ILLINOIS COLLEGE OF OPTOMETRY

2018 RESEARCH PRESENTATIONS

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36 ICO PRESENTATIONS

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Change in Mean Ocular Perfusion Pressure from Upright to Trendelenburg Position

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INTRODUCTION

- We are witnessing expanded utilization of inversion bed therapy for lower back pain and sciatica to decompress the spine. Likewise, numerous spine, prostatectomy, and laparoscopic surgeries often involve a 15-45° head-down (Trendelenburg) non-physiologic position for upwards of 4-6 hours duration.
- During head down positioning, the optic disc may have dysfunctional autoregulation with reduced mean ocular perfusion pressure (MOPP), increasing risk of ischemic optic neuropathy or related circulatory insufficiency.
- This prospective study explores the change in MOPP when body position is converted from an upright position to an inverted, head-down/Trendelenburg position for up to 4 minutes. We will investigate factors related to this change, including age, gender, BMI, height, weight, refractive error, ethnicity, blood pressure, pulse, intraocular pressure.

METHODS

- The research cohort consisted of attendees at the American Academy of Optometry meeting in Chicago 2017 who volunteered at the Exhibit Hall Inversion Booth.
- The study was approved by the IRB of the Illinois College of Optometry and all participants signed an informed consent.
- The primary exclusion criterion included cardiac conditions, stroke, current or past spine, head or neck trauma, wt.+300lbs, <4'10" or >6'6", BP ≥ 200/100, and IOP ≥32.
- Blood pressure (BP), pulse, and intraocular pressure (IOP) were measured upright and at a 30-degree, head-down Trendelenburg position at 1-2 minute and 3-4 minute timepoints.
- In lieu of Ophthalmodynamometry for measuring CRA pressure, calculation, calculation of MOPP was obtained for each timepoint using mean (brachial) artery pressure (MAP) = 1/3 x SystolicBP + 2/3 x DiastolicBP.
- 2/3rds of MAP is the correction factor for CRA pressure, so MOPP = 2/3 x MAP – IOP.
- Statistical analysis included pair-wise comparisons and regression analyses, and central tendency data was presented as median (inter-quartile range [IQR]).

FIG. 1
Inversion Booth

TABLE 1
Baseline Characteristics of total sample = 230

TABLE 2
Mean Ocullar Perfusion Pressure Data

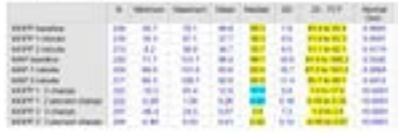


TABLE 3
Factors related to MOPP from baseline to first timepoint after inversion

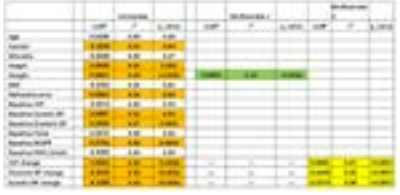
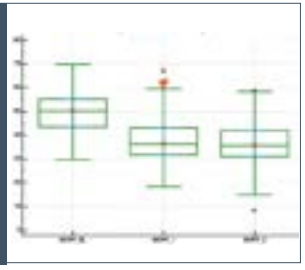


FIG. 2
Boxplot of MOPP at all three timepoints



RESULTS

- N = 230: 99 men (43%) and 131 women (57%), qualified to participate with a median (IQR) age of 31 (26,48); ethnicity was primarily 70.9% Caucasian, 22.6% Asian.
- MOPP decreased by 25% avg (16, 35) [median 12.9mmHg] from baseline to inversion time (IT) 1, but only changed 2% avg (-5, 7) [0.6mmHg] from IT1 to IT2.
- This corresponded with MOPP values (mm Hg) of 50.3 (43.4, 55.4), 36.3 (31.9, 43.3), and 35.7 (31.1, 42.1) at baseline, IT1, and IT2, respectively.
- Comparative: IOVS July 2010: Vol 51 study, MOPP (mmHg): entire cohort upright 50.7
- In regression analyses using demographic and baseline clinical variables, weight was the only independent variable related to percent MOPP change from baseline to IT1 (r^2=0.05, p=0.008).
- No significant impact on MOPP with inversion: age, gender, BMI, height, refractive error, pulse, ethnicity.
- When including variables related to change in IOP and BP from baseline to IT1, % MOPP change was independently related to ↑IOP, ↓DBP, and ↓SBP (total r^2=0.74, p<0.001)

FIG. 3
Distibution of baseline mean ocular perfusion pressure (MOPP)

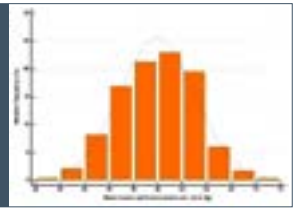
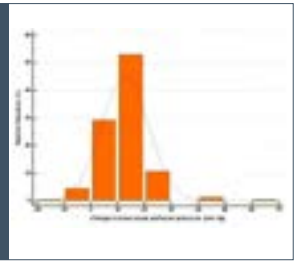


FIG. 4
Distibution of change in mean ocular pressure from baseline to first timepoint after inversion



CONCLUSIONS

- With our generally young and healthy participants, MOPP decreased by 25% from an upright to a 30-degree Trendelenburg position. The magnitude of MOPP change on inversion was clearly due to ↑IOP, 2° to diastolic BP↓, and also with ↑weight.
- With head down activities, sufficient BP to overcome ↑IOT is essential to maintain adequate OPP; vascular dysregulation could threaten necessary perfusion.
- Age was not a factor in reduced MOPP. This was surprising. Our healthy cohort may have been a reason. Nonetheless, elderly inversion bed use in the presence of OHT and low BP (HTN meds?) may have potential for breakdown of disc autoregulation (risk factors: HTN, DM, hyperlipidemia atherosclerosis).
- Future studies may target populations at high risk for MOPP-related ocular compromise with chronic and extended inversion bed use, including morbidities of low tension glaucoma, vertebrobasilar and ocular insufficiency disorders, poor autoregulation, hyper/hypotension, and obesity.

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ACKNOWLEDGEMENTS

We would like to thank the Illinois College of Optometry, Zeiss and ICare for their generous support of this clinical research.

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WORLD COUNCIL OF OPTOMETRY

World Council of Optometry: Advocacy, Education, Policy Development and Humanitarian Outreach

WHAT IS THE WORLD COUNCIL OF OPTOMETRY (WCO)?

WCO is an international membership-based organization that focuses on:

- **Supporting** the improvement of optometric services
- **Advocating** for improvement and expansion of optometric education
- **Expanding** the scope of optometric practice around the world

WCO VISION

The WCO envisions a world where optometry makes high quality eye health and vision care accessible to all people.

OPTOMETRIC RESOURCES

- The Why Optometry? Document
- Global Competency Based Model of Scope of Practice in Optometry
- Position Papers
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WCO REPRESENTS OPTOMETRY'S VOICE GLOBALLY

- Represents more than **60** countries through almost **300 memberships** across six world regions

ORGANIZATIONAL STRUCTURE

The WCO:

- Is composed of 5 Standing Committees:
  - Public Health
  - Legislation, Registration and Standards
  - Education
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WCO serves as a resource to their members in the development of optometry in countries where the practice of optometry is:

- non-existent
- limited in scope
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Individual membership is open to optometrists, vision scientists, faculty, students, researchers and eye care industry professionals.

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The Incidental Findings: Silent Maxillary Sinus Syndrome

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INTRODUCTION

Silent sinus syndrome is an important consideration in the differential diagnosis of patients presenting with painless, unilateral enophthalmos. This case demonstrates the clinical features of the silent sinus syndrome including the clinical presentation, patient symptoms, diagnostic studies and management.

CLINICAL FINDINGS

75yo AAM presents for Neuro-Optometry consultation for evaluation of ONH pallor OD>OS

Clinical Exam:
BCVA: 20/125 PHNI OD, 20/50-2 PHNI OS
Pupil Testing: PERRL 1+APD OD
> 40 prism diopter CRXT
CVF, EOM, Slit Lamp: unremarkable
Posterior segment: diffuse ONH pallor OD>OS
Facial asymmetry showing a narrowed interpalpebral fissure width, enophthalmos, and hypoglobus OS
Hertel Exophthalmometry: Base 102 16mm/13mm

Imaging:
Cirrus OCT: severe diffuse RNFL / GCC thinning OD>OS
External photos: mild hypoglobus OS
MRI of brain and orbits without contrast:
Sequela from moderate chronic microangiopathic disease – no acute disease
Bilateral Optic Atrophy OD>OS with optic chiasm atrophy
*Enophthalmos of left globe
*Depression of left lamina papyracea
*Small size of left maxillary sinus containing mucosal thickening / fluid

DIAGNOSIS AND DISCUSSION

Silent sinus syndrome (SSS) is a rare condition resulting in unilateral, painless enophthalmos and hypoglobus secondary to increased orbital volume. It most often presents between the third to fifth decade of life and shows no gender predilection[1]. Patients are typically unaware of any previous sinus disease and present with complaints of unilateral ptosis or facial asymmetry without history of trauma[2,3]. Clinically, deepened superior lid sulcus, upper lid retraction, and hypoglobus can be observed. Few cases of vertical diplopia or restricted motility have been reported[4]. It has been theorized that occlusion of the ostiomeatal complex results in an accumulation of fluids creating negative pressure within the sinus. This force leads to a vacuum effect allowing for inward retraction of the sinus walls and the orbital floor[1,3]. The definitive diagnosis of SSS is confirmed with CT or MRI imaging.

FIGURE 1
T2 weighted Axial MRI showing enophthalmos OS

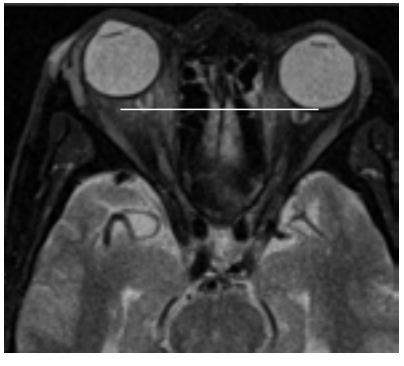


FIGURE 2
T2 weighted Axial MRI showing a small left maxillary sinus with mucosal thickening

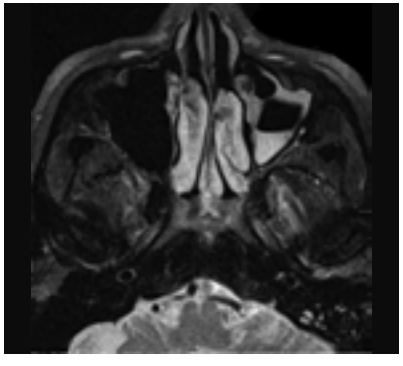


FIGURE 3
T2 weighted Coronal MRI showing a small left maxillary sinus with mucosal thickening and enophthalmos OS

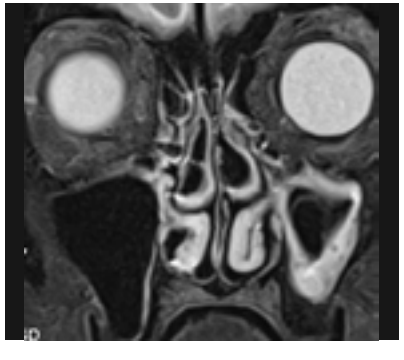
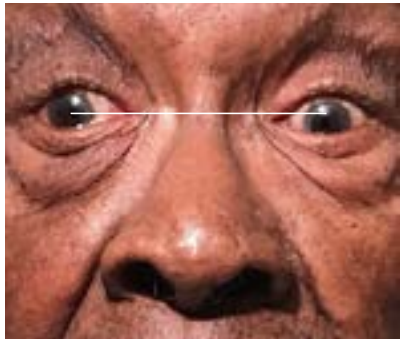


FIGURE 4
Small hypoglobus OS with large angle exotropia OD



MANAGEMENT

Treatment for SSS includes endoscopic sinus surgery allowing for opening of the ostiomeatal complex. Typically, re-establishing aeration of the sinus allows for sufficient improvement of enophthalmos[3]. In some cases, subsequent correction of the orbital floor may be necessary to reposition the globe[1]. Since our patient was essentially monocular and not complaining of diplopia or cosmetic impairment, surgical correction was deferred. Periodic observation with serial exophthalmometry was advised.

CONCLUSION

Silent sinus syndrome must be included in a differential diagnosis for a patient presenting with unilateral, painless enophthalmos or ptosis. Patients are typically unaware of any previous sinus disease or trauma[2]. It is a diagnosis of exclusion and can only be confirmed with radiologic imaging showing characteristic findings such as maxillary sinus hypoplasia and opacification with thinning and retraction of the orbital floor[1]. Treatment includes endoscopic sinus surgery to open the ostiomeatal complex obstruction and subsequent orbital floor reconstruction as necessary[1].

BIBLIOGRAPHY

Available upon request

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CISS: A Useful Tool to Evaluate Visual Symptoms in Young Adults with Accommodative Insufficiency and Convergence Excess

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PURPOSE

The Convergence Insufficiency Symptom Survey (CISS) has been validated to aid in the diagnosis of convergence insufficiency (CI) in both children and young adults. Accommodative insufficiency (AI) and convergence excess (CE) share some common symptoms with CI. Our previous study showed that CISS is a valuable tool to evaluate visual symptoms in young adults with CE. The purpose of this study was to assess the validity of CISS in evaluating visual symptoms in young adults with AI and those with combined conditions of CE and AI.

TABLE 1
Convergence Insufficiency Symptom Survey

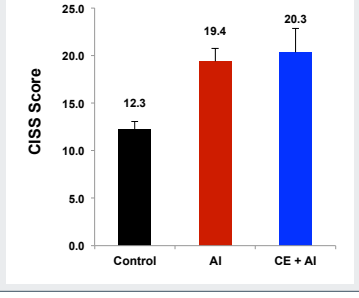
		Never 0	Infrequently	Sometimes2	Fairly Often 3	Always 4
1	Do your eyes feel tired when reading or doing close work?					
2	Do your eyes feel uncomfortable when reading or doing close work?					
3	Do you have headaches when reading or doing close work?					
4	Do you feel sleepy when reading or doing close work?					
5	Do you lose concentration when reading or doing close work?					
6	Do you have trouble remembering what you have read?					
7	Do you have double vision when reading or doing close work?					
8	Do you see the words move, jump, swim or appear to float on the page when reading or doing close work?					
9	Do you feel like you read slowly?					
10	Do your eyes ever hurt when reading or doing close work?					
11	Do your eyes ever feel sore when reading or doing close work?					
12	Do you feel a 'pulling' feeling around your eyes when reading or doing close work?					
13	Do you notice the words blurring or coming in and out of focus when reading or doing close work?					
14	Do you lose your place while reading or doing close work?					
15	Do you have to re-read the same line of words when reading?					

TABLE 2
Clinical Measurements in the Control Subjects (n = 96), Accommodative Insufficiency Subjects (n = 34), and Subjects with Both Convergence Excess and Accommodative Insufficiency (n= 18)

Clinical Measurement	Control [Mean (95%CI)]	AI [Mean (95%CI)]	CE + AI [Mean (95%CI)]	*P* Value
Phoria @ Distance	-0.1 (-0.2 to 0)	0.1 (-0.2 to 0.3)	-0.2 (-0.7 to 0.3)	.32
Phoria @ Near	-0.5 (-0.8 to -0.2)	0.1 (-1.2 to 1.3)	7.7 (5.4 to 10.1)	<.0001*
NPC Break	3.4 (3.1 to 3.7)	3.5 (2.9 to 4.1)	3.9 (2.6 to 5.2)	.26
NFV Break	18.0 (17.2 to 18.8)	17.1 (15.8 to 18.5)	15.6 (12.6 to 18.6)	.02
NFV Recovery	13.2 (12.6 to 13.8)	12.2 (11.1 to 13.4)	10.1 (8.0 to 12.2)	.004*
PFV Break	36.2 (34.0 to 38.5)	38.7 (33.6 to 43.8)	43.9 (38.0 to 49.8)	.10
PFV Recovery	26.2 (23.9 to 28.6)	27.0 (22.5 to 31.4)	30.8 (25.8 to 35.7)	.49
Accom. Amp.(OD)	9.7 (9.4 to 10.0)	7.9 (7.3 to 8.4)	7.8 (7.2 to 8.5)	<.0001*
CISS score	12.3 (10.7 to 13.8)	19.4 (15.9 to 22.9)	20.3 (14.9 to 25.8)	<.0001*

**indicates statistical significance*

FIGURE 1
CISS Scores (mean ±SE) in the Control Subjects, Subjects with Accommodative Insufficiency, and Subjects with Both Convergence Excess and Accommodative Insufficiency.



METHODS

A total of 148 optometry students were enrolled. Ninety-six of them had normal binocular vision (NBV), 34 had AI, and 18 had CE as well as AI. An analysis of variance (ANOVA) was performed to compare the CISS scores among NBV, AI, and CE plus AI groups.

RESULTS

The average age of the subjects was 22.55 years, ranging from 20.00 to 35.40 years. Table 1 shows the 15 questions in the CISS. The clinical measurements are listed in Table 2. The mean (± SD) CISS scores were 12.27 ± 7.72 (NBV), 19.40 ± 10.24 (AI), and 20.33 ± 10.92 (CE plus AI). A significant difference was detected among NBV, AI, and CE plus AI groups (P<0.0001). Post hoc tests showed significant difference between the NBV and AI groups (P<0.0001) and between NBV and CE plus AI groups (P=0.001), but not between AI and CE plus AI groups (P=0.95).

CONCLUSIONS

- Young adults with AI had a significantly higher CISS score than those with NBV.
- Young adults with both CE and AI had a significantly higher CISS score than those with NBV.
- The results of this study demonstrate that the CISS can be used to evaluate visual symptoms in young adults with AI or with both CE and AI.

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Pediatric Retinal Dystrophy: Hidden Among the Amblyopes

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BACKGROUND

Cone-rod dystrophies present first with suddenly decreased visual acuity, sensitivity to light, and decreased color vision. Other symptoms include central scotomas, peripheral vision loss, and night blindness. As symptoms progress and central visual acuity is reduced, nystagmus may develop. Anatomical changes in the retina may not be apparent when symptoms begin, leading to frequent misdiagnosis. There are many kinds of cone-rod dystrophies, with the most common being mutations to the autosomal recessive ABCA4 gene.

CASE HISTORY

An eight year-old Japanese female in second grade with Cone-Rod Dystrophy was referred for an evaluation with Low Vision devices for academic activities. Her concerns were worsening blurred vision, increasing photosensitivity, and reduced school performance. She reported difficulty seeing the board at school even though seated in the first row. She first began wearing glasses in June 2015 in Japan. When vision further deteriorated in 2017 a doctor in the US diagnosed bilateral Refractive Amblyopia and prescribed in-office vision therapy. After a year of therapy with multiple doctors, the patient was referred to a hereditary retinal disease specialist who diagnosed Cone-Rod Dystrophy in June 2018. The patient's systemic and family history was unremarkable.

CLINICAL FINDINGS

- DVAcc: 10/100 OD, OS, OU
- NVAcc: 0.2/1.0M OD, 0.2/1.6M OS, 0.2m/1.25M OU.
- Mars Contrast Sensitivity: 1.40 CSF OU, Moderate Impairment.
- PERRLA (-)APD OD,OS
- FROM OD,OS
- FTFC OD,OS
- Orthophoric
- (+) Random Dot Stereo
- Trial Frame Refraction
  - OD: +1.25 -4.75 x 010 10/60
  - OS: +1.25 -2.50 x 010 10/80
- Telescope Evaluation
  - 3.25x25mm OD, DVA 20/60 OD
- Near Magnifier Evaluation
  - Dome Magnifier (3x) NVA 0.2m/0.6M OU
- The patient met with the Adaptive Technology department to evaluate devices for use at school. Among electronic magnifiers, the patient found tablet and hand-held versions to be most beneficial.
- Ocular health examination was unremarkable.

FIGURE 1

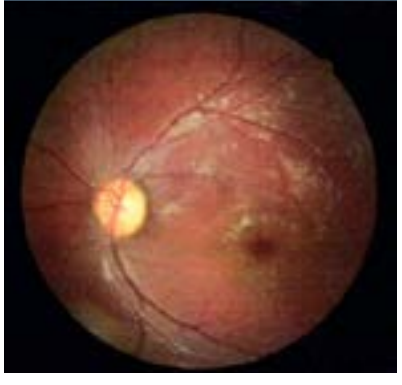


FIGURE 2

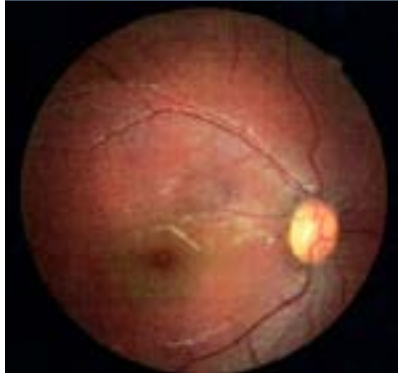
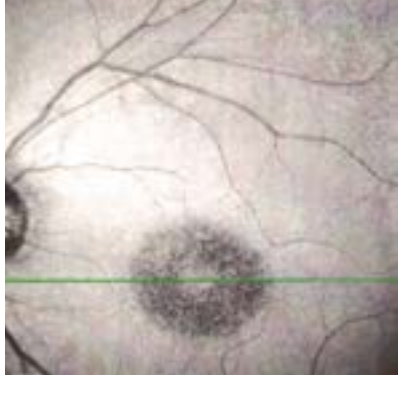


FIGURE 3

FIGURE 4



DIFFERENTIALS

- Leber's Congenital Amaurosis
- Stargardt Disease
- Juvenile Neuronal Ceroid Lipofuscinoses

TREATMENT

A Dome Magnifier (3x) for near magnification and a 3.25x25mm Hand-Held Telescope for distance viewing were prescribed to the patient. Electronic magnifiers were recommended for use in school. The patient and her mother were counseled with concerning dual enrollment in public schools in order to receive visual accommodations in the classroom. In order to rule out Juvenile Neuronal Ceroid Lipofuscinoses (Batten disease), a blood sample was taken. The patient was scheduled to take an Electroretinogram with her ophthalmologist.

DISCUSSION

Both cone-rod dystrophy and Batten disease (JNCL) can go undetected with dilated fundus examination alone. Ocular coherence tomography and fundus autofluorescence can image early changes in sensory retina, while electroretinograms can demonstrate reduced amplitudes and delays in the retina signals. These tests are pivotal for avoiding misdiagnosis in pediatric populations, where a comprehensive exam may not provide adequate evidence for rapid, progressive loss of visual function. Amblyopia is a diagnosis of exclusion, and additional testing should be considered to eliminate differential diagnoses.

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Financial Support - None

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EyePrintPRO™ Fitting for a Patient with Refractory Ocular Surface Disease and a Glaucoma Drainage Device

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INTRODUCTION

Sjögren's syndrome (SS) is a chronic, progressive, multi-systemic autoimmune disease that is characterized by lymphocytic infiltration of the exocrine glands and autoantibody production.[1] The most common presenting symptoms are dry eye and dry mouth, ranging from mild discomfort to debilitating symptoms; potentially leading to decreased quality of life.[2] When traditional therapies fail in managing recalcitrant ocular surface disease, patients may be prescribed autologous/allogeneic serum, scleral lenses, and/or adjunctive surgical treatments.[3]

Scleral lenses are large diameter gas-permeable contact lenses that rest completely on the conjunctival tissue overlying the sclera, vault the entire cornea and limbus and are supported by a tear reservoir.[4] The precorneal tear reservoir rehabilitates the cornea and mechanically protects the ocular surface from the shearing forces of the lids and environment.[5,6] Patients with refractory ocular surface disease often necessitate larger diameter scleral lenses; requiring advanced haptic designs (increased toricity/quadrant specific) to achieve proper alignment with the sclera. This may be further complicated by surgical procedures.

The EyePrintPRO™ is a prosthetic scleral device designed to match the exact contours of the ocular surface allowing for optimization of fit and vision. This is achieved through an FDA process known as EyePrinting where an impression of the anterior ocular surface is obtained and is scanned with a 3D scanner. Elevation Specific Design Technology™ then creates a scleral shell that precisely matches the eye.

This case report highlights a SS patient and a glaucoma drainage device with debilitating ocular dryness symptoms. She had failed with all previous therapies at managing her ocular surface disease but significant improvements in corneal signs and dryness symptoms were noted with an ocular impression-based scleral lens, EyePrintPro.

CASE

74 year-old Caucasian female presented for a dry eye consultation.

Chief Complaint	**Symptoms of irritation and burning for over 20 years**
Ocular History	Keratoconjunctivitis Sicca Ocular Rosacea Blepharitis Pseudophakia POAG Allery to fluorescein
Ocular Surgical History	Glaucoma drainage device OD Punctal cauterization OU
Medical History	Sjögren's Syndrome and Rheumatoid Arthritis (20 years) Asthma Chronic Sinusitis
Current Ocular Therapy	Autologous serum tears 6 x/day, preservative free artificial tears every hour, Omega 3 1000mg po bid, doxycycline 50mg bid po, moisture goggles, Zioptan every night OU
Previous Dry Eye Therapy	Failed with ointments, topical cyclosporine and topical lifitegrast due to severe ocular burning. Lipiflow performed 2 years prior.

Examination Findings:

	OD	OS
Entering VA (SRx)	20/100, pinhole 20/50	20/25
Adnexa	Mild redness, swollen UL	Mild redness, swollen UL
Lids/Lashes	1+ collarettes, 2+ MGD, telangiectasia	1+ collarettes, 2+ MGD, telangiectasia
Conjunctiva	Trace injection, superior bleb	Trace injection
Sclera	White and quiet	White and quiet
Cornea	Trace PEE, haze	Trace PEE, haze
Angle/PI	3-4+ nasal and temporal	3-4+ nasal and temporal
Anterior Chamber	AC shunt valve	Deep and quiet
Iris	Iris normal	Iris normal
Lens	PCIOL in good position	PCIOL in good position
IOP	13mmHg	13mmHg

Secondary to the patient's history, examination findings, and large bleb OD, the EyePrintPro™ was selected to vault over the bleb and to enhance ocular comfort. An impression was taken and sent to the lab. The Elevation Specific Design Technology™ created a lens that aligned with the patient's irregular surface.

FIGURE 1
3D scan of ocular impression with limbal data points

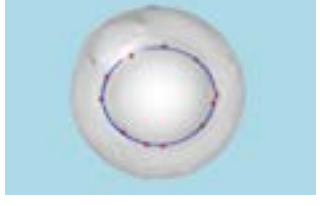


FIGURE 2A-C
Images of lens OD designed from software: straight ahead view, superior view, superior nasal view

FIGURE 3
EyePrintPRO™ lens OD, irregular contours to match the exact surface of the eye

FIGURES 4A-B
Right eye pre-lens fit and with EyePrintPRO™ lens

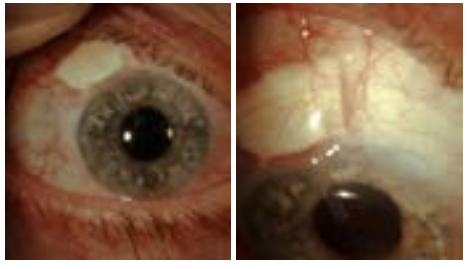
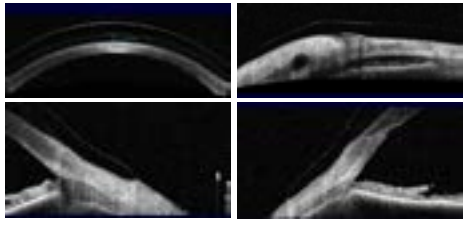


FIGURE 5
EyePrintPRO™ lens of left eye demonstrating adequate alignment

FIGURES 6A-D
Anterior segment images of right lens showing even alignment over irregular contours



The patient's vision improved to 20/25 OD, OS and she has been successfully wearing the devices for over one year, noting a marked improvement in ocular comfort and reduction in lid and conjunctival redness. Her IOPs have remained stable at 13mmHg OU.

