relationship(s);Guardion Health Sciences:Code I (Personal Financial Interest);Guardion Health Sciences:Code F (Financial Support)

David Evans is Chief Science Officer at Guardion Health Sciences: Commercial Relationship(s);Guardion Health Sciences: Code F (Financial Support);Guardion Health Sciences:Code P (Patent);Guardion Health Sciences:Code R (Recipient);Guardion Health Sciences:Code I (Personal Financial Interest);Guardion Health Sciences:Code E (Employment);Guardion Health Sciences:Code S (Non-remunerative)

MapcatSF and formulations were generously donated by Guardion Health Sciences.
CSV-1000HGT was generously donated by VectorVision.

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A Retrospective Longitudinal Study of Refractive Error Change over time in Children Aged 3 to 17 Years

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PURPOSE

To assess changes in refractive error over a 3-year period in children aged 3 to 17 years old. In addition, the associations of refractive error change with age, gender, and race were studied.

METHODS

A total of 5,570 medical records of children seen in a school-based eye clinic in Chicago were reviewed. Children who had a comprehensive eye exam in 4 consecutive years and had autho-cyclorefraction in yearly exam were qualified for the study, resulting in 267 subjects. Cycloplegia was induced with one drop of 1% tropicamide and 2.5% phenylephrine hydrochloride and two drops of 1% cyclopentolate (5 minutes apart). After 30 minutes of cycloplegia, auto-refraction was measured using either Canon R-F10 or Topkon KR-800. Myopia was defined as the spherical equivalent (SE) ≤ -0.75 D in the right eye, emmetropia as between +0.75 D and -0.75 D and hyperopia as ≥+0.75 D. The annual change in refractive error was calculated based on SE of cyclorefraction.

Table 1
Demographic Characteristics of the Subjects (n = 267)

Gender	Number of Subjects (%)
Female	151 (56.6)
Male	116 (43.4)
Race	Number of Subjects (%)
Non-Hispanic Black	166 (62.2%)
Hispanic/Latino	95 (35.6%)
Non-Hispanic White	6 (2.2%)
Age (years)	
Range	3.0 – 17.9
Mean (SD)	9.3 (3.4)
Baseline Refractive Error (SE)	Number of Subjects (%)
Myopia (≤ -0.75 D)	71 (26.6%)
Emmotropia (-0.75 to +0.75 D)	141 (52.8%)
Myopia (≥ 0.75 D)	55 (20.6%)

Table 2
Yearly Change in Refractive Error in Children Aged 3 to 17 years (n = 267)

Age	Refractive Error	n	Mean Yearly Change	SD
< 7 Years Old	myopia	11	-0.49	0.49
	emmetropia	26	-0.13	0.29
	hyperopia	34	-0.11	0.28
	Total	71	-0.18	0.35
7 – 12 Years Old	myopia	54	-0.46	0.43
	emmetropia	45	-0.20	0.30
	hyperopia	42	-0.16	0.20
	Total	141	-0.29	0.36
12 -17 Years Old	myopia	36	-0.22	0.29
	emmetropia	13	-0.19	0.32
	hyperopia	6	-0.13	0.29
	Total	55	-0.20	0.29
All Children	myopia	101	-0.38	0.41
	emmetropia	84	-0.18	0.30
	hyperopia	82	-0.14	0.24
	Total	267	-0.24	0.35

Figure 1
Distribution of Refractive Error in Year 1 and Year 4 of the study (n=276)

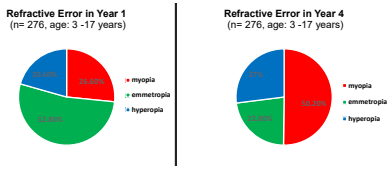


Figure 2
Each Colored Trace is a Child Refractive Error Change Over 3 Years Period (aged < 7 years, n = 71)

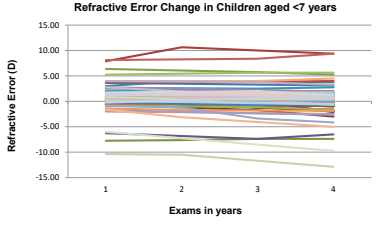


Figure 3
Each Colored Trace is a Child Refractive Error Change Over 3 Years Period (aged from 7 – 12 years, n = 141)

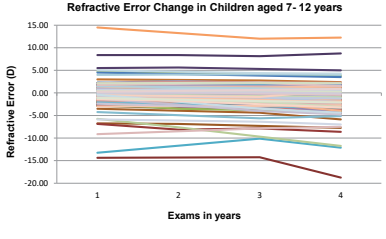
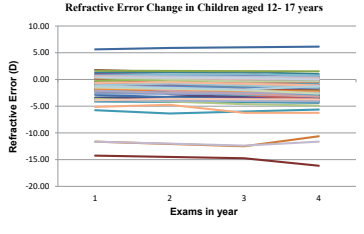


Figure 4
Each Colored Trace is a Child Refractive Error Change Over 3 Years Period (aged from 12 - 17 years, n = 55)



RESULTS

The prevalence of myopia, emmetropia, and hyperopia was 37.8% (n=101), 31.5% (n=84), and 30.7% (n=82) respectively in the 1st-year eye exam, which changed to 50.2% (n=134), 22.8% (n=61), and 27% (n=72) in 4th-year eye exam. The average yearly change in refractive error among all subjects was -0.24 D, with statistically significant difference (P<0.0001) among myopia (-0.38 D), emmetropia (-0.18 D), and hyperopia (-0.14 D). Post hoc tests show statistical significant difference in refractive error change between myopia and emmetropia groups (P<0.0001) as well as between myopia and hyperopia groups (P<0.0001), with no difference between emmetropia and hyperopia groups (P = 0.80). Multiple regressions showed that both children age (B= 0.14, P = 0.025) and SE of the 1st exam (B= 0.2, P = 0.01) were statistically significant predictors of annual change in refractive error with more change seen in myopes and younger children.

CONCLUSION

Our study found that

- Myopic children (yearly rate: -0.38 D) had more robust change in refractive error than hyperopes (-0.14 D) and emmetropes (-0.18 D).
- Change in refractive error can be predicted by children age and baseline refractive error.

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Prevalence of Diabetic Retinopathy in Diabetes: the Result of a Large Urban Eye clinic

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PURPOSE

Diabetic retinopathy (DR) is the leading cause of vision loss in adults. The prevalence of diagnosed diabetes mellitus (DM) in the United States has increased sharply since 1990. The purpose of this study was to investigate the prevalence of DR in an urban Chicago eye clinic. The race/ethnicity characteristics of DR were also studied.

Table 1
Race/Ethnicity Characteristics of Patients with DM (n = 16,671)

Race	Patients with DM (n/%)	All Patients
Black	10,083 (20.8%)	48,390
Non-Hispanic white	534 (13.6%)	3,915
Hispanic white	1,397 (22.5%)	6,208
Other	4,657 (18.9%)	24,596
total	16,671 (20.1)	83,109

Table 2
Race/Ethnicity Characteristics of Patients with DR (n = 4,090)

Race	Patients with DR (n)	% in DM	% in All Patients
Black	2,492	25%	5.1%
Non-Hispanic white	125	23%	3.2%
Hispanic white	381	27%	6.1%
Other	1092	23%	4.4%
total	4090	25%	4.9%

METHODS

Data of a cross-sectional sample of 83,109 adult subjects (≥18 years old) who had comprehensive eye exams at an urban multidisciplinary eye clinic, the Illinois Eye Institute (Nov 1, 2011 to Oct 31, 2016) were analyzed by a retrospective review of their electronic health records (EHR). Vision-threatening DR (VTDR) was defined as presence of severe non-proliferative DR, proliferative DR, or clinically significant macular edema. Non-VTDR was defined as mild and moderate non-proliferative DR.

Table 3
Race/Ethnicity Characteristics of Patients with VTDR (n = 1,887) and non-VTDR (n = 2,203)

DM Category	Race	n	% in DR	% in DM	% in All Patients
VTDR	Black	1,126	45.2%	11.2%	2.3%
	Non-Hispanic white	49	39.2%	9.2%	1.3%
	Hispanic white	195	51.2%	14.0%	3.1%
	Other	517	47.3%	11.1%	2.1%
	Total	1,887	46.1%	11.3%	2.3%
Non-VTDR	Black	1,366	54.8%	13.5%	2.8%
	Non-Hispanic white	76	60.8%	14.2%	1.9%
	Hispanic white	186	48.8%	13.3%	3.0%
	Other	575	52.7%	12.3%	2.3%
	Total	2,203	53.9%	13.2%	2.3%

RESULTS

A total of 16,671 subjects (20.1%) self-reported that they had DM. Through comprehensive eye exam, DR was diagnosed in 4,090 (25.0%) of DM subjects, including 1,887 subjects with VTDR (46.1% of DR subjects and 11.3% of DM subjects) and 2,203 subjects with non-VTDR. The prevalence of VTDR among subjects with DR was higher in non-Hispanic Blacks (45.2%) and Hispanic/Latinos (51.2%) compared to non-Hispanic Whites (39.2%).

CONCLUSION

- Prevalence of DR (25.0% of DM) in this population is comparable to other studies in the United States, 28.5% in Zhang et al study[1].
- However, the prevalence of VTDR (11.3% of DR) is significantly higher in this population compared to other published studies as 4.4% of DR[1].
- In addition, we found that the prevalence of VTDR is higher in non-Hispanic Blacks (45.2% of DR) and Hispanic/Latinos (51.2% of DR) than in non-Hispanic Whites (39.2%of DR).
- Our findings further indicate the need for comprehensive eye exam among diabetic populations of urban areas.

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Cross-Sectional Analysis to Determine if There is Any Evidence of Retinal Degeneration Among People with the Idiopathic Long Anterior Zonule Trait

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BACKGROUND / PURPOSE

The long anterior zonule (LAZ) trait is characterized by aberrant zonular fibers central to the usual anterior capsular insertion zone[1-5] (Figure 1). Pigment dispersion occurs with LAZ (Figure 2), which may be confused with primary, or classic, pigment dispersion syndrome.[2,4,6-10] Evidence suggests that eyes with LAZ have higher intraocular pressure on average than eyes without LAZ, and there is suggestion of association with glaucoma.[11,12] Rarely, LAZ may be caused by an S163R mutation in the C1q tumor necrosis factor-related protein 5 gene (C1QTNF5/CTRP5) in association with late-onset retinal degeneration (L-ORD),[13-15] but usually it is idiopathic, with suggested prevalence near 2%.[9] Although retinal/macular degeneration is prominent with the S163R C1QTNF5 mutation-related LAZ, there are no reports on retinal status among people with idiopathic LAZ.[12]

METHODS

Consecutive patients of eight practitioners in an urban, primary eye care teaching setting in Chicago, IL, USA were checked for LAZ during 2011-2018, and detailed data were collected on ocular/systemic health, lifestyle, and demographic variables (Figure 3, Table 1).[11] All patients had comprehensive eye examination, including dilated retinal evaluation. We collected data on retinal status on all subjects, which included the presence/absence of macular degeneration, diabetic retinopathy, or other significant retinal disease. In addition to descriptive statistics on subjects, we explored the data using multiple logistic regression to assess the relationship of LAZ to retinal status in order to provide control for potential confounding variables.

FIGURE 1
Retroillumination images with focus at the anterior capsule. Control eye, illustrating normal zonules and typical zonule insertion zone (top). Long anterior zonule phenotype with aberrant zonules extending beyond the normal insertion zone along the anterior capsule (bottom).

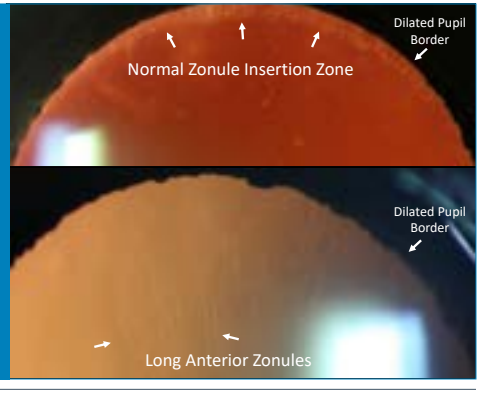


FIGURE 2
Direct illumination of pigmented long anterior zonules along the anterior capsule.

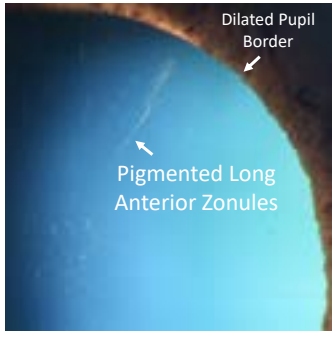
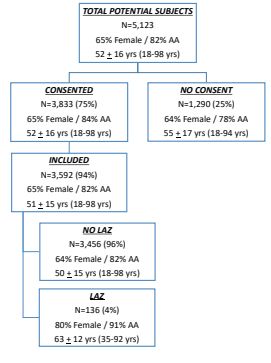


FIGURE 3
Flow diagram illustrating selection of subjects.



RESULTS

Among 3,592 tested, 136 (3.8%) had LAZ. Subject distributions relative to LAZ and other variables of interest are shown in Table 1. LAZ was bilateral in 78% of subjects (12%/10% right/left eye only). Macular degeneration of any degree was reported in only 0.3% of control subject right/left eyes, but no LAZ eyes had evidence of macular or generalized retinal degeneration (P>0.5). However, while controlling for numerous factors, including age, sex, and others (Table 2), there was a tendency for people who had type 2 diabetes and LAZ in either eye to also have diabetic retinopathy in either eye (OR=2.0, 95% CI=0.96 to 4.22, P=0.06) (Table 2).

TABLE 1
UNADJUSTED RELATIONSHIPS TO LAZ

Variable	Controls (N=3,456)	LAZ (N=136, either eye)	P-value[a]
Age, mean years ± SD[1] (range)	50 ± 15 (18-98)	63 ± 12 (35-92)	**<0.0001**
Race (African-American / Other)	(82% / 18%)	(91% / 9%)	**(0.006)**
African-American	82%	91%	
Asian	2%	0%	
Hispanic	8%	5%	
White	6%	1%	
Other	2%	1%	
Gender, female	64%	80%	**0.001**
Education, >High School	61%	60%	0.81
Refractive error, D (sphere-equivalent)			
Right eye	-0.96 ± 2.92	+0.50 ± 2.24	**<0.0001**
Left eye	-0.92 ± 2.82	+0.55 ± 2.58	**<0.0001**
Macular degeneration	<1%	0%	0.49
Diabetic retinopathy (among all subjects)	4%	8%	**0.04**
BMI, kg/m² (>overweight / <normal weight)	(73% / 27%)	(82% / 18%)	**(0.03)**
Obese, >30	45%	51%	
Overweight, 25.0 - 29.9	29%	31%	0.06
Normal weight, 18.5 - 24.9	23%	15%	
Underweight, <18.5	4%	4%	
BMI, mean ± SD	30.5 ± 7.8	32.0 ± 8.9	0.07
Smoking (ever / never)	(47% / 53%)	(53% / 47%)	(0.20)
Current	30%	27%	
Past	18%	26%	0.64
Never	53%	47%	
Alcohol (ever / never)	(60% / 40%)	(63% /37%)	(0.57)
Current	48%	44%	
Past	11%	16%	0.70
Never	41%	40%	
Smoking exposure in home as child			
Moderate or heavy / minimal or none	44% / 56%	47% / 53%	0.49
Diabetes, on medication	22%	33%	**0.002**
Hypertension, on medication	47%	75%	**<0.0001**
Blood pressure, mm Hg (clinic measure)			
Systolic, mean ± SD	129 ± 18	135 ± 20	**0.004**
Diastolic, mean ± SD	79 ± 11	79 ± 11	0.81
Cholesterol, on medication - per record	16%	26%	**0.003**
Cholesterol, on medication ever - per survey	29%	44%	**0.0002**
Cancer history, any site	4%	7%	0.20

[1]Abbreviations: BMI, body mass index; D, diopters; kg/m2, kilogram per meter squared; LAZ, long anterior zonule trait; mm Hg, millimeters of mercury; SD, standard deviation;
[a]Bolded p-values significant at p<0.05 level; Chi-square test statistics used for categorical variable comparisons; Student's *t* test and Wilcoxon rank-sum test used for continuous variables; Mantel-Haenszel chi-square test for trend used to assess dose-response with ordinal variables
[**]Note: Some categorical data in table may not sum perfectly due to rounding

DISCUSSION

Although people who have LAZ that is due to C1QTNF5/CTRP5 mutation exhibit severe retinal degeneration, there was no evidence of macular/retinal degeneration among the idiopathic LAZ variety prevalent in our subject population. This is important to the evolving characterization of this idiopathic phenotype, which may have association with glaucoma.[11]

Although macular degeneration was not present among our LAZ subjects, analyses did however suggest that people with LAZ and diabetes might be more likely to exhibit diabetic retinopathy (Table 2). This new preliminary finding is interesting and deserves further study because this could suggest that unknown gene mutation(s) responsible for idiopathic LAZ might influence some aspects of retinal function that increase likelihood of retinopathy among subjects with type 2 diabetes. There are limitations with this current data however. Although we assessed numerous important factors in this analysis relative to diabetic retinopathy, we did not have information on other variables that will be important to include in future investigation, such as duration of disease, blood sugar control, severity of retinopathy, and others.[16-22]

TABLE 2
MULTIVARIATE ANALYSIS EVALUATING THE RELATIONSHIP OF LAZ TO PRESENCE OF DIABETIC RETINOPATHY[a]

Variable	Estimate	Standard Error	P-value	Odds Ratio	95% CI
Intercept	-1.84	0.93	--	--	
†LAZ trait present (either eye)	0.70	0.38	0.06	2.02	0.97 to 4.22
Age (per decade)	-0.29	0.08	0.001	0.75	0.63 to 0.89
Gender (male)	0.42	0.20	0.04	1.53	1.03 to 2.27
Hypertension (diagnosed, treated)	0.53	0.29	0.07	1.70	0.96 to 3.02
Systolic BP (per 10 mm Hg)	0.12	0.05	0.01	1.14	1.03 to 1.25
Cholesterol med (reported history)	0.51	0.23	0.02	1.68	1.08 to 2.62
BMI (per 10 units) (kg/m²)	-0.35	0.13	0.008	0.70	0.54 to 0.91

[1]Abbreviations: BMI, body mass index; BP, blood pressure; CI, confidence interval; D, diopter; LAZ, long anterior zonule trait; kg/m², kilograms per meter-squared; mm Hg, millimeters of mercury
[a]Subanalysis includes 742 subjects with type 2 diabetes, 135 of which have diabetic retinopathy

CONCLUSIONS

In this relatively large sample of predominantly African-American LAZ subjects, there was no evidence for retinal or macular degeneration resembling that reported in families with LAZ, L-ORD, and C1QTNF5 mutation. More study should be done to assess potential relation between LAZ and diabetic retinopathy.