CONCLUSION

Patients with refractory ocular surface disease further complicated by conditions such as glaucoma surgery can be extremely difficult to manage with traditional scleral lens designs. The EyePrintPro utiizes an impression of the ocular surface to make a truly customized device of the ocular surface, providing improved vision, an optimal fit and ocular surface protection. When SS patients have failed with other therapies, options such as the EyePrintPro may be considered.

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ACKNOWLEDGEMENTS

Special thanks to David Slater for the images of the EyePrintPRO™

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Gaze Evoked Nystagmus as the Presenting Sign in Pediatric and Late Onset Multiple Sclerosis: A Case Comparison

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INTRODUCTION

Multiple sclerosis most commonly presents between 20 to 30 years of age. As our understanding of the condition grows, an increasing number of patients are being diagnosed with MS both earlier and later in life. Age is no longer an exclusion criterion for diagnosis of MS, but there is still often a delay in diagnosis of affected persons outside of the normal age range. Pediatric-onset multiple sclerosis refers to diagnosis before age 18, while late-onset multiple sclerosis is diagnosed after age 50. Combined, these variations account for less than 10% of diagnosed multiple sclerosis cases. Multiple sclerosis in these age groups is associated with earlier progression to disability, making timely diagnosis critical.

CASE REPORT

Patient JD A 14-year-old female was referred to our clinic for evaluation of nystagmus and diplopia. The patient reported numbness on the left side of her face and symptoms of vestibular dysfunction that had started 5 days prior. Her prior ocular and medical history were both unremarkable and denied any recent trauma. She had normal vision and our dilated ocular health examination was unremarkable.

PUPILS equal, round, reactive, no APD

CVF FTFC OD, OS

MOTILITY CAXT and CLHyperT, gaze-evoked nystagmus most evident in left gaze, 2 mm left ptosis

DIFFERENTIAL DIAGNOSIS multiple sclerosis, space-occupying lesion

MRI multiple enhancing and non-enhancing white matter lesions in the cortex, cerebellum and medulla, suggestive of active demyelination

Patient CA A 71-year-old female, presented with complaints of diplopia and headache for the past several days. Her ocular history included anatomical narrow angle glaucoma which was being managed with a topical prostaglandin analog, while her medical history was remarkable for hypertension controlled with oral medication. She had mild reduction in vision, owing to cataracts, but otherwise unremarkable ocular health upon dilation.

PUPILS equal, round, reactive, no APD

CVF FTFC OD, OS

MOTILITY right horizontal gaze palsy with gaze-evoked nystagmus most evident in right gaze

DIFFERENTIAL DIAGNOSIS cerebrovascular disorder, multiple sclerosis

MRI scattered white matter lesions in the cortex, pons, cerebellum and spinal cord, some demonstrating contrast enhancement, concerning for demyelination

FIGURE 1
MRI results for patient JD, showing multiple lesions in the parietal lobe, corona radiata and corpus callosum demonstrating enhancement on T1 post-gadolinium

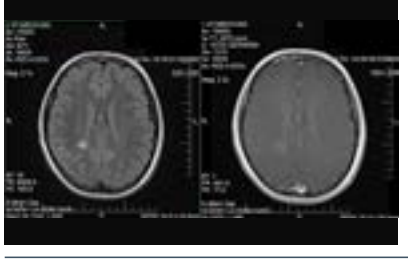

FIGURE 2
MRI results for patient JD, showing a nonenhancing left cerebellar lesion on axial flair

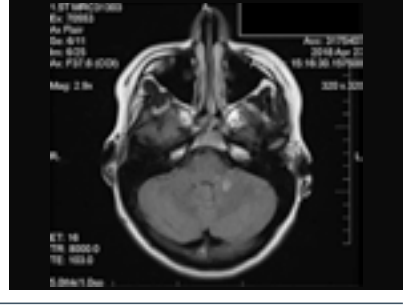

FIGURE 3
Patient JD in left gaze, demonstrating a left hypertropia and mild left ptosis

FIGURE 4
Patient CA attempting to look to the right, demonstrating a right gaze palsy

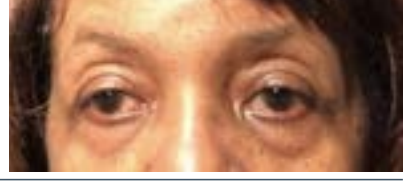

FIGURE 5: Expanded Disability Status Scale (EDSS)

DISCUSSION

Pediatric-onset multiple sclerosis (POMS) accounts for only 3-10% of MS cases. The relapsing-remitting form is present in 98% of POMS, while primary progressive and secondary progressive are unlikely. This condition is generally associated with a more aggressive disease onset and higher relapse rate; however, children experience better recovery from relapses. MS can cause significant cognitive impairment in this age group and they tend to reach EDSS 6.0 at a younger age, which may support early institution of disease modifying-therapy.

Late-onset multiple sclerosis (LOMS) accounts for ~4.5% of cases of MS, while only 0.5-1.3% of cases present in the 7th decade of life or later. This population is more likely to be misdiagnosed or experience a delay in diagnosis, as T2 hyperintense lesions are common in elderly patients, especially if co-morbid vascular risk factors are present. Though a relapsing-remitting course of disease is most common, a higher percentage of patients with LOMS have the primary progressive form of disease than in adult-onset MS. The disease course in LOMS tends to cause a more rapid progression to disability and Expanded Disability Status Score (EDSS) of 6.0.

Though multiple sclerosis most commonly presents in the young adult age group, eye care providers must be suspicious when patients of all ages present with ocular motility and visual signs consistent with those seen in multiple sclerosis. Patients with both late-onset and pediatric multiple sclerosis have been shown to reach disability milestones earlier, and early initiation of treatment may delay the onset of permanent disability. Unfortunately, there is an absence of evidence-based guidelines regarding the treatment of both POMS and LOMS, but there are many studies currently under way. These cases emphasize the importance of prompt diagnosis and the important role optometrists may play when ocular findings are the presenting sign.

REFERENCES

Available upon request

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Suspicion of Keratoconus in children at a school–based vision clinic: a pilot study of an at–risk population

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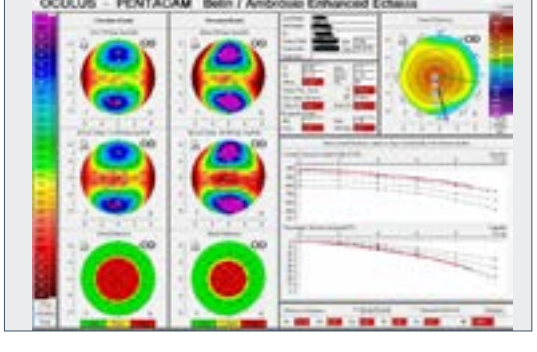
BACKGROUND

The Illinois Eye Institute at Princeton School-based vision clinic has seen over 46,000 children since opening in 2011. The population served is 92.5% African-American or Hispanic. From right eye cycloplegic results, 2352 of 30,303 patient (7.8%) have astigmatism ≥2.50 diopters (max. 8.50 D). Over the past year a collaborative investigation between the IEI and the International Keratoconus Academy (IKA) was instituted to attempt to determine the prevalence of keratoconus in the population. Corneal tomography utilizing the Oculus Pentacam was routinely performed and results analyzed using the ectasia detection software provided with the Pentacam.

FIGURE 1



PURPOSE

Keratoconus often begins in puberty and reported prevalence rates vary between 50-200 per 100,000 people. The literature states it is more prevalent in African-American and Hispanic races. The purpose of this study is to obtain topography scans on each patient. The scans are read by masked experts who then determine patients' risk and/or diagnosis of keratoconus. Patients found to be at risk for the disease and its progression will then be contacted and receive further diagnostic and appropriate treatments (contact lens fits, cross-linking).

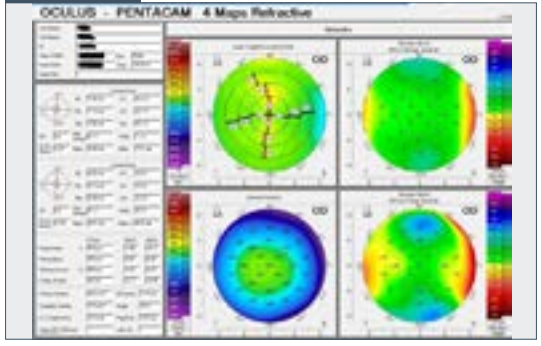
METHODS

It was decided to review the first 3 months of data for this presentation. Tomography maps were collected from the first 325 patients (ages 5-17; 178 females, 147 males) tested with the goal of ensuring the protocol was adequate for accurate data collection. The tomographer has not historically been used on children this young and we needed to demonstrate it was possible to gather good data from this select group. The recommendations from the scan reviewers utilizing the Belin Ambrosio Ectasia Analysis software (version 3) suggested the total deviation (final D) and the ART-max (thinnest pachymetry/ pachymetry progression index) be analyzed. A final D value < 1.61 and an ARTmax of <380 determine a patient as keratoconic suspect. Amongst other factors including repeatability, these two numbers are used as the criteria for the study and are the most reliable indicators in diagnosing the disease.

TABLE 1: Pentacam Findings

PRIMARY CONSIDERATIONS	Kertoconus
Final D	>2.61
Front Elevation Thinnest - All Eyes	>8
Back Elevation Thinnest - Myopia	>18
Back Elevation Thinnest - Hyperopia/mixed	>28
Asymmetry in Thinnest Points	>25
SECONDARY CONSIDERATIONS	
ART-Max	<340
Pach Thinnest	<480
Progressive Index Avg.	>1.35

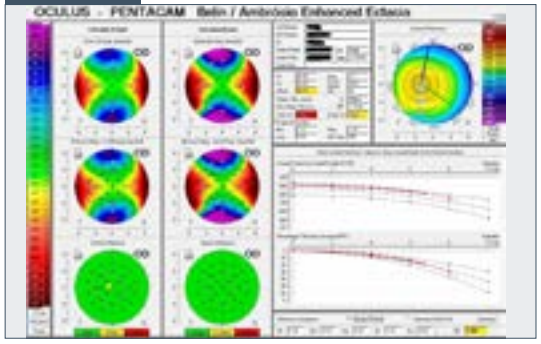
FIGURE 2



RESULTS

In the initial 3 months of the study, topography was completed on 325 subjects of which 309 (615 eyes) were readable. Using the guidelines of a final D < 1.61 and ARTmax <380, 254 eyes, slightly over one-third, are keratoconus suspects. The early limited viable scans may have been influenced by erroneous factors such as fixation, blinking, or lid position (16 excluded) as there was an initial learning curve. While these results may be higher than average, they support the prevalence in our high risk population.

FIGURE 3



CONCLUSION

It is evident there is a high number of keratoconus suspects in our patient population. This pilot study shows it is possible and important to perform topography as part of pediatric eye exams. Our goal is to intervene prior to damage from keratoconus. This will ensue our patients maintain vision and good ocular health as long as possible for a brighter future. As scans are continued throughout the 3-year study, further data will be presented.

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Co-management of an alkali ocular surface chemical burn with persistently elevated pH

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INTRODUCTION

Alkali ocular surface chemical burns are true ocular emergencies. They comprise 7.8-18% of all ocular traumas and most commonly occur in work related incidents (67%) in men ages 20-40. Immediate irrigation to neutral pH is important to minimize potential complications and increase visual prognosis.

CASE PRESENTATION

A 47 yo white male presented to the urgent care clinic with painful, light sensitive, red eyes OD>OS for one day. He works in a bakery and had splashed a metal equipment cleaning chemical into both eyes 22 hours prior to presentation. He was referred by a local emergency room and had irrigated for 15 minutes at work and 15 minutes in the ER.

PERTINENT FINDINGS

Initial Presentation		
	OD	**OS**
Visual Acuity (PH)	20/30	20/30
Adnexa	Erythematous vesicles along cheeks - **PHOTO 1A**	
Conjunctiva	Superior temporal palpebral abrasion 3+ diffuse injection – **PHOTO 1B**	Superior whitened palpebral conjunctiva, 3+ diffuse injection
Cornea	Inferior corneal abrasion - **PHOTO 1C** 2+ diffuse superficial punctate keratitis - **PHOTO 1D** 1+ stromal edema (-) limbal blanching	
Anterior Chamber	Grossly viewed, (-) hypopyon	
IOP (tonopen)	14	11
Plan Treatment	85 minutes of in office irrigation (**TABLE 1**). Patient refused continued irrigation or referral. OU: 15 minutes of irrigation with saline BID, erythromycin ung 6x/day, cyclopentolate TID, PF AT's q1h, acetaminophen 650 mg q4h. RTC 24 hours.	

TABLE 1: pH testing on initial presentation

Time After Irrigation	pH OD	pH OS
Entering	8.4	8.4
20 minutes	7.6	8.0
50 minutes	7.6	7.6
85 minutes	7.4	7.4

PHOTO 1A

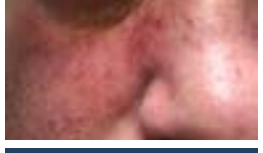


PHOTO 1C

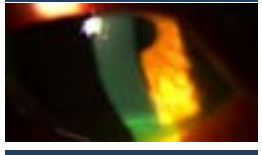


PHOTO 1B

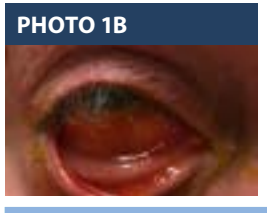


PHOTO 1D

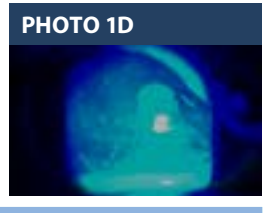
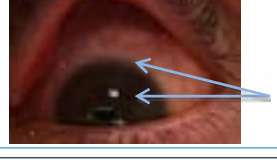


PHOTO 2A



Day 3 Changes		
	OD	**OS**
Cornea	Stable	Superior limbal blanching and larger, central corneal abrasion - **PHOTO 2A**
Plan Treatment	60 minutes of in office irrigation (**TABLE 2**) Patient refused continued irrigation, accepted immediate referral to hospital after discussion with on call OMD. Continue medications from day one, **add doxycycline 50 mg BID, vitamin C 1000 mg QD**	

TABLE 2: pH testing on day 3

Time After Irrigation	pH OD	pH OS
Entering	8.0	7.8
60 minutes	7.6	7.6

OMD Findings		
	OD	**OS**
Initial ER visit	pH neutralized; CPM with addition of ofloxacin QID OU	
Day 5 follow up	Improved corneal healing, residual 2+ inferior punctate keratitis CPM; Add prednisolone acetate QID OU	
Day 25 follow up	Cornea and conjunctiva healed (-) limbal stem cell deficiency	

DISEASE COURSE

Alkaline substances are more common, more damaging, and quicker to penetrate the ocular structures than acidic. They are lipophilic, breaking apart fatty acids of cell membranes, penetrating anterior segment tissues, and degrading collagen matrix and proteoglycan ground substance. The lysis of cell membranes triggers the release of inflammatory factors such as prostaglandins, leukotrienes, and interleukins causing an immediate inflammatory response.

DISCUSSION

Our case demonstrates a patient with an alkali chemical burn OU from a work-related incident whose pH was persistently elevated. Neutralization was reached through co-management with ophthalmology. Ocular surface therapy was initiated, including the addition of oral anti-inflammatory agents: vitamin C and doxycycline, and the tissue fully healed from the initial insult.

CONCLUSION

Immediate irrigation to neutral pH is imperative to maximize visual prognosis and minimize complications but it is often more painful than the burn itself. In cases with persistently elevated pH and/or refusal of continued irrigation, as seen with our patient, co-management in a hospital setting is necessary. Stronger pain relief, either orally or IV, is available along with additional irrigation methods including saline drip or Morgan lens irrigation. The Morgan Lens is a medical device available in most emergency rooms that allows continuous flow of solution to the ocular surface.

Once neutralized, treatment goals include reducing inflammation and promoting corneal healing. Oral doxycycline and vitamin C show promise as adjunct forms of treatment. Doxycycline, used for its anti-inflammatory properties, promotes corneal epithelial healing and decreases inflammation in chemical burns. Vitamin C contributes to epithelial wound healing and reduction in corneal opacification by promoting the production of collagen.

REFERENCES **Available upon request**

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Recurrent Central Retinal Vein Occlusion

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Jesse Brown VAMC & Hines VAH Chicago, Illinois

BACKGROUND

A 71 year-old Caucasian male presents with blur OS and is diagnosed with recurrent central retinal vein occlusion (CRVO) leading to discovery of an underlying coagulopathy.

CASE DETAILS

Ocular History	Medical History
• Acute inferior ischemic hemi-retinal vein occlusion with CME OD 03/16 • Acute non-ischemic central retinal vein occlusion without CME OS 12/16 • Hypertensive retinopathy OU • Mild cataract OS • Pseudophakia OD	• Severe aortic stenosis s/p aortic valve replacement 03/17 • Hypertension • Hyperlipidemia • Type 2 Diabetes Mellitus

Exam Findings

	OD	OS
VA	20/25-1	20/60-2 PH 20/40-2
CVF	FTFC	FTFC
EOMS	FROM	FROM
Pupils	PERRL, (-)APD	PERRL, (-)APD
Anterior Segment	WNL	WNL
IOP	12	10
ONH	Collateral vessels nasal rim	Fine vessels inf-temp rim; c/o NVD vs. early collaterals
Macula	Intra-retinal hemorrhages not involving center	Scattered intra-retinal hemorrhages with mild thickening
Periphery	Few intra-retinal hemorrhages 360	Dense intra-retinal hemorrhages 360 with venous engorgement

OTHER EXAM FINDINGS

- Gonioscopy: open to ciliary body grade IV 360 OU, (-)NVA OU
- Macular OCT: cystoid macular edema OS
- Fluorescein angiogram: delayed venous filling with peripheral areas of non-perfusion and CME OS

LABORATORY STUDIES

- Syphilis panel: non-reactive
- ACE, lysozyme, CRP, ESR, CBC with differential, ANA, PTT, INR: normal
- Antithrombin III, Protein S: normal
- Protein C: functional elevated
- Factor V Leiden: homozygous
- Cardiolipin Ab IgG, IgM, IgA: negative
- Lipoprotein electrophoresis: normal
- Carotid Duplex 12/16 and 04/18: no evidence of hemodynamically significant internal carotid or vertebral stenosis right and left side

DISCUSSION

About Activated Protein C Resistance
Protein C inhibits coagulation by inactivating factors V and VIII. When there is a mutation in factor V, there is resistance of factor V to protein C that leads to an increased risk of thrombosis. Factor V Leiden is a single point mutation in factor V gene at position 169 and is the most common mutation, accounting for more than 95% of cases of thrombosis. There are two mutation types: homozygous which leads to a 80-fold increase in risk of thrombosis and heterozygous which leads to a 7-fold increase in risk of thrombosis.

FIGURE 1

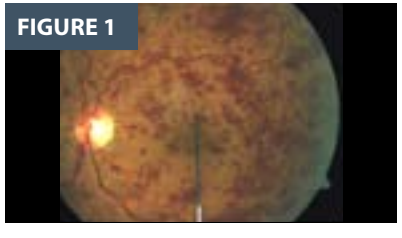


FIGURE 2

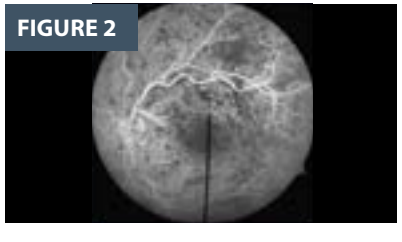
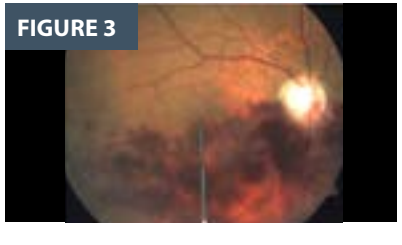


FIGURE 3



Central Retinal Vein Occlusion Recurrence
- Probability of recurrence in the same eye is 0.9% within two years and 2.5% within four years.
- Probability of recurrence in the fellow eye is 7.7% within two years and 11.9% within four years.

Differential Diagnosis
- Other hypercoagulabilities
- Aortic Stenosis
- Diabetes
- Inflammatory disease
- Carotid artery disease
- Hypertension
- Hyperlipidemia

FIGURE 4

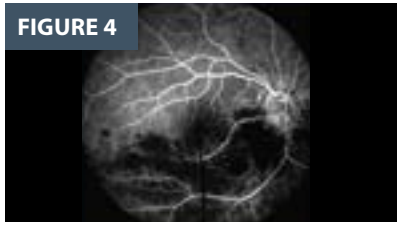


FIGURE 5

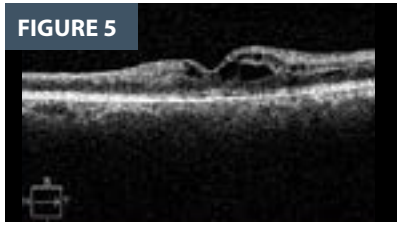
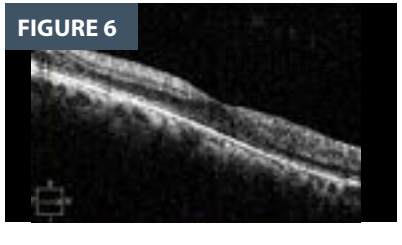


FIGURE 6



TREATMENT & MANAGEMENT

- Referral to retina specialist for treatment of CME.
- Primary care and hematology consulted for further evaluation of activated protein C resistance.

CONCLUSION

- This report highlights a patient found to have an underlying coagulopathy.
- Additional work-up is indicated if:
  - Young patient
  - Recurrent presentation
  - In absence of known systemic risk factors
- It is important for optometrists to be aware of other etiologies of vein occlusions and order appropriate lab tests.

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ACKNOWLEDGEMENTS

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When Diplopia is NOT a Binocular Vision Issue

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Diplopia is often diagnosed and treated as a binocular vision issue. This case allows practitioner to understand the role of maculopathies in the complaint of diplopia.

CASE

A 54 year old patient is seeking a second opinion regarding a case of horizontal diplopia. The patient's history is positive for bilateral myopia and a traumatic retinal detachment and subsequent surgical repair OS. After the surgical procedure patient reports blur OS and diplopia at DISTANCE that was present prior to the surgical treatment. VA OD is 20/20, OS 20/40. Patient was diagnosed as a convergence insufficiency and treated with 7 sessions of vision therapy. Patient records reflect stable findings of orthophoria at distance and a 14ΔIAXT at near. A tremendous improvement in convergence ranges and NPC was noted.

Six months post op from retinal detachment surgery and at the conclusion of the seven sessions of vision therapy the patient reports to our clinic noting that diplopia remains at distance (diplopia has never been present at near). VA revealed OD stable at 20/20 and OS decreased to 20/70. Anterior segment evaluation of the lens reveals trace nuclear sclerosis OU. Posterior pole evaluation reveals a scar inferior to the macula OS secondary to the surgical procedure. A macular OCT reveals an epiretinal membrane (ERM) and macular edema.

Binocular diplopia is typically caused by misalignment attributed to ocular motor dysfunction. The clinical findings in this case prove that intermittent diplopia is not always related to binocular vision issues.

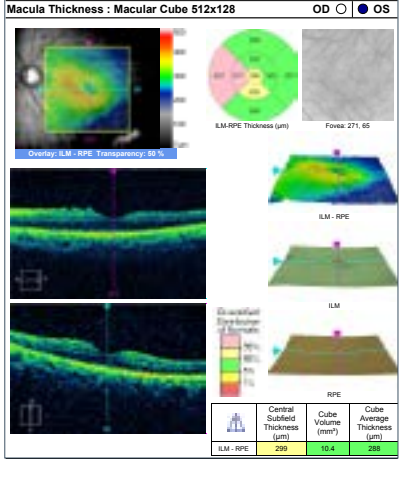
Maculopathies are an atypical causes of diplopia. Variations in the anatomy of the macula can affect foveal correspondence and create diplopia. Changes in retinal anatomy cause misalignment of the retinal elements and thus affect central and peripheral fusion.

The patients OCT revealed macular puckering that contributed to the perception of intermittent diplopia. This clinical presentation has been termed "Dragged-Fovea Diplopia Syndrome". The maculopathy altered the photoreceptor arrangement thus altering central sensory fusion ability.

Initial Clinical Findings
54 year old male

Past ocular history	Traumatic retinal detachment OS with successful surgical repair	
Chief Complaint	Double Vision at distance	
	Distance	Near
Visual acuity	OD 20/20 OS 20/40	OD 20/25 OS 20/30
Cover Test	orthophoria	14 Δ exophoria
Worth 4 Dot	Left eye suppression	4 dots
Vergences	BI x/02/01 BO x/04/02	BI x/06/00 BO x/25/20
NPC		15 cm / 18 cm
Steropsis	(+) Randot Stereopsis	
Diagnosis / Treatment	Convergence insufficiency Vision Therapy treatment began	

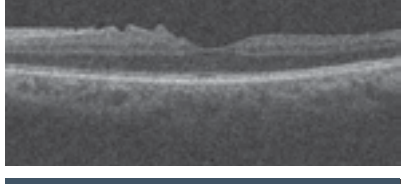
Macular Cube



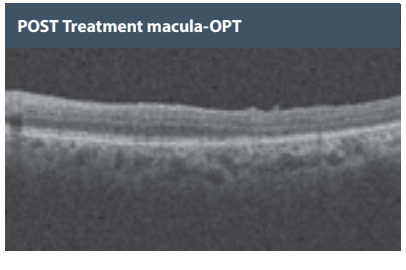
Vision Therapy Treatment
54 year old male

	Convergence Insufficiency	
Vision Therapy sessions	7 sessions completed	
Chief Complaint	Double Vision at distance continues, has not improved with therapy	
	Distance	Near
Cover Test	orthophoria	14 Δ IAXT'
Worth 4 Dot	Left eye suppression	4 dots
Vergence improvement	BI x/08/06 BO x/>45/>45	BI x/10/04 BO x/>45/>45
NPC		TN X5 = TN, no diplopia
Steropsis	(+) Randot Stereopsis	
Diagnosis / Treatment	Assessment by new provider Convergence insufficiency Great gains in clinical finds Diplopia at distance NOT resolved Diplopia at distance symptom does not correlate with clinical findings	

Pre treatment macula-OPT



POST Treatment macula-OPT



Summary of Findings
54 year old male

Convergence Insufficiency and IXT at near
does not align with complaint of distance diplopia

Maculopathy determined as atypical cause of distance diplopia
Macular puckering revealed on OCT

Diagnosed Dragged Fovea Diplopia Syndrome
Maculopathy alters photoreceptor arrangement altering sensory fusion ability

ERM (Epiretinal Membrane) surgery
Patient diplopia complaint resolved post op

CONCLUSION

Determining the underlying etiology of diplopia is crucial to determining the proper treatment approach for the patient. The patient consistently complained of diplopia at distance yet no exotropia was noted at distance. Treatment of diplopia secondary to Dragged-Fovea Diplopia Syndrome is not successful when instituting typical binocular vision treatment modalities. As with our patient orthoptic training does not eliminate the symptoms. Prism is also unpredictable and is rarely successful because of the etiology of disrupted macular elements in the affected eye vs. binocular misalignment. Available treatment options rarely provide a complete cure. The use of monocular occlusion in its various forms and monovision have proven to aid in controlling the diplopia. Lastly, ERM peeling surgery may also eliminate diplopia.