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Barriers to Referral for Low Vision Services (LVR) by Eye Care Professionals

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Purpose: Low Vision Rehabilitation (LVR) is a specialty within eye care that aims to improve the quality of life for patients with visual impairment or blindness. It is currently estimated that by the year 2050 the population of Americans that will be considered low vision and the need for referral will more than double. It is widely accepted that Low Vision Rehabilitation (LVR) is underutilized but impactful service. Eye care professionals are often the 'gate keepers' for LVR services and their knowledge of what occurs during LVR is critical so they can educate about the potential benefits of LVR and refer. This study investigated how often eye care professionals refer patients to LVR and what are barriers that may cause a lack of referral.

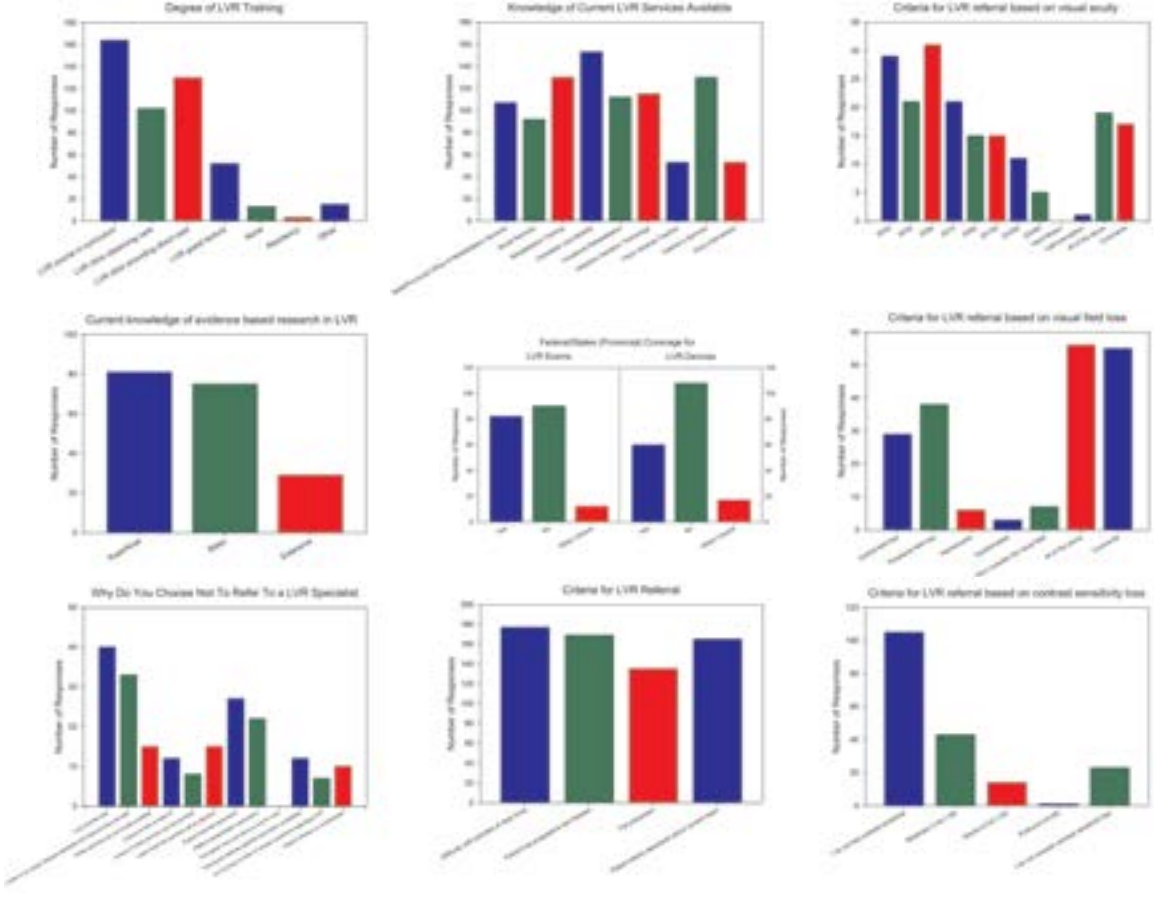
Methods: A 21-item survey was distributed electronically via professional channels to eye care physicians. Data was collected regarding information about doctor demographics, practice modality, and knowledge of low vision rehabilitation. This survey was designed to understand doctors' criteria for low vision rehabilitation referral and what they feel their degree of knowledge is on this subject. Data was analyzed using IBM SPSS v21 (Armonk, NY) with a $p<0.05$ as the significance level. Non-parametric tests with a significant p value set at 0.05. Data presented as number (or percentage) of respondents or median values.

Results: 191 surveys were completed by professionals in 13 states and provinces, with optometrists accounting for 92% of those completing the survey, with 4% being completed by occupational therapists with training in LV. Of the optometrist completing the survey, 60% practice in a multimodal setting and 19% were LV specialists.

	Minimal Training	Basic Training	Advanced Training	p value
n responders (%)	47 (25%)	96 (50%)	46 (24%)	
Years in practice	16-20 years	11-15 years	11-15 years	0.46
Evidenced Based Research in LVR	Superficial	Basic	Extensive	<0.001*
Current Knowledge of Services	Basic	Basic	Extensive	<0.001*
# LVR Clinics Aware of in Area	3	3	4	0.04*
Criteria: Daily Living Problems	Yes	Yes	Yes	0.09
Criteria: Visual Acuity	20/60	20/60	20/40	0.04*
Criteria: Visual Field Loss	Central Field Loss	Central Field Loss	Central Field Loss	0.46
Criteria: Contrast Sensitivity Loss	Do Not Test	Do Not Test	Moderate (1.04-1.48)	0.004*
Criteria: Progressive Eye Disease	Yes	Yes	Yes	0.57
Criteria: Fall Prevention	Yes	Yes	Yes	0.15
Criteria: Depression	Yes	Yes	Yes	0.67
Aware of WHO Guidelines	No	No	Yes	<0.001*

Conclusion: While providers do consider clinical findings for referring for LVR, providers also are paying attention to functional concerns of patients to use as a basis for referral.

Increase in LVR education during professional training as well as during continuing education, would allow for a better understanding of LVR and likely better referral patterns.



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Disclosures: No financial relationships to disclose

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Combining Dilating Drops in Different Solutions Can Provide a Larger Dilation

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Purpose: The goal of this study is to determine whether a combination drop of 2.5% phenylephrine (P) , 0.5% tropicamide (T) and 0.5% ketorolac (K) will have the same effect on pupil dilation as compared to the standard of P & T drops. The benefit of using a combination drop will reduce the amount of drop administration during ophthalmic procedures such as cataract surgery. This ultimately will decrease procedure cost as well as produce a longer dilation that occurs quicker.

Methods: Healthy subjects between the age of 20 – 50 were recruited from students and staff at ICO. After verifying eligibility and documenting that blood and intraocular pressures were within range, we measured pupil size using a Neuroptics pupillometer prior to and every 30 minutes for two hours following dilation of one eye using one of three solutions: 1) P & T Drops administered as 2 separate drops, 15 seconds apart 2) PTK Drop, 1 drop of the drug combination in artificial tears and 3) PTK Gel, 1 drop of the drug combination in a more viscous tear solution.

Data was analyzed using IBM SPSS V21 (Armonk, NY) with a $p < 0.05$ as the significance level. ANOVA with repeated measures was used for the comparison of changes in dilation size across time, as well as interactions with age. Data are presented as mean ± SEM.

Results:

	P & T Drops	PTK Drop	PTK Gel	P value
N	55	24	26	
Age (years)	24 ± 0.5	40 ± 1*	37 ± 1	p<0.001
Largest pupil size (mm)	8.2 ± 0.1	7.7 ± 0.2	8.1 ± 0.2	p=0.170
Maximal dilation amount (mm)	1.9 ± 0.1	3.5 ± 0.2*	4.0 ± 0.2*	p<0.001
Time of maximal dilation (min)	74 ± 3	74 ± 5	72 ± 4	p=0.81

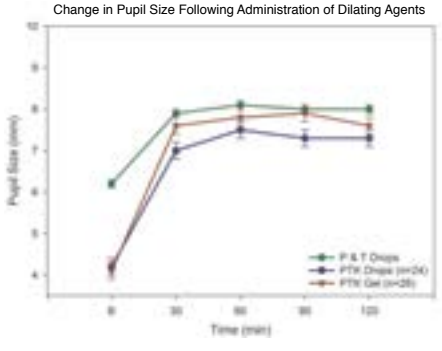
*= different as compared to P & T Drops

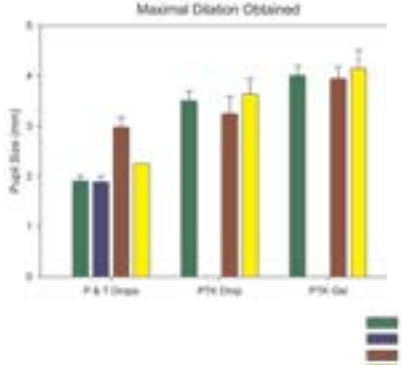
Conclusion: PTK drops and gel both provide the best increase in pupil size which is seen starting at 30 mins and is stable for at least two hours.

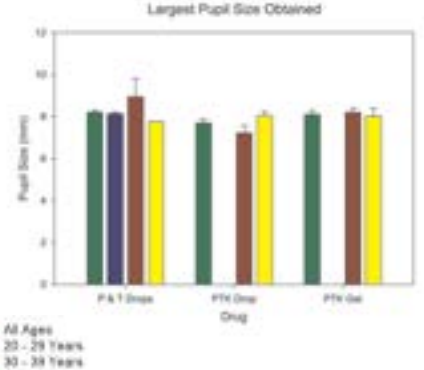
While age was a factor, it was significant only for the 2.5% PTK drop group.

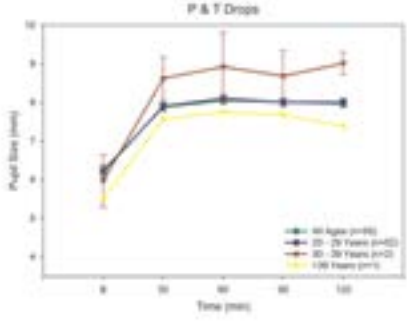
These solutions will be mostly used in the above 30 age group, in which the addition of the keterolac increased the size and stability of the dilation.

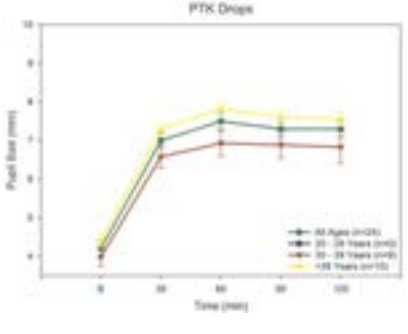
Future Direction: The phenylephrine, tropicamide, ketorolac drug combination in both drop and gel format can maximize dilation across the patients most likely to need a large, stable dilation.

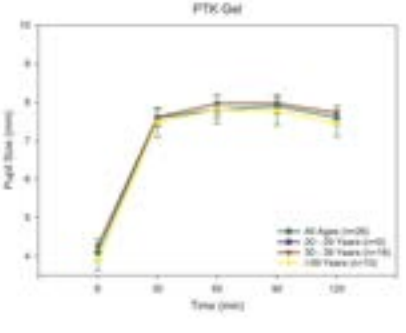












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Obtaining a Stable Large Pupil Using a Drug Combination in Patients Between the Ages of 30 – 50.

Zoltoski, Rebecca K.[1]; Ashtiani-Zarandi, Jaana[1]; Bannon, Michael[1]; Beachnau, Alexandra[1]; Lake, Russell[1]; Pourhosseini, Pedram[1]; Roa, Maria-Alessandra[1]; Ruiz, Thomas; Sammak, Nazli[1]; McArdle, George[2]; Roberts, Daniel[1];
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Purpose

Appropriate mydriasis is an integral part of a successful cataract extraction, contributing to procedural safety and clinical outcome. Methods to make mydriasis quicker and more long-lasting, but still safe were assessed. The current method is to use repeated separate drops of 2.5% phenylephrine (P) and 0.5% tropicamide (T). The addition of topical nonsteroidal anti-inflammatory drops, as a new therapy method, such as 0.5% ketorolac (K) have shown effectiveness in maintenance of mydriasis during cataract surgery. We conducted a quantitative study to maximize pupil size using a gel solution that contained differing concentrations of P to evaluate the lowest dose with out impacting effectiveness.

Methods

Healthy subjects between the ages of 30 – 50 were recruited from students and staff at ICO. After verifying eligibility and documenting that blood and intraocular pressures were within range and that the anterior surface of the eye was healthy, pupil size was measured using a Neuroptics pupillometer prior to and every 30 minutes for two hours following dilation of one eye using 1 drop of a gel solution containing 2.5% PTK or 10% PTK. The patient was rechecked to confirm that the blood and intraocular pressures had not changed and that the front surface of the eye was not damaged by the procedure.

Data was analyzed using IBM SPSS V21 (Armonk, NY) with a $p < 0.05$ as the significance level. ANOVA with repeated measures was used for the comparison of changes in dilation size across time, as well as interactions with race. Data are presented as mean ± SEM.

Results

No change in BP or IOP was noted in any of the subjects.

Conclusions

Both drug combinations were safe and effective at causing a large, stable pupil dilation.

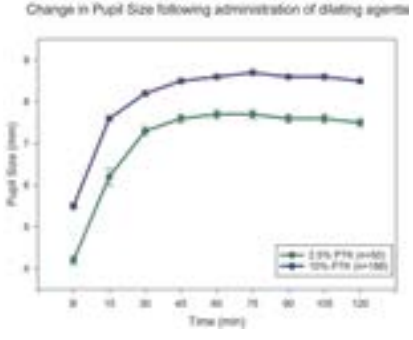
The 10% concentration of phenylephrine provided a larger pupil that was stable for at least two hours.

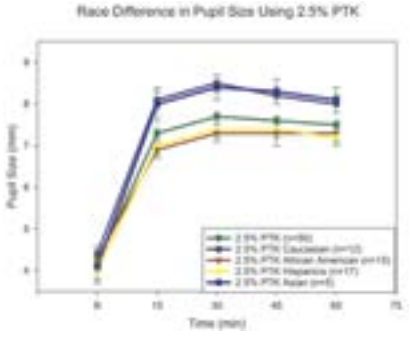
	2.5% PTK	10% PTK	P value
N	50	188	
Age (years)	39 ± 1	34 ± 1	p=0.1
Largest pupil size (mm)	7.9 ± 0.1	8.7 ± 0.05	p<0.001
Maximal dilation amount (mm)	3.8 ± 0.2	3.2 ± 0.08	p=0.001
Time of maximal dilation (min)	73 ± 3	76 ± 2	p=0.81

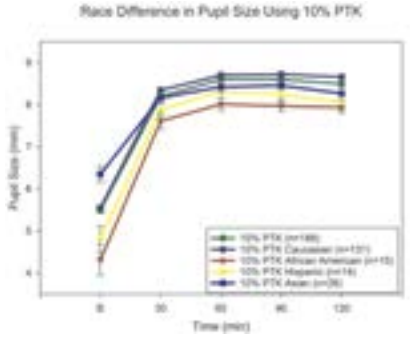
There was a difference in response to the drugs depending on race but only at the 2.5% level.

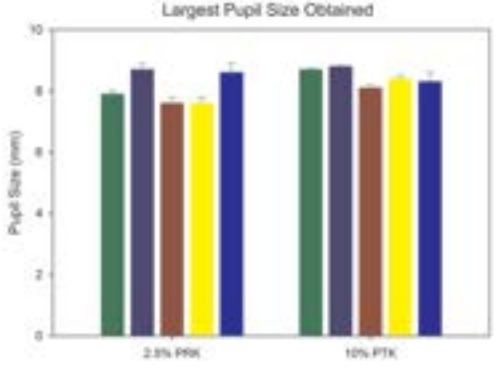
Future Direction

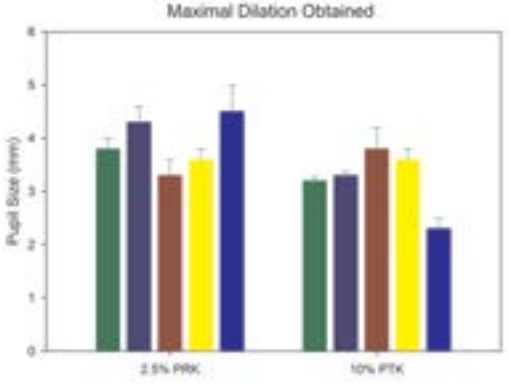
The availability of 2 drug concentrations could give the clinicians more options to better suit their patient needs to maximize their dilation for better surgical outcomes. More analysis of racial differences is needed to finalize these observations.











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Rebecca K. Zoltoski, None; Jaana Ashtiani-Zarandi, None; Michael Bannon, None; Alexandra Beachnau, None; Russell Lake, None; Pedram Pourhosseini, None; Maria-Alessandra Roa, None; Thomas Ruiz, None; Nazli Sammak, None; George McArdle, Lenticular Research Group Code P (Patent)

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CHILDREN'S MERCY

1 ICO PRESENTATION

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Pediatric Blepharokeratoconjunctivitis

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INTRODUCTION

Blepharokeratoconjunctivitis (BKC) is an important consideration in the differential diagnoses of chronic red eyes in pediatric patients. Clinical presentation includes eyelid inflammation resulting in conjunctival and corneal involvement. This case comparison will demonstrate two differing presentations of pediatric BKC, as well as options for management.