Our patient was treated with ERM surgery which resolved his complaint of diplopia. Visual Acuity improvement is minimal.

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A new perspective on central serous chorioretinopathy: the pachychoroid disease spectrum

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BACKGROUND

Central serous chorioretinopathy (CSR) is a condition that involves fluid accumulation between retina and RPE, leading to a serous retinal detachment. The condition is most commonly found in young to middle aged adults with men being more common than women. Although the exact cause of the condition is not fully understood, high stress as well as long term steroid usage have been associated with the disease.

PERTINENT FINDINGS

78 y/o African American male presents with longstanding decreased vision OU

OCULAR HISTORY: (+) CSR diagnosed 12/17

MEDICAL HISTORY: (+) Type 2 Diabetes, Heart disease, High cholesterol, Hypertension, Foot rash
(+) Stroke 2017 &2018
(-) Recent Stress, overuse of caffeine, or oral steroid use

MEDICATIONS: Multiple medications due to complex history
(+) long term use of fluocinonide, topical steroid cream to treat food rash

VA (cc): OD 20/30, PHNI
OS 20/40, PHNI

SLIT LAMP: Unremarkable OD, OS

DFE OD: juxtapapillary CNVM, scattered dot blot hemes, attenuated vessels
OS: Area of elevation in the macula with pigmentary changes, blot heme, attenuated vessels

EDI OCTOD: Juxtapapillary PED with hyper-reflective punctate precipitates and CNVM, RPE atrophy at sub-RPE detachment. Subfoveal choroidal thickness 480um
OS: subfoveal PED with hyper-reflective punctate precipitates. Subfoveal choroidal thickness 454 um

OCT A OU: dilated vessels that do not taper towards the posterior pole

DIAGNOSIS: Chronic central serous chorioretinopathy OU with active CNVM OD

DIFFERENTIAL DIAGNOSES: Polypoidal choroidal vasculopathy (PCV), Age related macular degeneration

DISCUSSION

This case is unique presentation of chronic CSR OU with CNVM OD due to the patient's atypical age at presentation and demonstrates the spectrum of pachychoroidal disease with the use of multiple imaging techniques to support the diagnosis. The diagnosis of CSR in this patient is supported by OCT A findings of pachyvessels, which are defined as dilated choroidal vessels in Haller's layer & choroidal vessels that do not taper in the posterior pole. As well as hyper-reflective punctate precipitates, which are thought to represent an accumulation of fibrin or the shed outer photoreceptors. In addition, this patient reports chronic use of a topical steroid for a foot rash. The pathogenesis of pachychoroid disease is unknown but an altered response to steroids have been suggested. Mineralocorticoid receptors are expressed in the choroid and stimulation of the receptors have been shown to increase choroidal thickness and congestion.

PCV is an important differential due to the patient's age, race, and presence of CNVM. OCT A findings for PCV include pachyvessels and a thickened choroid. Fundus findings for PCV can include choroidal polyps and CNVM with surrounding exudates and hemorrhages.

CONCLUSION

The treatment method of CNVM 2nd to CSR & PCV is the same, which is anti-VEGF injections. Discontinuation of steroids have been shown to help decrease sub-retinal fluid & re-attachment of the retina. The common pathology for pachychoroid disease lies in a thickened hyper-permeable choroid. CSR develops as the RPE experiences fluid overload from the choroid. Micro-tears can develop in the Bruch's membrane leading to pachychoroid neo-vasculopathy. These vessels may end up develop terminal end polyps, a classic finding in PCV. Studies have shown eyes with suspected PCV can also demonstrate characteristics of chronic CSR in approximately 3-5% of the patients. It has been suspected that PCV may even be a worsening form of CSR in pachychoroid disease. Even though the clinical presentation of CSR and PCV differ, they are now believed to belong to the spectrum of pachychoroid disease which includes a thickened choroid with pachyvessels.

REFERENCES

Available upon request

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FIGURE 1A: Fundus photo OD

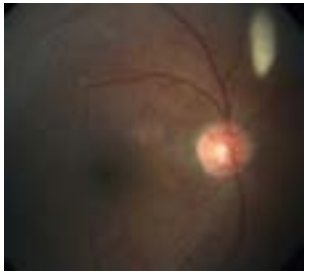


FIGURE 1B: Fundus photo OS

FIGURE 2A: OCT OD with juxtapapillary SRD and active CNVM

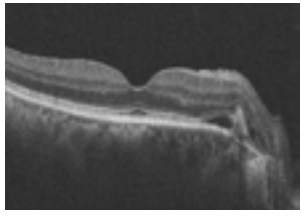


FIGURE 2B: OCT OS showing shallow broad SRD with embedded hyper-reflective punctate precipitates

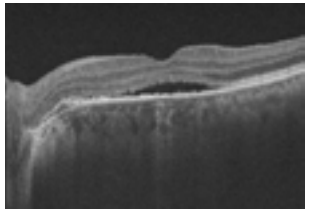


FIGURE 3: EDI OCT illustrating increased choroidal thickness

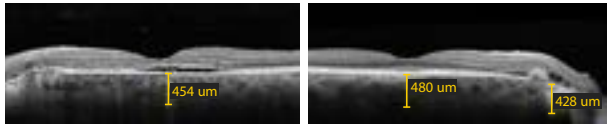
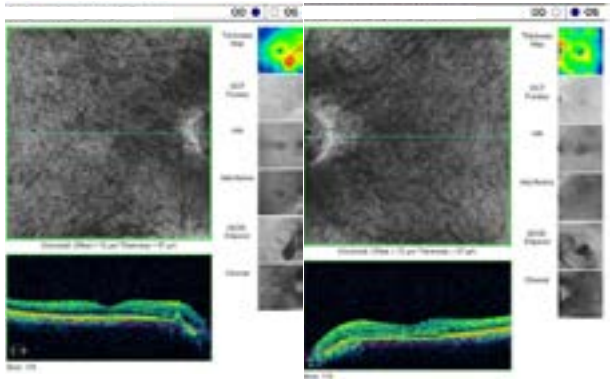


FIGURE 4: OCT A dilated choroidal vessels in posterior pole



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Mock Injection Practicals Improve Student Performance on the Injections Skills Exam

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PURPOSE

In the summer of 2017 a new approach to best prepare students for the Injections Skills Examination (ISE) of Part III National Board of Examiners in Optometry (NBEO) was undertaken. Mock injection practicals (MIP) were used as a tool to improve skill performance on the ISE examination, an area in which scores had been historically low. The literature supports improved performance and patient outcomes with simulation based education in medicine [1-4]. The purpose of this study was to determine if ISE scores of NBEO were improved by MIP.

METHODS

A total of 154 students in the 2018 class took the Injections and Minor Surgical Procedures course in the Spring of 2017. All students either were required (on campus in the summer quarter) or voluntarily participated (on campus in the fall and winter quarter) to take the MIP. The testing environment was meant to simulate the ISE, as detailed on the NBEO website (Figure 1). A single faculty member scored and gave immediate feedback regarding performance and technique. The students had ten minutes to perform the skills, followed by ten minutes dedicated to individual feedback. The Mann-Whitney test was used to compare the ISE scores of NBEO between students with MIP and students without MIP.

FIGURE 1

FIGURE 2
Mean and median injection scores for the MIP and No MIP cohorts.

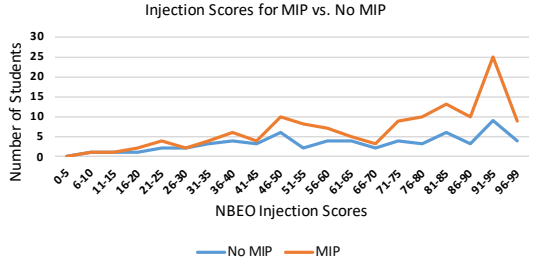
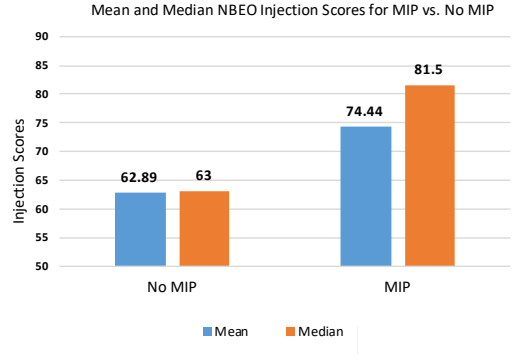


FIGURE 3
Overall performance of students with MIP vs. No MIP on the ISE.



RESULTS

A total of 70 students participated in MIP and the rest of the 65 students did not. The average (SD; median) ISE for students without MIP was 62.89 (SD= 25.63; median=63.00) versus 74.44 (SD= 21.81: median=81.50) for students with MIP with a statistically significant difference, P= 0.01 (Figure 2).

The average (SD; median) grade point average for the students without MIP was 3.26 (SD= .42; median = 3.29) versus 3.30 (SD= .44; median = 3.38) without statistical significance (P=0.55).

The difference in mean score between the two groups of exam takers was 11.55% higher for those who sat for the mock practical, but perhaps more representatively, the difference in median score between these two groups was 18.5% (Figure 3).

CONCLUSION

Partaking in the mock practical significantly improved students' performance on the ISE scores of NBEO, and therefore may lead to a better overall score. As with other studies in medicine, simulation had a positive impact on student performance. This data suggests that individualized instruction in a mock practical format is an effective way to boost skill performance of optometry students.

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Prescribing trends of optical magnification vs assistive technology for near visual goals from 2008 to 2017 in a low vision rehabilitation clinic

Tracy L. Matchinski, OD, FAAO; Elise M. Corgiat, OD; Kara E. Crumbliss, OD, FAAO
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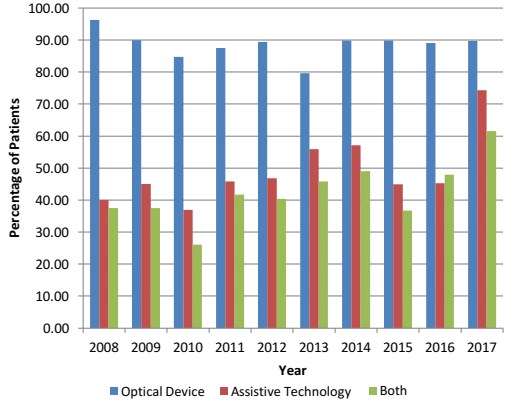
INTRODUCTION

Near visual goals are a primary concern for patients with visual impairment. To visually meet these goals, low vision rehabilitation providers can prescribe optical magnification (OM) and/or assistive technology (AT). With the rapid evolution of AT, the question that presents itself is if the prescription of optical magnification becoming archaic? One aim of this study was to investigate near prescribing trends in a low vision clinic of OM vs AT over the last decade.

METHODS

This retrospective study investigated prescribing trends for near visual goals. Five hundred and twenty-six (526) medical records were randomly reviewed in a low vision clinic with date of service from 2008-2017. The records were new patients to the low vision clinic and had to have a referring doctor's letter to be included. The low vision rehabilitation examination was done by one of eight (8) optometrists. All optometrists were residency trained in low vision and four had achieved AAO Low Vision Diplomate status. Data was collected on 57 areas of the record including what was prescribed for near visual goals. Near OM devices included microscopes +4 and over, hand held magnifiers and stand magnifiers. AT included electronic magnification devices and computer adaptation (enlargement or speech).

FIGURE 1
Prescription of Optical Magnification vs. Assistive Technology



RESULTS

Near visual tasks were reported as the primary goal in 71% of patients and the secondary goal of 29% of patients. To meet these goals, Figure 1 displays the prescription of optical magnification vs assistive technology over the last decade. The prescription of OM has stayed steady between 80-96%. AT prescription shows a general increasing trend over the decade from 40% in 2008 to 74% in 2017. The prescription of both OM and AT also shows a general increasing trend from 38% in 2008 to 62% in 2017. Figure 2 illustrates the breakdown of prescription by age groups. OM prescription was similar across all groups (77-91%) and prescription of AT and both decreased with increasing age. The youngest age groups were prescribed assistive technology in 76% of cases and the oldest age group 35%. Figure 3 provides information on age distribution of patients in this study. Figures 4 and 5 provide information on types of service referrals and AT prescribed.

CONCLUSIONS

This study shows that the prescription of OM has stayed stable and AT has increased. Importantly, the prescription of OM is not declining even as the prescription of AT is increasing. Patients are also selecting both AT and OM to meet their needs. Even with the rapid evolution and availability of AT, prescription of OM continues to be a viable option for patients with visual impairment, especially in the oldest cohort. This data supports two additional important conclusions: 1) Low vision examinations should continue to include both OM and AT solutions for patients with visual impairment and 2) Low Vision Rehabilitation courses in optometric education institutions need to continue to provide didactic course work on how to prescribe OM as well as AT.

FIGURE 2
# of Patients Rx'ed Optical Magnification vs. Assistive Technology By Age Range

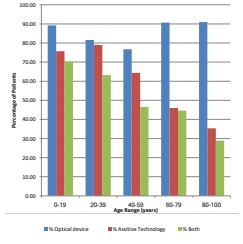


FIGURE 3
Patient Demographics: Age Range By Decade

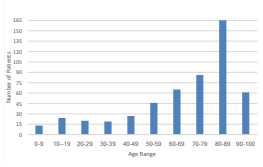


FIGURE 4
Pecentage of Service Referrals By Year

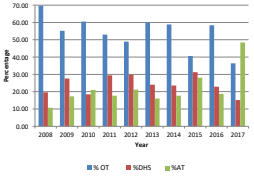
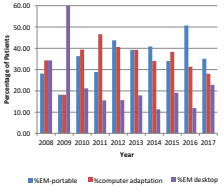


FIGURE 5
Percentage of types of Assistive Technology Rx'ed by Year



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Incidence and outcomes of Driving as a goal in a low vision population

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INTRODUCTION

Driving is a means of independence and is a common goal of patients with visual impairment. Driving is a complex task that has visual and nonvisual factors to consider. An optometrist evaluates whether the patient is able to meet the local visual requirements for licensure. An optometrist may prescribe a bioptic telescope. Currently 45 states in the United States allow bioptic driving if the patients meet certain requirements. Utah, Iowa, Connecticut, Maine, and Washington, DC, explicitly state that bioptics are not permitted to be used while driving, and Minnesota permits them on a case-by-case basis.[1]

Other factors are considered in driving safety and performance. The optometrist works in conjunction with occupational therapists and certified driver instructors for safe bioptic use and driving evaluation/training. The aim of this study was to evaluate the incidence and outcomes of driving as a goal in a low vision population.

METHODS

This was a retrospective study of 526 medical records that were randomly reviewed in a low vision clinic with date of service from 2008-2017. The records were new patients referred to the low vision clinic and by a managing eye doctor and had a letter of referral included. Of this study cohort, there were 21 records of patients under sixteen years old excluded as they were not old enough to drive. The low vision rehabilitation examination was done by one of eight optometrists. All eight optometrists were residency trained in low vision and four had achieved AAO Low Vision Diplomate status. Data was collected on 57 areas of the record including what was prescribed to meet the goal of driving.

FIGURE 1
Resolution of patients' driving goal

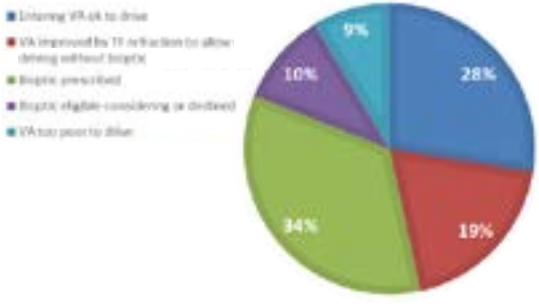

FIGURE 2
Pictures the types of bioptics prescribed

2.2 X Ocutech Sight Scope

2.2X and 3x WATS Designs for Vision

3X Mini Ocutech

4X VES Explorer Ocutech

RESULTS

The charts reviewed included 331 females and 195 males with an average age 67.8 years old. Of charts reviewed 11.4% (58/505) of patients had driving as a primary or secondary goal. Of this cohort 27% (16/58) had initial entering visual acuity that met licensure requirements of 20/70 or better for non-telescopic driving. After trial frame refraction 19% (11/58) had improved visual acuity with refractive correction that met licensure requirements of 20/70 or better for non-telescopic driving. With bioptic telescope evaluation 44% (26/58) of patients had corrected visual acuity 20/100 or better and achieved acuity of 20/40 or better with the bioptic allowing them to pursue this licensure. The average visual acuity attained was 20/33 through the telescope ranging from 20/25-20/40. Different telescopic designs were prescribed with powers ranging from 2.2X to 4X and an average power of 3.06X. Ten percent (6/58) of telescopic eligible patients declined to pursue this option. The remaining 9% (5/58) could not achieve acuity to meet legal driving requirements. Figure 1 illustrates these results.

Of 81% (47/58) of patients who were eligible to pursue continued driving 47% (22/47) were referred to driver's rehabilitation programs and 34% (16/47) were referred to occupational therapy. Illinois state law does not require a patient to have additional training, however training and evaluation of other factors related to safe driving performance including reaction time, cognition and proper use of the bioptics are needed.

CONCLUSION

A majority 91% (53/58) of patients referred to a specialty low vision clinic presenting with a goal of driving were eligible to achieve this goal. The low vision examiner can maximize visual ability and prescribe bioptic telescopes and training to meet driver requirements and patient goals. In addition, the referral for training with the bioptic and driver rehabilitation are an important part of the process.

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Torpedo Maculopathy: a Pediatric Case Report and Discussion of OCT Applications

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BACKGROUND

A 5 year old male presented for his first eye examination in preparation for the upcoming school year. He had no visual or ocular complaints and his parents had no concerns. He was born premature at 32 weeks with no other pregnancy or delivery complications. His medical history was otherwise unremarkable.

The patient's entering visual acuity was 20/20-1 and 20/20 in the right and left eyes respectively. The confrontation fields, pupil, and EOM testing were unremarkable. Accommodative and binocular vision testing showed normal results. His refractive error was minimal and age-expected. Anterior segment findings were unremarkable. Ophthalmoscopy revealed normal posterior segment findings in the right eye (figure 1). In the left eye a flat, oval-shaped lesion was discovered just temporal to the fovea (figures 2 and 3). It had variable pigmentation and measured 1 x 1.5 disk diameters, with one end pointing to the fovea. The rest of the posterior segment findings in the left eye were normal.

FIGURE 1

FIGURE 2

FIGURE 3

IMAGING/RESULTS

Fundus photography of the lesion was taken (figures 1–3) and optical coherence tomography (OCT) was performed (figures 4–7). The retinal thickness appeared normal and grossly symmetrical between the eyes. The OCT cross-sections revealed variable degrees of disruption of the photoreceptor layers from the outer nuclear layer to the interdigitation zone and disorganization of the retinal pigmented epithelium (RPE) throughout the lesion in the left eye. The retinal findings in this patient's left eye are highly suggestive of torpedo maculopathy.

DISCUSSION

Torpedo maculopathy is a rare, unilateral, congenital condition which usually remains stable throughout life. The classic lesion is hypopigmented and oval (or "torpedo") shaped, located in the temporal macula with one end pointing toward the fovea. These lesions may also present with hyperpigmentation, a sub/intra-retinal cleft, fundus excavation, or visual field loss. This condition may be diagnosed by the characteristic shape and location of the lesion alone. Differentials include congenital hypertrophy of the RPE (including the variant associated with Gardner syndrome), congenital albinotic spots of the RPE, and choroidal nevi. If the area of the lesion is excavated, then conditions similar in appearance should be included (such as coloboma and posterior staphyloma).[1]

OCT scans are used to help classify torpedo lesions. Type 1 lesions present with attenuation of outer retinal layers. Type 2 lesions show outer retinal cavitation in addition to attenuation of outer retinal layers.[2] It is likely that these two types are phenotypic variations and not different stages of torpedo maculopathy.[3] A recently proposed type 3 lesion would make a distinction by describing excavated lesions without intra/sub-retinal clefts.[4]

FIGURE 4

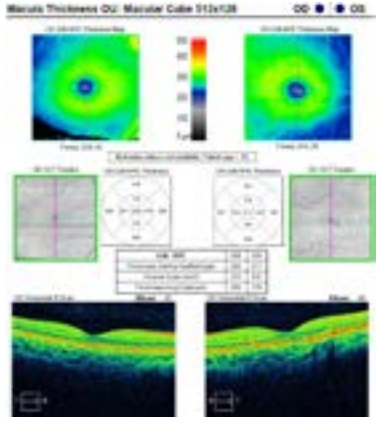


FIGURE 5

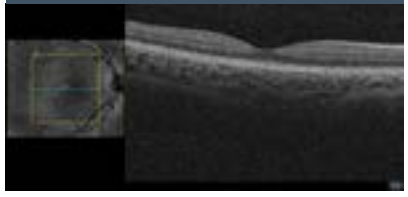
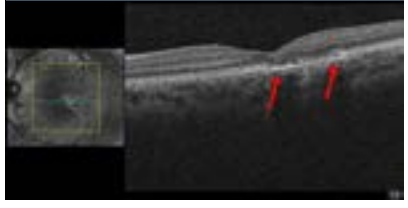


FIGURE 6

FIGURE 7



CONCLUSION

Torpedo maculopathy is generally benign; patients are usually asymptomatic and retain good central visual acuity throughout their lives. As such, treatment is usually not indicated and patients should be monitored with regular eye exams. However, there have been three reported cases of torpedo maculopathy with associated choroidal neovascular membrane (CNVM) formation.[3,5] OCT scans should be used regularly to monitor torpedo maculopathy patients for the presence of CNVM formation. OCT-angiography scans can also be used to visualize the choriocapillaris, which usually has an abnormal appearance beneath the torpedo lesion.[6]

This patient needed no treatment and was instructed to return in one year for an annual comprehensive eye exam. His case demonstrates the importance of dilating patients during their first comprehensive eye exam, even when asymptomatic. Fortunately for this patient torpedo maculopathy has a good prognosis. Had it been a more threatening pathology (many of which present without symptoms), the appropriate diagnosis could be made and treatment initiated. This case also demonstrates that a patient's young age shouldn't necessarily preclude imaging from being ordered.

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The Long Road to Coats': Three Years of Serial Imaging Leading to the Diagnosis

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INTRODUCTION

Retinal arterial macroaneurysms (RAM) usually present as an isolated aneurysm and most often spontaneously regress. The most common clinical feature is retinal hemorrhage involving multiple layers. RAM is associated with hypertension and arteriosclerotic disease and is more commonly found in elderly women. When a patient presents with multiple RAM a differential that needs to be considered is Coats' disease. We present an atypical case with serial imaging that aided in the diagnosis of adult onset Coats' disease.

CASE REPORT

A 59-year-old African American female presented with a central hazy cloud in her vision OD. She noted this after completing a marathon 6 days prior.

Medical History:
+ GERD
Recent unremarkable vascular workup and MRI
148/82 mmHg RAS

Exam Findings:
BCVA: 20/500 OD PHNI, 20/20 OS
Anterior segment: trace nuclear sclerosis OU

Characteristics of Coats' Disease

Retinal macroaneurysm	
Retinal telangiectasia	
Exudation	
Microaneurysms	
Macular Fibrosis	
Vascular Sheathing	

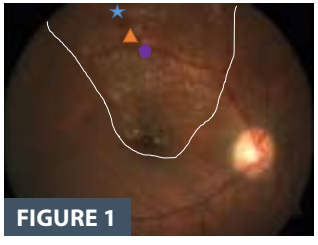

Figure 1: Fundus Photo of the right eye, year one. A retinal macroaneurysm, retinal telangiectasia, vascular sheathing and prominent exudation (outlined) is visible superior temporal to the optic nerve.

Figure 2: Fundus Photo of the left eye, year one. Clinically unaffected fellow eye.

Figure 3: Optical coherence tomography of the right eye, year one. The image reveals hyper-reflective lesions creating shadowing through the deeper retinal layers resulting from macular exudation.

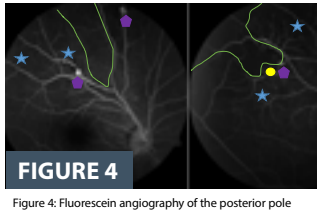

Figure 4: Fluorescein angiography of the posterior pole and periphery of the right eye, year two. The posterior pole image reveals multiple macroaneurysms, early retinal ischemia (outlined) and retinal telangiectasia. The peripheral image shows a macroaneurysm, mild retinal ischemia (outlined), retinal telangiectasia and a few microaneurysms.

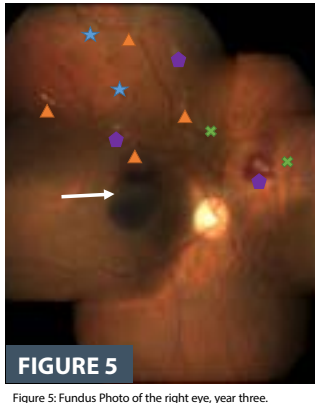

Figure 5: Fundus Photo of the right eye, year three. Multiple retinal macroaneurysms, retinal telangiectasia, vascular sheathing and exudation is visible superiorly. Additionally, a macular hemorrhage (arrow) involving multiple retinal layers is present.

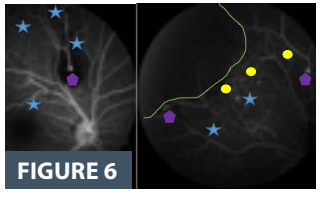

Figure 6: Fluorescein angiography of the posterior pole and periphery of the right eye, year three. The posterior pole image reveals a newly developed macroaneurysm with associated retinal hemorrhage, and retinal telangiectasia. The peripheral image shows a macroaneurysm with significant retinal ischemia (outline), retinal telangiectasia and numerous microaneurysms.

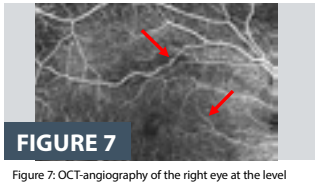

Figure 7: OCT-angiography of the right eye at the level of the superficial capillary plexus, year three. The image reveals mild vascular abnormalities of the superficial network and a distorted foveal avascular zone.

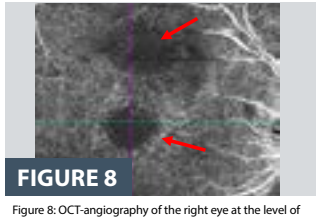

Figure 8: OCT-angiography of the right eye at the level of the deep capillary plexus, year three. The image reveals disruption of flow of the normal vascular network and an enlarged foveal avascular zone (arrow). The disruption of flow superior to the fovea corresponds with a multilayered retinal hemorrhage due to a microaneurysm (arrow).