DISCUSSION

BKC is characterized by chronic eyelid disease with resultant conjunctival and corneal involvement. BKC is a well-described condition in adults, but is underreported and often over-looked in children. Clinical findings involving the eyelids include marginal inflammation in the form of anterior or posterior blepharitis, lid margin telangiectasia, madarosis, tylosis, or even trichiasis. In moderate cases, conjunctival involvement can be seen with papillary or follicular reactions. Corneal involvement in the form of marginal infiltrates or marginal ulcerations may be seen in more severe, acute forms of BKC. Corneal involvement puts these patients at risk for loss of vision if vascularization or scarring occur.

In pediatric cases, BKC is often classified under various clinical diagnoses including: Staphylococcal Marginal Keratitis, Staphylococcal Phlyctenular Disease, Marginal Infiltrative Keratitis, Childhood Acne Rosacea, or Blepharokeratitis. BKC is an easily identifiable condition with symptoms of chronic ocular redness, tearing, photophobia, or frequent eye rubbing.

CASE 1

CC: 6 yr. 4 mo. female presents with a red right eye x 1 day

	Day 1		Week 2		Week 3	
Symptoms	Red OD x 1 day, tearing, itching		Reduced redness. No itching, tearing, pain		All symptoms resolved	
VA	20/25	20/25+	20/20-2	20/20-2	20/20-2	20/20-2
Pupils	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD
CVF	FTFC	FTFC	FTFC	FTFC	FTFC	FTFC
EOMs	FROM	FROM	FROM	FROM	FROM	FROM
Lids/Lashes	**2+ scurf**	**1+ scurf**	**1+ scurf**	**1+ scurf**	**1+ scurf**	**1+ scurf**
Conjunctiva	**1+ nasal injection, 1+ LL papillae**	**1+ LL papillae**	**Trace nasal injection, 1+ LL papillae**	**1+ LL papillae**	**White & Quiet**	**White & Quiet**
Sclera	White & Quiet	White & Quiet	White & Quiet	White & Quiet	White & Quiet	White & Quiet
Cornea	**3 IN marginal infiltrates 0.5/1mm 1+ overlying PEE (Figure1)**	**1+ inf SPK**	**3 IN marginal infiltrates, decreased density, trace overlying PEE**	**Clear**	**3 IN marginal infiltrates, decreased density, no staining**	**Clear**
A/C	Deep & Quiet	Deep & Quiet	Deep & Quiet	Deep & Quiet	Deep & Quiet	Deep & Quiet
Diagnosis	BKC - 3 staph marginal infiltrates		BKC – improved signs & symptoms		BKC – improved signs, no symptoms	
Treatment	Erythromycin ung bid OU, warm compresses bid OU, Lid Scrubs BID OU		Erythromycin ung bid OU, warm compresses bid OU, Lid Scrubs BID OU		Use erythromycin ung until gone, continue warm compresses bid OU & Lid scrubs bid OU **(patient lost to f/u)**	

CASE 2

CC: 11yr. 3 mo. male presents with complaints of red right eye upon awakening x 5 days. H/O hordeolum / preseptal cellulitis

	Day 1		1 week		1 month	
Symptoms	Red OD x 5 days, tearing, photophobia, blurry vision		Improved redness / vision, no pain or photophobia		All symptoms resolved	
VA	20/80 PH 20/70	20/20-1	20/80 PH 20/50-1	20/20-2	20/60 PH 20/40-1	20/20
Pupils	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD	PERRL (-)APD
CVF	FTFC	FTFC	FTFC	FTFC	FTFC	FTFC
EOMs	FROM	FROM	FROM	FROM	FROM	FROM
Lids/Lashes	**1+ scurf, 1+MGD**	**1+ scurf, 1+MGD**	**1+ scurf**	**1+ scurf**	**Normal**	**Normal**
Conjunctiva	**White & Quiet**	**White & Quiet**	**White & Quiet**	**White & Quiet**	**White & Quiet**	**White & Quiet**
Sclera	White & Quiet	White & Quiet	White & Quiet	White & Quiet	White & Quiet	White & Quiet
Cornea	**360 neo, nasal neo leading to 1x2mm elevated epi lesion in Vaxis surrounding stromal haze (Figure2)**	**Clear**	**1x2mm nasal infiltrate in Vaxis w/ small neo frond, regression of neo 360**	**Clear**	**1x2mm possible stromal scar / resolving infiltrate in nasal Vaxis, trace PEE, regressing ghost vessels Sup & Nasal (Figure3)**	**Clear**
A/C	Deep & Quiet	Deep & Quiet	Deep & Quiet	Deep & Quiet	Deep & Quiet	Deep & Quiet
Diagnosis	BKC - nasal phlyctenule		BKC – improved signs & symptoms		BKC – resolved, residual stromal scar within Vaxis	
Treatment	Tobradex QID OD, Warm compresses & lid scrubs bid OU		Taper Tobradex to BID x 1 week then stop. Continue warm compresses & lid scrubs bid OU		Continue warm compresses & lid scrubs bid OU	

FIGURE 1: Three inferonasal 0.5x1mm marginal infiltrates OD with 1+ nasal bulbar conjunctival injection on Day 1 exam

FIGURE 2: 360 corneal neovascularization. Nasal neo-frond leading to a 1x2mm phlyctenule within nasal Vaxis on Day 1 exam.

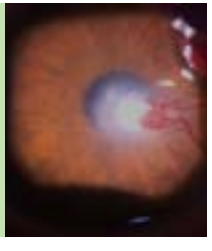

FIGURE 3: Resolved corneal neovascularization. 1x2mm possible stromal scar vs. resolving infiltrate within nasal Vaxis at 1-month f/u exam.

MANAGEMENT

Treatment of pediatric BKC follows a regimen similar to that used in adults. Daily eyelid hygiene is the mainstay of BKC treatment and should be considered long-term as maintenance therapy. In more moderate to severe cases, topical antibiotics may be used to reduce the bacterial load on the eyelids and ocular surface. Macrolide antibiotics such as erythromycin or azithromycin have both antibacterial and anti-inflammatory properties and have shown to be quite effective in cases of childhood BKC. Chloramphenicol, an antibiotic mainly effective against Gram-positive bacteria, is effective against 94% of bacteria found in blepharitis and conjunctivitis. Topical corticosteroids may be used up to four times daily to reduce corneal or conjunctival inflammation; however, twice daily dosing usually provides adequate relief even in severe cases. It is important to remember that chronic steroid use should be limited to reduce risk of secondary glaucoma or cataracts. Early diagnosis and management are crucial to prevent or reduce the risk of visually significant corneal scarring.

CONCLUSION

This case comparison demonstrates two possible presentations of pediatric BKC in the form of phlyctenules or marginal corneal infiltrates. The management of these cases were similar including strict eyelid hygiene, antibiotic coverage to reduce bacterial load, and topical steroids to reduce surface inflammation. Many cases do well with combination steroid-antibiotic topical therapy, while others require more aggressive therapy with separate dosing schedules. Prompt treatment is necessary to prevent central corneal opacification and reduced BCVA as seen in Case 2. In such cases, amblyopia therapy or specialty contact lens wear should be initiated.

BIBLIOGRAPHY

Available upon request.

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COVD

2 ICO PRESENTATIONS

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Results from the 2016 and 2017 National Survey of Children's Health (NSCH) on vision services for children with diagnosed learning disabilities, behavior problems, ADHD, and autism

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Professor, Illinois College of Optometry - Co-Chair, National Center for Children's Vision and Eye Health

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PURPOSE

The National Survey of Children's Health (NSCH) is a two-step cross-sectional survey focused on physical and emotional health of children aged birth through 17 years of age in the United Sates. Questions included aspects of the child's physical health, mental health, presence of a medical home, family interactions, parental health, school experiences, and safe neighborhoods along with demographic information (age, sex, insurance, primary language, socioeconomic indicators to name a few). 2016 was the first time the NSCH and the National Survey of Children with Special Health Care needs were combined with future iterations to be implemented on an annual basis. Subjects with special health care needs and children who aged birth through 5 years of age were oversampled. The NSCH moving forward will be conducted annually so that data we be monitored longitudinally. The current analysis is looking at data from 2016 and 2017.

The 2016 survey included a new question requested by the National Center for Children's Vision and Eye Health (NCCVEH) to describe access to VA testing.
The question was added to this survey asked if a child had their VA checked with letters, numbers or symbols, if so, where did that take place (school, eye doctor, clinic, pediatrician, other).

For this presentation, we are looking at children diagnosed with learning disabilities, ADHD, autism and behavioral problems. The research looks at responses to VA testing and the location testing occurred. The analysis looks at factors that would direct the NCCVEH to improve public health interventions promoting vision health, development, and learning readiness. We also included the original question related to vision which was maintained on the new survey.

METHODS

The NSCH was funded by the Health and Human Services, HRSA and MCHB and administered by the US Census Bureau. The invitation to participate in the 2016 and 2017 NSCH was mailed to a sample of households from Census Master Address File. Interested respondents were provided with access to a website to be able to participate in the survey on-line or a paper option to participate in the survey if they preferred.

The 2016 and 2017 data were analyzed with SPSS V21.0 in additional to the analysis of the data using the weighted data from the Data Resource Center for Child and Adolescent Health. The NSCH is publicly available data and Institutional Review Board approval was not required for this study.

The file contained 71,811 observations representing the US. One child per household was randomly chosen as the interview subject (51.2% male, mean age 9.4, +/- 5.27 years). Of the subjects in the data, 23.1% were identified as children with special health care needs. This study will focus on learning disabilities, behavior problems, ADHD, and autism.

DATA

Percent of children with special health care needs (CSHCN), ages 0 through 17

	CSHCN	Non-CSHCN
% (95% CI)	18.2 (17.1 - 19.2)	81.8 (80.8 - 82.9)
Sample Count	4,912	16,687
Pop. Est.	13,327,498	60,096,885

ORIGINAL QUESTION COVERING VISION

Does the child have blindness or problems with seeing, even when wearing glasses?

	Has problems	Does not have problems
TOTAL POPULATION		
% (95% CI)	1.6 (1.3 - 1.9)	98.4 (98.1 - 98.7)
Sample Count	894	70,582
Pop. Est.	1,142,863	71,787,242
Children with special health care needs (CSHCN)	**Has problems**	**Does not have problems**
% (95% CI)	4.3 (3.5 - 5.4)	95.7 (94.6 - 96.5)
Sample Count	547	15,686
Pop. Est.	594,887	13,097,765
Non-CSHCN		
% (95% CI)	0.9 (0.7 - 1.2)	99.1 (98.8 - 99.3)
Sample Count	347	54,896
Pop. Est.	547,976	58,689,477

Does this child currently have a learning disability, age 3-17 years?

	Currently has condition	Does not currently have condition	Does not have condition
% (95% CI)	7 (6.5-7.6)	0.4 (0.3-0.5)	92.5 (92.0-93.1)
Sample Count	4,315	306	57,054
Pop. Est.	4,317,268	257,869	56,829,642

Does this child currently have behavioral or conduct problems, age 3-17 years?

	Currently has condition	Does not currently have condition	Does not have condition
% (95% CI)	7.1 (6.6-7.5)	1.8 (1.6-2.1)	91.1 (90.5-91.6)
Sample Count	4,552	1,141	55,934
Pop. Est.	4,343,943	1,132,579	55,856,821

Percent of children, ages 3 through 17, diagnosed with Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder (ADD/ADHD)

	Currently has condition	Does not currently have condition	Does not have condition
% (95% CI)	8.8 (8.3-9.3)	0.8 (0.6-0.9)	90.4 (89.9-90.9
Sample Count	6,115	537	54,687
Pop. Est.	5,338,419	470,354	55,001,165

Does this child currently have Autism or Autism Spectrum Disorder (ASD) including Asperger's Disorder, Pervasive Developmental Disorder, age 3-17 years?

	Currently has condition	Does not currently have condition	Does not have condition
% (95% CI)	2.8 (2.5_3.2)	0.2 (0.1-0.2)	97 (96.6-97-4)
Sample Count	1,679	129	59,791
Pop. Est.	1,725,297	93,648	59,468,274

NEW QUESTION COVERING VISION ADDED TO 2016 SURVEY

Has this child had his or her vision tested with pictures, shapes, or letters ever (0-5 years) or during the past 2 years (6-17 years)?

	Rec'd vision service	Didn't receive vision service
% (95% CI)	69.7 (68.9-70.5)	30.3 (29.5-31.1)
Sample Count	51,929	19,657
Pop. Est.	50,922,108	22,148,849

What kind of place did this child have his or her vision tested:

EYE DOCTOR OR EYE SPECIALIST (OPHTHALMOLOGIST OR OPTOMETRIST) OFFICE

	Rec'd vision service at eye doctor or eye specialist	Rec'd vision service, but not at eye doctor or eye specialist	Did not receive vision service
% (95% CI)	38.4 (37.5-39.2)	31.2 (30.4-32.1)	30.4 (29.6-31.2)
Sample Count	30,648	21,072	19,657
Pop. Est.	27,953,133	22,764,660	22,148,849

PEDIATRICIAN OR OTHER GENERAL DOCTOR'S OFFICE?

	Rec'd vision service at pediatrician or general doctor's office	Rec'd vision service, but not at pediatrician or general doctor's office	Did not receive vision service
% (95% CI)	30.5 (29.7-31.4)	39.1 (38.2-39.9)	30.4 (29.6-31.2)
Sample Count	20,542	31,178	19,657
Pop. Est.	22,241,532	28,476,260	22,148,849

SCHOOL

	Rec'd vision service at school	Rec'd vision service, but not at school	Did not receive vision service
% (95% CI)	15.4 (14.8-16.0)	54.2 (53.3-55.0)	30.4 (29.6-31.2)
Sample Count	11,792	39,928	19,657
Pop. Est.	11,247,865	39,469,927	22,148,849

CLINIC OR HEALTH CENTER

	Rec'd vision service at clinic or health ctr	Rec'd vision service, but not at clinic or health ctr	Did not receive vision service
% (95% CI)	3.5 (3.2-4.0)	66.1 (65.2-66.9)	30.4 (29.6-31.2)
Sample Count	1,727	49,993	19,657
Pop. Est.	2,583,698	48,134,094	22,148,849

Note: Percentages and population estimates (Pop.Est.) are weighted to represent child population in US.

RESULTS

Comparison of whether vision was tested and where vision was tested categorized by wether the parent indicated the children had been with LD, behavior problems, ADD/ADHD, or autism/ASD.

Note; The data is not taking into account the fact that some children fit into multiple categories. The numbers in some of the cells were too small for reliable statistical analysis.

Responses on vision testing for those reported with:

Total subjects identified as LD				4,706	
	Vision Tested	*Eye Doctor	*Pediatrician	*Clinic	*School
count	4018/4706	2874/4001	1254/4001	162/4001	946/4001
%	85.30%	71.80%	31.30%	4.04%	23.60%
Total subjects identified as Behavior Problems				5862	
	Vision Tested	*Eye Doctor	*Pediatrician	*Clinic	*School
count	4945/5862	3219/4931	1737/4931	187/4931	1257/4931
%	84.40%	65.30%	35.20%	3.80%	25.50%
Total subjects identified as ADD/ADHD				6788	
	Vision Tested	*Eye Doctor	*Pediatrician	Clinic	*School
count	5875/6788	4069/5858	1960/5858	193/5858	1288/5858
%	86.50%	69.5	33.50%	3.30%	22.00%
Total subjects identified as Autism/ASD				1855	
	Vision Tested	*Eye Doctor	*Pediatrician	*Clinic	*School
count	1504/1855	1011/1502	479/1502	49/1502	348/1502
%	81%	67.30%	31.90%	3.30%	23.20%

* Number responding to where vision tested in the denominator is not the same as those reported to have condition accounting for missing information in the survey

CONCLUSIONS

The literature is filled with the evidence tjhat children with learning disabilities, behavior problems, attention deficit disorder/attention deficit hyperactivity disorder and autism/ spectrum disorder have a high prevalence of vision problems.

In addition, the National Center for Children's Vision and Eye Health states that any child with a neurodevelopmental problems should be referred for a comprehensive eye exam by an eye care specialist (optometrist or ophthalmologist) and not simply receive a vision screening.

The data demonstrates that a gap still exists in following that recommendation.

This study demonstrates that many children do not have sufficient access to eye care services. Reasons include insurance, geographic location, as well as barriers.
The Affordable Care Act states that eye care is an essential benefit, yet all children do not access eye care services. Current state supported programs are at risk. We need to ensure that the scientific evidence supporting the need for eye care services is included in the push to keep vision as an essential service to ensure that children are properly diagnosed and treated so that they can reach the highest potential.

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Strabismus, Chorioretinal Scarring, and Unexpected Prism: A Case Report

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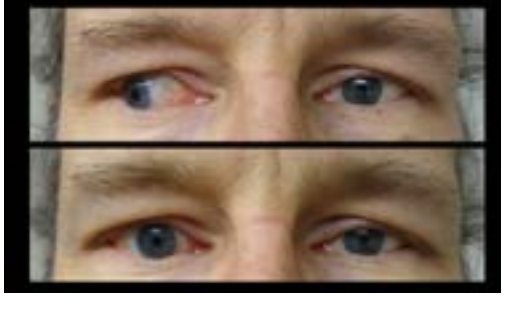
BACKGROUND

A 54 year old white male presented for a visual efficiency exam with a complaint of intermittent diplopia secondary to a longstanding eye turn. The episodes of diplopia occurred several times per week toward the end of the day, especially when looking at distance targets. He reports that the diplopia is peripheral due to loss of central vision in the right eye. He was most bothered by this while driving. In addition, the patient didn't like the cosmetic appearance of his large-angle eye turn and wondered if surgical correction was an option.

The patient had an ocular history of longstanding strabismus, amblyopia, nystagmus of the right eye, and high anisometropia. He had two previous strabismus surgeries performed when he was 18 months and 16 years old. He presented wearing a soft contact lens in the right eye (-8.00 DS Biofinity) along with a pair of bifocal glasses (+0.25 -2.00 x 140 OD, +0.50 -4.75 x 032 OS) with a 1.75 D add, 12 BI prism split evenly between the eyes, and 2 BD prism over the right eye. He also had a previous diagnosis of a deutan color defect and bilateral chorioretinal scars. His personal medical history was positive for arthritis.

FIGURE 1
The patient's eyes in deviated and aligned positions. Straightening his eyes took great effort and he fatigued quickly.