Figure 9: Fundus Photo of the right eye, several months later into year three. Multiple retinal macroaneurysms, retinal telangiectasia, vascular sheathing and exudation are present. Additionally, macular fibrosis has developed.

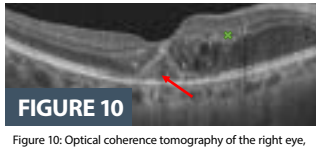

Figure 10: Optical coherence tomography of the right eye, year three. The image reveals foveal distortion due to macular fibrosis (arrow) following macular hemorrhage. Additionally, hyper-reflective lesions creating shadowing through the deeper retinal layers resulting from residual macular exudation.

CONCLUSIONS

This case demonstrates the value of serial imaging with an atypical presentation of RAM. The diagnostic importance of change over time, aided by photos, OCT, OCTA, and fluorescein angiography is highlighted as it ultimately aided in making the diagnosis of Coat's disease. This case adds to the documentation in the literature of serial imaging and presentation variations of a known condition which is important for clinical care.

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Medical and Vision Insurance Self–Assessments in an Urban Chicago Eye Clinic

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PURPOSE

Comprehensive eye examinations are important in the detection of ocular diseases and have the potential to detect signs of chronic systemic conditions. Careful examination of retinal blood vessels can provide information about underlying vasculopathic conditions such as hypertension and diabetes[1]. Early detection and treatment of these conditions can not only improve quality of life, but also reduce associated healthcare costs[1]. Given the importance of eye examinations, it is essential that individuals are adequately accessing this care.

The American Optometric Association (AOA) recommends that asymptomatic or risk free adults between the ages of 18 to 60 years should have an eye exam every two years, while adults 61 and older should have one annually[2]. At risk patients should be examined annually, or as recommended by their eye care physician. At risk patients include those with diabetes, hypertension, family history of ocular disease, those who wear contact lenses and those who are taking drugs with ocular side effects, for example[2].

Thus, it was of interest to determine whether the patient population at the Illinois Eye Institute has been receiving adequate eye care within the recommended timeframe outlined by the AOA. Additionally, we were interested in whether any significant differences existed in the access to eye and medical care between patients being seen in the urgent and primary care clinics. We inquired about patients' demographic factors as well as level of insurance coverage for eye and medical care to see if any of these factors were correlated to patient's decision to seek care.

METHODS

Surveys were distributed to patients waiting to be seen in the urgent and primary eye care clinics at the IEI over a 6 day period in June 2017. IRB approval was obtained. All patients over the age of 18 were approached to complete the survey. Informed consent was obtained. The survey included multiple choice questions to assess demographics, level of insurance coverage for eye and medical exams, time since last eye and medical exams, and known chronic medical and ocular conditions. Data was analyzed using SPSS software.

RESULTS

Of the 275 patients surveyed, 85.1% were seen in the primary eye care clinic, while 11.6% were seen in the urgent eye care clinic. The patient population was 64.4% female, with a mean age of 52.2 years (18 – 89 years). The majority of patients surveyed identified as African-American (73.1%), with 11.6% and 6.2% of the patients identifying as Hispanic and Caucasian respectively (see Figure 1).

67.6% of patients had full medical coverage, while 64% reported having full eye care coverage, see Figure 2. Since the introduction of the Affordable Care Act (aka. ACA, Obamacare) in 2009 in the USA, all Americans are mandated to have some form of health insurance[3]. Our study revealed that only 1.1% of patients at this time do not have medical insurance.

Most patients had an eye exam within the last two years (86.3%) and a medical exam within the last year (78.2%), see Figure 3. Of the patients surveyed, 40% had known ocular disease (most common glaucoma, 15.4%), and 53.5% had chronic medical conditions (most common diabetes, 19.3%), see Figures 4 and 5.

A significant correlation was seen between the following variables:

- Patients presenting to the Urgent Eye Care Clinic and patients without eye/vision insurance ($p=0.009$, $p<0.01$).
- More recent medical examination and more recent eye examination ($p=0.000$, $p<0.01$).
- Previous ocular disease and systemic disease and more recent eye examination ($p=0.000$, $p<0.01$ and $p=0.04$, $p<0.01$, respectively). This is most likely due to the fact that closer observation is required for patients with chronic ocular diseases, such as, glaucoma, diabetic retinopathy and dry eye disease.
- Higher body mass index (BMI) and higher prevalence of systemic disease ($p=0.012$, <0.05).
- Increasing age and ocular disease ($p=0.000$, $p<0.01$).

No significant correlation was seen between the following variables:

- Eye insurance and last eye examinations.
- Medical insurance and last medical examinations.
- Last eye exam between primary care and urgent care eye examinations.
- BMI and ocular disease.
- Eye/vision insurance and ocular disease.

FIGURE 1 Distribution of race.

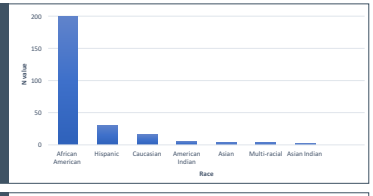


FIGURE 2 Distribution of eye and medical insurance.

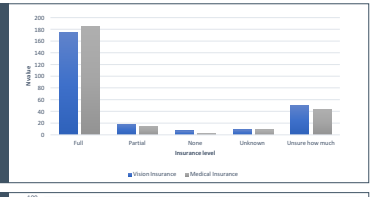


FIGURE 3 Distribution of last eye and medical examinations.

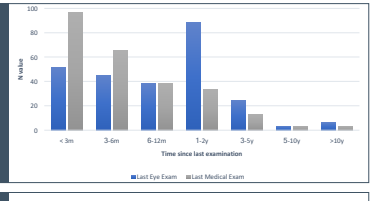


FIGURE 4 Known ocular disease to patients.

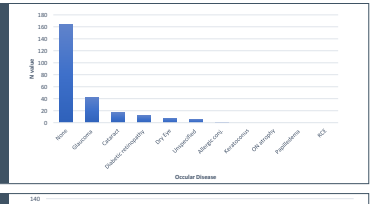
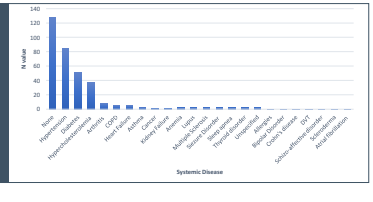


FIGURE 5 Known systemic disease to patients.



CONCLUSION

A high percentage (86%) of patients surveyed receive adequate eye care in a private healthcare setting. While the majority of patients reported having full coverage for eye and medical care examinations, there were a notable number of patients who were unsure of how much insurance coverage they had or whether they had insurance at all (21.8%). Only 1.1% of patients surveyed had no medical insurance. No statistically significant difference in the time since last eye examinations of patients in primary and urgent care were seen.

Providing adequate eye care services not only aids in reducing visual impairment, it can also provide early detection of systemic and ocular diseases which is an important element of delivering primary health care. Knowledge of insurance coverage may influence the decision for patients to seek medical or eye care.

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Top Diagnoses for New Patients in the Primary Care Clinic at an Optometric Teaching Facility

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PURPOSE

To analyze patient demographic and diagnostic data for new patients presenting for a comprehensive eye examination within the Primary Eye Care clinic of a high volume optometric teaching facility. In 2006 Soroka et al. analyzed diagnostic data on a population of profession-wide optometric practitioners and in 2015 Morettin presented the top discharge diagnoses in the Urgent Care service of the Illinois Eye Institute (IEI).

METHODS

This study used a retrospective data review of patient demographic information and diagnosis codes for all new comprehensive eye exams performed in the Primary Care Service of the IEI from January 1 to December 31, 2017.

Top 15 Diagnoses Overall (n=7369)

		Patients	Percentage
1.	Dry eye syndrome	1250	17.0 %
2.	Cataracts	1009	13.7 %
3.	Type II DM without complications	840	11.4 %
4.	Hypertension	585	7.9 %
5.	Glaucoma suspect	583	7.9 %
6.	Blepharitis	533	7.2 %
7.	Allergic conjunctivitis	381	5.2 %
8.	Lattice degeneration	331	4.5 %
9.	Hypertensive retinopathy	328	4.5 %
10.	Narrow angles	197	2.7 %
11.	Headache	160	2.2 %
12.	Refractive amblyopia	149	2.0 %
13.	Vitreous degeneration	148	2.0 %
14.	Convergence insufficiency	143	1.9 %
15.	Retinal hole	110	1.5 %

Top 10 Diagnoses 0-19 years (n=884)

		Patients	Percentage
1.	Allergic conjunctivitis	75	8.5 %
2.	Dry eye syndrome	53	6.0 %
3.	Convergence insufficiency	41	4.6 %
4.	Headache	31	3.5 %
5.	Lattice degeneration	29	3.3 %
6.	Refractive amblyopia	28	3.2 %
7.	Blepharitis	20	2.3 %
8.	Glaucoma suspect	18	2.0 %
9.	Esophoria	12	1.4 %
10.	Exophoria	10	1.1 %

Top 10 Diagnoses 20 – 39 years (n=1916)

		Patients	Percentage
1.	Dry eye syndrome	265	13.8 %
2.	Allergic conjunctivitis	140	7.3 %
3.	Lattice degeneration	138	7.2 %
4.	Blepharitis	110	5.7 %
5.	Type II DM without complications	82	4.2 %
6.	Glaucoma suspect	81	4.2 %
7.	Headache	70	3.7 %
8.	Refractive amblyopia	52	2.7 %
9.	Convergence insufficiency	50	2.6 %
10.	Retinal hole	45	2.3 %

Top 10 Diagnoses 40 – 59 years (n=3095)

		Patients	Percentage
1.	Dry eye syndrome	638	20.6 %
2.	Type II DM without complications	476	15.4 %
3.	Hypertension	333	10.8 %
4.	Cataracts	311	10.0 %
5.	Glaucoma suspect	285	9.2 %
6.	Blepharitis	249	8.0 %
7.	Hypertensive retinopathy	172	5.6 %
8.	Lattice degeneration	166	5.4 %
9.	Allergic conjunctivitis	132	4.3 %
10.	Narrow angles	109	3.5 %

Top 10 Diagnoses 60+ years (n= 1473)

		Patients	Percentage
1.	Cataracts	712	48.3 %
2.	Dry eye syndrome	294	20.0 %
3.	Type II DM without complications	275	18.7 %
4.	Hypertension	210	14.3 %
5.	Glaucoma suspect	199	13.5 %
6.	Blepharitis	143	9.7 %
7.	Hypertensive retinopathy	135	9.2 %
8.	Pseudophakia	81	5.5 %
9.	Narrow angles	79	5.4 %
10.	Type II DM with NPDR	74	5.0 %

RESULTS

There were 7369 new patients (62.3% female and 37.7% male) with a mean age of 51 years old (range 8-91) seen in 2017. The most common overall non-refractive diagnoses were dry eye syndrome (17.0%), cataracts (13.7%), Type 2 diabetes without complications (11.4%), hypertension (7.9%) and glaucoma suspect (7.9%). Smaller subsets of patients were grouped by age ranges and analyzed, and the most common diagnoses were allergic conjunctivitis for patients less than 19 years old (8.5%), dry eye syndrome for patients 20-39 years old (13.8%) and 40-59 years old (20.6%), and cataracts for patients over 60 years old (48.3%).

CONCLUSION

An initial eye examination in the Primary Care Service of the IEI commonly results in the diagnosis of non-refractive medical conditions. Soroka et al. found the most common non-refractive diagnoses were cataracts (3.56%), hypertension (3.29%), and dry eye syndrome (2.08%). Our study also showed these as the most common diagnoses in addition to Type 2 diabetes without complications and glaucoma suspect. Our percentages of patients with these diagnoses were significantly higher than those in Soroka's study demonstrating the importance of routine ocular health evaluations as part of an integrated preventative healthcare model.

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Visual loss in a case of a recurring, invasive pituitary macroadenoma

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INTRODUCTION

Pituitary adenomas are neoplasms of the pituitary gland that comprise 16.7% of all tumors. Adenomas may go undetected or are identified through visual impairment, endocrine dysfunction or other unrelated neuroimaging. These tumors may be classified as micro, macro, giant or carcinomatous. Macro adenomas may further be graded as invasive, in which the adenoma invades into the bone, mucous cavity, cavernous or sphenoid sinuses. Treatment is achieved often through transsphenoidal resection. Recurrences occur in about 15-20% of cases, often requiring repeat transsphenoidal removal with radiation therapy.

Early diagnosis and treatment is crucial in initial and recurrent tumors to preserve visual acuity and visual field prognosis after tumor resection. This case presents a reoccurring, invasive macroadenoma and the potential of visual recovery following repeat resection with additive beam radiation therapy.

CASE

A 44-year-old African American male presented with decreased vision right eye more than left for the past four years. He reported a history of optic neuropathy in his right eye, anxiety, hypothyroid and a brain tumor removed four years prior.

Patient was sent for magnetic resonance imaging (MRI) and a pituitary macroadenoma was confirmed. He then underwent transsphenoidal tumor resection with six weeks of beam radiation afterward.

	OD	OS
Pre-operative VA	Hand motion at 3 ft	20/30-2
3 months post-op	20/100	20/25-3
4 months post-op	20/40-2	20/25-3

FIGURE 1
HVF 24-2 SITA Standard of the left eye

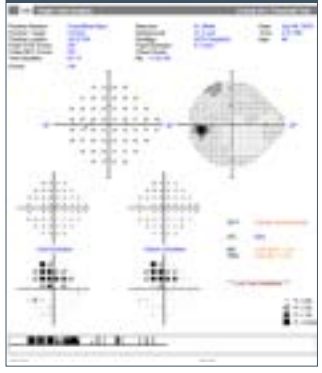


FIGURE 2
T1 weighted Coronal MRI showing pituitary macroadenoma

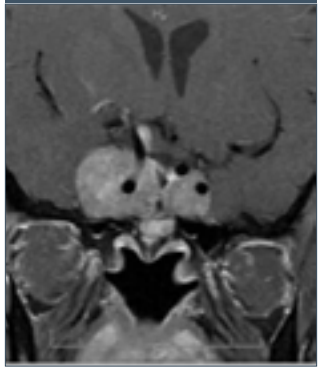


FIGURE 3
Goldmann Perimetry VF of the left eye post-op

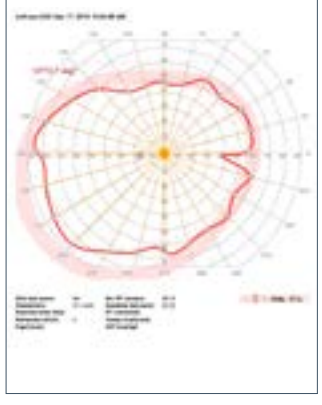


FIGURE 4
Goldmann Perimetry VF of the right eye post-op

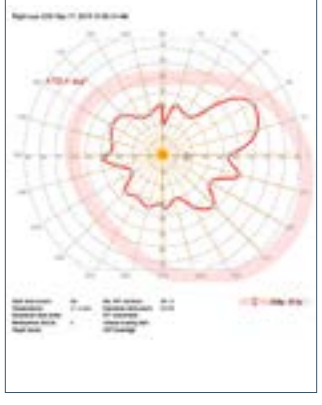


FIGURE 5
Topcon Swept Source Imaging of the right eye

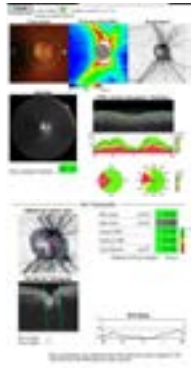
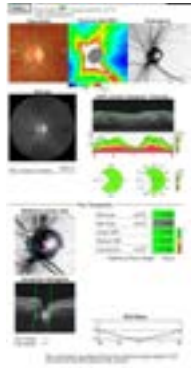


FIGURE 6
Topcon Swept Source Imaging of the left eye



DISCUSSION

This patient presented decreased vision and a visual field defect corresponding with an invasive, recurring macroadenoma. Commonly, acuity is reduced to 20/25 at presentation with a bitemporal hemianopia defect occurring at a rate of 47.1%. In this case, the anatomical variation likely caused by a postfixed chiasm lead to a junctional field defect found in 5.9% with hand-motion vision.

The most significant predictive parameter for visual and visual field recovery is early detection and surgical removal. After treatment, visual potential varies. 88.7% of patient's experience acuity improvement following a first time removal. However, this statistic decreases to 39% after a second treatment. Visual field has a higher rate of recovery at 95% dependent on early diagnosis with maximum improvement plateauing at six months post-operatively.

CONCLUSION

This case illustrates an atypical presentation of a pituitary adenoma due to the invasive nature of the mass leading to dramatic visual acuity and field loss. Without treatment and resection, it is possible that this patient would have been at increased risk for further visual damage. Restoration of ocular function appears optimistic due to a successful referral, removal and proper follow-up protocol.

REFERENCES

Upon request

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Visual Symptoms in Individuals with History of Traumatic Brain Injury

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INTRODUCTION

Traumatic brain injury (TBI) is a significant public health issue in U.S and can have many consequences, including visual symptoms.[1] The Brain Injury Vision Symptom Survey (BIVSS) recently has been validated to assist health care providers document vision complaints secondary to brain injury in adults.[2] The validation study did not exclude TBI subjects based on time of first or most recent TBI. Additionally, the control group for the study consisted of first- and third-year optometry students. Whether differences in scores on the BIVSS would manifest between those reporting a history of TBI and a control group with a wider age range is unknown.

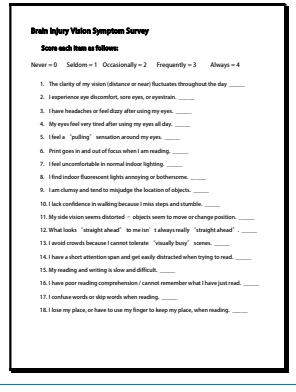
A study on long-term visual dysfunction (42 +/- 16.4 months) after blast-induced mild TBI reported that a significant number of subjects continued to suffer from photophobia and/or were diagnosed with oculomotor disorders.[3] In another study that administered the Rivermead Post Concussion Symptoms Questionnaire up to 322 days after injury, a significant difference in scores between mTbi subjects and controls manifested at all time-points tested.[4] Thus, lingering visual symptoms from mTBI, even two or more years after the event, may contribute to long-term disability and confound the diagnosis of other ocular or visual system disorders.

PURPOSE

1. To investigate whether individuals with history of mild TBI (mTBI) had more visual symptoms, as assessed by the BIVSS, compared to ones without mTBI.

2. To determine whether the demographic factors of Age, Gender, and number of mTBI's are correlated with BIVSS scores.

TABLE 1
Brain Injury Vision Symptom Survey



Brain Injury Vision Symptom Survey

Score each item as follows:

Never = 0 Seldom = 1 Occasionally = 2 Frequently = 3 Always = 4

1. The clarity of my vision (distance or near) fluctuates throughout the day _____
2. I experience eye discomfort, sore eyes, or eyestrain. _____
3. I have headaches or feel dizzy after using my eyes. _____
4. My eyes feel very tired after using my eyes all day. _____
5. I feel a "pulling" sensation around my eyes. _____
6. Print goes in and out of focus when I am reading. _____
7. I feel uncomfortable in normal indoor lighting. _____
8. I find indoor fluorescent lights annoying or bothersome. _____
9. I am clumsy and tend to misjudge the location of objects. _____
10. I lack confidence in walking because I miss steps and stumble. _____
11. My side vision seems distorted – objects seem to move or change position. _____
12. What looks "straight ahead" to me isn't always really "straight ahead". _____
13. I avoid crowds because I cannot tolerate "visually busy" scenes. _____
14. I have a short attention span and get easily distracted when trying to read. _____
15. My reading and writing is slow and difficult. _____
16. I have poor reading comprehension / cannot remember what I have just read. _____
17. I confuse words or skip words when reading. _____
18. I lose my place, or have to use my finger to keep my place, when reading. _____

METHODS

1. Retrospective review was conducted of demographic and BIVSS survey data from subjects for whom pupil responses were assessed as part of the Fellows Doing Research (FDR) AAO Exhibit Hall study in 2016, Chicago, IL.

2. The subjects included 150 adults between the ages of 19 and 81 years, inclusive.

3. Abbreviated (18 items) BIVSS surveys[5] were administered electronically via Survey Monkey. Subjects' responses were recorded using digital tablets.

TABLE 2
Demographic Characteristics of the Subjects (n = 150)

	Number of Subjects (%)
Gender	
Female	85 (56.7)
Male	63 (42.0)
mTBI History	
None	105 (70.0)
Once	27 (18.0)
Twice or more	18 (12.0)
Age (years)	
Range	19 - 81
Mean (SD)	34.9 (13.7)

TABLE 3
BIVSS Scores in Subjects with No History of mTBI, mTBI once, and twice or more.

	BIVSS Score	
	Mean	95%CI
Age		
< 30 years old (n=85)	7.18	5.77 - 8.58
30 to 60 years old (n=50)	7.28	5.34 - 9.22
> 60 years old (n=15)	7.73	4.23 - 11.24
mTBI history		
None (n=105)	6.75	5.53 - 7.98
Once (n=37)	5.89	3.64 - 8.14
Twice or more (n=18)	12.33*	8.74- 15.93

*P= 0.001

4. Statistical analyses were conducted with SPSS version 21.

- Descriptive statistics were calculated and Analysis of Covariance was used to compare the BIVSS scores among subjects without mTBI, with one episode of mTBI and with two or more episodes of mTBI by controlling cofounders of age and gender.

- Multiple regressions were performed to identify whether the explanatory variables of age, gender, history of mTBI, and number of mTBIs predicted BIVSS scores.

RESULTS

BIVSS scores were statistically significantly higher in subjects with two or more episodes of mTBI in subjects with no history of mTBI or with one episode of mTBI (P= 0.001). Both number of mTBIs (B=3.84, P= 0.002) and gender (B=-3.12, P= 0.003) statistically significantly predicted BIVSS scores.

CONCLUSION

- Individuals with more episodes of mTBI had more visual symptoms than ones without mTBI or with one episode of mTBI.

- Our findings indicate that heath care provides should be aware that mTBI can lead to significant visual symptoms.

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Repeatability of an Automated ETDRS Low Contrast Acuity Measurement in Individuals with Normal or Reduced Vision

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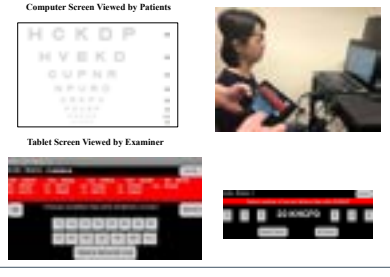
PURPOSE

Low-contrast acuity (LCA), as an important visual function test, has been identified as an important visual component in many types of patients. Computerized equipment can generate similar results as gold standard charts if test distance and position of the test screen are correct and external glare are limited. However, many of those systems have not yet been validated. The purpose of this study was to determine the repeatability of an automated ETDRS low contrast acuity (LCA) measurement and its agreement with the gold standard chart-based measurements, Sloan LCA chart, in normal subjects and subjects with reduced visual acuity (VA).

TABLE 1
Demographic Characteristics of the Subjects (n = 51)

	Number of Subjects (%)
Visual Acuity	
20/25 or better	33 (64.7)
20/30 to 20/100	18 (35.3)
Gender	
Female	42 (82.4)
Male	9 (17.6)
Race	
Black	22 (43.1)
Hispanic	8 (15.7)
White	16 (31.4)
Asian	5 (9.8)
Age (years)	
Range	22.6-91.1
Mean (SD)	46.7 (17.5)

FIGURE 1
Automated ETDRS low contrast acuity measurement



METHODS

Fifty-one subjects were tested (age 23 – 91 years), including 33 subjects with normal vision (VA of 20/25 or better) and 18 subjects with reduced vision (VA from 20/30 to 20/100). LCA at two contrast levels (10% and 2.5%) of one eye from each subject was measured in a random sequence with the Sloan LCA chart and automated tablet-computer system (M&S Technologies, Inc., Niles, IL). **Figure 1** shows the automated LCA test. Subjects were retested one week (± 3 days) later. Agreement between Sloan LCA and automated LCA (A-LCA) as well as repeatability between two visits were evaluated using the 95% limits of agreement (LoA).

FIGURE 2
Agreement between 10 % Sloan and Automated LCA and Repeatability of Sloan and Automated LCA Test

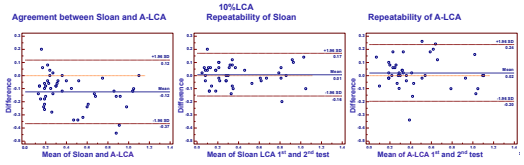
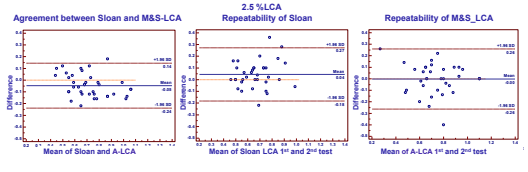


FIGURE 3
Agreement between 2.5% Sloan and Automated LCA and Repeatability of Sloan and Automated LCA Test



RESULTS

- **10% LCA (Figure 2)**

Table 1 lists demographic characteristics of the subjects. The mean (±SD) difference between 10% Sloan LCA and 10% A-LCA was -0.12 (± 0.12) logMAR (about 1 line) with statistical significance ($p < 0.001$). The average difference between visit 1 and 2 was 0.00± 0.08 and 0.02 ± 0.11 logMAR respectively for 10% Sloan LCA and A-LCA. The 95% LoA between A-LCA and Sloan LCA test was ± 0.24 logMAR at 10% contrast level. The repeatability of A-LCA (95% LoA = ± 0.22) was comparable to Sloan LCA (± 0.17) at 10% contrast level.

- **2.5% LCA (Figure 3)**

The mean (±SD) difference between 2.5% Sloan LCA and 2.5% A-LCA was -0.05 (± 0.10) logMAR (0.5 line) with statistical significance ($p = 0.005$). The average difference between visit 1 and 2 was 0.05± 0.12 and 0.00 ± 0.13 logMAR respectively for 2.5% Sloan LCA and A-LCA. The 95% LoA between A-LCA and Sloan LCA test was ± 0.19 logMAR at 2.5% contrast level. The repeatability of A-LCA (95% LoA = ± 0.26) was comparable to Sloan LCA (95% LoA = ± 0.23) at 2.5% contrast level.

CONCLUSION

- The automated ETDRS LCA measurement shows good repeatability at both contrast levels of 10% and 2.5% in both subjects with normal vision and ones with reduced vision.
- The agreement between automated ETDRS LCA measurement and Sloan LCA chart is fair at 10% contrast level and good at 2.5% contrast level.

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Combined Cilioretinal Artery and Central Retinal Vein Occlusion in 42–Year–Old Male

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BACKGROUND

A central retinal vein occlusion (CRVO) is a blockage of blood flow to the central retinal vein commonly seen in patients over the age of 65. Signs include decreased vision, pupillary changes, iris neovascularization, dilated retinal blood vessels, retinal hemorrhages, retinal edema and retinal neovascularization. A cilioretinal artery occlusion is a blockage of blood flow to the cilioretinal artery; also commonly seen in patients over the age of 65. Common etiologies include embolic cases, hypertensive necrosis, inflammatory or associated with a CRVO. Signs include visual field loss, pupillary changes, superficial retinal whitening, or retinal emboli.