CASE SUMMARY

	Right Eye	Left Eye
Presenting glasses Rx	+0.25 -2.00 x 140 / +1.75 / 6 BI, 2 BD	+0.50 -4.75 x 032 / +1.75 / 6 BI
Presenting VA (cc)	20/100-1 distance, 20/400+1 near	20/30 distance, 20/30 near
Pupil testing	Equal, round, reactive, no APD	Equal, round, reactive, no APD
EOM	**Restriction upon adduction**	Full range of motion
Confrontation fields	**ST defect centrally**	Full to finger counting all quadrants
Stereopsis	**No stereopsis**	
Cover Test	**Distance: 25 IRXT, 6 IRHypoT / Near: 50-60 CRXT, 8 CRHypoT**	
Worth Dot	**Distance: alternating diplopia & OD suppression; Intermediate/ Near: OD suppression**	
Manifest Rx	+0.75 -2.50 x 140 / +2.00	+1.00 -5.00 x 040 / +2.00
Manifest VA	20/100 distance, 20/200 near	20/25 distance, 20/20-1 near

The patient's manifest refraction above was determined with his -8.00 DS contact lens in place over the right eye. Based on the prism in the patient's presenting pair of glasses, one would expect a right hyper deviation. However, based on cover test findings and gross observation, the patient had a right hypotropia.

The above manifest refraction was trial-framed in office along with varying amounts of prism to try to relieve the diplopia. The patient couldn't tolerate BU prism over the right eye despite his right hypotropia. He was most comfortable with 2-4 BD prism over the right eye and 12 BI prism total, reporting no diplopia in office. Therefore, he was prescribed the above manifest refraction (over the contact lens in the right eye) with the same amount of prism in his presenting glasses: 12 BI prism split between the eyes and 2 BD prism over the right eye. He was also referred for a consultation with a strabismus surgeon.

MANAGEMENT

At the surgical consultation, the patient reported he was still experiencing some diplopia, athough the new glasses prescription was helping somewhat. The strabismus surgeon said that the patient would be a good candidate for an alignment procedure based on improved cosmesis alone. However, he was concerned about the possibility of diplopia persisting after the surgery. Before attempting surgery, he wanted the patient to go a month without using his contact lens (-8.00 DS) in the right eye. The purpose of this was to see whether the eye's vision could be blurred enough to eliminate diplopia, and whether or not the patient could tolerate it in his daily activities. The patient was hesitant but made a good effort and was compliant for the month-long trial. During the follow-up at the conclusion of the trial, the patient reported poor outcomes. He reported still seeing double, except one of the images was blurry and distracting, whereas before at least both images were clear. He also reported that he learned his color deficiency was less pronounced in his right eye, because by being uncorrected he had a subjectively harder time distinguishing colors. The surgeon decided that they would move forward with the procedure and plan on the patient wearing his contact lens along with glasses afterward. The patient would return for an examination after the surgery to evaluate further need for prism.

FIGURE 2
Amsler grid results. The marked area on the right eye grid was described as a "shimmering" area of missing vision. This corresponded to the area of retinopathy in his right eye. The marked area on the left eye grid was described as a "smudge" across his vision. He thought it might have been caused by an incident where he viewed a blow torch for an extended period of time.

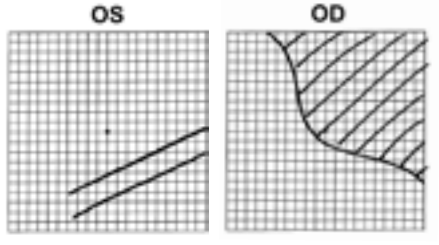


FIGURE 3
Fundus photo of the right eye.

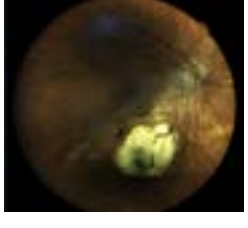
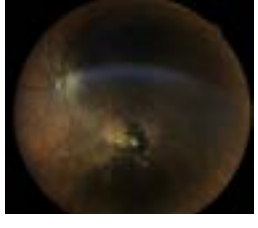


FIGURE 4
Fundus photo of the left eye.



DISCUSSION

The patient said that he was told his retinal scars were a result of his mother accidentally having received the rubella vaccine while pregnant with him. However, the appearance of the lesions was not consistent with rubella retinopathy. Regardless of the etiology, these scars contribute to a unique visual scenario for this patient. His vision in the right eye is significantly reduced by field loss associated with the retinal findings, amblyopia (strabismic/refractive), or both. However, his peripheral vision remains intact, causing symptomatic diplopia when his eyes are not aligned at distance. (He reported suppressing his right eye enough while reading to eliminate this problem at near.) Based on how his right eye adapted to these issues, the patient preferred vertical prism in the opposite direction of what would be expected based on his tropia. It's possible that this was due to eccentric fixation related to his central scotoma in that eye. This case is an example of needing to be flexible and relying on your patient's subjective responses to help prescribe prism, because the exam findings don't make complete sense. The next challenge in this case will be determining the patient's glasses needs following the strabismus surgery.

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1 ICO PRESENTATION

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Alzheimer's Disease: Exploring Pathophysiology & Earlier Detection via the Retina

Stephanie L. Adams, OD, PhD [1,2] • Ivana Delalle, MD, PhD [2]
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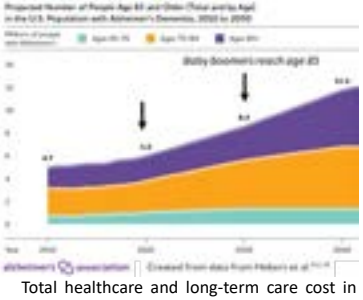
Alzheimer's Disease: Incidence & burden

Alzheimer's disease (AD), the most common cause of dementia, is a rapidly growing epidemic in the U.S. currently affecting 5.8 million Americans. With the aging population, in 2030 the U.S. will be expected to care for over 8 million Americans with AD.



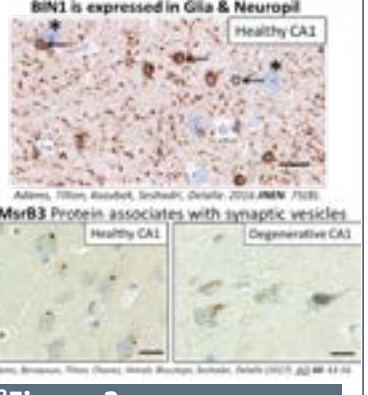
Total healthcare and long-term care cost in 2019 for individuals with dementia is estimated at $290 billion, with Medicare and Medicaid expected to pay the majority. The national cost of AD is predicted to rise to over one *trillion* dollars over the next 30 years.

Characterization of novel AD-associated genes[2]

With failed treatment efforts to target amyloid-beta plaques, it is clear the pathophysiology of AD is still poorly understood. Genome-wide association studies (GWAS) identified novel genetic markers associated with AD, including in the Bridging Integrator-1 (BIN1) and methionine sulfoxide reductase B3 (MsrB3) genes. Our research characterized the protein expression of BIN1 and MsrB3, localizing them to cellular compartments, and quantifying changes in healthy versus AD human brain using post mortem hippocampi.[2]

	Avg age	CDR score	BB stage	# subjects
Group 1	66.3	0	0	n=6
Group 2	91.2	0-0.5	I-III	n=11
Group 3	88.0	1-2	IV-V	n=7

[2]Figure 1



[2]Figure 2

©Adams, SL. 2018. Neuronal phenotypes in human hippocampus and neocortex in late-onset Alzheimer's disease. (Doctoral dissertation) Accession No. 10615583.

We also showed the risk-allele of *MrsB3* is associated with increased risk for brain infarcts, or small strokes.[2] The data support an important role for **vascular health** in AD pathophysiology.

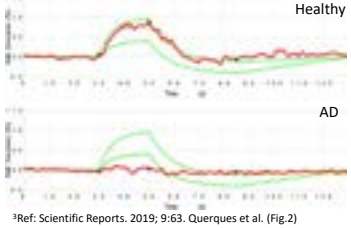
The neurosensory and vascular retina is an extension of the brain. Consistently, neurodegenerative diseases of the brain cause changes in retinal structures.

AD changes in the retina, an extension of the brain

Amyloid-beta plaques, the hallmark of AD, are found in the retina in AD patients. Interestingly, loss of nerve fiber volume, decreased vasculature density, and damaged vascular regulation in the retina have been associated with cognitive impairment.

Querques et al. studied dynamic vascular health as an early AD biomarker. The authors found decreased arteriole regulation in patients with mild cognitive impairment and AD.[3]

From: Functional and morphological changes of the retinal vessels in Alzheimer's disease and mild cognitive impairment[3]



[3]Ref: Scientific Reports. 2019; 9:63. Querques et al. (Fig.2)
doi:10.1038/s41598-018-37271-6
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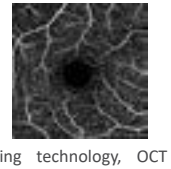
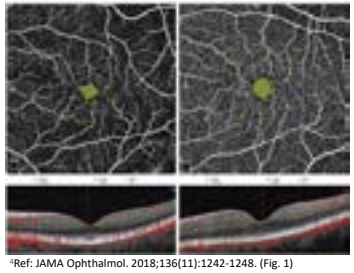
New OCTA technology offers a potential AD biomarker



A novel retina imaging technology, OCT angiography (OCTA), can evaluate neuronal and vasculature structure simultaneously in living subjects, which may allow identification of structural biomarkers of AD. The goal is to develop a non-invasive, inexpensive screening tool for early detection of AD that could be administered at a comprehensive eye exam.

O'Bryhim et al. compared cognitively normal subjects, with or without AD-associated biomarkers found on PET scan or CSF analysis. They used the OCTA to compare a retinal vascular structure, the foveal avascular zone (FAZ), which houses our sharpest vision.[4]

From: Association of Preclinical Alzheimer Disease With Optical Coherence Tomographic Angiography Findings[4]



[4]Ref: JAMA Ophthalmol. 2018;136(11):1242-1248. (Fig. 1)
doi:10.1001/jamaophthalmol.2018.3556

The authors found an enlarged FAZ in individuals with preclinical AD-associated biomarkers compared to controls.[4]

Conclusion

Novel retinal imaging technology, the OCTA, has identified new biomarkers for Alzheimer's disease linked to vascular health. This area of vision research may allow for earlier diagnosis, better understanding of pathophysiology, and evaluation of therapeutic strategies in neurodegenerative disease using the retina.

References available upon request
Funding [2]NIA: R01 AG033193

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GLOBAL SPECIALTY LENS SYMPOSIUM

4 ICO PRESENTATIONS

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"I am not Lazy...My Doctor Was!" Utilizing Hybrid Lens Designs on "Amblyopic" Anisometropic Astigmat

Gregory M. Pappas; Frances D. Mangahas; Louise A. Sclafani, OD, FAAO

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BACKGROUND

Amblyopia, commonly referred to as "lazy eye" can manifest in a variety of ways including strabismus, anisometropia, astigmatism, myopia, cataract, and other conditions resulting in visual deprivation. Anisometropia is defined as a condition where each eye has a significantly different refractive error, usually differing in at least 3.00D.1 The main focus of this case series will be refractive amblyopia due to anisometropia and ultimately uncorrected astigmatism. Varying treatment options have been used including patching, spectacles and contact lenses with the latter offering the least amount of aniseikonia and potentially improved outcomes. Since many of these patients are children, it is often challenging to discover the astigmatic portion in the highly ametropic eye thus that portion remains untreated. Limited parameters or practitioner avoidance, aka "laziness" can also contribute to this deepening amblyopia. Recent developments in specialty contacts lenses have offered new options for patient with high amounts of spherical anisometropia and astigmatism. This case series demonstrates the benefits of ultimately correcting this portion of the prescription even after decades of lens wear.

This case report will focus on two patients followed for 10+ years by the same practitioner at the University of Chicago Hospital, SoLo Eye Care and the Illinois Eye Institute (IEI) presenting with anisometropia and high myopia with uncorrected cylinder that were treated with Duette® hybrid contact lenses.

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SoLo Eye Care & Eyewear Gallery

Frances D. Mangahas
Illinois College of Optometry, Class of 2020.

Louise A. Sclafani OD, FAAO
Clinical Associate, Illinois Eye Institute
SoLo Eye Care & Eyewear Gallery
VP, Professional Affairs, SynergEyes, Carlsbad, CA

CASE SERIES

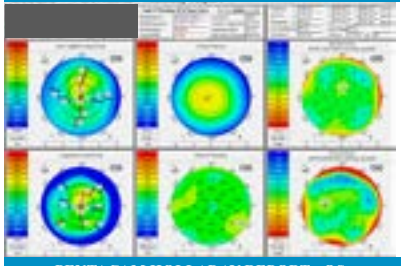
Patient 1: 29 yo AAF originally diagnosed at the age of 5 with 5 D anisometropia. At that time and for the years subsequent, she was treated with spherical soft lenses with various powers and brands as the years progressed. At times, she experienced compliance issues with patching, I/R and hypoxia however as she matured, she became a more mature lens wearer. Her best visual potential was OD = 20/20 and OS = 20/60. Most recently, she developed elevated IOP secondary to steroid treatment of Lupus and her awareness of visual acuity became more astute. She presents 6 months ago wearing Bausch & Lomb's PureVision lenses, OD -6.00D sphere, OS -11.50D sphere with the visual acuity (20/20, 20/60) however reports "blur" in the left eye. Her IOP was well managed with a prostaglandin, however a stable and repeatable over-refraction indicates OS = pl -1.00 015 = 20/40. Topography was performed and revealed significant corneal cylinder measuring 43.70 @ 010/ 45.80 @100. The patient was offered a spectacle over-correction to be worn over the soft spheres, gas permeable lenses or hybrid lenses. She opted for hybrid lenses and was successfully fit in SynergEyes Duette® lens. She achieved her best lifetime visual acuity = 20/25-.

Patient 2: 24 yo WM who presented 5 years ago with a history of anisometropic amblyopia of 5 D and wearing spherical soft lenses. Astigmatism was discovered at that time and he was re-fit in a toric lens in the - 8D left eye, however cylinder was not available for the amblyopic -15D right eye. He refused rigid lenses due to his occupation and the custom soft toric was cost prohibited. At the time one of the major contact lens companies was in process of expanding their parameters to meet this patient needs however after waiting several years, this did not come to fruition. He opted for a spectacle over-correction. Six months ago he presents wearing CooperVision Biofinity® lenses of the following: OD -15.00D 20/40 and OS -8.50 -0.75 x 170 20/25. Topography indicated corneal astigmatism and mild ectasia: OD = 43.36/44.71@ 031 OS = 43.47/44.47 @ 074 that had been uncorrected for. A SynergEyes Duette® hybrid lens was ordered for the right eye rendering 20/20- vision and an updated Coopervision Biofinity Toric® for the left. The patient has requested to have the left eye refit in a hybrid lens.

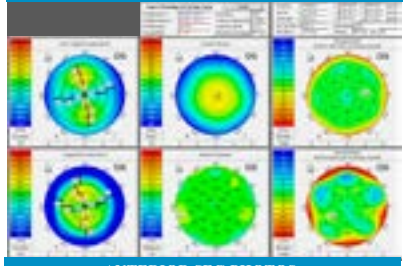
Both of these patients show evidence of the amazing benefits of specialty contact lenses. Each patient seemed unable to reach 20/20 vision due to refractive amblyopia, have now been correctable to their best visual acuity by means of these lenses. It is clear that there is true promise for optimal visual acuity in the field of specialty contacts.

PATIENT 1

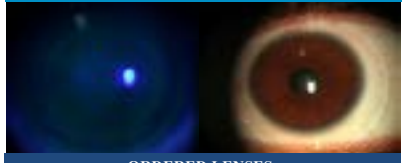
PENTACAM HOLLADAY REPORT - OD



PENTACAM HOLLADAY REPORT - OS



ANTERIOR SEG PHOTOS



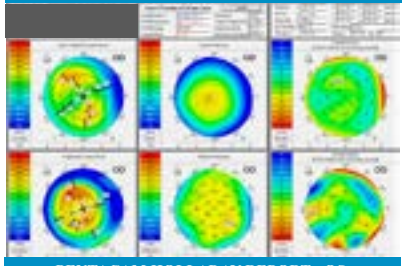
ORDERED LENSES

OD: Biofinity Energys® / BC 8.6/ -6.00 SPH

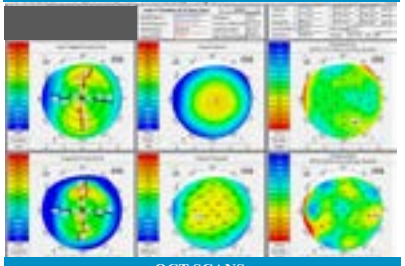
OS: SynergEyes Duette® TH/ BC 7.6/ SC 8.4/ -11.50 SPH

PATIENT 2

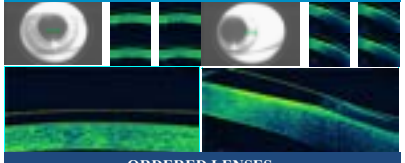
PENTACAM HOLLADAY REPORT - OD



PENTACAM HOLLADAY REPORT - OS



OCT SCANS



ORDERED LENSES

OD: SynergEyes Duette® TH/ BC 7.7/ SC 8.4/ -14.50 SPH

OS: Coopervision Biofinity Toric® / BC 8.7/ -9.00 -0.75 x 170

RELEVENCE

Both of these patients achieved much better visual outcomes when their astigmatism is managed. Often we neglect this portion in high ametropes because we assume that the amblyopia is a result the difference in the spherical portion.2 We can unmask this by utilizing topographical information in this population and thus determining better treatment options and ultimately better visual outcomes. Finally, it is important to utilize specialty lenses to correct astigmatism. A hybrid contact lens offers stable GP optics in the center, and the comfort of a soft surround. It is important for us to remember that we are in control of the management of these patients. The continuous development of new specialty contact lens technology has specifically helped with the treatment of patients with anisometropia.6 Hybrid lenses give the optometrist the necessary parameters to correct for a patient's anisometropia and allow for the avoidance of anisocoria.4 Being able to fully correct a patient's refractive error will help in the avoidance amblyopia associated with anisometropia, and allow the patient to experience clear, comfortable, binocular vision.