In combined cases, the mechanism is not well known; however, there are two proposed hypotheses.

1) Mechanical compression of the artery due to increase in venous pressure.
2) Reduced perfusion pressure to arteries causing decreased circulation leading to decreased retinal circulation and subsequent venous stasis and thrombosis.

CASE REPORT

42-year-old African American male presented to the urgent care clinic with complaints of sudden onset decreased vision OS.

	07/13/2016	
	OD	OS
VA	20/20 cc	20/40 cc (PHNI)
EOM	FROM	FROM
PUPILS	WNL	WNL
CVF	FTFC	FTFC
IOP	13 mmHg	13 mmHg

OCULAR HISTORY: unremarkable

MEDICAL HISTORY: Followed for pulmonary embolism with recent changes in medication. Patient reports poor compliance with follow up schedule and recent increase in alcohol intake.

MEDICATIONS: Eliquis

ANTERIOR SEGMENT: Unremarkable OD, OS

DFE: See photos.

OCT: Acute thickening along the cilioretinal artery OS.

ECHOCARDIOGRAM: Left ventricle performance severely reduced and suspicious thrombus.

CAROTID DUPLEX: No plaque formation in right or left carotid arteries.

DIAGNOSIS: Combined cilioretinal artery and central retinal vein occlusion.

FIGURE 1
OD Posterior Pole

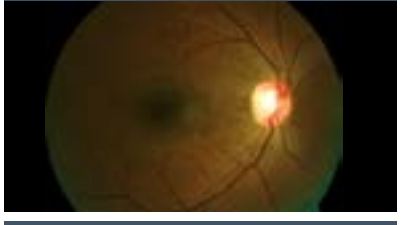


FIGURE 2
OS Posterior Pole

FIGURE 3
OS Retinal OCT showing retinal edema

TREATMENT

Patient saw retinal specialist and received 2 treatments of anti-VEGF. Vision had returned to 20/40. Patient also saw hematology, was told to discontinue Eliquis, and restarted warfarin. Now sees hematology monthly.

FIGURE 4
OS Retinal OCT s/p AntiVEGf with improved retinal edema.

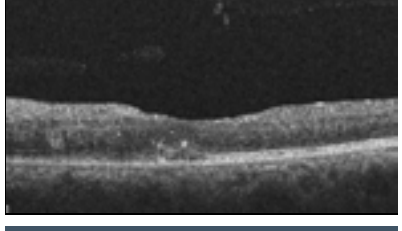
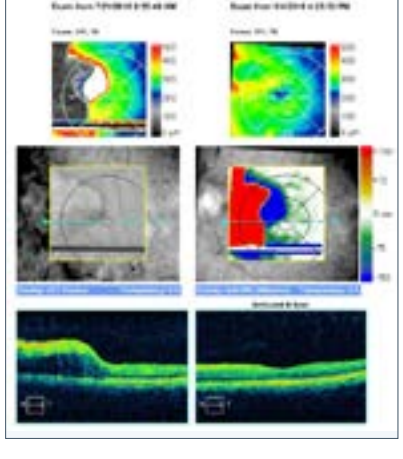


FIGURE 5
OS Retinal Change Analysis



DISCUSSION

Pulmonary embolism is a blockage in one of the pulmonary arteries. Clots can travel from the legs or other parts of the body. This can lead to pulmonary hypertension, as blood pressure in the lungs can be high and weaken the right side of the heart. Treatment includes prevention of new clots or preventing current clots from becoming larger. Historically, heparin and warfarin are standard treatment options. However, novel blood thinners now allow quick oral treatment with less required blood work. These include Pradaxa, Xarelto, Eliquis and Savaysa.

Without close monitoring, efficacy cannot be determined. In this patient's case, Eliquis was not controlling the patient's condition. Due in inefficacy, patient had a combined Cilioretinal Artery and Central Retinal vein occlusion. Complications related to the CRVO include neovascularization or macular edema. While the cilioretinal artery occlusion does not require treatment, etiology must be determined. Appropriate management includes a fluorescein angiography, systemic work up including: carotid/cardiac work up and blood work. Blood work can rule out inflammatory etiology or coagulopathies. In most cases, 70% of eyes return to 20/40 vision or better.

CONCLUSION

Our patient received 2 anti-VEGf injections after consulting with retina. Patient had full systemic work up and his treatment was altered. While at one point his vision dropped to 20/125, the patient's vision did return to 20/40. Patient is now followed monthly and compliant with treatment/management.

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Pigment Epithelial Detachment in a Patient Undergoing Carboplatin and Paclitaxel Chemotherapy Treatment for Endometrial Cancer

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PURPOSE

To present a case of a patient presenting with pigment epithelial detachment (PED) after beginning a combination chemotherapy treatment of carboplatin and paclitaxel for endometrial cancer.

CASE REPORT

- 65-year-old African American female presented for a comprehensive eye exam.
- No specific visual or ocular complaints.
- 3 weeks prior to this visit, she started an intense six-week round of chemotherapy treatment of carboplatin and paclitaxel for endometrial cancer.
- BCVA
  - 20/20 in the right (OD)
  - 20/20 left eyes (OS).
- Pupils, eye movements and confrontational visual fields were within normal limits OD, OS.
- Slit lamp bio-microscope: mild nuclear cataracts in both eyes.
- A dilated fundus exam was significant for an epi-retinal membrane (ERM) in the right eye and a small area of elevation and RPE mottling inferior to the fovea in the left eye.
- OCT confirmed an ERM without traction in the right eye and a moderate PED inferior to the fovea in the left eye (Figures 1 and 3a). No ocular treatment was initiated.
- 3 weeks after discontinuing chemotherapy treatment with Carboplatin and Paclitaxel, the PED had significantly decreased. (Figure 2)
- 8 months after she initially presented (9 months after initiating the chemotherapy combination), her PED had completely resolved with remaining retinal mottling at the site inferior to the macula, with no effect on visual acuity (Figure 3b).

DISCUSSION

Ocular toxicities are common in chemotherapy treatment, but often under reported. Paclitaxel is a chemotherapy agent from the taxane group. Taxanes are anti-miotics often used to treat breast and ovarian cancer. This chemotherapy drug class can cause scotomas, macular edema and ischemic optic neuropathy. Taxanes cause disruption of the retinal pigment epithelium (RPE) due to the drug's effect on microtubules, which are responsible for intracellular transport leading to fluid accumulation in intracellular spaces of the RPE[2,3]. Carboplatin on the other hand, is a platinum complex compound used to treat an array of cancers including ovarian cancer. Treatments with carboplatin have been shown to cause optic neuropathy and maculopathy weeks after intravenous injection[4]. The heavy metal components of Carboplatin cause toxicity to cellular organization, specifically axons[1]. The combination of these two chemotherapy agents along with radiation have shown great success in decreasing recurrence and improving survival in endometrial cancer, in most cases by 60-80%[3].

FIGURE 1
Macular thickness OCT (1st visit) showing PED inferior to the central fovea

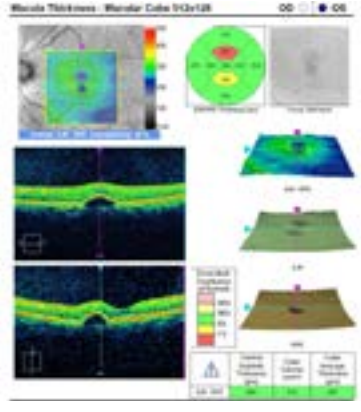


FIGURE 2
Macular Cube OCT showing decreased elevation in PED 3 weeks after discontinuing combination chemotherapy of carboplatin and paclitaxel

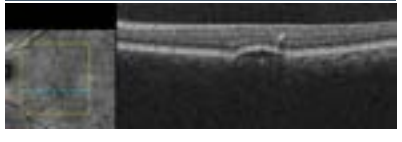
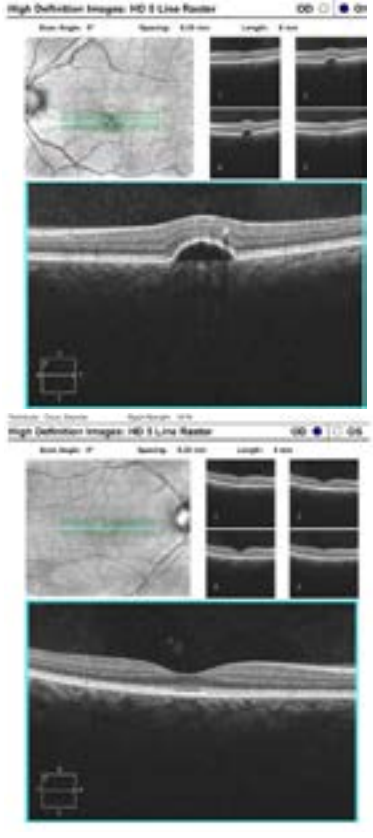


FIGURE 3A AND 3B
Initial presentation 3 weeks after starting chemotherapy treatment with HD 5-line raster OCT (a) and 9 months after initial treatment (b).



CONCLUSION

Previous case studies have shown an association with macular edema during treatment of chemotherapy with these agents. However, most cases presented binocular findings and without a mention of a PED outside the macula. As presented in this and other cases, most macular conditions resolve after cessation of treatment with these chemotherapy agent(s). Therefore, it is important to acknowledge that patients receiving chemotherapy should have a baseline exam prior to treatment, after starting treatment, and after discontinuing chemotherapy. Communication between oncologists, primary care doctors and eye care professionals is a necessity, while patients begin to undergo treatment with known agents that could cause ocular side effects.

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Incidence and Onset of Rebound Iritis Following Cataract Surgery in Patients Injected with Triamcinolone Acetonide and Moxifloxacin HCL.

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BACKGROUND

"Dropless" cataract surgery is becoming a commonly employed method to reduce the incidence of endophthalmitis post-cataract extraction (CE). Traditionally, a course of topical antibiotic and steroid drops are administered after CE. Trans-zonular injection of intravitreal Triamcinolone Acetonide and Moxifloxacin HCL (Tri-Moxi) during phacoemulsification eliminates the need for any postoperative ophthalmic drops. Our study investigates the risk versus benefit of the use of the drug Tri-Moxi during CE.

PURPOSE

The purpose of our study was to investigate the incidence and onset of rebound iritis following CE in those subjects injected with drug Tri-Moxi.

METHODS

- Retrospective chart review of 100 procedures at the Illinois Eye Institute (IEI).
- Subjects were between 52 - 90 years of age.
- CE via phacoemulsification technique, with an intravitreal trans-zonular injection of Tri-Moxi.
- Only subjects that did not receive preoperative topical medications of an NSAID or steroid were included.
- Rebound iritis was defined as an increase in anterior chamber cell or flare at least 1 week after surgery, but within 6 months status post-operatively with Tri-Moxi.

Statistical analyses using the parametric method was performed to investigate any correlation between:

- Age during CE
- Race
- Gender
- History of ocular inflammation
- Rate of rebound inflammation
- Days until onset of rebound inflammation
- Best corrected visual acuity (BCVA) pre-operatively.

RESULTS

- The age group most affected by rebound inflammation was 50-60 years old at 45%.(Figure 1)
- African Americans were the most common race to develop rebound inflammation after CE with Tri-Moxi. (Figure 2)
- Subjects 20/50-20/150 were more prevalent to have rebound iritis status post CE with Tri-Moxi. (Figure 3 and 4)
- The rate of rebound inflammation was found to be 21% in our study. Past studies have suggested a correlation of pigmentation, which can be associated with race, and rebound inflammation; however, this study did not find a significant correlation between race and inflammation. This is likely due to the unequal numbers per race and the abundance of African American subjects in this study.

FIGURE 1 Percentage of patients with rebound inflammation by age.

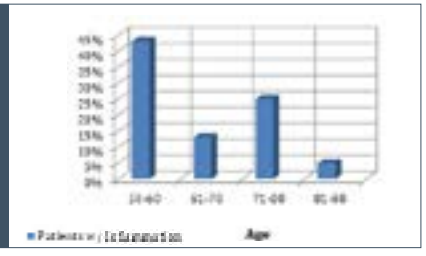

FIGURE 2 Number of patients with rebound inflammation by race.

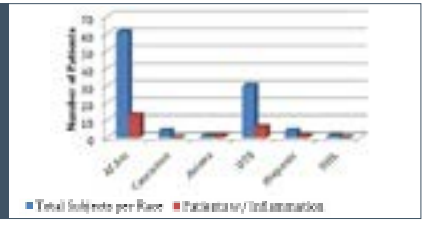

FIGURE 3 Number of patients with rebound inflammation sorted by pre-operative BCVA.

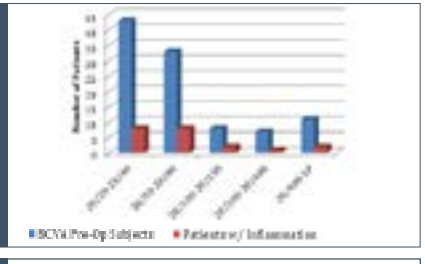

FIGURE 4 Table showing percentage of patients with rebound inflammation by pre-operative BCVA

BCVA Pre-Op			
Visual Acuity of Patients	BCVA Pre-Op Patients	Patients w/ Inflammation	Percentage of Patients w/ Inflammation
20/20-20/40	42	8	19%
20/50-20/80	33	8	24%
20/100-20/150	8	2	25%
20/200-20/400	7	1	14%
20/400-LP	11	2	18%

CONCLUSION

The incidence of rebound iritis following CE performed with Tri-Moxi injection at IEI was 21%. This number is significantly higher than reported in past literature, which on average is about 9%. In this chart review, the cases of rebound inflammation were treated with an additional course of a topical steroid that resolved with no further complications. "Dropless" CE with Tri-Moxi should be considered as cost-effective and safe as the current post-operative protocol of instilling drops after CE. However, eye care providers treating these patients postoperatively should be aware that there may be an increased risk for rebound iritis.

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Factors related to intraocular pressure elevation upon change from upright position to 30 degrees below horizontal position

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INTRODUCTION

While it has long been known that any amount of inversion, from supine positioning to complete inversion, will cause an increase in the intraocular pressure (IOP) it is not know the exact mechanisms that contribute to this increase. This study investigated if there were any characteristics, which could be identified by optical coherence imaging (OCT) of the optic nerve that would contribute to a greater increase in IOP upon inversion.

PURPOSE

To measure degree of IOP elevation and the factors associated with IOP change when shifting from upright position to 30-degree Trendelenburg position (head inverted 30 degrees below horizontal).

TABLE 1
Demographics

Demographics: Total sample = 230

	N	Minimum	Maximum	Mean	Median	SD	25 - 75 P	Normal Distr.
Age	230	21.000	71.000	36.778	31.000	13.8831	26.000 to 48.000	<0.0001
BMI	228	10.539	37.914	24.575	23.831	3.8188	21.973 to 26.471	<0.0001
WT__LB_	228	78.000	275.000	154.496	155.000	31.7903	130.000 to 175.000	0.0001
HT__IN_	229	59.000	78.000	67.210	67.000	3.7801	64.000 to 70.000	0.0029
RE_OD_SE	186	-15.000	7.000	-3.048	-3.000	3.4008	-5.000 to -0.250	0.0055
RNFL	174	65.000	122.000	94.454	94.000	10.6871	88.000 to 101.000	0.6848

TABLE 2
Regression Analysis

PERCENT IOP CHANGE BASELINE TO INVERSION 1

	UNIVARIATE COEFF	UNIVARIATE R-SQUARE	UNIVARIATE P	MULTIVARIATE COEFF	MULTIVARIATE R-SQUARE	MULTIVARIATE P
age	0.0033	0.02	0.05			
gender	-0.1349	0.04	0.004			
height	0.0218	0.05	0.0005			
weight	0.0025	0.05	0.0007	0.0030	0.09	0.0001
bmi	0.0013	0.00	0.83			
ethnicity	0.0134	0.00	0.61			
refractive error	0.0220	0.04	0.006	0.0163	0.03	0.02
IOP 1 (baseline)	-0.0412	0.20	<0.0001	-0.0401	0.21	<0.0001
SBP 1 (baseline)	0.0000	0.00	0.99			
DBP 1 (baseline)	-0.0030	0.01	0.21			
Pulse 1 (baseline)	-0.0061	0.05	0.001	-0.0059	0.06	0.009
RNFL	0.0032	0.01	0.21			
SBP 1_2 PERCENT	0.3857	0.01	0.15			
DBP 1_2 PERCENT	-0.0363	0.00	0.88			
PULSE 1_2 PERCENT	0.2872	0.01	0.17	TOTAL R2:	0.31	

METHODS

- Subjects recruited from the exhibit hall of the American Academy of Optometry 2018 meeting
- Subjects initially completed an intake questionnaire and OCT imaging
- Blood pressure and IOP measurements using an ICare tonometer were taken while sitting, 1 min and 2 minutes after inversion to 30 degrees

FIGURE 1

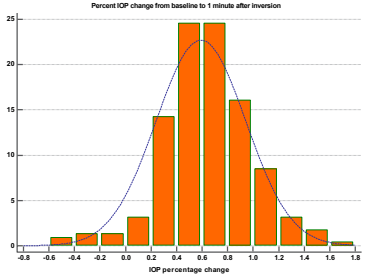


FIGURE 2

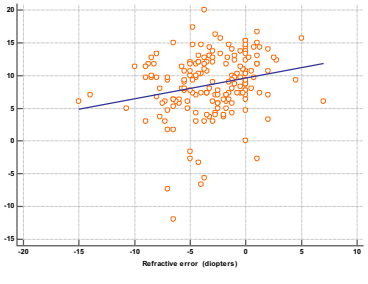


FIGURE 3

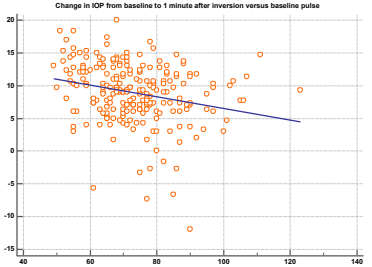
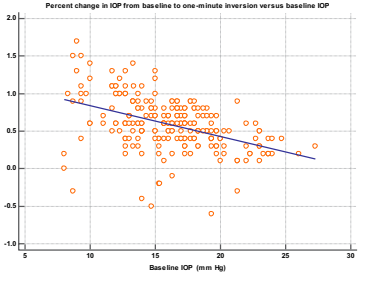


FIGURE 4



RESULTS

- Median IOP increased from 16.3 (±3.8) mmHg at baseline to 25.0 (±5.8) mmHg at one minute
- This change represented a 60% (±35%) increase in IOP, and 95% of all eyes demonstrated an IOP increase upon positional change (Figure 1)
- Univariate analysis showed IOP change was
  - directly corelated to age, height, weight, and refractive error
  - Inversely corelated to baseline IOP, baseline pulse and female gender
- Multivariate regression analysis showed IOP change was independently related to
  - Increasing weight
  - Less myopic refractive error
  - Lower baseline pulse
  - Lower baseline IOP

CONCLUSIONS

- IOP increased a median of 60% in 95% of people after 1 minute of inversion
- IOP elevation was related to greater weight, more hyperopic refractive error and lower initial IOP
- This is a consideration for patients undergoing the Trendelenburg position

ACKNOWLEDGEMENTS

We would like to thank the Illinois College of Optometry, Zeiss and ICare for their generous support.

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Factors influencing clinical interpretation of OCT-derived retinal nerve fiber layer thickness, neuro-retinal rim area, and vertical cup-disc ratio

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INTRODUCTION/ BACKGROUND

- Accurate interpretation of OCT is critical in the Glaucoma decision making process.
- Studies have shown varying relationships amongst OCT ONH parameters, RNFL thickness, and other clinical factors.[1-4]
- Understanding the influence of ocular and non-ocular factors on ONH parameters and RNFL thickness, and their inter-relationship in normal eyes can inform practitioners on their interpretation of OCT data
- Ultimately this knowledge assists in reducing misinterpretation that may result in unnecessary treatment and subsequent burden on patients suspected of having glaucoma

METHODS

- Subjects for this study were recruited in the exhibit hall of the 2017 AAO meeting in Chicago, IL
- The Institutional Review Board at the Illinois College of Optometry approved the study and all subjects completed informed consent prior to participating in any study procedures.
- Subjects completed an intake questionnaire (that included data for age, gender, ethnicity, height, weight, refractive error, medication use, eye health, and systemic health information)
- Each subject underwent SD-OCT imaging of the right optic nerve, followed by IOP and BP measurements in upright and inverted positions.
- OCT Image quality was assessed by a panel of experts and included only if considered good quality by consensus (Good quality as defined by Cirrus Normative Database Study Group)[4]
- Data analysis focused on multivariate logistic and linear regression analyses to explore relationships between retinal nerve fiber layer thickness (RNFL), neuro-retinal rim area (RA), and vertical cup-disc ratio (VCD) and the other variables in this study.

RESULTS

- 206 eyes of 206 subjects had good quality OCT data and were included
- Mean age was 36.5 +/- 13.9 years and 56.8% were female.
- Ethnic makeup was 71.4% Caucasian, 22.8% Asian, 1.9% African American, 1.9% Latino, and 2% other.
- No subjects had known glaucoma or other optic nerve disease
- In multivariate regression analyses, optic disc area was independently related to all three optic nerve variables (RNFL, RA, and VCD)

TABLE 1
Demographics

	N	Mean	Median	SD	Range	25 - 75 P	Normal Distr.
Age (yrs)	206	36.5	31.0	13.9	21.0-71.0	26.0 to 45.0	<0.0001
BMI	204	24.6	23.8	3.7	17.6-37.9	22.0 to 26.5	<0.0001
Weight (pounds)	204	155.3	155.0	31.2	78.0-2.75	130.0 to 175.5	0.0114
Height (inches)	205	67.3	67.0	3.8	59.0-78.0	64.0 to 70.0	0.0060
Refractive Error (Diopters)	165	-2.9	-2.8	3.3	-14.0- +7.0	-5.0 to -0.00	0.0600

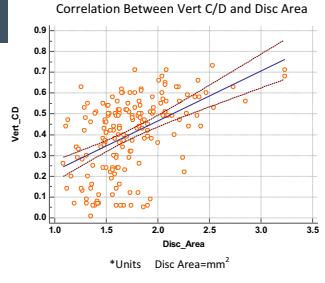
*Only weight and refractive error were normally distributed

TABLE 2
MULTIVARIATE REGRESSION ANALYSES: FACTORS RELATED TO TOTAL RNFL AND RIM AREA

	RNFL (0.36)			RIM AREA (0.91)			Vertical CD (0.81)		
Factor	**coeff**	**r^2**	**p-value**	**coeff**	**r^2**	**p-value**	**coeff**	**r^2**	**p-value**
Age	-0.1811	0.05	0.006						
Refractive error	1.1946	0.14	<0.0001				0.0346	0.03	0.03
Disc area	7.6721	0.10	0.0002	0.6794	0.85	<0.0001	0.5738	0.52	<0.0001
Cup volume				-0.9881	0.53	<0.0001	-0.4211	0.08	0.0006
Rim area	0.0112	0.25	<0.0001	--	--	--	-0.7888	0.58	<0.0001
Vertical CD ratio				-0.6949	0.59	<0.0001	--	--	--
Total RNFL	--	--	--	0.0030	0.14	<0.0001			

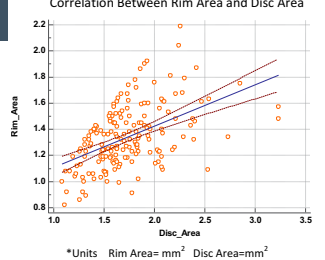
BMI, Height, Weight, Ethnicity, Gender: not related to RNFL/Rim area

FIG 1



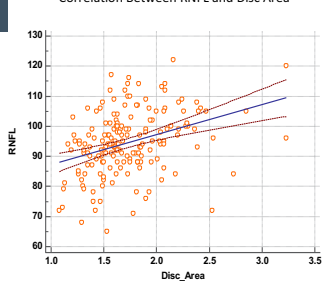
*Units Disc Area=mm^2

FIG 2



*Units Rim Area= mm^2 Disc Area=mm^2

FIG 3



*Units RNFL=µm Disc Area=mm^2

CONCLUSION

- Several clinical variables significantly impact OCT-derived optic nerve variables and should be considered when interpreting OCT data.
- Specifically, our data supports the consideration of disc area, refractive error, age, and inter-relationships between OCT variables as important information for optimally using OCT technology within clinical decision-making.

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ACKNOWLEDGEMENTS

We would like to thank the Illinois College of Optometry, Zeiss and ICare for their generous support.

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Comparative Frequencies of SD–OCT Optic Nerve Imaging Abnormalities in Normal Eyes

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INTRODUCTION

- OCT used in the management of glaucoma, has robust capabilities in the assessment of progression and rates of deterioration of this disease. However, interpretation of scan results in identifying glaucomatous defects and its progression has proven to be challenging, in part due to structural variations.
- Clinical evaluation and interpretation of OCT is confounded by numerous anatomic variables which can occur in normal eyes.
- Moreover, each OCT scan results are dependent on the quality of scan acquisition, technician's skill, variable anatomy, refractive error and media. Also, OCT's can change over time, due to aging, increase in media density, and progression of glaucomatous disease.
- Understanding the common variables and influences on an OCT scan will facilitate proper interpretation of that scan even though specific findings in the RNFL scan results are not considered normal.

STUDY PURPOSE

Purpose: Clinical interpretation of abnormal flags on spectral-domain optical coherence tomography (SD-OCT) imaging requires understanding of variables that can influence scan results in normal eyes. This study examined the frequency of abnormal SD-OCT flags on optic nerve cube scans and the factors associated with these abnormal flags. Further, this study determined if a change in mean ocular perfusion pressure (MOPP) on inversion was associated with OCT flags.

STUDY DESIGN

Cross- sectional population study –single screening

- Inclusion criteria required, consent obtained, intake questionnaire performed, exclusion criteria applied
- IOP measured with I-Care tonometry before, 1 minute during, and several minutes after 30 Degree inversion
- OCT RNFL scans were performed on participant right eyes.
  - Frequency of Flags for RNFL (total, inferior, superior) as well as RA and VCDR were determined. -Specific flags for 6,7,8 and 11:00 were determined.
- Blood pressures were measured before and after inversion
- Right eye data was used unless it was ineligible, then the left eye was utilized
- Data was measured in masked fashion. Paired samples t-test was performed, single and stepwise multivariate regression analysis performed.

IAT: I-Care Applanation Tonometry: Each of three sets of readings had 3 readings each and were averaged for each interval. Each series of readings were accepted if "green" on a minimum of 2 out of three readings.