Advancement in contact lens technology has drastically increased in a variety of different applications. While many optometrists are aware of the advancement of lenses in the treatment of ocular surface diseases like keratoconus, contact lens optics are also pushing the standard of care to new levels. In the past, contact lens had limited ranges, reducing the number of potential candidates for lens wear. It was not uncommon for patients to sacrifice clarity of vision due to the limited parameters. However, with the expansion of contact lens development, more and more patients are experiencing the clearest vision they have ever had with the use of specialty contact lenses.

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DSEK REJECTION: A CASE SERIES

Laurel Roberts, OD • Jennifer S. Harthan, OD, FAAO, FSLS
Renée E. Reeder, OD, FAAO, FBCLA, FIACLE* • Lindsay A. Sicks, OD, FAAO, FIACLE, FSLS
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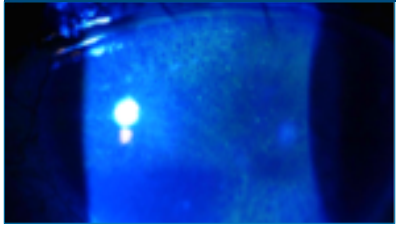
INTRODUCTION

Descemet's stripping endothelial keratoplasty (DSEK) is a partial thickness corneal transplant procedure for endothelial dysfunction. Graft rejection is less common with DSEK compared to full thickness penetrating keratoplasty (PKP) because there is less transplanted tissue, no sutures, less disruption to the blood-aqueous barrier and no immune system exposure to donor cell antigens.

CASE 1

A 59-year-old African American female with Fuch's dystrophy underwent combined cataract extraction and DSEK OS in 2017. She reported blurred vision 11 months later and was diagnosed with suspected graft rejection and central vein occlusion OS. She presented to our clinic for a second opinion on 9/10/2018. She had 20/20 VA OD. Slit lamp examination revealed Fuch's dystrophy OU. PH acuity was 20/800. Examination showed irregular endothelial folds and 3+ diffuse punctate epithelial erosions with surrounding microcystic edema (see Figure 1). Treatment OS was initiated with prednisolone acetate 1% Q2h, Systane Ultra PF ATs Q30 min, and timolol BID due to IOP of 28mm Hg.

FIGURE 1: Punctate epithelial erosions with surrounding microcystic edema OS



The patient missed a follow-up and returned 1 month later with increased edema. Figure 2 shows global pachymetry OS at the initial visit (2a) and first follow-up visit (2b). An anterior chamber reaction was noted and a cycloplegic was added. The patient was followed closely for the next few days, during which the edema decreased (Figure 2c/d) and the anterior chamber reaction resolved.

The patient was lost to follow-up for two months, returning with complaints of blurry vision and light sensitivity. She claimed to be compliant with her medications. Vision was CF @ 3 feet and the anterior segment findings are shown in Figure 3. Figure 2e shows the global pachymetry at that visit. Dorzolamide TID OS was started. Steroid dosing was decreased and importance of follow-up emphasized.

FIGURE 2: Serial pachymetry OS (Pentacam)

FIGURE 2a: 9/10/2018 FIGURE 2b: 10/1/2018

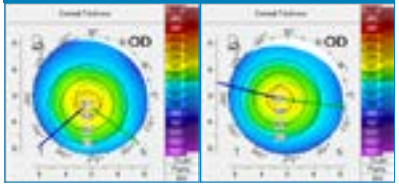


FIGURE 2c: 10/3/2018 FIGURE 2d: 10/6/2018

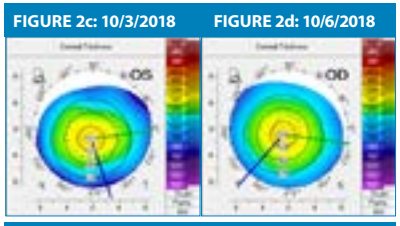
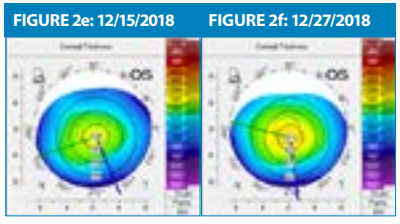


FIGURE 2e: 12/15/2018 FIGURE 2f: 12/27/2018



The patient returned 2 weeks later with improvement in symptoms but had not tapered the steroid. There was noted improvement in corneal appearance and decreased edema. Pachymetry can be seen in Figure 2f. With continued improvement in corneal appearance we hope to taper her off of the steroid completely, though visual prognosis is limited due to the CRVO.

FIGURE 3: Endothelial pigment and edema OS

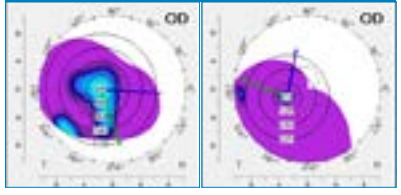
CASE 2

A 61-year-old African American male with bilateral iridocorneal endothelial (ICE) syndrome and glaucoma underwent DSEK OD in June 2015 complicated by post-operative corneal edema. The spectrum of conditions that are included in ICE cause abnormalities of the endothelium, anterior chamber, and iris leading to poor vision and associated glaucoma. The patient was concurrently managed for glaucoma and low vision by other optometrists. He has historically poor compliance with medications and follow up secondary to cognitive dysfunction.

The patient presented on 9/6/18 with reduced VA OD. Slit lamp revealed diffuse punctate epithelial erosions and dense peripheral stromal haze OD. Global pachymetry had dramatically increased and graft rejection was suspected. Figure 4a/b compare global pachymetry values prior to the rejection episode and at this visit. Patient cooperation was poor on both measurements giving poor quality images.

FIGURE 4: Pachymetry OD before and after graft rejection showing increase in edema (Pentacam)

FIGURE 4a: 5/24/2018 FIGURE 4b: 9/6/2018



Prednisolone acetate TID OD was added to current meds: oral doxycycline, vitamin C, NaCl 5% ung and IOP-lowering medications. The patient was referred to a corneal specialist.

On 9/20/2018, the corneal specialist discussed the risks and benefits of a new transplant OD but decided to monitor. The patient continued oral doxycycline, vitamin C, NaCl 5% ung QAM, Bion Tears TID while decreasing the prednisolone acetate to BID. The patient was followed for the next two months and there was mild improvement in corneal edema.

On 11/21/2018, the edema was unresolved. The Pentacam could not measure corneal thickness and specular microscopy was unobtainable due to poor image quality from heavy edema seen in Figures 5 and 6. The patient no-showed his follow-up for re-graft consult 1 month later.

FIGURE 5: Parallelepiped showing severe corneal edema OD

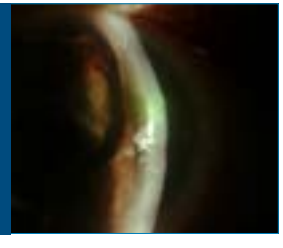
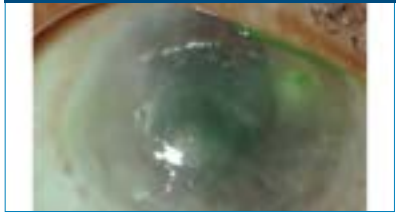


FIGURE 6: Dense stromal haze OD



DISCUSSION

Post-transplant patients should be educated regarding potential complications such as rejection and graft failure. Heavy emphasis should be placed on the need for strict compliance with medications and follow-up appointments to prevent or reverse any early graft rejection, avoiding the need for re-graft. In patients with ocular comorbidities, it is critical to co-manage and communicate with other specialists regarding treatment plans.

CONCLUSION

DSEK is widely replacing PKP in the surgical management of corneal endothelial disease without significant corneal scarring. Though less common with DSEK than PKP, graft rejection is still a serious potential complication. Rejection is identified by reduced endothelial cell count, increased pachymetry, corneal edema, and/or reduced visual acuity. Patients are typically treated with topical steroids and hyperosmotic agents. Diagnostic testing should be routinely performed on post-DSEK patients to assist in early diagnosis of graft rejection. A global increase in pachymetry or loss of endothelial cell density can be early indicators of rejection.

REFERENCES AVAILABLE UPON REQUESTION

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Prosthetic Contact Lens Masks Full Corneal Opacity Secondary to Trauma

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INTRODUCTION

Prosthetic contact lenses can be utilized for a variety of clinical indications including:

- Altered light perception and symptomatic relief of glare or photophobia secondary to iris and pupil defects.
- Masking of ocular disfigurements secondary to birth defect, trauma, surgical complications, or other eye disease.
- Daily cosmetic wear for eye color change.

There are a variety of prosthetic contact lenses options available including soft and gas permeable options. Choice of lens design is tailored to the individual's visual and cosmetic needs. Soft prosthetic lenses allow for optimal comfort. Computer-printed soft prosthetic lenses are more reproducible and affordable than hand-painted designs.

CASE PRESENTATION

A 52-year-old African American female had complete corneal opacification OD secondary to childhood trauma. The patient reported negative self-esteem due to her appearance, and she hoped to mask the abnormality with a prosthetic contact lens.

Visual acuity in the right eye was light perception (LP). Extraocular motilities were full range of motion; however, she had a constant right esotropia. Slit lamp examination revealed a dense, full white corneal opacity with overlying band keratopathy with an uneven surface OD (Figure 1). No posterior segment structures were visible. The left eye had good uncorrected vision (20/20-1) with normal anterior and posterior segment findings. Due to the full corneal opacity, ultrasound biometry (B-scan) was performed to evaluate the posterior segment health of the non-seeing eye. Results of the B-scan were unremarkable.

DISCUSSION

The right eye was fit with a tinted Alden HP49 prosthetic soft contact lens with parameters: 8.6 / 14.50 / plano

While there was some surface irregularity, the soft lens exhibited good stability, centration and movement with blinks in all directions of gaze. To fully mask the corneal opacification, while simultaneously matching the fellow iris, a #5 walnut tint with iris diameter of 11.5mm was chosen.

FIGURE 1
Dense, full white corneal opacity of the right eye.

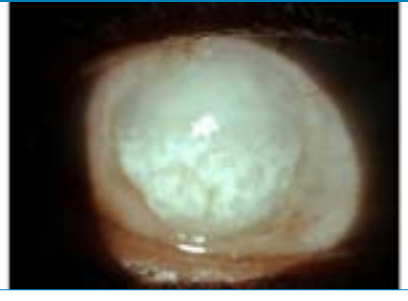

FIGURE 2
Variation of the walnut tint and the black pupil sizes. Image courtesy of Alden Optical.

*SHADES: #1 Light, #2 Medium, #3 Dark, #4 Very Dark, #5 Extremely Dark

Customizable lens options for the walnut coloration are shown in Figure 2. A black pupil with a 4 mm diameter gave the most realistic appearance to match the fellow eye.

FIGURE 3
Final customized prosthetic lens on the patients right eye.

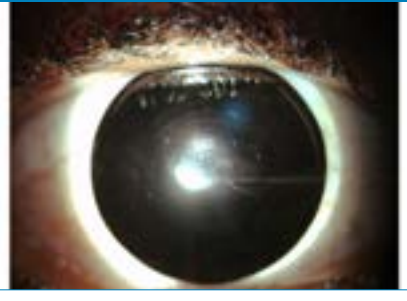

FIGURE 4
Prosthetic contact lens successfully matching the fellow eye for a realistic appearance. Images courtesy of the patient and shared with permission.

At the dispense appointment, the patient was extremely pleased with the outcome of the customized lens, as seen in Figures 3 and 4. The patient was successful with application and removal training prior to dispense of the lens. She was also prescribed polycarbonate spectacles for full time wear over the contact lens for protection.

CONCLUSION

Contact lenses have a wide range of clinical applications and may improve patients' quality of life in ways beyond visual acuity. Choosing an appropriate prosthetic lens includes:

- Consideration of the patient's visual and cosmetic needs and daily activities
- Iris and pupil diameter
- Iris color match
- Ocular health

These lenses often have annual or quarterly replacement schedules, so compatible care systems should be recommended to remove both build-up and avoid fading lens pigment. Polycarbonate spectacles should be prescribed for full time wear over the contact lens to protect the fellow seeing eye.

Many patients who can benefit from prosthetic lenses may be unaware of their availability. Specialty contact lens practitioners can initiate the conversation and significantly improve the well- being of patients by fitting these lenses.

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Scleral Lenses in the Management of Phlyctenular Keratoconjunctivitis

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PURPOSE

Modern scleral contact lenses are fit for a variety of regular and irregular corneal disorders. In patients who have severe corneal irregularity, such as from ectasia or scarring, scleral lenses can protect the ocular surface, serve as a fluid reservoir, provide vision improvement and reduce higher order aberrations[1]. In cases where there is existing corneal neovascularization, close monitoring is warranted.

CASE

A 19-year-old African-American male presented with symptoms of "extreme dryness" related to pediatric blepharokeratoconjunctivitis. He felt like he was "starting to lose vision" in the left eye and also had photophobia.

Ocular history was positive for allergic conjunctivitis, blepharokeratoconjunctivitis, phlyctenular keratoconjunctivitis, and related corneal scarring and neovascularization. Medical history was positive for carpal tunnel syndrome.

Slit lamp evaluation revealed corneal scarring and neovascularization OU along with a central iron line (see Figure 1).

FIGURE 1: Right eye scarring and neovascularization

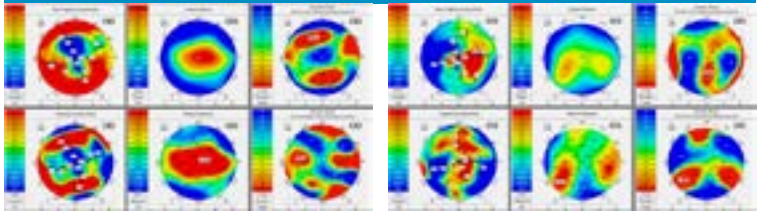
METHODS

Refractive management

Uncorrected acuity was OD 20/400 and OS 20/80. Acuity improved to 20/50 OS with manifest refraction. There was no improvement in OD acuity after manifest. Scleral lenses were chosen for management to both improve vision and protect the ocular surface. Tomography maps can be seen in Figure 2.

FIGURE 2: Pentacam tomography maps

Right eye (2018) | Left eye (2018)



Medical management

The patient's medications included doxycycline 50mg po BID, Restasis 0.05% cyclosporine BID (Allergan), Refresh Optive Sensitive (Allergan) preservative-free artificial tears, lid scrubs (OcuSoft), and hypochlorous acid spray (OcuSoft). He was managed with topical steroids during symptomatic episodes. The flare-ups of phlyctenular keratoconjunctivitis were initially co-managed with a corneal specialist, who cleared the patient for scleral lens fitting after there was no longer any sign of active phlyctenulosis.

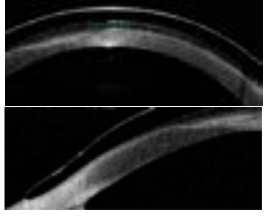
RESULTS

Application of Jupiter (Essilor/ABBA) 15.6mm diameter scleral lenses improved vision to OD 20/30 and OS 20/20. The patient has been successfully managed in scleral lenses for the past 4 years with small adjustments to the haptic landing over time to improve fit. The central clearance can be seen in Figure 3.

The patient's current lens parameters are:

OD	Jupiter 15.6	7.10 (47.50) / -5.75 / STD
OS	Jupiter 15.6	7.03 (48.00) / -8.00 / FL1

FIGURE 3: Lens fit imaging with Visante

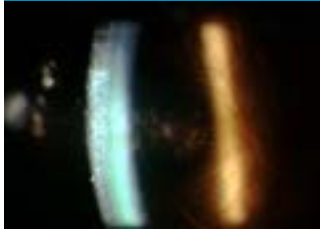


DISCUSSION

Corneal neovascularization (CNV) is ingrowth of blood vessels from the limbal vascular plexus into the cornea. CNV can have a variety of causes: contact lens wear, corneal infection, ocular surface diseases due to inflammation, chemical injury, and limbal stem cell deficiency[2].

CNV can reduce visual acuity when blood vessels invade the cornea, because they induce stromal opacification and surface irregularity which causes higher order aberrations[2]. This can be accompanied by extravasation of fluid and lipids, which leads to corneal edema and lipid keratopathy (see Figure 4).

FIGURE 4: Neovascularization and lipid keratopathy



New or progressing CNV can be of concern if it arises during or as a consequence of scleral lens wear. In severe cases with active inflammation, lens discontinuation is advised. In this patient case, the CNV existed prior to scleral lens wear and remained stable and inactive over time.

Lens adjustments to consider in cases of progressive CNV include[3]:

1. Use of hyper-Dk materials
2. Reduction in lens center thickness
3. Loosening peripheral curves (if lens too tight)
4. Increasing limbal clearance (if insufficient)

CONCLUSION

Patients with a history of phlyctenular keratoconjunctivitis and pediatric blepharokeratoconjunctivitis with residual corneal scarring and neovascularization can successfully wear scleral lenses to improve vision.

Close monitoring of these patients to ensure they are compliant with lid hygiene and ocular surface treatments can be instrumental in their success and in the prevention of inflammatory complications.

Periodic (frequency may be dictated by comorbidities) assessment of scleral lenses can allow for changes to be made to improve fit and prevent complications.

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HEART OF AMERICA

7 ICO PRESENTATIONS

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Incomplete Homonymous Hemianopia and Seizures Secondary to Occipital Lobe Arteriovenous Malformation

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INTRODUCTION

Arteriovenous malformations are an important consideration in the differential diagnosis of patients presenting with homonymous visual field defects and or seizures. This case demonstrates the clinical features of an occipital lobe arteriovenous malformation including the clinical presentation, patient symptoms, diagnostic studies, and management.