BP: Automated cuff readings

TABLE 1
Characteristics of Sample (n=177)

	N	Min.	Max	Mean	Median	SD
Age (years)	177	20	71	36	30	14
BMI	172	17.6	37.9	24.7	23.9	3.8
Refractive error	146	-11.75	7.00	-2.83	-2.88	3.09
Vertical CD ratio	177	0.01	0.73	0.40	0.44	0.18
Disc Area	177	1.08	3.23	1.73	1.66	0.37
Rim Area	177	0.82	2.19	1.34	1.32	0.24
RNFL (total)	177	68	122	95	94	10
RNFL Sup Quad	177	74	160	114	114	17
RNFL Inf Quad	176	73	177	122	123	20.0
RNFL 6 Oclock	176	64	210	131	131	31
RNFL 7 Oclock	177	83	200	139	138	23
RNFL 8 Oclock	177	37	147	73	66	21
RNFL 11 Oclock	177	82	207	135	136	22
Signal Strength	177	7	10	9	9	1

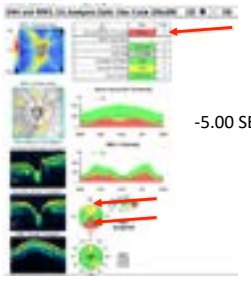
TABLE 2
Frequency of OCT flags (n=177)

Variable	Number	%
RNFL (6:00)	27	15.3
RNFL (superior)	19	10.7
RNFL (total)	18	10.2
RNFL (inferior)	14	8.0
Vertical CD ratio (VCDR)	9	5.1
Cup/disc ratio (CDR)	7	4.0
Rim Area	6	3.4
RNFL (11:00)	4	2.3
RNFL (7:00)	2	1.1
RNFL (8:00)	2	1.1

OCT: A minimum acceptable signal strength of 7 was used. Each OCT was reviewed by 3 SME's simultaneously. Interpretation of OCT quality and results were accepted if there was a consensus opinion for acceptance.

TABLE 3
Multivariate regression analysis: factors independently associated with OCT flags (estimate/ r2/ p-value)

OCT Flags	Refractive error	Rim area	Rim area flag	Vertical CD flag
RNFL (total)	-0.0277	-0.2788		
	0.07 (0.001)	0.05 (0.01)		
RNFL (superior)	-0.0173	-0.2691		
	0.03 (0.04)	0.04 (0.02)		
RNFL (inferior)	-0.0277	-0.2124		
	0.09 (0.002)	0.04 (0.02)		
VCDR		-0.1623	0.4042	
		0.03 (0.02)	0.11 (<0.0001)	
Rim area				0.3155
				0.15 (<0.0001)



-5.00 SE

CONCLUSIONS

RNFL flags were twice as common as VCDR flags and thrice as common as RA flags.

Increasing myopia was associated with higher frequencies of total and sectoral RNFL flags but was not associated with increasing RA or VCDR flags.

When interpreting SD-OCT optic nerve cube scans, clinicians should consider that RA and VCD flags can occur coincidently in normal eyes, while frequency of abnormal RNFL flags rises as myopia increases.

We found no associations between MOPP and any OCT flags.

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ACKNOWLEDGEMENTS

We would like to thank the Illinois College of Optometry, Zeiss and ICare for their generous support.

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Scleral Lens Fogging in Graft–versus–Host Disease Patient with Fluorescein Hypersensitivity

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INTRODUCTION

Graft-versus-host Disease (GvHD) occurs when a donor tissue's immune system aggressively attacks host tissue because of a difference in minor histocompatibility complexes[1-3]. Patients experience an ocular component (Ocular Graft-versus-host Disease [oGvHD]) in 40-60% of cases[2-4]. Symptoms include increased mucus production, dryness, irritation, foreign body sensation, burning, redness and blurriness.

CASE PRESENTATION

A 30-year-old Hispanic female was referred to Illinois Eye Institute for contact lens fitting for oGvHD. She had undergone bone marrow transplants (2011/2013) after being diagnosed with leukemia. She was diagnosed with GvHD of the skin (often the presenting sign) in 2016[1-3]. At the time of examination, the patient was in remission and taking the immunosuppressive drugs Cellcept and Sirolimus. Her chief ocular complaints were extreme dryness and irritation. Current topical therapy included serum tears, steroid drops, and artificial tears, with punctal cauterization performed in 2016. Her allergies to medications included vancomycin and clarithromycin.

Entrance testing and posterior segment evaluation were normal. Anterior segment findings are summarized in Table 1.

TABLE 1

Initial		Final
20/70 OD and 20/80 OS	**Best visual acuity**	20/30 and 20/40-1 (with lens)
Clumped lashes w/ debris	**Lids and lashes**	1+ MGD w/ scalloped lid margins
3+ injection	**Conjunctiva**	Trace injection
2+ diffuse staining	**Cornea**	Clear, No staining performed
Irregular	**Tear film**	Stable

Atlas topography revealed a dessicated, irregular corneal surface (Figure 1). A diagnostic fitting was performed with Onefit 2.0 scleral lenses (Blanchard Laboratories, Manchester, NH)[5]. Given a previous adverse reaction to fluorescein dye, optical coherence tomography (OCT) was utilized for lens-to-cornea fitting evaluation[6-7]. Lenses were then ordered and dispensed two weeks later after successful insertion and removal training. At the progress report, the patient reported difficulty removing lenses and complained of foggy vision, consistent with post-lens tear film turbidity seen on examination (Figure 2).

Lens adjustments were made to add toric haptics to better align to the scleral landscape, and a smaller diameter lens was used to avoid putting pressure on mucin-producing goblet cells of conjunctiva[8]. The central clearance was also lowered as a large post-lens tear reservoir can accumulate debris leading to foggy vision[9-11]. Extra limbal clearance (XLC) was added to avoid limbal touch in a low centrally vaulted lens. The lenses were treated with Tangible Hydra-PEG (Tangible Science, Menlo Park, CA) and she was directed to fill the lens bowl with a high viscosity solution in addition to preservative free saline to prevent debris accumulation. Hydrogen peroxide-based cleaner was recommended for cleaning.

The lenses were adjusted several times to optimize the fitting relationship. The final lens fit and OCT images are shown in Figure 3. With lens wear, the patient noted improvement in vision and oGvHD signs as noted in Table 1. She is now able to comfortably wear lenses for 10-12h/day with occasional midday re-insertion. At this time, her topical therapy has been reduced to preservative free artificial tears as needed.

FIGURE 1
Atlas topography of a) right eye and b) left eye showing tear film disruption.

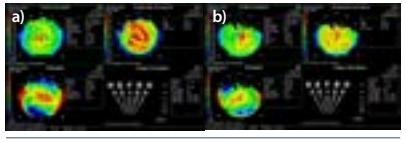


FIGURE 2
a) parallelepiped showing post-lens tear film debris b) foggy lens surface and tear reservoir and c) the post-lens tear film turbidity in the right eye on Pentacam Scheimpflug image.

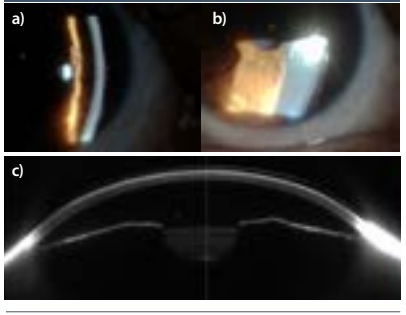
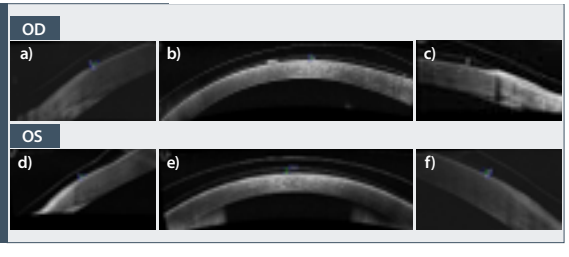


FIGURE 3
Cirrus anterior segment OCT shows with calipers a) temporal limbal clearance OD b) central clearance OD and c) nasal limbal clearance OD and d) nasal limbal clearance OS e) central clearance OS and f) temporal limbal clearance OS.



DISCUSSION

As oGvHD signs and symptoms mimic those of dry eye, a multifaceted treatment approach is indicated, with the addition of systemic therapy to quiet the immune system as directed by the stem cell transplant physician[1-4]. Topical therapy includes tear supplementation, prevention of evaporation, lid hygiene, and anti-inflammatory drops[2-4]. In addition to systemic and topical therapy, large diameter gas-permeable scleral lenses can provide a liquid corneal bandage with trifold benefit: a tear reservoir to improve comfort, a physical barrier for protection against mechanical trauma, and a smooth refractive surface to improve visual outcome[4,11-13]. Scleral lens wearers can also, however, suffer from lens fogging due to the accumulation of post-lens tear reservoir debris. This is common in patients with dry eye and increased lipid production, and may be exacerbated in oGvHD patients due to an inflammatory increase in tear film debris[9]. Lens fogging may be reduced with minimal central clearance, optimal limbal clearance, and a well-designed lens edge incorporating toricity where needed. Filling the lens bowl with viscous solution has also been shown to be beneficial[8-11]. Treatment of lenses with Tangible Hydra-PEG coating and use of hydrogen peroxide cleaning solution can also help decrease fogging[14].

CONCLUSION

In addition to topical and systemic therapy, scleral lenses may help to mitigate the signs and symptoms experienced by patients with oGvHD and improve their quality of life. Using the latest technology allows for personalized and innovative care for patients with complications including lens fogging and allergies.

ACKNOWLEDGEMENTS

Special thanks to Drs. Lindsay Sicks, Jennifer Harthan, and Janice Jurkus for their assistance with this case.

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PRESENCE OF THE IDIOPATHIC LONG ANTERIOR ZONULE TRAIT AND LIKELIHOOD OF HAVING NUMEROUS COEXISTING HEALTH CONDITIONS AND NEGATIVE LIFESTYLE FACTORS

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INTRODUCTION

The long anterior zonule (LAZ) trait, which is characterized by zonular fibers existing central to the normal anterior insertion zone,[1-4] may be detected after pupillary dilation as radially oriented, fine lines along the midperipheral anterior lens capsule (Fig. 1, 2). Due to their location, LAZ fibers may rub against the posterior iris pigment epithelium, causing their pigmentation and other pigment dispersion signs, including Krukenberg's spindles and trabecular pigmentation.[5,6] Due to these signs, LAZ-associated pigment dispersion may be confused with the more well-known "classic" pigment dispersion syndrome.[6,7] Rarely, LAZ may be associated with gene mutation (C1QTNF5) causing late-onset retinal degeneration (L-ORD),[8,9] but another idiopathic LAZ variety, possibly with >2% prevalence,[6,10] has association with higher intraocular pressure[11] and is being investigated as a risk factor for glaucoma.[6,11-14] Due to suspicion that the idiopathic LAZ variety may: 1) result from an alternative gene mutation,[8,9,15] 2) have expression related to environmental factors, and 3) have association with certain health conditions,[6,10] we studied the confluence of health problems and lifestyle factors among subjects with LAZ.[11]

METHODS

Patients presenting to multiple practitioners within the Primary Eye Care Service at the Illinois Eye Institute, an urban, academic eye care facility in Chicago, IL, USA, were included for study if they were >18 years of age, having their pupils dilated, and consented to answer a supplemental questionnaire.[11] Subjects were examined for LAZ, and data was collected from routine history and measurement at time of exam, the questionnaire, and medical record review after examination. With the primary goal to further investigate health associations with LAZ, numerous demographic, health, and lifestyle factors were assessed relative to LAZ. First, univariate relationships were assessed, and then multiple logistic regression was used to test LAZ relationships along with simultaneous control of other independent variables. Selection of final models was aided using stepwise, forward, and backward regression techniques. Due to collinearity between health related variables, we explored use of an illness index score of ten coexisting negative health factors (maximum score 10, one point each factor) to assess relationships to LAZ (Table 1).

RESULTS

Figure 3 summarizes the selection of subjects, with there being a 75% response rate. Tables 2 and 3 summarize characteristics of subjects and unadjusted associations. Final multivariate models showed that, while controlling for age (P<0.0001) and gender (P<0.001), the likelihood of having LAZ increased by 1.2x (OR=1.2, 95% CI=1.1 to 1.3, P=0.002) with each additional health factor present (Table 4), and the likelihood of LAZ was 1.7x greater (OR=1.7, 95%CI=1.2 to 2.4, P=0.005) when four or more factors were present (Table 5).

TABLE 1
ILLNESS INDEX SCORE† VARIABLES

Variable
Smoking - ever vs. never
Alcohol use - ever vs. never
Smoking exposure in home as child - Moderate or heavy vs. minimal or none
Body mass index – obese/overweight vs. normal/underweight
Hypertension, on medication
Diabetes, on medication
Cholesterol, ever taken medication per survey
Lung disease, any type reported
Heart disease, any type reported
Cancer history, any site

†One (1) point for each factor (possible score 0-10)

TABLE 2
OCULAR CHARACTERISTICS - UNADJUSTED

Variable	Eye	Controls N=3,243 RE N=3,247 LE	LAZ† N=111 RE N=109 LE	P-value‡
*Refractive error	Right	-0.92 ± 2.91	+0.70 ± 2.01	**<0.0001**
	Left	-0.89 ± 2.80	+0.66 ± 2.75	**<0.0001**
Krukenberg's spindle	Right	1.4%	14.4%	**<0.0001**
	Left	1.2%	13.0%	**<0.0001**
Pupillary iris strands	Right	14.6%	28.1%	**<0.0001**
	Left	12.4%	26.9%	**<0.0001**
Glaucoma, on med	Right	4.2%	13.6%	**<0.0001**
	Left	4.0%	11.2%	**0.0003**

†Abbreviations: LAZ, long anterior zonule trait; med, medication; RE, LE, right eye, left eye;
‡Bolded p-values significant at α=0.05 level
*Spherical-equivalent in diopters ± standard deviation

TABLE 3
DEMOGRAPHIC AND HEALTH VARIABLE RELATIONSHIPS - UNADJUSTED

Variable	Controls (N=3,263)	LAZ (N=136, either eye)	P-value‡
Age, mean years ± SD† (range)	50 ± 15 (18-94)	63 ± 12 (25-92)	**<0.0001**
Race (African-American / Other)	(82% / 18%)	(93% / 7%)	**(0.001)**
African-American	82%	93%	
Asian	2%	0%	
Hispanic	8%	5%	
White	6%	1%	
Other	2%	1%	
Gender, female	64%	80%	**0.002**
Education, >High School	61%	62%	0.88
*BMI, kg/m² (overweight / normal weight)	(73% / 27%)	(83% / 17%)	**(0.01)**
Underweight, <18.5	4%	4%	
Normal weight, 18.5 - 24.9	23%	13%	**0.04**
Overweight, 25.0 - 29.9	29%	32%	
Obese, ≥30	45%	52%	
BMI, mean ± SD	30.5 ± 7.8	32.2 ± 9.0	**0.04**
*Smoking (ever / never)	(48% / 52%)	(53% / 47%)	(0.22)
Current	30%	27%	
Past	18%	26%	0.72
Never	53%	47%	
*Alcohol (ever / never)	(60% / 40%)	(62% / 38%)	(0.61)
Current	48%	43%	
Past	11%	16%	0.64
Never	41%	40%	
*Smoking exposure in home as child Moderate or heavy / minimal or none	44% / 56%	49% / 51%	0.32
*Diabetes, on medication	22%	32%	**0.004**
*Hypertension, on medication	47%	75%	**<0.0001**
Blood pressure, mm Hg			
Systolic, mean ± SD	129 ± 18	134 ± 20	**0.001**
Diastolic, mean ± SD	79 ± 11	79 ± 11	0.60
Cholesterol, on medication - per record	16%	26%	**0.003**
*Cholesterol, on medication ever - per survey	29%	43%	**0.0008**
*Cancer history, any site	4%	7%	0.15
*Lung disease, any type	13%	19%	**0.04**
*Heart disease, any type	6%	12%	**0.003**

†Abbreviations: kg/m2, kilogram per meter squared; LAZ, long anterior zonule trait; SD, standard deviation;
‡Bolded p-values significant at α=0.05 level; Chi-square test statistics used for categorical variable comparisons; Student t-test used to assess differences with continuous variables; Mantel-Haenszel chi-square test for trend used to assess differences with ordinal variables
*Denotes the ten factors used to calculate illness index score
**Note: Some categorical data in table may not sum perfectly due to rounding

TABLE 4
MULTIVARIATE ANALYSIS - LAZ† AS DEPENDENT VARIABLE

Variable	Coefficient	Standard Error	P-value‡	Odds Ratio	95% CI
Intercept	-8.7	0.66	--	--	--
Age, by decade	0.57	0.08	<0.0001	1.8	1.5 to 2.1
Gender, female	0.87	0.24	0.0003	2.3	1.5 to 3.8
Illness Index Score, 0-10	0.18	0.06	0.002	1.2	1.1 to 1.3

†Abbreviations: CI, confidence interval; LAZ, long anterior zonule;
‡Variables included in model if significant at α=0.05 level

TABLE 5
MULTIVARIATE ANALYSIS - LAZ† AS DEPENDENT VARIABLE

Variable	Coefficient	Standard Error	P-value‡	Odds Ratio	95% CI
Intercept	-8.4	0.61	--	--	--
Age, by decade	0.62	0.07	<0.0001	1.9	1.6 to 2.1
Gender, female	0.82	0.23	0.0004	2.3	1.4 to 3.6
Illness Index Score, ≥4.0 vs <4.0	0.52	0.19	0.005	1.7	1.2 to 2.4

†Abbreviations: CI, confidence interval; LAZ, long anterior zonule trait;
‡Variables included in model if significant at α=0.05 level

FIGURE 1
Normal zonule insertion zone (left) compared to long anterior zonule (LAZ) trait (right).

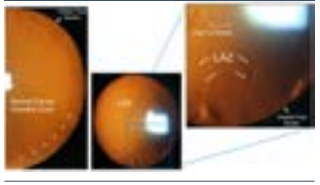

FIGURE 2
Pigmented, segmental long anterior zonule (LAZ) trait example.

FIGURE 3
Flow diagram illustrating selection of subjects.

COMMENT / CONCLUSIONS

People with the idiopathic LAZ trait may be more likely to have numerous coexisting health problems and health risk factors than people without the trait. The reason for this is unknown, but demonstrating this relationship adds further to the characterization of the LAZ phenotype. Possibly, genetic mutation(s) responsible for this LAZ variety also influence certain health conditions, or gene-environment interactions that involve certain health conditions or risk factors may influence expression of the LAZ trait. Understanding the pathophysiology surrounding LAZ appears to be an important goal since the LAZ trait has been shown to have a relationship to intraocular pressure and possibly glaucoma.

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A Call to Action: Transient Vision Loss—the Emergent Risk for Significant Cerebral Infarct, why Timing Matters and the Importance of Establishing Multidiscpilinary Protocols

Shelby Rogers, OD - Jesse Brown VAMC and Hines VAH, Ocular Disease and Low Vision Resident

INTRODUCTION

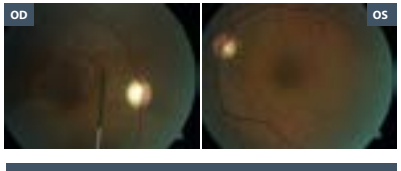
- Vasculopathic patient with acute transient bilateral vision loss, sent to ED for urgent evaluation and experienced CVA within 24-hours. Recommended guidelines for management of TIA patients and importance of immediate team-based action

Case History
- 61 year old AA male
- Chief Complaint=vision "blacks out" OU lasting approx. 30-40 min, most recently yesterday morning, has occurred 3x in the past 2 weeks

Ocular History
- Left homonymous hemianopsia after CVA 06/2017
- Cilioretinal Artery Occlusion OD w/ macular ischemia 08/2017
- Type II DM w/o retinopathy OU
- Mild cataracts OU

Medical History
- R middle cerebellar artery CVA 06/2017
  - Residual L upper/lower extremity paralysis
- Total right ICA total occlusions/p incomplete thrombectomy (6/17)
- HTN
- Type II DM
- HL
- OSA
- Asthma
- Atrial fibrillation
- Renal cell carcinoma – s/p R nephrectomy
- Pulmonary emboli

FUNDUS PHOTOS 8/3/18



GVF 8/3/18

EXAM FINDINGS

	OD	OS
VA	5/200 c EV (Feinbloom); PHNI	20/30-1; PH: 20/25
CVF	Complete left constriction	Complete left constriction
EOMs	FROM	FROM
Pupils	(+)direct/consensual; (-)APD	(+)direct/consensual; (-)APD
Anterior Segment	WNL	WNL
IOP	22	16
DFE	See photos, (-)emboli	See photos, (-)emboli

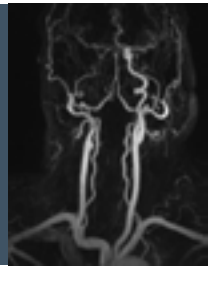
Physical Studies
- BP: 161/99
- Pt denies: HA, diplopia, bowel/bladder incontinence, worsening/weaking of extremities, new sensory deficits
- No changes to residual L sided motor and sensory deficits
- ABCD2 score= 4
  - Age (>60)=1
  - BP (>140/90)=1
  - Clinical Features=0 (neither speech nor weakness)
  - Duration (10-59 min)=1
  - Diabetes=1

Radiology Studies
- MRA Head/Neck—7/31/18 (w&w/o contrast):
  - Occluded right ICA, likely chronic
  - Diminutive caliber of right MCA, supplied by collateral circulation
  - Other major arteries of head/neck= WNL
- MRI Brain—7/31/18 (w&w/o contrast):
  - Chronic changes to large right MCA territory infarct with suspected areas of superimposed acute to subacute infarct within the residual brain tissue in the right basal ganglia and right ventricular white matter

Laboratory Studies
- WNL: CHEM-7, CBC, BNP, Troponin, Lipid Profile, Capillary blood glucose
- HbA1c: 5.4%

7/31/18 MRA

- Occluded right ICA with retrograde filling of the distal segment, likely chronic.
- Diminutive caliber of the right MCA, supplied by collateral circulation.



DIFFERENTIAL DIAGNOSIS

Primary: **Transient Loss of Vision OU**

- Carotid occlusive disease
- Acephalgic migraine
- Temporal Arteritis
- Vasovagal syncope
- Hypoglycemia
- Vertebrobasilar disease
- Migraine with aura
- Seizure
- Arrhythmia

TIA RECOMMENDED EVALUATION

WORK-UP
DWI-MRI
ECG
Lab studies - CBC w/platelet, chem panel, coagulation, ESR/CRP (pts w/o major risk factors /suspected GCA)
DFE (ocular symptoms)

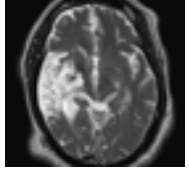
TREATMENT
Immediate anti-platelet therapy within 24 hours
Possible carotid endarterectomy within 2 weeks

HOSPITALIZATION
Symptoms within 72 hours and if ABCD2 score ≥4
If DWI-MRI is abnormal
If adequate out-patient care cannot be quickly achieved

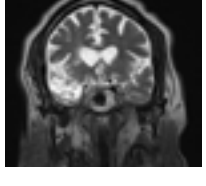
PATIENT OUTCOME

- **Diagnosis: Transient Loss of Vision OU related to a Transient Ischemic Attack**
- Admitted for same day for work-up and observation
- Developed new lower extremity weakness overnight
- Repeat MRI Brain: Acute ischemia/infarct in residual cerebral parenchyma

8/14/18 MRI T2 AXIAL



8/14/18 MRI T2 CORONAL



DISCUSSION

- New definition of TIA from the American Heart Association:
  - "A transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia without acute infarct"
    - This implies that all patients with TIA symptoms should have immediate MRIs performed
- Incidence: 200,000-500,000 people in the US/year (all types of TIAs)
- 15% of CVAs are heralded by TIA
- 12% of TIA patients will die within one year
- Risk of developing a CVA after TIA
  - <48 hours after symptoms= 3-10%
  - 2-90 days= 9-17%

- American Heart Association recommends anyone with acute or permanent vision loss symptoms should get urgent brain imaging

CONCLUSION

- Ocular TIAs are true emergencies
  - just as dangerous as cerebral- equal risk of stroke, MI, or death
- Need to accurately recognize symptoms and be able to differentiate from other conditions on differentials list
- Timing matters, <48 hours=high risk
- Need to establish collaborative care team and a plan
  - Emergency department, vascular surgery and/or neurology

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ACKNOWLEDGEMENTS

Thank you to the attending doctors at the Jesse Brown VAMC: Dr. Charles Kinnaird, Dr. Jennifer Brown, Dr. Michelle Marciniak, Dr. Lauren Ristin, Dr. Victoria Buckto, Dr. Michelle Lee, Dr. Mallory McLaughlin

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A case of post–concussion syndrome with visual impairment progressing from right inferior homonymous quadrantanopia to bilateral inferior altitudinal hemianopia without concomitant neuroimaging pathology.

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INTRODUCTION

Visual field (VF) defects are a frequent sequela of post-concussion syndrome (PCS) although targeted homonymous quadrantanopia field loss is rare. Neuroimaging techniques typically identify brain lesions associated with specific VF defects in cases of PCS. We present a rare case of PCS with an absence of any correlation between neuroimaging and a right inferior homonymous quadrantanopia defect progressing to a bilateral inferior altitudinal hemianopia. This 23-month case study evaluates the progression of VF loss and provides a low vision rehabilitation protocol for improving visual function and quality of life.

CASE REPORT

A 43-year-old female sustained head impact to her left temporal-frontal region from an automobile accident. A neurological exam including magnetic resonance imaging (MRI) was negative for any neurological pathology. Humphrey VF 24-2 (Threshold test) showed a congruous right inferior homonymous quadrantanopia, suggesting a lesion in the left parietal optic radiation. Magnetic resonance angiography (MRA) and magnetic resonance venography (MRV) images were also negative with only mild vessel malformations. A B-scan ocular ultrasound and extended dilated retinal exam were also unremarkable. Our patient experienced common PCS symptoms including difficulty reading, performing her work and doing normal household activities. We monitored VF, ocular health and visual functional abilities during a 23-month period. The VF, repeated 11 times (Figure 1, 2), showed a rate of progression for right eye (OD) of -14.6 ± 10.9%/year (95% confidence) and in the left eye (OS) a rate of progression -23.4 ± 18.6%/year (95% confidence). The VF Index (Figure 3) reduced to 60% OD and 48% OS, correlating with patient symptoms and awareness of the visual loss. The optical coherence tomography OCT of macula and ONH (6 exams) were normal except for mild decrease in OS RNFL (Table 1). Pupillometry (Table 2) shows more reduced responses in OS than in OD, suggesting neural defect. Other test results: VAcc 20/20 R/L; Dynamic VA 20/40 R/L; QOL= initial 39/60, now 58/60; NPC 12/20 cm; K-D 107sec; DEM 2 SD↓; Visagraph GLE 4; attention & reaction time 2 SD↓; presbyopia.