CLINICAL FINDINGS

44yo CM presents complaining of difficulty seeing down and to the right

Medical History

Epilepsy (managed with Tegretol)

Clinical Exam:

BCVA: 20/20 OD, 20/20 OS, 20/20 OU

Pupil Testing: PERRL (-) APD

EOM: FROM with end-gaze nystagmus (owing to Tegretol use)

CVF: OD: temporal constriction inferior > superior

OS: nasal constriction inferior > superior

Anterior segment and posterior segment exams: unremarkable

Imaging:

HVF 24-2 size III: incomplete right homonymous hemianopia denser below the midline

MRI of brain: Left occipital lobe arteriovenous malformation superior to the calcarine fissure

DIAGNOSIS AND DISCUSSION

Patients presenting with homonymous visual field defects (VFD) accompanied by seizures or headaches should be evaluated for OL-AVM. It has been reported that up to 57% of patient with an OL-AVM will present with homonymous VFD and / or headache, and 29% with seizures. Headache is the initial symptom in 14% of patients, described as "throbbing" ipsilateral the AVM with scintillating scotomas contralateral. No direct correlation has been found between the size or location of the AVM with the severity of the VFD.

MANAGEMENT

Treatment of an arteriovenous malformation, including resection, radiosurgery, embolism, or observation, is warranted only if the risk of iatrogenic visual field loss, hemorrhage, or death is minimal. It is possible that treatment can worsen an existing VFD, or cause of a new VFD, therefore significantly impacting the patient's quality of life. In this case, treatment was deferred due to high risk for worsening VFD.

FIGURE 1: HVF 24-2 Size III, incomplete right homonymous hemianopia denser below the midline

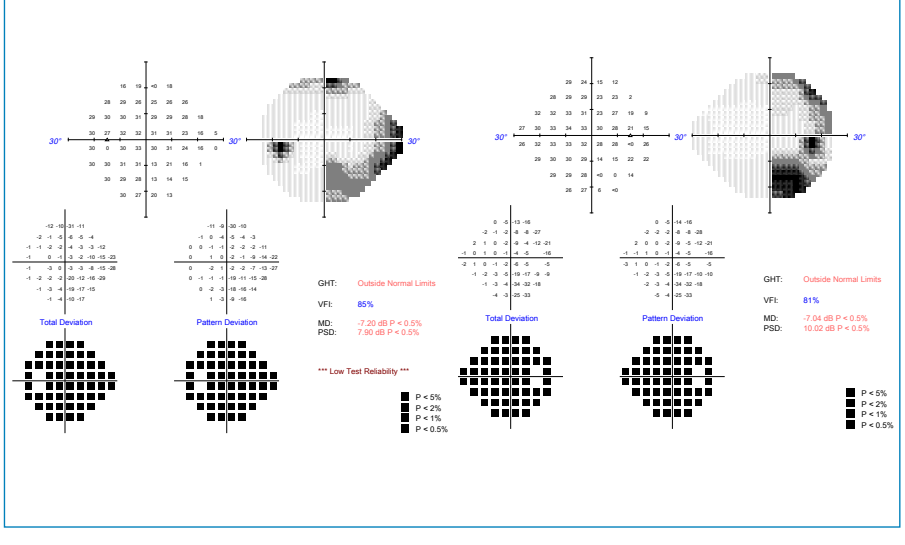
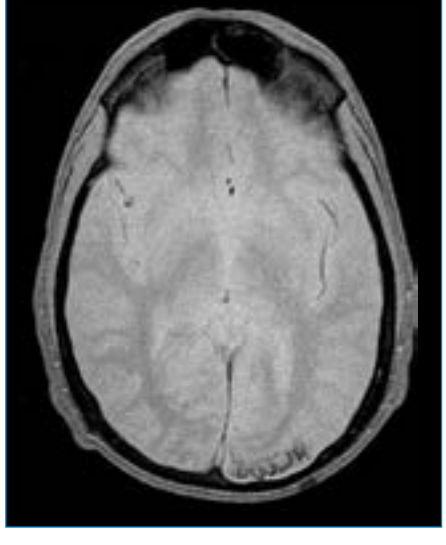


FIGURE 2: MRI, left OL-AVM superior to the calcarine fissure



CONCLUSION

Patients presenting with homonymous visual field defects accompanied by seizures or headaches should always be worked up for possible AVM with high suspicion for the occipital lobe. AVM's are a potentially fatal condition and immediate testing and frequent evaluations are necessary. Appropriate work-up includes visual field testing as well as an MRI of the brain. If an OL-AVM is identified, treatment may be considered if risk of iatrogenic field loss or hemorrhage is minimal. In this case, an OL-AVM was determined to be the cause for his frequent seizures, as well as the homonymous visual field defect; however, treatment was deferred due to high risk for worsening VFD.

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Navigating Denial in A Recently Acquired Hemianopic Patient

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PURPOSE

Prism can play an integral part in vision rehabilitation. Whether temporary or permanent, the functional enhancements provided by prism can be significant for a wide array of patients. With that said, training and fitting of prism is not always and easy process. It can require multiple fittings and multiple visits before benefits are realized. In the case of stroke and TBI patients, struggling to accept and adjust to their newfound impairment is not uncommon. Climbing these walls of neglect and denial can be just as vital as fitting the prism itself. As such, patience and understanding are essential facets in successful prism fits.

CASE HISTORY

70-year old African American female presents for prism fit and evaluation six months after acquiring a right sided homonymous hemianopsia due to stroke. Patient would like to be able to use all of her vision despite acknowledging the right side of her vision is gone. Previous Peli and Fresnel prism fits were unsuccessful four months prior, as the patient noticed visual field expansion but could not adapt and accept. Occupational therapy session two months later reveals incomplete right sided neglect on clock drawing test. However, good potential to achieve visual goals was found and prism re-fit was recommended. Vision stable. No other ocular or visual complaints. Medical history remarkable for diabetes, hypertension, and atrial fibrillation. Patient taking atorvastatin, carvedilol, Coumadin, furosemide, lyrica, and metformin. Allergy to tramadol.

FIGURE 1: Right eye Humphrey visual field revealing complete temporal defect correlating to patient's right homonymous hemianopia.

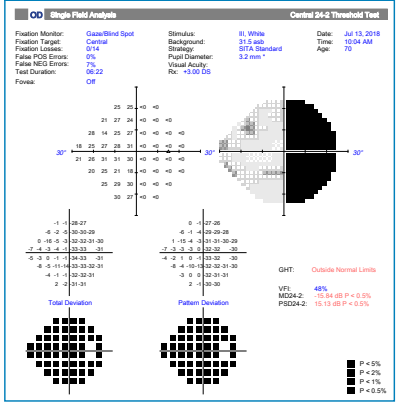

FIGURE 2: Left eye Humphrey visual field revealing complete nasal defect correlating to patient's right homonymous hemianopia.

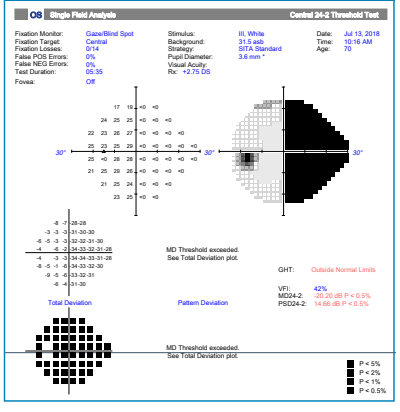

FIGURE 3: Fresnel prism display.

CASE FINDINGS

Best corrected visual acuity of 20/40 in both eyes. Confrontation visual fields reveal right-sided homonymous hemianopia. Other entrance tests unremarkable. Ocular health unremarkable. Attempted Peli prism over the right eye, and yolked prism glasses. Patient unable to appreciate visual field expansion with Eli Peli prism. Patient noticed improvement in visual field with yolked prism glasses, but did not feel they helped improve her ability to scan, track, and move. Patient wants to retry when her new glasses prescription comes in as she thinks seeing clear will help her appreciate the prism. Will re-attempt prism fit in 2 months after patient picks up new glasses prescription.

FOLLOW–UP #1

Patient did not show, suffered a second stroke on her left side.

FOLLOW–UP #2

Patient 2 months recovered since most recent stroke. Patient is more motivated to try prism now, vision and visual field stable. Vision, entrance testing, and ocular health stable. Attempted Peli prism fit over the right eye, unsuccessful. However, patient able to appreciate visual field enhancement with 40 diopter Fresnel stick-on sector prism over right eye. Fresnel sector prism fit over glasses prescription and dispensed.

CONCLUSIONS

Accepting the damage wrought by an ischemic or traumatic event can be difficult. This patient had a stroke and has been struggling to fully accept the visual changes associated. Despite previous failures, slight progressions can occur. As such, it is essential to continue working with these patients to monitor their improvement via corrective lenses, prism fitting, or other devices, as they accept and combat the limitations that stand in their way.

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Supraclavicular Lymphadenopathy Secondary to Metastatic Lung Carcinoma Presenting as Horner Syndrome

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INTRODUCTION

Horner's syndrome occurs when there is damage along the oculosympathetic pathway. Etiologies of this rare condition are widespread given the extensive course of the fibers through the head, chest and neck. Prompt imaging and accurate diagnosis are essential in patients with an acquired Horner syndrome.

CASE PRESENTATION

A 62 yo AA female presented to the urgent care clinic with a complaint of "smaller left eye" x 2 weeks with intermittent HA on the left side. Medical history was significant for RA and osteoarthritis. Patient had no history of trauma and was a smoker. Patient's visual acuity was 20/20 OD, OS. Both pupils reacted to light with no APD.

PERTINENT FINDINGS

Examination revealed a 3 mm ptosis OS with anisocoria OD>OS, greater in dim illumination (FIGURE 1 & TABLE 1). Her ptosis improved and reverse anisocoria occurred after instillation of apraclonidine, confirming damage to the oculosympathetic pathway (FIGURE 2 & TABLE 2).

Next day chest X-Ray (FIGURE 3), CTA neck (FIGURE 4) and chest CT (FIGURE 5) revealed left lobe lung carcinoma with metastatic disease in the mediastinum. Metastasis to the left supraclavicular lymph nodes was the etiology of the patient's clinical pre-ganglionic Horner syndrome. MRI (FIGURE 6) showed several enhancing intracranial lesions indicative of metastasis to the brain.

FIGURE 1: Ptosis OS

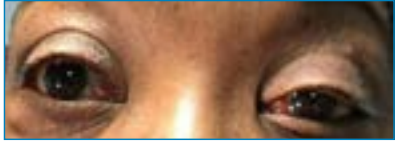


TABLE 1: Before Apraclonidine

	OD	OS
Pupil Size (Bright)	2 mm	1.5 mm
Pupil Size (Dim)	4 mm	3 mm
Adnexa	MRD1: 4 mm MRD2: 5 mm MFD: 7 mm	MRD1: 1 mm MRD2: 5 mm MFD: 9 mm

FIGURE 2: Ptosis improved and reverse anisocoria after apraclonidine

TABLE 2: After Apraclonidine

	OD	OS
Pupil size (Bright)	2 mm	3 mm
Pupil size (Dim)	4 mm	5 mm

FIGURE 3: Chest X-Ray – First visualization of mass within left lung

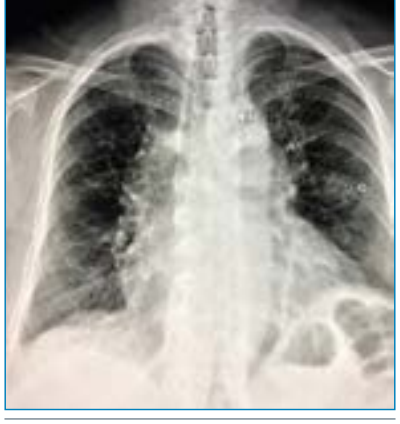


FIGURE 4: CTA neck – confluent lymphadenopathy in left supraclavicular region

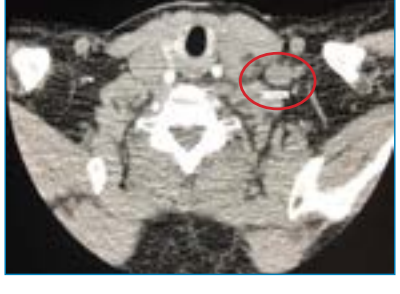


FIGURE 5: Chest CT – Further characterization of left upper lobe nodule

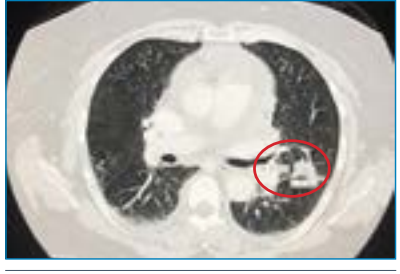
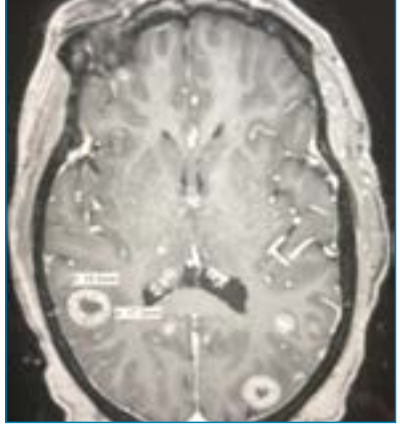


FIGURE 6: MRI – Bilateral peripherally enhancing lesions indicative of metastasis



DIAGNOSIS & DISCUSSION

This case demonstrates a patient with metastatic lung carcinoma whose initial presenting sign was an acquired Horner syndrome. Imaging revealed a pre-ganglionic lesion caused by lymphadenopathy in the neck. Imaging from the sternum to the head is necessary in an acquired Horner's to rule out malignant underlying etiologies. Pre-ganglionic Horner's has a high association with pulmonary malignancy, with Pancoast tumor being the most classical example. Lymphadenopathy should be included in differential diagnosis. This patient received radiation and chemotherapy for treatment.

CONCLUSION

Acquired Horner syndrome can be the presenting sign of life-threatening pathology in the head, chest, and neck. Careful history, clinical exam, and proper imaging studies are essential to diagnose the syndrome, help localize the lesion, and determine proper treatment for the underlying etiology.

REFERENCES

Available upon request

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Asymptomatic Presentation of Late Onset Coat's Disease

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BACKGROUND

Coat's Disease is a rare idiopathic condition involving typically the temporal blood vessels of the retina. These telangiectatic vessels become dilated and leaky causing retinal exudation which can lead to complications such as retinal detachments. The typical onset age of Coat's is between 5-10 years, most commonly in males. These cases usually present with the more severe form with complaints such as leukocoria and strabismus. Later onset or adult onset Coat's disease are less severe upon presentation and typically diagnosed due to complaints of decreased VA or through routine ophthalmic exams.

PRESENTATION

17-year-old Asian male presents with blurry vision without correction worse OD. Reports good acuity with current SRx. Denies any double vision, flashes, floaters, or recent changes in vision. Denies any known history of hereditary disorders.

EXAM FINDINGS

Entering VA were 20/20 OD, OS. Entrance testing and anterior segment were within normal limits. Posterior segment revealed mild vascular tortuosity OU. OD showed ring of exudates superior temporal OD surrounding area of scattered hemorrhage, "light bulb aneurysms", and telangiectatic vessels. OCT was performed on the patient demonstrated areas of edema superior temporal with intra-retinal hyper-reflective exudates. OCT raster through area of macroaneurysm exposed significant intra-retinal edema and retinal thickening. OCT A revealed retinal arterial aneurysms with dilated tortuous vessels in the superficial layer of the retina.

FIGURE 1A, 1B: Posterior pole OD, OS

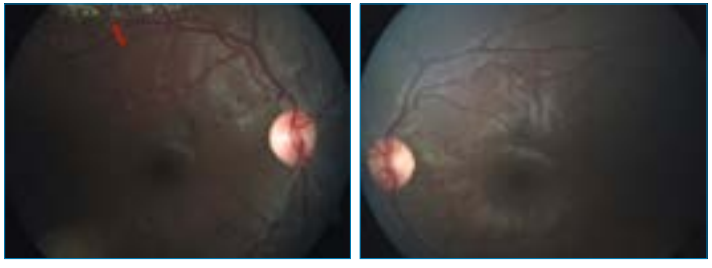


FIGURE 1C: Region of circular ring of exudates surrounding bulb like macroaneurysm and retinal telangiectasia

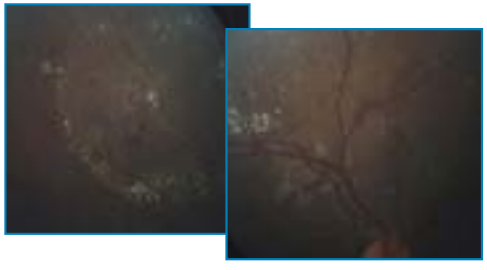


FIGURE 2: OCT A OD superficial dilated tortuous vessels, retinal telangiectasia, and intraretinal edema

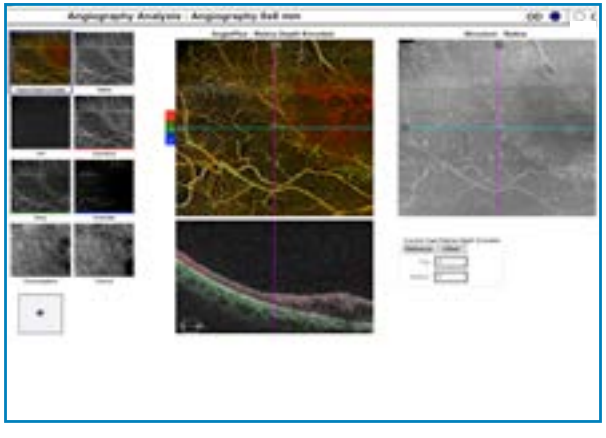
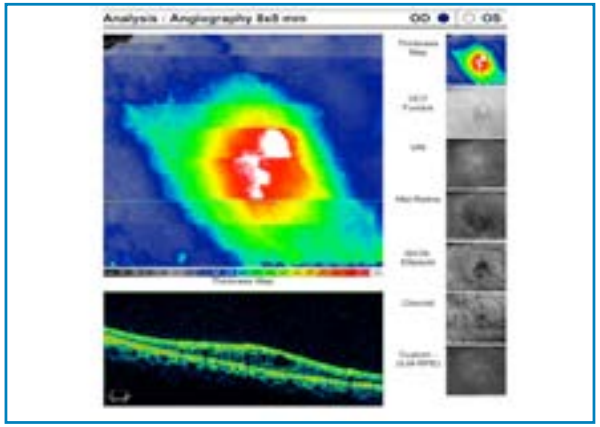


FIGURE 3: OCT A OD thickness map with significant retinal thickening within region of exudate



DIAGNOSIS AND DISCUSSION

The diagnosis of Coat's disease in our patient is based on the clinical presentation. Based on the Sheild's Classification for staging, our patient falls under Stage 2A of Coat's disease; demonstrating localized region of extrafoveal exudation as well as telangiectasia. Wide field fluorescence angiography can be considered in the future follow up appointments to check for leakage in the involved eye as well as to check for presence of leakage in the fellow eye. Newer studies have shown that small areas of leakage could be seen in the fellow eye. Indicating the disease is a very asymmetrical bilateral condition and not unilateral as once thought.

The reason that our patient shows a more atypical presentation of the condition is due to his age. The average age of onset for Coat's disease is approximately 5 years old. Whereas our patient is much older. In addition, the disease presentation is very localized compared to typical cases of Coat's disease.

CONCLUSION

Treatment involves laser coagulation, Anti-VEGF, intravitreal triamcinolone, as well as cryotherapy to target peripheral retinal telangiectasia. Newer methods include a combination of Anti-VEGF therapy as well as laser coagulation to target regions of telangiectasia. This has shown to have better outcomes in stopping progression and preventing recurrences. In later stages of the disease in which retinal detachment is present, vitreal-retinal surgery is required to repair the detached retina.

REFERENCES

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Disseminated Chorioretinal Atrophy Leading to Diagnosis of Inactive Syphilitic Chorioretinitis

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INTRODUCTION

The incidence of syphilis worldwide is 11 million new cases per year on average. Infection is transmitted via Treponema pallidum bacteria through mucous membranes. There are four stages of syphilis: primary, secondary, tertiary and latent. Ocular involvement may occur at any stage of infection, with non-granulomatous anterior uveitis being the most common ophthalmic manifestation. This case demonstrates an unusual finding of latent syphilitic chorioretinitis.

CLINICAL FINDINGS

61-year-old African American male was referred to an optometry neurology clinic for suspected toxic-nutritional optic atrophy OU. A gradual subjective clouding of vision over the past five years was reported. Medical history was significant for HTN, high cholesterol, alcoholism and depression.

	OD	OS
BCVA	20/60	20/300
PH	NI	NI

IMAGE 1: Cirrus OCT Ganglion Cell OU

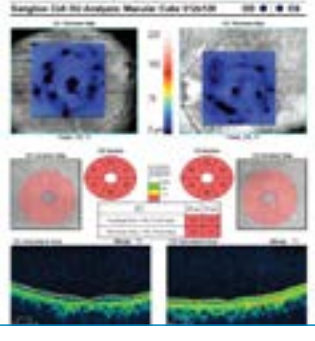


IMAGE 2A: Fundus Photo of the Right Eye

IMAGE 2B: Fundus Photo of the Left Eye

IMAGE 3A: HVF FAST PAC of the Right Eye

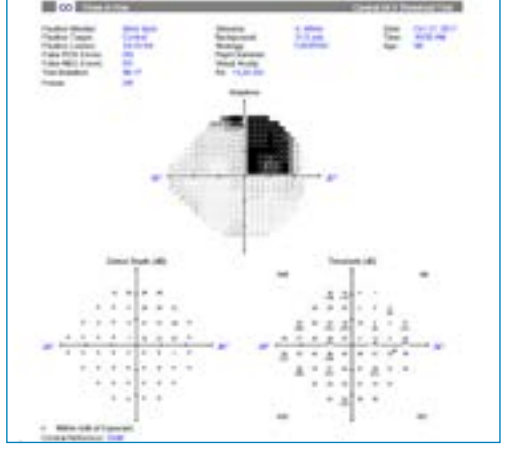
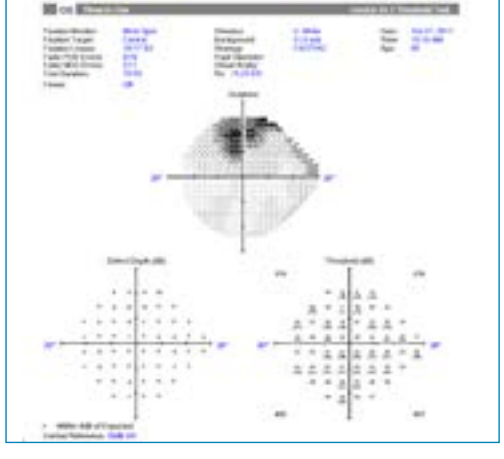


IMAGE 3B: HVF FAST PAC of the Left Eye



Anterior and posterior chamber were negative for cells, flare or active vitritis. Posterior fundus revealed diffuse disseminated chorioretinal atrophy with mottling and optic nerve pallor in both eyes. HVF showed a superior temporal defect OD and a moderate superior defect OS. Cirrus OCT had scattered RNFL thinning inferiorly OD, superior and inferior OS with dense GCC loss OU. Lab testing was requested and FTA-Abs results were positive. A lumbar puncture was ordered as a result to rule out neurosyphilis.

DIAGNOSIS AND DISCUSSION

On average, about 1% of syphilis cases present with ocular involvement. In early or late ocular syphilis, stromal keratitis, scleritis, iridocyclitis, papilledema, retinal and choroidal inflammation can be seen. Once inactive, patients will present with corneal scarring, chorioretinal pigmentation and atrophy, vascular narrowing or occlusion and optic atrophy. Suspicion should be confirmed with treponemal and/or non-treponemal titers. Tertiary syphilis, however, will have a falsely negative RPR/VDRL titer in 30% of cases. In the case of ocular involvement, lumbar punctures should also be performed to rule out neurosyphilis.

CONCLUSION

Since 2013, the CDC has reported a 76% increase in syphilitic disease, which has thought to be in correlation with the rise in HIV. Early treatment for active ocular syphilitic infection is imperative. As clinicians, it is essential to be aware of active or inactive presentation to prevent further visual deterioration and for early detection of neurosyphilis.

REFERENCES

Upon request.

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Atypical Endophthalmitis after Cataract Surgery with Intracameral Moxifloxacin Injection

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INTRODUCTION

Endophthalmitis is a rare yet visually devastating complication of intraocular surgery. Due to advances in surgical procedures the incidence of endophthalmitis is less than 1%. Despite these advances, complications can still arise and require immediate identification and referral.

PRESENTATION

88-year-old AF reported sudden onset "blacked out" vision without pain 8 days s/p cataract extraction with 0.8 cc moxifloxacin injection OS. She was seen the day prior for her 1 week PO exam. BCVA was 20/50 OD, OS and exam findings were remarkable for 2-3+ cell OS. Current drop schedule included prednisolone acetate TID and ketorolac QID.

EXAM RESULTS

Entering BCVA on our examination was 20/50 OD and HM OS. Biomicroscopy revealed 4+ cell, fibrin tissue in the anterior chamber with a 0.75mm hypopyon. The eye was not injected and the patient denied ocular pain. Patient was referred to on-call ophthalmology where a vitreous tap was performed. She received intravitreal vancomycin and ceftazidime OS. Vitreous tap revealed cultures of staphylococcus epidermis. Patient was given oral moxifloxacin and brought in for retinal consult.

FIGURE 1: External slit lamp photo showing new onset hypopyon, OS

Differential Diagnosis	Symptoms	Clinical Signs	Onset
Infectious Endophthalmitis	• **Vision loss** • Ocular pain • Red Eye	• **Media haze** • **Fibrin** • **Positive vitreous tap**	• **1-2 weeks post-surgery**
Sterile Endophthalmitis	• Vision loss • Ocular pain	• AC reaction • **Dense vitreous opacity** • **Hypopyon rare**	• 1-2 days post intravitreal injection
Toxic Anterior Segment Syndrome	• Vision loss • Ocular pain	• **Limbus to limbus edema** • **Elevated IOP** • Severe AC reaction • Hypopyon	• Within 24 hours post-surgery
Lens Induced Uveitis	• Vision loss • Ocular pain	• **Elevated IOP** • **AC reaction with mutton fat KPS** • Hypopyon • **Iris chafing against IOL** • **Visible lens remnants**	• Within 24 hours post-surgery, although can be delayed

FIGURE 2: Table featuring unique features of differential diagnosis in bold print

CONCLUSION

Due to acute drop in vision from 20/50 to HM within 24 hours warranted prompt referral. The lack of symptoms of pain and injection made the initial diagnosis of infectious endophthalmitis difficult. Other etiologies such as sterile endophthalmitis, toxic anterior segment syndrome and lens induced uveitis must be considered. Although they all have their unique clinical findings vitreous tap must be performed in all cases of suspected endophthalmitis to ensure proper treatment. Endophthalmitis is a complication of cataract surgery with an estimated prevalence of 0.07%. Intracameral moxifloxacin injection reduces this complication to 0.02%. Despite prophylaxis, postoperative infection is still possible and requires prompt treatment. Reduced acuity is the presenting sign in 94% of endophthalmitis cases. Pain and conjunctival injection are only present in 82% and 75% of cases respectively. Optometrist must be aware of the acute symptoms of endophthalmitis to provide prompt referral.

REFERENCES

Upon request

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Gas Permeable Lens Correction of Monocular Diplopia Following Phototherapeutic Keratectomy for Granular Dystrophy

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INTRODUCTION

Corneal granular dystrophy is an autosomal dominant stromal dystrophy that can cause glare and reduced vision. The condition and symptoms can recur even after surgical intervention with phototherapeutic keratectomy (PTK). Leave several extra sentences here for additional info. xxxxxxxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

CASE PRESENTATION

A 56-year-old male presented with complaints of monocular diplopia OD. He had a 26-year history of bilateral corneal granular dystrophy and was asymptomatic until three years ago when he experienced progressive blurry vision. As a result, he pursued PTK. Since the procedure, he has noted constant double vision and shadowing OD that is not improved with spectacles. Medical history was positive for colon cancer and medication-controlled diabetes.

Entering visual acuity with spectacles was OD 20/40-1 (PH 20/20) and OS 20/20-2. Entrance testing was normal. Slit lamp examination revealed central white granular opacities, OS>OD as seen in the figure 1. Staining shown in figure 2. Figure 3 shows epithelial origin. Topography was performed prior to lens fitting since in figure 4. xxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxv xxxxxxxxxxxxxxxxxxxxxxxxxxxx xxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxx

A corneal gas-permeable (GP) lens was trialed OD. Vision improved to 20/25+ with over-refraction. The patient reported resolution of the diplopia. A custom corneal GP lens was designed: BC 7.80; OAD 9.5; OZ 8.3; power +0.50sph; SCR-W 9.0/0.3; PCR 10.5/0.3.

The patient achieved 20/20 OD at the dispense. There was no diplopia or residual over-refraction. After successful insertion, removal, and lens care training in-office, the lens was dispensed.

FIGURE 1: A shows dystrophy OD and B shows dystrophy OS

FIGURE 1a: OD **FIGURE 1b: OS**

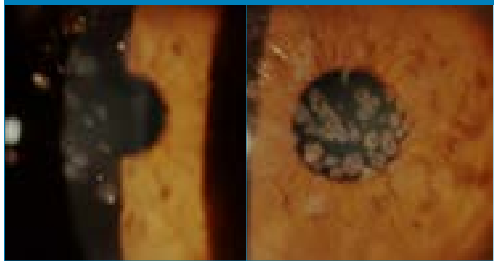

FIGURE 2: shows staining OS

DISCUSSION

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FIGURE 3: Endothelial pigment and edema OS

FIGURE 3a:

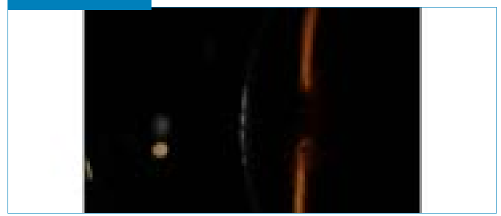


FIGURE 3b:

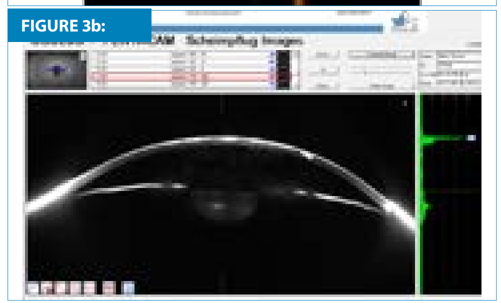
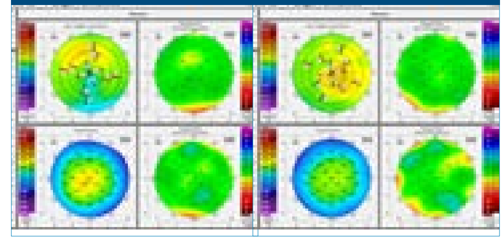


FIGURE 4: A shows OD topo and b shows OS topo



CONCLUSION

GP lenses can be successful in patients with granular dystrophy. The lenses can be used to improve both best-corrected vision and symptoms of diplopia secondary to the corneal irregularity, even after surgical intervention has failed.

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REFENCES

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2.

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IOA CONVENTION

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Post–operative considerations in cataract extraction with Kahook dual blade goniotomy

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BACKGROUND

Minimally invasive glaucoma surgery (MIGS) procedures are becoming more common and when combined with cataract extraction (CE), allow surgeons the ability to address more than one disease entity simultaneously. Initial post-operative care does not significantly vary whether a patient has undergone straight CE or CE+MIGS, but it is prudent to be aware of procedural differences.

CASE REPORT

A 72 year old male with both normotensive glaucoma and moderate cataracts was scheduled for cataract surgery with Kahook dual blade (KDB) goniotomy OU. Prior to the first surgery he neglected to suspend use of systemic Plavix and the decision was made to perform straight cataract extraction. The second eye did subsequently have the combined procedure. Post-operative care on the first eye was unremarkable. Post-operative care on the second (MIGS) eye necessitated treatment of high IOP on day 1 and day 7, extended inflammatory response, and monitoring of potential mild hyphema. None of these complications should be unexpected in such combined procedure cases, as the Kahook blade itself may lead to additional intra-operative bleeding and result in slower resolution of inflammation. Final visual acuity was ultimately improved in each eye, and both had successful surgical outcomes. The patient is still being monitored for glaucoma. IOP was two points lower in the MIGS eye two months post-operatively, but additional time and subsequent testing is still needed to determine whether treatment or medications should be altered based on IOP control in either eye.

CONCLUSION

Knowing how to observe and manage these MIGS cases, and the Kahook here specifically, allows the clinician to feel more confident throughout the post-operative period and provide assurance to the patient.

DISCUSSION

Given the currently aging American population, and the increasing number of patients with ocular and systemic comorbidities, modern optometric practice is becoming more cognizant of the benefits of early intervention in conditions such as glaucoma and cataracts. Since 2017 most Medicare contractors no longer have a universal visual acuity requirement prior to cataract surgery. Instead a lifestyle complaint is the necessary documentation, or in some cases, addressing the need for a clear media in order to evaluate retinal or nerve disease.

Treatment of glaucoma has historically progressed through the regimen of topical medications, selective laser trabeculoplasty (SLT), and incisional surgery such as trabeculectomy or tube shunt. With the advent of minimally invasive glaucoma surgery (MIGS) techniques, another set of options is available. MIGS procedures are typically performed from inside the eye, concurrent with, and through the same incisions created during cataract surgery.

Minimally invasive surgical procedures
MIGS
iStent and iStent inject
XEN Gel stent
Hydrus microstent
Trabectome
Kahook dual blade
GATT
Goniotomy
Canaloplasty
Endocyclophotocoagulation
Micropulse

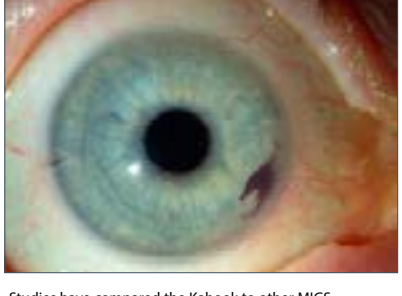
KDB

The Kahook Dual Blade has been available in the US since 2015 and differs from other trabeculectomy techniques such as GATT and trabectome in that it is designed to remove trabecular meshwork as completely as possible without surrounding tissue damage, causing less fibrosis and ensuring longer efficacy. The tip of this disposable blade tapers sharply in order to cleanly and smoothly advance, creating a parallel incision and precisely excising a strip of TM. Three to five clock hours of tissue are removed; no device is implanted.

FIGURE 1
Image from World Glaucoma Association

Performed in combination with cataract extraction, the post-operative course may not vary from a standard CE antibiotic, steroid, and NSAID regimen. The two most commonly seen complications are increased IOP and hyphema. Any IOP spike may be treated topically and is transient. Intraoperative hyphema has been noted in up to 40% of patients and residual blood in the anterior chamber may remain for the first week after surgery. Other issues such as corneal edema or rebound inflammation are not specific to the Kahook procedure and are treated accordingly.

FIGURE 2
Mild nasal angle hyphema after MIGS. Image from eyeworld.org



Studies have compared the Kahook to other MIGS techniques and their ability to maintain lower IOP and reduce dependence on topical medications. It has been found to have similar or better results to both the iStent and Trabectome in both areas.

SUMMARY

By encountering a patient who had both straight phaco w/PCIOL OD and phaco w/PCIOL w/Kahook OS, we were able to compare not only the subjective recovery process, but also the post-operative findings and management. VA of 20/60 OD 20/50 OS was improved to 20/40 OD (small macular scar) and 20/25 OS. With a history of moderate glaucoma, the patient was on brimonidine bid OU and latanoprost qhs OU. Average IOP was mid-high teens prior to surgery and mid-low teens after. Medications had not been altered as of 3 months post-op. The patient reported a similar postoperative course of subjective visual improvement and did not report any notable difference in the recovery periods. From the provider's perspective the follow up care did not include any significant or unexpected events, with IOP spike, inflammation, and hyphema all resolving with standard treatment.

Optometrists who are comanaging cataract/MIGS patients should feel confident that the Kahook dual blade procedure is a viable option with likelihood of additional IOP lowering vs CE alone.

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MINNESOTA OA

2 ICO PRESENTATION

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Sterile Stromal Thinning – Care and Management

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ABSTRACT

A nearly complete epithelial defect results in diffuse sterile stromal thinning. A comprehensive look at rebuilding stromal thickness followed by a treatment place including scleral lenses to maximize visual potential for a healing cornea.