FIGURE 1
OD Visual Field Progression

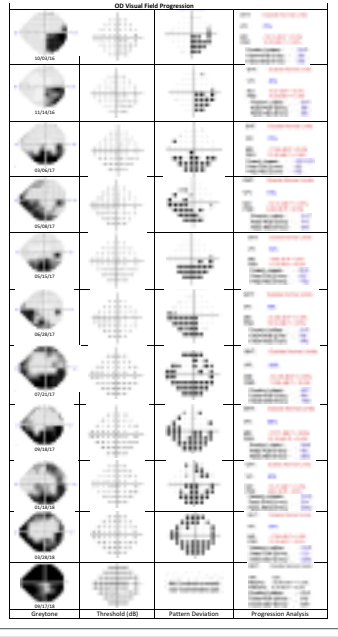


FIGURE 2
OS Visual Field Progression

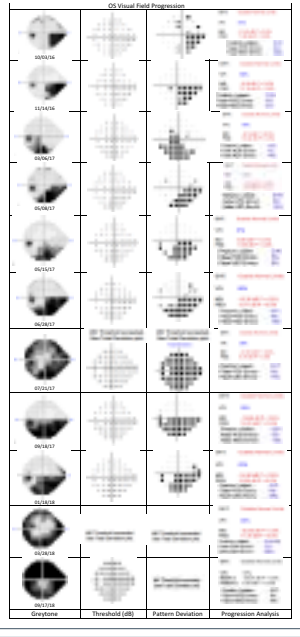


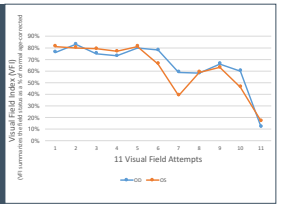
TABLE 1. OCT of ONH and MACULA

ONH	OD	OS
Average RNFL Thickness	101.7 µm	97.5 µm
C/D Ratio	0.39	0.37
Rim Area	1.68 mm^2	1.74 mm^2
Disc Area	1.99 mm^2	2.025 mm^2
MACULA	**OD**	**OS**
ILM - RPE Central THK	245.2 µm	244.4 µm
Average GCL + IPL THK	82.67 µm	82.5 µm
Minimum GCL + IPL THK	81.83 µm	81 µm

TABLE 2. PUPILLOMETRY PLR-3000

(6 sessions each)	OD	OS
Latency - constriction	.20 sec	.23 sec
Velocity – constriction	-2.63 °/sec	-2.45°/sec
Velocity - dilation	1.44°/sec	1.32°/sec
Time to recovery 75%	0.9 sec	1.3 sec.
Diameter – maximum	3.9 mm	4.2 mm
Diameter – minimum	3.0 mm	3.2 mm

FIGURE 3
Progression of Visual Field Index (VFI)



DISCUSSION

Integrated therapy (VT, PT, OT, vestibular, cognitive, pain meds and PTSD counseling) provided moderate help. The VF loss caused difficulties reading, driving, cooking and visual-spatial orientation to inferior VF objects. More success was achieved with adaptive oculomotor strategies, field expansion prisms, and visual search / visual scanning training. We continue to manage the patient using this visual rehabilitation protocol with goals of enhancing visual function, adaptive behavior, life skills and quality of life. Also, in coordination with her neurologist, she is receiving ongoing standard PCS medical management.

CONCLUSION

Our case presents a post-traumatic VF defect that is progressive and without correlating pathology visible with various imaging techniques. Therefore, the mechanism of her visual symptoms causing the VF defect is unknown. Although, neuronal damage, on a microscopic level, is hypothesized as an explanation for the cause of many PCS symptoms. PCS cases require close monitoring with an integrated medical care team. The inclusion of visual rehabilitative therapies is essential for enhancing visual function and overall quality of life.

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References available on request

Grant Support provided by ICO RRC and Brittany Research Fund

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Reversible 'fingerprint' cataract following extreme blood glucose fluctuation

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BACKGROUND

Transient, reversible cataracts from extreme hyperglycemia are rare but well documented in the literature. "True" diabetic cataracts are characterized by rapid onset, occur bilaterally and have the potential to be reversible. In almost all cases, these cataracts are described as white punctate or stellate opacities in the anterior or posterior subcapsular region. They most commonly occur in children and adults under the age of 40.[1] The etiology is believed to be osmotic in nature from the combined effects of increased sorbitol accumulation within the lens during times of hyperglycemia, altered membrane permeability and subsequent hypertonicity of the lens relative to the aqueous humor once blood glucose levels decrease.[1,2] The opacities are reversible with timely control of blood glucose levels. Histological studies show swollen outer lens fibers and normal inner lens fibers helping to explain why subcapsular changes are most commonly seen.[1] To date, there is only a single case report in the literature that describes a transient diabetic cataract appearing in a fingerprint-like pattern within the adult nucleus.[3] This is a second case report of a reversible, nuclear 'fingerprint' cataract.

CASE REPORT

A 69-year-old black female presented with a complaint of blurred vision. See table 1 for a summary of visits.

TABLE 1
Summary of visits. Blood glucose (BG). Pinhole (PH). Anterior cortical cataracts (ACC). Over the counter (OTC). Average (Avg)

Visit	Complaint	Blood Glucose	Refractive	Lens
1 day	Blur with glasses is worse Distance vision better through	Started glipizide 2 weeks ago for hyperglycemia. BG 500 mg/dl at the time, now 140-180 mg/dl	Habitual lensometry: OD: +2.00 -1.25 x 095 / +2.50 PH 20/20 OS: +1.75 -1.50 x 090 / +2.50 PH 20/20	OD: Trace ACC OS: Trace ACC
2 weeks	Blur with and without glasses "Fog-like film" Vision better with +3.25 OTC readers	Glipizide discontinued on 2 days prior due to extreme BG lows. Avg BG 122 mg/dl, (50-178 mg/dl)	Manifest refraction: OD: +4.00 -1.25 x 090 20/30 OS: +3.50 -1.00 x 091 20/50	OD: Image 1a OS: Image 1b
2 months	Fog has cleared Improved vision through habitual glasses	Monitoring BG without medications. Avg BG 135 mg/dl, (97-181 md/dl)	Manifest refraction: OD: +2.50 -1.00 x 095 20/20 OS: +3.00 -1.50 x 091 20/20	OD: Image 2a OS: Image 2b
3 months	Improved vision Clear through habitual glasses	Monitoring BG without medications. PCP happy with diet control Avg BG 135 mg/dl, (98-166 mg/dl)	Manifest refraction: OD: +2.00 -1.25 x 092 20/20 OS: +2.00 -1.25 x 091 20/20	OD: Trace ACC, near complete resolution of fingerprint opacity OS: Trace ACC, near complete resolution of fingerprint opacity

IMAGE 1A
Retroillumination of fingerprint-like nuclear opacity OD, appearing 2 weeks after initial visit.

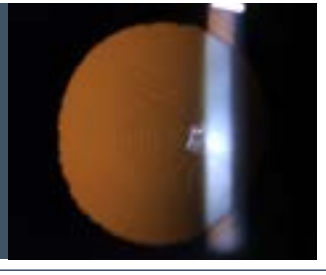


IMAGE 1B
Retroillumination of fingerprint-like nuclear opacity OS, appearing 2 weeks after initial visit.

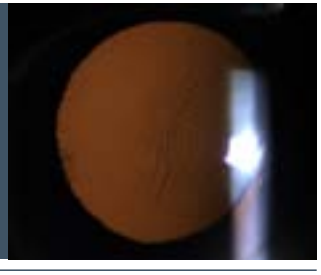


IMAGE 2A
Partial regression of fingerprint-like nuclear opacity OD at 2 months.

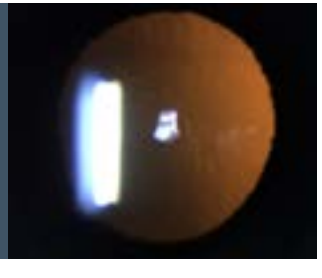
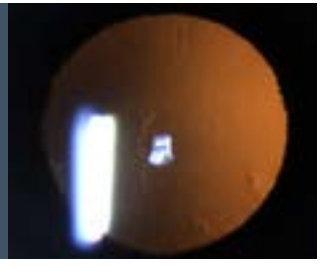


IMAGE 2B
Partial regression of fingerprint-like nuclear opacity OS at 2 months.



CONCLUSION

Reports of extreme blood glucose fluctuations and patient complaints of blur after initiation of treatment for hyperglycemia are common, yet this is only the second case report of a transient, nuclear fingerprint-like cataract in the literature. However, a similar pattern of opacity has been observed in a diabetic rat model.[4]

In both patients, the timing of the cataract trailed the initial complaint of reduced acuity and the nuclear opacity cleared within 2-3 months.

This 'fingerprint' cataract may occur more frequently than what is reported due to the offset timing of refractive and lenticular changes and the relatively rapid clearing of the opacity with stabilization of blood glucose.

Recognizing this presentation and understanding that both the refractive and lenticular changes are reversible is important for proper management.

ACKNOWLEDGEMENTS

The author wishes to thank Bruce Teitelbaum for his suggestions in the preparation of this case report.

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A Comparison of Healthcare Utilization Costs for Low Vision Rehabilitation

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BACKGROUND

The Veterans Affairs (VA) Low Vision Intervention Trial II was a multicenter RCT at VA sites to compare LV rehabilitation (including therapy and homework to teach device use, eccentric viewing and environmental modification) with basic LV services (LV devices dispensed without therapy) for patients with macular diseases and near normal or moderate levels of visual impairment. Both treatments were found to be effective. In analysis stratified by visual acuity, LV rehabilitation was more effective than basic LV services for patients with visual acuity worse than 20/63 to 20/200. Basic LV services are sufficient for most patients with LV who have near normal vision.[1]

PURPOSE

- To compare health care utilization, costs and outcomes between patients in LOVIT II who received LV rehabilitation and basic low vision

TABLE 1
Direct Healthcare Utilization and Costs

	Basic Low Vision (n=160)		Low Vision Rehabilitation (n=163)		Difference	
	Resource Use (Hours) Mean (SD)	Cost* ($) Mean (SD)*	Resource Use (Hours) Mean (SD)	Cost* ($) Mean (SD)*	Resource Use Diff. in means (95% CI)	Cost Diff. in means (95% CI)
Optometry Exam	NA	385 (55)	NA	298 (42)	NA	87 (76 to 97)
Optometrist's Time/Cost	3.45 (0.51)	261 (39)	2.60 (0.39)	197 (29)	0.85 (0.76 to 0.95)	65 (57 to 72)
Optometrists' preparation and completion time	1.17 (0.22)	88 (17)	1.17 (0.22)	89 (17)	-0.003 (-0.05 to 0.03)	0 (-4 to 3)
Exam	1.41 (0.38)	107 (29)	1.41 (0.36)	107 (28)	0.0010 (-0.076 to 0.081)	0 (-7 to 6)
Device dispensing with demonstration of use and maintenance	0.86 (0.26)	65 (20)	NA	NA	NA	NA
Additional time/cost	0.02 (0.11)	1 (8)	0.02 (0.13)	2 (10)	-0.0048 (-0.013 to 0.021)	0 (-2 to 2)
Administrative & clerical support	0.33 (0.02)	10 (1)	0.44 (0.06)	13 (2)	-0.12 (-0.13 to -0.10)	-3 (-4 to -3)
Overhead	NA	134 (16)	NA	88 (12)	NA	26 (22 to 29)
Low Vision Therapy	NA	13 (8)	NA	404 (208)	NA	-391 (-424 to -360)
Therapist's Time/Cost	0.10 (0.13)	4 (6)	6.31 (3.32)	276 (145)	-6.21 (-6.69 to -5.69)	-272 (-295 to -249)
Therapists' preparation and completion time	NA	NA	2.39 (1.09)	105 (48)	NA	NA
Therapy session/homework review	NA	NA	3.74 (2.56)	164 (112)	NA	NA
Additional time/cost	0.10 (0.13)	4 (6)	0.17 (0.34)	8 (15)	-0.078 (-0.15 to -0.031)	-3 (-6 to -1)
Administrative and clerical support	0.16 (0.02)	5 (1)	0.28 (0.06)	8 (2)	-0.12 (-0.13 to -0.10)	-3 (-4 to -3)
Overhead	NA	4 (2)	NA	119 (61)	NA	-115 (-125 to -106)
Total Optometry and Therapy Cost	NA	390 (62)	NA	702 (208)	NA	-311 (-347 to -278)
Devices and Supplies	NA	1,265 (655)	NA	1,086 (761)	NA	178 (21 to 327)
Monocular telescope	NA	84 (92)	NA	63 (88)	NA	21 (1 to 40)
Telescopes	NA	183 (211)	NA	150 (199)	NA	33 (-12 to 79)
Pocket magnifier	NA	39 (29)	NA	29 (27)	NA	11 (5 to 17)
Stand magnifier	NA	121 (107)	NA	100 (108)	NA	21 (-1 to 44)
Intermediate distance device	NA	8 (16)	NA	9 (17)	NA	-1 (-5 to 2)
Reading glasses	NA	95 (134)	NA	88 (131)	NA	7 (-22 to 36)
Large in-line video magnifier	NA	388 (538)	NA	360 (528)	NA	28 (-89 to 144)
Portable video magnifier	NA	206 (282)	NA	145 (255)	NA	62 (13 to 121)
Outdoor filters	NA	21 (23)	NA	21 (23)	NA	0 (-5 to 5)
Prescription sun EX	NA	50 (115)	NA	38 (102)	NA	12 (-3 to 34)
Indoor filters	NA	7 (16)	NA	5 (14)	NA	2 (-1 to 6)
Reading stand	NA	23 (31)	NA	28 (32)	NA	-5 (-11 to 2)
Lamp	NA	36 (53)	NA	49 (56)	NA	-13 (-24 to 0)
Total Direct Cost	4.04 (0.54)	1,662 (671)	9.63 (3.37)	1,788 (864)	-5.59 (-6.12 to -5.11)	-126 (-299 to 101)

LV = Low vision; SD=standard deviation; Diff. = Difference
* Difference in mean resource use or costs between patients randomized to basic LV service or LV rehabilitation (i.e., Basic LV Service - LV Rehabilitation)
† The hourly wage rates (not including benefits) were estimated as $58.31 for the optometrist, $33.66 for the low vision therapist, $22.81 for administrative and clerical support.
‡ Means without standard deviations indicate that one estimate was used for all patients.

METHODS

- Direct healthcare utilization and costs (initial optometry exam, LV devices, therapy visits or dispensing visit) were measured from the health care clinician's (VA's) perspective; time and transportation costs were also assessed from the patient's and caregiver's (friends and family members) perspectives.
- Prevailing wage rates or acquisition costs were applied; costs converted to 2017 U.S. dollars.
- Outcomes were measured as changes in functional ability (logits) on VA LV VFQ-48 from baseline to 4-month follow-up.

RESULTS

- The VA mean (SD) direct health care cost per patient was not significantly different between patients who were randomized to receive basic LV services ($1662 [671]) or LV rehabilitation ($1788 [864]) (basic LV services, $126 lower); 95% CI, $299 lower to $35 higher.
- However, basic LV services required less patient and caregiver time and had lower transportation costs.
- Patients receiving LV rehabilitation had greater improvements in overall visual ability, reading ability, visual information and visual motor skill scores than patients who received basic LV.[1]

TABLE 2
Indirect Resource Utilization and Costs of Patients and Caregivers

	Basic Low Vision (n=160)		Low Vision Rehabilitation (n=163)		Difference*	
	Resource Use (Hours) Mean (SD)	Cost* ($) Mean (SD)†	Resource Use (Hours) Mean (SD)	Cost* ($) Mean (SD)†	Resource Use Diff. in means (95% CI)	Cost Diff. in means (95% CI)
Patient's time:						
Patient's transportation to outpatient clinic	3.58 (2.42)	NA	5.69 (3.71)	NA	-2.11 (-2.84 to -1.47)	NA
Patient's care from optometrist	2.27 (0.50)	NA	1.41 (0.36)	NA	0.86 (0.76 to 0.95)	NA
Patient's therapy from LV therapist	0.08 (0.04)	NA	3.86 (2.61)	NA	-3.78 (-4.20 to -3.39)	NA
Patient's time doing homework	NA	NA	1.90 (2.26)	NA	NA	NA
Total Patient Time	5.93 (2.43)	NA	12.86 (6.79)	NA	-6.93 (-8.13 to -5.84)	NA
Caregiver's time‡	3.64 (3.46)	NA	5.89 (6.48)	NA	-2.25 (-3.44 to -1.15)	NA
Transportation to outpatient clinic*	53.19 (45.42)	28 (24)	112.60 (151.28)	60 (81)	-59.41 (-87.98 to -9.65)	-32 (-47 to -21)

LV = Low vision; SD=standard deviation; Diff. = Difference
* Difference in mean resource use or costs between patients randomized to basic LV service or LV rehabilitation (i.e., Basic LV Service - LV Rehabilitation)
† Caregiver's time was valued at the median wage for a home health aide of $10.87 per hour.
‡ Resource use for transportation was measured in miles. We estimated distances from Veterans' homes to VA LV outpatient centers and estimated transportation costs using the federal reimbursement rate of $0.535 per mile for private automobiles.[14]

TABLE 3
Sensitivity Analyses

	Basic Low Vision (n=160)		Low Vision Rehabilitation (n=163)		Difference*	
	Resource Use (Hours) Mean (SD)	Cost ($) Mean (SD)	Resource Use (Hours) Mean (SD)	Cost ($) Mean (SD)	Resource Use Diff. in means (95% CI)	Cost Diff. in means (95% CI)
Stratified by BCDVA						
BCDVA Better Eye 20/50-20/63 (n=132)	3.99 (0.58)	1386 (583)	8.57 (2.31)	1542 (640)	-4.59 (-5.16 to -4.08)	-156 (-362 to 99)
BCDVA Better Eye <20/63-20/200 (n=191)	4.07 (0.50)	1856 (663)	10.35 (3.77)	1955 (955)	-6.28 (-7.00 to -5.48)	-99 (-339 to 130)
LV devices dispensed on same visit as LV exam in basic LV services						
Patient Time	3.23 (1.31)	NA	12.86 (6.79)	NA	-9.63 (-10.73 to -8.61)	NA
Caregiver's time	2.05 (1.92)	NA	5.89 (6.48)	NA	-3.84 (-5.00 to -2.95)	NA
Transportation to outpatient clinic	27.18 (22.95)	15 (12)	112.60 (151.28)	60 (81)	-85.42 (-114.25 to -66.54)	-46 (-63 to -30)

BCDVA= best corrected distance visual acuity; LV = Low vision; SD=standard deviation; Diff. = Difference
* Difference in mean resource use or costs between patients randomized to basic LV service or LV rehabilitation (i.e., Basic LV Service - LV Rehabilitation)

CONCLUSIONS

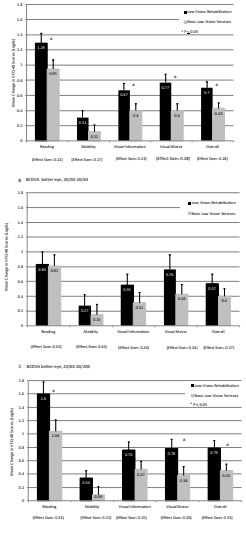
- LV rehabilitation was associated with improvement in several dimensions of visual function, with similar direct heath care costs as for basic LV services. However, LV rehabilitation often involves a greater time commitment and costs to patients and caregivers.[2]

SENSITIVITY ANALYSES

Used to examine alternative cost scenarios

- Costs and outcomes were examined by preplanned stratification BCDVA-better eye (20/50-20/63 and worse than 20/63 to 20/200). Although the costs were higher for the group with worse visual acuity, the mean direct health care costs per patient were similar for LV rehabilitation and basic LV.[2]

FIGURE 1
Comparison of Mean Changes in Veterans Affairs Low Vision Visual Functioning Questionnaire (VA LV VFQ-40)



- LV devices were usually not stocked, so a second visit was often required for dispensing. Cost savings to patients and informal caregivers could occur if the devices were stocked and patients received their LV devices the same day as their LV exam.[2]
- National estimates of mean costs for LV rehabilitation or basic LV services were assessed using Medicare reimbursement rates, appropriate RVUs and a 2015 conversion factor.
  Assumptions
  - Initial visit HCPCS E&M code 99205 (office/outpatient visit-new), HCPCS code 92083 (visual field exam)
  - For basic LV, additional dispensing visit LV HCPCS Code 99215 (office outpatient visit established)
  - For LV rehabilitation, OT HCPCS code 97535 (self-care/home management billed in 15 minute units)
  - LV device costs were the same for both treatment groups
- With a 20% co-insurance rate, Medicare's mean cost for LV devices without therapy would be $279, while patient's cost would be $1205 ($70 co-insurance + $1,119 LV devices plus $20 refraction cost). For LV rehabilitation, Medicare's mean cost would be $620, while patient's cost would be $1,294 ($155 coinsurance + $1,119 LV devices plus $20 refraction cost).
- Patients with VA insurance don't have co-payments or charges for LV devices.

Conclusions
Patient's out-of-pocket costs under Medicare are significantly higher than those for Veterans because refraction and LV devices are not covered by Medicare and Medicare has a 20% co-insurance rate for patients without supplemental insurance.

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FINANCIAL SUPPORT

Department of Veterans Affairs (VA) Rehabilitation Research and Development Service #C6958R

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Comparison of Near Vergences with Traditional Risley Prisms and with Risley Prisms in an Automated Phoropter

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INTRODUCTION

Traditional methods for measuring vergences include prism bar and Risley prism (RP). Previous studies have demonstrated that these two methods of vergence measurement are different from one another.[1-5] Newer digital phoropters contain rotary prisms which progress in small step increments of variable magnitude. While vergences measured with a digital phoropter can be considered in-phoropter, the patient is required to make a small jump vergence rather than a smooth vergence. The purpose of this study was to compare near vergences measured with an automated phoropter to those measured with RP.

METHODS

Twenty-seven adult subjects with normal binocular vision were recruited from the Illinois College of Optometry student population. Baseline refraction with binocular balance was performed and utilized as control lenses for each patient. The Reichert VRx Digital Phoroptor® with rotary prism was used to measure vergences set at an increment of 0.25 prism diopter (PD) per eye, or 0.5PD total (0.5PD auto). Subjects were randomized between RP and 0.5PD auto and allowed a 5-minute rest period between methods of measuring near horizontal vergence measurements.

Paired t-test, Bland-Altman[6, 7] and Pearson correlation analyses were performed to compare base-in (BI) and base-out (BO) break and recovery values between RP and 0.5PD auto. Agreement was assessed by determining the 95% limits of agreement (LoA): ± 1.96 SD of the mean difference between the two tests.

RESULTS

The average for each measurement is shown in Figure 1. Mean BI differences between RP and 0.5PD auto (± SD) were 1.0 (± 3.6) PD for break ($P = 0.10$, Figures 1 and 2) and -3.8 (± 4.3) PD for recovery ($P < 0.001$, Figures 1 and 2). Mean BO differences between the tests (± SD) were -2.3 (± 9.4) PD for break ($P = 0.24$, Figures 1 and 2) and -6.7 (± 11.3) PD for recovery ($P = 0.01$, Figures 1 and 2). BI break and recovery were strongly correlated between the two tests ($r = 0.74$, $P < 0.001$ and $r = 0.74$, $P < 0.001$, respectively). BO break and recovery were moderately correlated ($r = 0.45$, $P = 0.02$ and $r = 0.48$, $P = 0.01$, respectively). Agreement between the two tests was better for BI than BO with 95% LoA: 7.2 PD for BI break, 8.5 PD for BI recovery, 18.3 PD for BO break and 22.3 PD for BO recovery (Figure 2).

FIGURE 1: Mean of near vergence measurement.
Values are mean ± standard error. N = 27 for each method of measurement. Significant differences ($P < 0.05$) between methods for each measurement are indicated by (*).

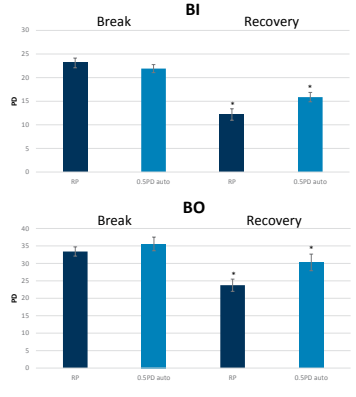
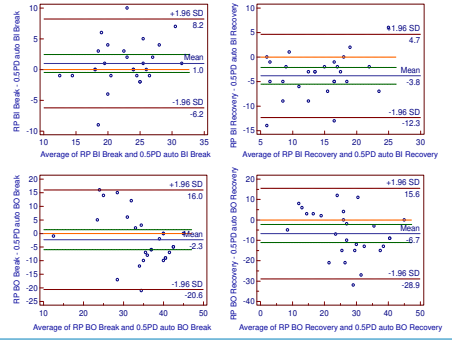


FIGURE 2: Difference vs mean Bland-Altman plots of vergence method comparisons for near.
The solid dark blue line in each plot represents the mean difference (MD) of RP and 0.5PD auto vergence. The coarsely dashed dark red lines represent the lower and upper 95% LoA (MD ± 1.96 SD).



CONCLUSIONS

Though this digital instrument measures vergences in an in-phoropter technique, the measurement of recovery for both BI and BO differs between traditional RP and this digital phoropter. While the measurement of break for both BI and BO is not statistically different between the two methods, the agreement between the two methods is relatively poor.

It is not recommended to utilize these two methods interchangeably to monitor vergences on an individual patient. In addition, clinicians should use caution when comparing vergence ranges measured digitally with published norms for PB vergences. With increasing popularity of digital phoropters, establishing normative data for vergences measured in various small step increments within a digital phoropter is warranted.

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Normative Database for Rapid Number Naming using the King–Devick Test in Children Aged 5 to 14 Years

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PURPOSE

Normative database in children for rapid number naming using the King-Devick test (KD) was established in 1983. It is critical to have an updated normative database of KD test considering the change of children learning environment and technology. The purpose of this study was to establish normative data of KD test in children aged 5 to 14 years.

METHODS

659 children aged 5 to 14 years were enrolled in 5 clinical sites. Three test cards of KD test were administered on each participant (Figure 1). One-way analysis of variance was used to determine whether KD time and errors were different among the age groups.

RESULTS

The clinical characteristics of KD test participants are listed in Table 1. The average time to complete the KD test by age, standard deviation (SD), and 95% confidence interval are listed in Table 2. In addition, the average errors (SD) by age and corresponding 95% confidence interval are listed in Table 3. The KD test mean time and errors by age are further illustrated in Figure 2 and Figure 3. Post hoc tests showed a statistically significant difference in performance in age groups 5 and 6 compared to other ages (P<0.01). Age groups 7 and 8 also showed a difference to other age groups except age 14. Age groups 9 to 13 years showed no significant difference in performance (P>0.01).