CASE REPORT

A 48 year old Caucasian female suffering from chornic dry eye presents regularly to the PineCone Vision Center. Attempts to relieve symptoms with artificial tears, Bruder mask, Xiidra and pulse Pred Forte therapy only marginally improved clinic appearance as well as DEQ symptom score. The patient was educated on further treatment options including autologous serum tears, True Tear and amniotic membrane therapy. In order to relieve signs and symptoms this patient pursued treatment via a sutureless dehydrated amniotic membrane, which was placed OD without complication. Onset of severe pain caused patient to return to clinic the following day, the not yet dissolved amniotic membrane was removed. This revealed an epithelial defect and secondary sterile ulceration. This case report covers the subsequent treatment to rebuild corneal thickness and scleral lens fit to correct irregular astigmatism.

EXAM DATA

Expansion on Table 1:

- Visit 1 10/31/18: Patient presents to clinic for amniotic membrane treatment 10/31/18 with consistent signs and symptoms, started on Gatifloxacin QID OD and Pred Forte QID OD. Successful placement without complication with instruction to return for follow up in 5 days. Previously known pachymetry: 506um at pupil center and 503um at thinnest local.

- Visit 2 11/1/18: Patient presents to clinic in severe pain, light perception visual acuity. Non-dissolved Amniotic membrane removed, bandage contact lens placed. Patient was instructed to continue Gatifloxacin QID OD, Pred Forte QID OD.

- Visit 5 11/13/18: Improved acuity noted, pachymetry showed 400um at pupil center and 280um at thinnest local. Bandage contact lens removed. Thinning and haze appreciated. Added Durezol q2hr OD, Vitamin C 1000-1500mg PO QD.
- Visit 8 11/30/18: Valley Contax Custom Stable Elite scleral lens fit, ordered. Base Curve: 8.23, Diameter: 15.80. Continuously improved pachymetry 462um at pupil center and 404um at thinnest local. Decrease Durezol TID OD, continue Vitamin C 1000-1500mg PO QD.

- Visit 11 01/15/19: Lenses fitting well. Slit lamp exam only remarkable for corneal thinning OD, pachymetry 454um at pupil center and 438um at thinnest local. Discontinued all drops, Vitamin C 1000-1500mg PO QD.

FIGURES 1-4: TOPOGRAPHYS THROUGH KEY EXAMS

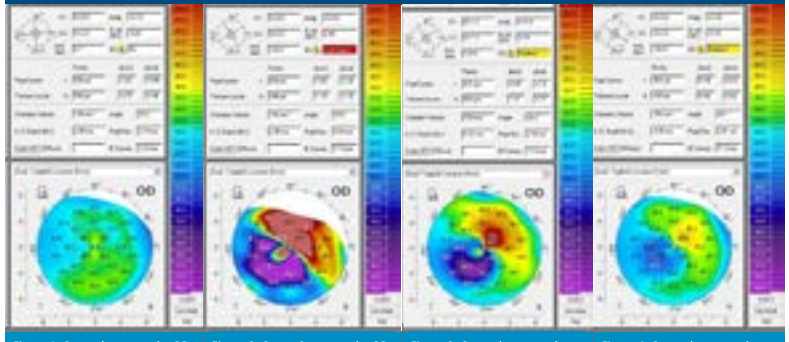

Figure 1. Corneal topography OD at a CEE 08/31/18 prior to corneal abrasion and stromal thinning. Pachymetry at pupil center 506um, thinnest 503um with mild regular astigmatism.

Figure 2: Corneal topography OD 11/13/18 on Visit 5. Pachymetry at pupil center 400um, thinnest 280um with irregular astigmatism.

Figure 3: Corneal topography OD taken 11/30/18 at visit 8. Pachymetry improved at pupil center to 431um, thinnest improved to 404um. Improved irregular astigmatism.

Figure 4: Corneal topography taken 1/15/19 at visit 11. Pachymetry at pupil center improved to 454um, thinnest improved to 438um. Improved irregular astigmatism.

Exam	Visual Acuity OD	Cornea	Pachymetry	Exam notes, treatment
Visit 1 10/31/18	20/40	1+ SPK	506/503	Amniotic Membrane, Pred Forte QID, Gatifloxacin QID
Visit 2 11/1/18	LP	80% abrasion, 2+ Descemet's folds, corneal edema	n/a	Did not remove bandage contact lens due to healing epithelial cells. Pred Forte QID, Gatifloxacin QID
Visit 5 11/13/18	20/125 PH 20/60	Thinning, haze, ectasia	400/280	Bandage contact lens removed. Thinning first noted. Discontinue Pred Forte, begin Durezol q2hr OD, added Vitamin C 1000-1500mh PO QID
Visit 8 11/30/18	20/200 PH 20/100	Improved thinning, haze	462/404	Scleral lens fit, ordered Valley Contax. Improved pachymetry. Decrease Durezol TID OD, continue vitamin C 1000-1500mg PO QD.
Visit 11 1/15/18	20/20	thinning	454/438	Improved appearance, successful scleral fit. Discontinue all drops, continue vitamin C

Table 1. Exam details from key points of the treatment strategy. The pachymetry numbers indicate pupil center corneal thickness in microns/thinnest local corneal thickness in microns.

FIGURES 5-6: TOPOGRAPHYS THROUGH KEY EXAMS

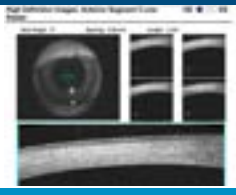

Figure 5: Anterior segment OCT OD on 11/13/18 visit 5 showing central stromal thinning, haze.

Figure 6: Anterior segment camera photo OD taken 11/13/18 at visit 4 showing central haze where center of the corneal abrasion occurred, reducing visual acuity to 20/400 PHNI OD.

DISCUSSION

After initial insult and treatment the corneal epithelium healed properly, but the etiology of the secondary sterile stromal thinning is unknown. Regardless of causation the results show a comprehensive view of rebuilding corneal thickness. Reducing stromal haze and inflammation with the use of Pred Acetate can improve visual potential but may contribute to delayed corneal thinning[1]. In this case the application of Pred Acetate was necessary to reduce corneal haze but may have contributed to later thinning. Another treatment, ascorbic acid has been proven to travel from the blood stream through the ciliary body epithelium and into the aqueous humor where it can be transported to corneal stroma via endothelium pumps[2]. Once in the corneal stroma ascorbic acid activates stromal keratocytes, resulting in increased collagen production and thus increased corneal thickness[3]. The highest density of corneal keratocytes resides in the middle and posterior stroma[4] in this case directly improving corneal thickness.

A diagnostic differential was an alkali burn. According to Davis et al. topical steroid use in the treatment of alkali burns in conjunction with topical vitamin C does not contribute to corneoscleral melting[5]. This rules out the possibility of Pred Acetate contributing to the sterile stromal thinning.

Further research indicates considering use of Doxycycline, citrate drops, 1% medroxyprogesterone and platelet rich plasma eye drops in addition to antibiotics, cycloplegic agents and steroid drops to assist in promoting stromal thickness after a chemical injury[6].

The vault over the cornea attributed to a successful scleral lens fit assists in stable vision through healing as well as maintaining a tear film over a traditionally dry cornea. To normalize vision and reduce symptoms of irregular astigmatism this patient was fit in Valley Contax scleral monovision lenses. After two months of treatment this patient recovered to a visual acuity improved from reduced 20/30 caused by central superficial puntate keratitis to 20/20 in scleral lenses. This patient is now pain free with a higher quality vision. The PineCone Vision Center now considers adding autologous serum OU and restarting Xiidra OU to continue treating this patient's dry eye.

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Retrobulbar Optic Neuritis and Multiple Sclerosis

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BACKGROUND

Retrobulbar optic neuritis is the inflammation of the optic nerve between the back of the eye and the brain. It has a predilection for females and often presents at 20-40 years of age. Optic neuritis has been linked to multiple sclerosis (MS). Half of MS patients present with ocular findings as the initial manifestation of disease.

CASE

Patient ML is a 34 year old Caucasian male who presented with a complaint of both acute blurred vision and eye pain of the right eye only. Onset was 4 days prior to initial visit and increased in severity until the day prior to initial visit, at which symptoms plateaued in severity. Pain was described as a dull pain radiating posterior to the eye upon eye movement. No pain was noted in primary gaze.

Systemic history includes hypertension and vitamin B12 deficiency. Medication includes lisinopril and monthly vitamin B12 injections. Patient reported a history of Bell's palsy involving the right lower face and left leg and intermittent left hand numbness.

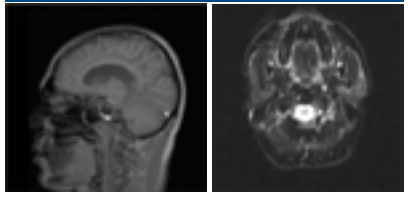
Patient denied any refractive errors or ocular conditions but noted he had an episode of bilateral eye pain associated with blurred vision many years prior.

FIGURE 1: Pertinent Findings Overview

Test	Visit #1: 11/23/2018	Visit #2: 11/29/2018	Visit #3: 12/18/2018	Visit #4: 1/24/2019
DVA sc	OD: 20/60 – PH20/40 OS: 20/20-2 OU: 20/20-2	OD: 20/400 – PH20/100 OS: 20/20-2 OU: 20/20-2	OD: 20/40-3 – PHNI OS: 20/20-2 OU: 20/20-2	OD: 20/20-1 OS: 20/20-2 OU: 20/20-1
Pupils	PERRL (-)RAPD?	PERRL 4+ APD OD	PERRL 1+ APD OD	PERRL (-)APD
EOMs	Full, (+)pain	Full, (+)pain	Full, (-)pain	Full, (-)pain
Red Cap Test	OD: 50% OS: 100%	OD: 30% OS: 100%	OD: 70% OS: 100%	N/A
IOP	18/18 mmHg	16/16 mmHg	12/12 mmHg	12/15 mmHg

Anterior segment showed small stromal scar inferior nasal outside of the visual axis in the right eye. Posterior pole examination showed extorted optic nerves.

FIGURE 2: MRI with and without contrast



Brain MRI with and without contrast showed numerous suspicious T2 FLAIR hyperintensities involving corpus callosum and pericallosal, subcortical, periventricular, and infratentorial white matter. These findings are compatible with a demyelinating process. Enhancement involving the superior left temporal lesion also suggest active demyelination.

Orbital MRI with and without contrast show extraocular muscles, optic chiasm, and optic tracts all within normal limits with normal enhancement. There was mild STIR hyperintensity and enhancement of the canalicular segment of the right optic nerve noted.

FIGURE 3: 24-2 Visual Fields from Visits 1-4

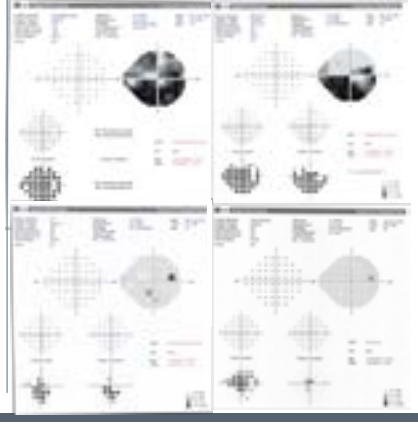


FIGURE 4: Macular OCT

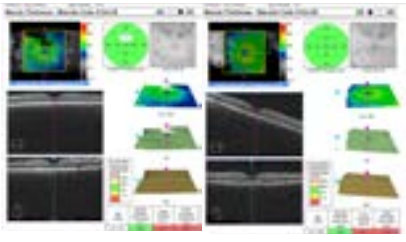


FIGURE 5: Optic Nerve Head OCT

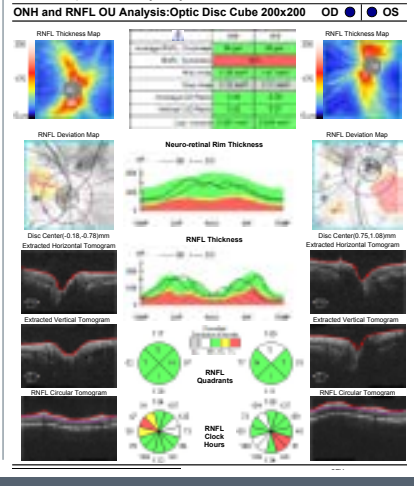


FIGURE 6: ERG

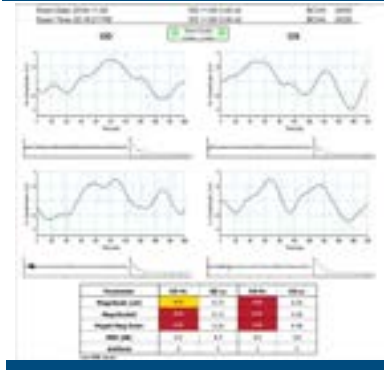


FIGURE 7: VEP

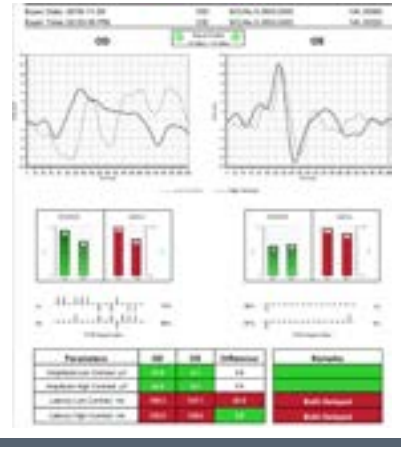
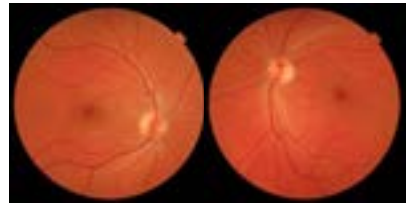


FIGURE 8: Fundus photos showing extortion of OD, OS



NEUROLOGY CONSULTATION

Assessment:
Ophthalmological exam shows decreased vision and APD OD, colour and contrast sensitivity deficit
Neurological exam is benign except for decreased left foot vibration sensation
MRI changes met diagnostic criteria for MS.

Plan:
Check MS mimickers: anticardiolipin, ANA cascade, ENA, Lyme, ACE, ESR, CRP
Check vitamin D levels – want to keep vitamin D levels high in MS patients
Cervical & thoracic spine MRI for potential lesions
Start 5 days of daily ig IV solmedrol
Follow up after MRI to review labs, MRI results, and visual response to treatment

CONCLUSION

MS is one of the most common demyelinating disorders of the central nervous system. Early diagnosis and treatment with disease modifying therapies can delay development of future clinical episodes and overall disease progression. Half of patients present with ocular findings as the initial manifestation of MS. As a patient presents with optic neuritis, it is important to monitor progress of recovery with automated perimetry and to refer patients for a neurology consultation to determine a diagnosis or their risk of MS. Although visual evoked potential (VEP) testing is not normally indicated in classic acute optic neuritis cases, consider VEP testing to help detect optic nerve compromise. In this particular case, VEP testing helped determine that the patient likely had a prior episode of optic neuritis to the left eye which was not affected when he presented to clinic.

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NEUROSCIENCE

1 ICO PRESENTATION

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Budge, Waller, and Bernard: sympathetic control of head structures

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INTRODUCTION

The ciliospinal center of Budge is a commonly used term in the health science world. It represents what would later be called the preganglionic sympathetic neuron cell bodies supplying the dilator pupillae muscle, and by extension over decades of use, other sympathetic targets in the eye. These somata are specifically found in the lateral horn of the first and second thoracic levels of the spinal cord. Subsequently, some of these neuron cell bodies have also been found in the eighth cervical spinal cord level in humans.[1] Two main groups of researchers appear to have been conducting experiments in the 1850's aimed at defining the neural circuitry involved in the autonomic control of structures in the head.

Julius Ludwig Budge

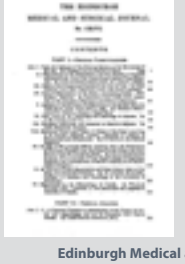
Augustus Volney Waller

Julius Ludwig Budge (1811-1888) did most of his research on the autonomic nervous system in Bonn.[2] During much of this time, Augustus Volney Waller (1816-1870) collaborated with him.[3] In 1839, Waller had discovered in frog tongues the phenomenon that would later be known as wallerian degeneration. In 1851, he moved to Bonn to work with Budge and brought his nerve fiber tracing technique along with him. Working mostly on frogs and anesthetized rabbits, Budge and Waller appeared more interested in the control of the pupil, although they also made observations of vasomotor and other effects.[4] In that same year, Budge and Waller, using Waller's nerve fiber degeneration technique, found that the fibers of the sympathetics to the head had their origin in the spinal cord, specifically from the first and second thoracic segments.[4] They called this region the ciliospinal center. If they sectioned the fibers at their origin, the same autonomic effects in the head were produced as by sectioning the sympathetic chain in the neck. In 1852, Budge and Waller were awarded the Monthyon Prize of the French Academy of Sciences for this work.

Notice on the journal title page the comment signed by C.S. Sherrington, 1894.

Claude Bernard

The other research group, based in Paris, was headed by Claude Bernard (1813-1878).[5] Bernard was a world renowned physiologist who studied under François Magendie and was most famous for his discovery of the glycogenic function of the liver. In his studies of the autonomic control of head structures, he focused mainly on vasomotor control and seemed to only secondarily observe pupillary and other phenomena. Bernard was a vivisectionist, choosing to work mostly on dogs with no anesthesia. In 1852, Bernard was the first to make a complete study of all of the effects of sectioning and stimulating the cervical portion of the sympathetic chain.



Edinburgh Medical and Surgical Journal

In 1853, The Edinburgh Medical and Surgical Journal published a two-part English translation of what we might call a review article that Budge had written in German in 1852.[6-7] In this, he outlined his experimental findings, giving credit to Waller where appropriate. Even though Budge recognized more than a few other researchers for their previous contributions to the field, he did not mention Bernard. Immediately following this article, in the same issue, the editors of the journal chose to publish an article by Bernard.[8] In this article Bernard proceeded to give a timeline showing how he found many of the same findings as Budge and Waller (except for the location of the ciliospinal center) before they did and had described them better.

CONCLUSION

Even though Bernard gave a fuller account of the effects of the sympathetics to the head, it is Budge, with the help of Waller, that has been bestowed the honorific of an eponym. An argument could be made that Waller's name should be included in the eponymous term, since it was his technique that led to the discovery.

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