FIG. 1
King-Devick Test

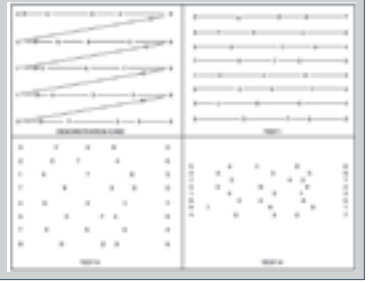

FIG. 2
Mean KD Test Time ± Standard Error

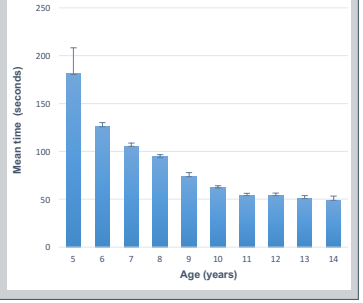

FIG. 3
Mean KD Test Errors ± Standard Error

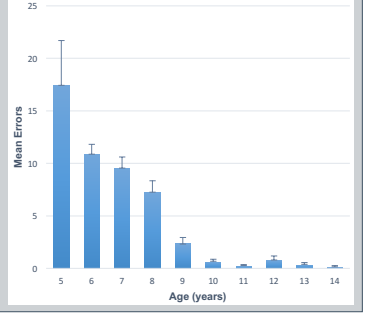

TABLE 1
Characteristics of KD Test Participants

	KDT Participants (%) (n = 659)
Gender	
Female	319 (48.4)
Male	340 (51.6)
Race/Ethnicity	
Caucasian	529 (80.3)
African-American	69 (10.5)
Asian*	17 (2.6)
Others**	44 (6.7)

* Asian or Pacific Islander
**American Indians/Alaskan natives, unknown ethnicity, or those that declined to specify

TABLE 2
The Mean KD Test Time (SD) by Age

Age	N	KD Time (seconds) Mean±SD	95% Confidence Interval for KD Time (seconds)	
			Upper	Lower
5	16	181.36 ± 107.70	238.75	123.97
6	141	126.49 ± 42.86	133.63	119.36
7	170	106.30 ± 29.90	110.83	101.77
8	153	94.31 ± 26.01	98.46	90.15
9	45	74.60 ± 22.01	81.21	67.98
10	48	62.65 ± 10.32	65.64	59.65
11	42	54.89 ± 8.84	57.65	52.14
12	21	54.87 ± 6.69	57.91	51.82
13	16	51.66 ± 8.94	56.43	46.90
14	7	49.75 ± 9.09	58.16	41.34

TABLE 3
The Mean KD Test Errors (SD) by Age

Age	KD Errors Mean±SD	95% Confidence Interval for KD Errors	
		Upper	Lower
5	17.44 ± 17.03	26.51	8.36
6	10.88 ± 10.98	12.71	9.05
7	9.56 ± 13.55	11.61	7.51
8	7.25 ± 13.52	9.41	5.10
9	2.33 ± 4.13	3.58	1.09
10	0.67 ± 1.48	1.10	0.24
11	0.26 ± 0.73	0.49	0.03
12	0.81 ± 1.75	1.61	0.01
13	0.38 ± 0.72	0.76	-0.01
14	0.14 ± 0.38	0.49	-0.21

CONCLUSION

We reported here the normative KD time and errors in children aged 5 to 14 years. Age groups 5 to 8 have a statistically significant difference in performance compared to other groups; interestingly, age 9 years and older showed no significant difference. Results from age group 14 years are limited by a small sample size. An updated normative data in KD test is useful in detecting and studying reading dysfunction, eye movement disorders, brain injury, and neurological conditions.

DISCLOSURE

KD test booklets used in the study were provided by King-Devick technologies, Oakbrook Terrance, IL. Drs. Leong and Talaber are employees of King–Devick Test, LLC. Dr. Messner is a member of the scientific advisory board for King Devick Technologies. None of the other authors have any disclosure.

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Eyes Across Horizons

Mission Statement

"To allow doctors to use the skills they have been given to provide eye care to those in need across the world. We aim to improve the lives of others through the gift of sight. By creating awareness and believing in exceptional vision care, we hope to end preventable blindness across horizons."

About Us

Eyes Across Horizons is a program offered to Walmart associate optometrists which allows them to travel abroad and provide much needed eye care to underserved populations using a mobile clinic.

The Mobile Clinic

The van will be operated by:

- 3 Optometrists
- 2 Technicians
- 1 Pharmacist
- 1 Receptionist

Partnership with Walmart Pharmacy

This opportunity will also be available for Walmart associate pharmacist to bring much needed vaccines and other ocular medications to needed areas.

How to Join?

Simply visit www.walmart.com/EyesAcrossHorizons to create your profile and begin your journey!

Why become part of Eyes Across Horizons?

- Opportunity to experience eye care abroad.
- The program is fully funded by the Walmart Corporation.
- 39 million people around the world are blind, 80% of which could have been prevented.
- Make a difference while exploring the world!

Examples of Current Locations

- Brazil
- Costa Rica
- India
- Kenya
- Mexico
- Swaziland
- Guatemala
- Namibia

Help stop preventable blindness!

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When All Else Pales: An Atypical Case of Presumed Ocular Albinism

Samantha Gagnon, O.D. • Heather McLeod, O.D., FAAO • Julianna Sher, B.S., B.A.

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BACKGROUND

Albinism is classified as a group of congenital hereditary disorders involving decreased or absent melanin synthesis. Melanin pigments are produced by specialized organelles called melanosomes located in melanocytes that are predominantly located in dermal and follicular tissue. In the eye, melanocytes are most heavily concentrated in the iris, retinal pigment epithelium, and choroidal stroma. On examination, patients with albinism will phenotypically present with depigmentation of these structures. While this absence of pigmentation classically leads to additional findings such as decreased visual acuity within the range of 20/40 – 20/400, nystagmus, marked photophobia, decreased stereopsis, and a hypopigmented fundus with foveal hypoplasia, wide ranges in phenotypic variation have been cited in the literature.

CASE REPORT:

CC: 29 y.o. Caucasian female presented to primary care clinic complaining of mildly blurred vision, OD = OS, that had been longstanding since childhood. She considered herself "blur tolerant" and thought slightly blurred vision was "normal" for her. This blurry vision was accompanied by complaints of mild photophobia alleviated with the use of sunglasses and occasional diplopia when fatigued. Personal ocular history revealed moderate levels of myopia, mildly reduced stereoscopic acuity, and convergence excess. Personal medical history was unremarkable and the patient was not taking medications. Family ocular history revealed macular degeneration in a maternal great aunt.

BCVA: OD: 20/20-1; OS: 20/20-2
Pupils: PERRL, (-) APD OD, OS
EOMs: FROM, (-) nystagmus OD, OS
CVF: FTFC OD, OS
Adnexa: Skin: pale with slight ability to suntan; Hair: naturally dirty blonde
Iris: Severe, diffuse, iris transillumination defects spanning from pupillary margin to limbus with 360-degree intraocular lens show-through OD, OS
Fundus: Loss of bilateral foveal light reflexes secondary to foveal hypoplasia OD, OS. Mild absence of macular luteal pigment with severe peripheral hypopigmentation of retinal pigment epithelium 360-degrees OD, OS.

VEP: Equal amplitude and latency of waveforms between occipital cortices to monocular stimulation.

Diagnosis: Ocular Albinism Carrier
Differential Diagnoses: Oculocutaneous Albinism, Ocular Albinism

Figure 1: Right eye anterior segment photo displaying severe, diffuse iris transillumination defects from pupillary margin to limbus

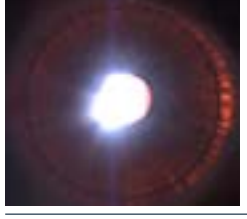


Figure 2: Left eye anterior segment photo displaying severe, diffuse iris transillumination defects from pupillary margin to limbus

Figure 3: Right eye fundus photo displaying absent foveal light reflex and severe hypopigmentation of peripheral retinal pigment epithelium

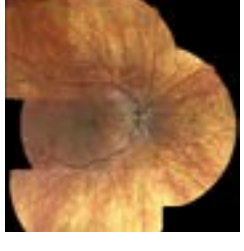


Figure 4: Left eye fundus photo displaying absent foveal light reflex and severe hypopigmentation of peripheral retinal pigment epithelium

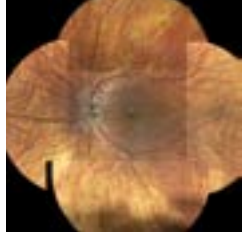


Figure 5: Right eye macular OCT displaying foveal hypoplasia

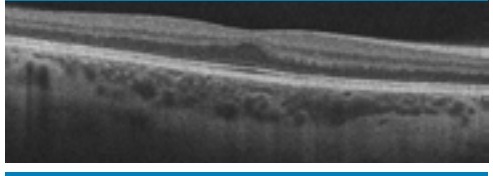


Figure 6: Left eye macular OCT displaying foveal hypoplasia

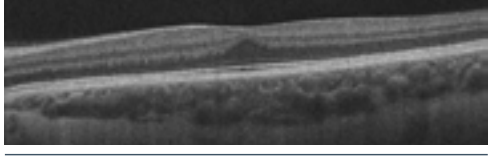


Figure 7: Right eye fundus autofluorescence displaying decreased macular pigmentation

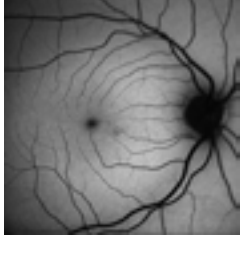
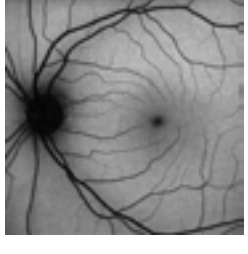


Figure 8: Left eye fundus autofluorescence displaying decreased macular pigmentation



DISCUSSION

The diagnosis of ocular and oculocutaneous albinism can be aided through electrodiagnostic testing of monocular visual evoked potential (VEP). In a non-albino eye, retinal nerve fibers located nasal to the retinal vertical meridian decussate at the optic chiasm and travel to the contralateral hemisphere for processing. Temporal retinal nerve fibers do not decussate at the optic chiasm and travel to the ipsilateral hemisphere for processing. Therefore, when a central strip of retina is stimulated during monocular VEP testing, bilateral occipital hemispheres should display waveform responses of equal amplitude and latency. In an albino retina, the majority of retinal nerve fibers decussate at the optic chiasm resulting in higher amplitude of the contralateral waveform and increased latency of the ipsilateral waveform. This misrouting of retinal nerve fibers is present in confirmed cases of both ocular and oculocutaneous albinism but is absent in carrier states.

An unremarkable monocular VEP suggested that the patient was manifesting signs consistent with an albinism carrier. While determining whether the patient was a carrier of ocular versus oculocutaneous albinism could not be confirmed without genetic testing, frequent case studies in the literature cite similar ocular findings in female carriers of X-linked recessive ocular albinism. Due to similarities in presentation, a carrier of ocular albinism remained at the top of the list of differential diagnoses.

CONCLUSION

While classic cases of ocular and oculocutaneous albinism are associated with substantially reduced visual acuity and nystagmus, a wide range of phenotypic variations can present. In cases involving young patients uncorrectable to 20/20 without significant media opacity, atypical ocular and oculocutaneous albinism along with carrier states should remain on the list of differential diagnoses. Additional testing including OCT, fundus autofluorescence, and electrodiagnostics can help support diagnosis when the clinical picture is unclear.

REFERENCES

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Mending the Net: Choroidal Neovascular Membrane as the Presenting Feature in Presumed Ocular Histoplasmosis

Samantha Gagnon, O.D.

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BACKGROUND

Presumed ocular histoplasmosis syndrome (POHS) is a multifocal chorioretinitis secondary to infection by the dimorphic fungus *Histoplasma capsulatum*. This fungus is native to the Ohio-Mississippi River Valley where 60-80% of residents react positively to skin testing for the organism. After initial pulmonary inoculation by histoplasmin spores, dissemination to the liver, spleen, and choroid occurs via the bloodstream. Clinical diagnosis of POHS is determined by observation of a triad of multiple midperipheral atrophic chorioretinal scars, peripapillary atrophy, and maculopathy secondary to choroidal neovascular membrane (CNVM). Of the 4.4% of patients with positive skin tests who go on to develop ocular signs of POHS, only 1 in 1000 develop maculopathy.

CASE REPORT

CC: 43 y.o. Caucasian female presented to urgent care clinic complaining of acute onset distorted vision in the right eye for the past two days. Patient had positive family history of macular degeneration in a maternal grandmother but no personal history of ocular disease. Last eye examination was two years ago where findings were unremarkable excepting moderate myopia. Medical history was also unremarkable and the patient was not taking medications. Patient reported spending summer months as a child in Seneca, IL but had otherwise been a Chicago native her entire life.

VA: OD: 20/100; OS: 20/20-2
Pupils: PERRL, (-) APD OD, OS
Amsler Grid: OD: nasal distortion of grid lines; OS: unremarkable
CVF: FTFC OD, OS
IOP: 18/19
BP: 158/98
Fundus: OD: discrete grey/green retinal elevation temporal to fovea bordered by subretinal hemorrhage inferotemporal, peripapillary atrophy, midperipheral atrophic chorioretinal scars; OS: early accumulation of reticular drusen superior and temporal to macula, peripapillary atrophy, midperipheral atrophic chorioretinal scars
Retinal OCT: OD: subfoveal CNVM; OS: early accumulation of reticular drusen temporal to fovea

Diagnosis: Choroidal Neovascular Membrane Secondary to Presumed Ocular Histoplasmosis Syndrome
Differential Diagnoses: Exudative Macular Degeneration, Degenerative Myopia, Polypoidal Choroidal Vasculopathy

Figure 1: Right eye fundus photo

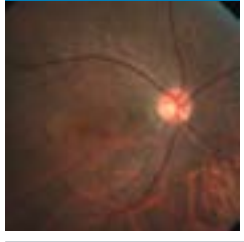

Figure 2: Left eye fundus photo

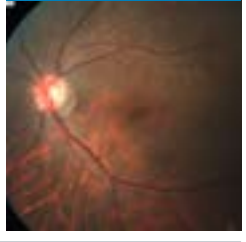

Figure 3: Right eye retinal OCT

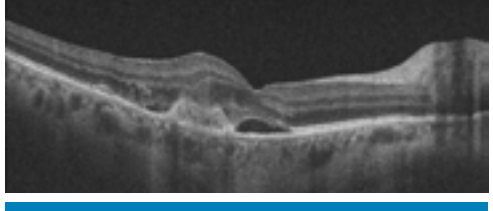

Figure 4: Left eye retinal OCT

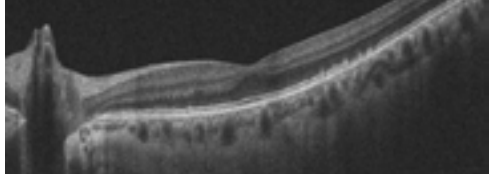

Figure 5: Right eye displaying midperipheral atrophic chorioretinal scars

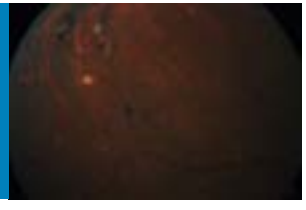

Figure 6: Left eye displaying midperipheral atrophic chorioretinal scars

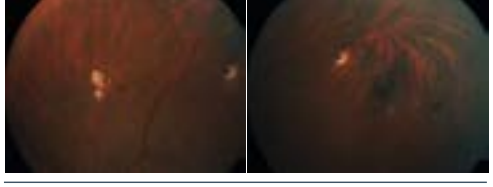

Figure 7: Map displaying Seneca, IL as a moderately endemic area of Histoplasmosis along Ohio-Mississippi River Valley

TREATMENT AND MANAGEMENT

After diagnosis of CNVM was confirmed via retinal OCT and fluorescein angiography, treatment options were discussed with the patient. Historically, photodynamic therapy with verteporfin was used for both subfoveal and juxtafoveal membranes while focal laser was implemented in extrafoveal cases. With the advent of anti-vascular endothelial growth factor, standard of care has shifted toward the use of anti-VEGF injections for both subfoveal and juxtafoveal membranes. The use of focal laser in cases of extrafoveal lesions is still common practice and is often used in combination with anti-VEGF therapy. Given the subfoveal location of the CNVM, a series of anti-VEGF injections was recommended to the patient.

The diagnosis of presumed ocular histoplasmosis was determined based on the presence of the classic triad of maculopathy, bilateral midperipheral atrophic chorioretinal scars, and bilateral peripapillary atrophy. The patient's historical summer residence in Seneca, IL falls in a moderately endemic zone for Histoplasmosis along the Ohio – Mississippi River Valley, supporting the diagnosis. Clinically, the presence of two out of three findings associated with the POHS triad is sufficient for diagnosis. Individuals who manifest midperipheral atrophic chorioretinal scars and peripapillary atrophy without maculopathy should be followed yearly with dilated eye examinations. For those with history of quiescent CNVM, 4-6 month dilated follow-up examinations should be implemented with appropriate use of ancillary testing. Active CNVM requires prompt referral to a retinal specialist for treatment.

CONCLUSION

While only 1 in 1000 patients with ocular signs of POHS go on to develop maculopathy, the presence of a CNVM can have blinding consequences. With prompt diagnosis and treatment, visual outcomes can be dramatically improved. While photodynamic therapy with verteporfin and focal laser treatment were historically the treatment of choice for subfoveal CNVM associated with POHS, anti-VEGF therapy is now the gold standard treatment for this condition.

REFERENCES: Available upon request.

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Using OCT to Determine Ischemia in Central Retinal Vein Occlusions

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BACKGROUND

Central Retinal Vein Occlusions (CRVO) can have devastating visual consequences, especially with increased retinal ischemia. Fluorescein angiography has long been the preferred method of determining retinal ischemia related to CRVO[1]. However, inter-grader variability causes inconsistent results[1]. Newer research is suggesting using macular spectral domain optical coherence tomography (SD-OCT) to predict the amount of retinal ischemia from CRVO[1].

Assessing retinal ischemia with SD-OCT has three categories: Grade 1: none to mild, Grade 2: moderate, Grade 3: severe. Grade 1 has excellent delineation of the inner retinal layers (IRL). Grade 2 shows partial loss of the delineation of IRL and increased reflectivity indicating loss of blood flow. Grade 3 depicts severe loss and significant increased reflectivity of IRL[1].

CASE PRESENTATIONS

Two patients with CRVO and cystic macular edema (CME) were evaluated and had SD-OCT imaging.

Case 1 is a 54year old African American male complaining of a blurred vision OS for one day. BVCA was 20/25 OD and 20/30 OS, without RAPD OD/OS. A referral to the retinal ophthalmologist was made and he was treated with intra-vitreal anti-VEGF and given excellent prognosis.

Figure 1: Case 1: SD-OCT OD showing Grade 1 ischemia

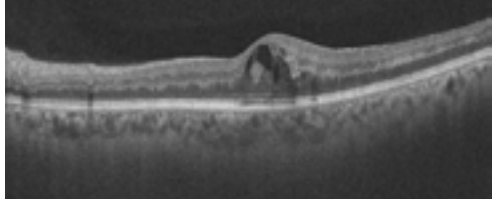


Figure 2: Case 1: Fundus photo showing venous tortuosity, few hemorrhages and mild exudation at macula

Case 2 is a 90year old African American male complaining of dim vision OU for six months. BCVA was 20/30 OD and 20/25 OS without RAPD OD/OS.

Figure 3: Case 2: Fundus photo showing venous tortuosity and scattered hemorrhages

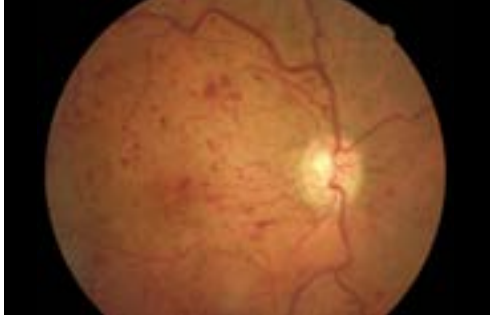
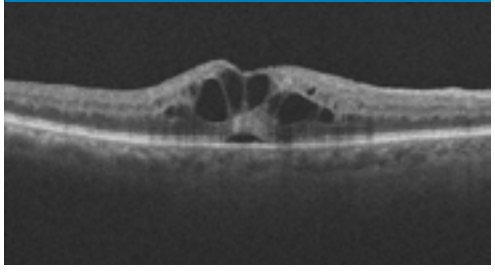
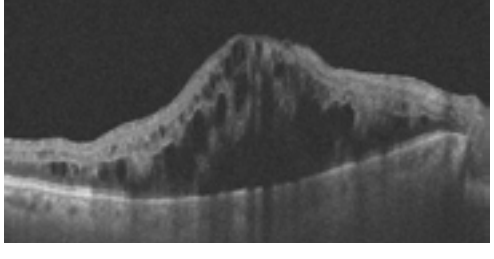


Figure 4: Case 2: SD-OCT OS showing Grade 1 ischemia



Case 2 patient was lost to follow up and returned three months later with blurry vision OD, worsening since last visit. BCVA was 20/800 OD with a 2+ RAPD and 20/25 OS. Dilation showed extensive hemorrhaging, venous tortuosity and CME in the right eye.

Figure 5: Case 2: SD-OCT OS, 3 months after initial onset, showing Grade 3 ischemia



The patient was referred again to see the retina ophthalmologist. At the consultation, he was given a poor prognosis due to ischemic CRVO and longstanding CME.

DISCUSSION

Non-ischemic CRVOs often progress to ischemic CRVOs. All methods for grading level of ischemia, (visual acuity, visual field, fluorescein angiography, and RAPD) are found to have high false negatives[1]. Up to 34% of patients can progress from non-ischemic to ischemic in 3 years[2] which is why patients need close and continued follow up. The sooner patients are diagnosed with a conversion to ischemic CRVO, the sooner treatment can begin and prevent further vision loss.

CONCLUSION

Grading fluorescein angiographies is subjective by the reader and can have inter and intra-grader replicate coefficients of variation over 20%[3]. Given such high variability, SD-OCT can be obtained instead of subjecting the patient to the risks and side effects of fluorescein angiography. Also, by utilizing SD-OCT, both CME and retinal ischemia can be monitored with one simple test. SD-OCT grading for retinal ischemia is still subjective, so it should not be used in place of clinical examination to determine ischemic versus non-ischemic CRVO. However, if future studies show similar or better coefficients of variation, than that of fluorescein angiography, it could become the new standard of care.

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Available Upon Request

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Perioperative Disruption of Ocular Perfusion Resulting in Acute Bilateral Vision Loss

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INTRODUCTION

Perioperative vision loss is a rare complication of some surgical procedures, and one that may be exacerbated by the hypotensive effects of general anesthesia. Important risk factors include, but are not limited to, prone position during surgery, spine, head, and neck surgeries, male sex, vascular disease, hypotension, anemia, and associated blood loss.

CASE HISTORY

A 67-year-old black male presents with darker, and reduced quantity of vision in both eyes since a surgical procedure to drain mucus from the lungs 5 days prior. His ocular and medical history are significant for severe primary open angle glaucoma OU, Sorsby's macular dystrophy versus Doyne's honeycomb retinal dystrophy, metastatic lung cancer, and hypertension. His glaucoma medications consisted of latanoprost qhs OU, brimonidine bid OU, and dorzolamide-timolol bid OU, and systemically he was also taking hydrochlorothiazide for hypertension. As a complication of his end-stage lung cancer, the patient was found to have excess mucus in the lungs and was subsequently hospitalized and operated upon. The patient was placed under general anesthesia during which he underwent a successful lung draining procedure, and immediately upon awaking noted a significant darkening and reduction of his overall quantity of vision.

	OD	OS
DVA cc	20/25	20/25-2
Pupils	ERRL, no APD	ERRL, no APD
EOMs	SAFE	SAFE
BP	107/68 mmHg	
IOP	14 mmHg	12 mmHg
Anterior Segment	Significant only for 1+ guttata, and 1+ NS cataracts OU	
Posterior Segment	See fundus photos	

All dilated exam findings were unchanged relative to the most recent examination from 3 months prior, however repeat performance of 10-2 Humphrey visual field demonstrated dramatic constriction of central field to fixation OD (the patient was unable to continue for testing OS due to experiencing severe neck and body pain). The patient has an excellent history of reliable compliance with glaucoma medications, and the vision loss occurred in the context of low systolic blood pressure readings, commonplace anesthesia-exacerbated hypotension, and the direct blood pressure-lowering effect of an intra-thoracic draining procedure. Based on these factors, the most likely cause of vision loss was an acute perioperative ischemic event due to loss of perfusion which managed to almost complete the loss of vision started by glaucoma.

Figure 1: 2014 fundus photos, OD and OS.

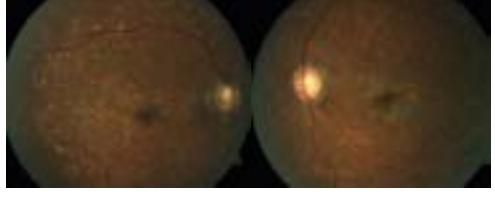
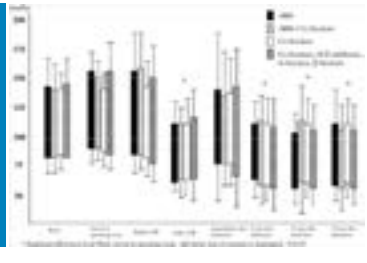


Figure 2: Data represents blood pressure measurements of patients on antihypertensive medications at time points before and after induction of general anesthesia.

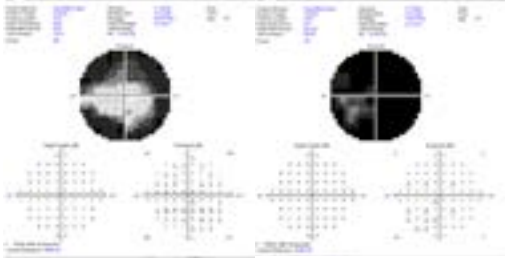


DISCUSSION

An interplay of several factors determines whether ocular perfusion will occur successfully, or whether it will fail. In the case of this patient, blood pressure, intraocular pressure, medications and anesthesia, and lung function are likely to have been the most relevant. The patient was taking medication to lower his blood pressure, and did so the morning before surgery, as instructed. Intraoperatively, patients have been shown to undergo a significant decrease in blood pressure immediately after losing consciousness due to general anesthesia, resulting in a hypotensive state shown to persist for at least 15 minutes. Patients on anti-hypertensive medications are at higher risk of secondary hypotension as a result of drug interactions with anesthetics.

In addition, the patient's intrathoracic pressure would have decreased significantly intraoperatively as a direct result of the draining of mucus from the lungs with the indirect result of a drop in blood pressure. Until this point the lungs were operating at sub-optimal capacity to oxygenate and transport blood as a result of their mucus-filled state, meaning the blood that did reach the ocular tissues brought less oxygen with it.

Figure 3: 10-2 visual fields of right eye before and after surgical intervention.



Furthermore, there is some evidence to suggest that elevated blood pressure prior to loss of consciousness and exacerbated by mechanical stimulation of the airway during intubation may stimulate an auto-regulatory response in the peripheral vasculature which serves to further impede ocular perfusion. In the context of this confluence of contributory elements, the very real risk to the patient's ocular health and visual function becomes clear.

CONCLUSION

The potentially life-saving benefits of surgical procedures will always take precedence over considerations for vision preservation. However, appropriate education of our patients regarding their ocular and systemic risk factors and potential for perioperative complications is an essential part of our role as optometrists, and health care providers in general. Furthermore, sharing this information with primary care physicians to allow for informed decision making and improved patient education maximizes our utility within the patient's health care team.

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Neurosyphilis Presenting as Acute Unilateral Anterior Uveitis

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INTRODUCTION

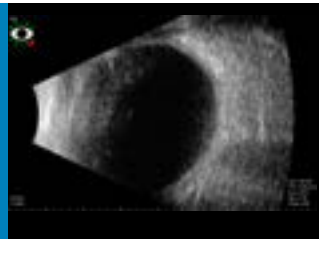
Syphilis (Treponema pallidum) infection is characterized by distinct stages and various manifestations of potentially devastating severity. Optometrists with a high index of suspicion can initiate laboratory testing and allow for earlier diagnosis of this serious disease. Given the myriad presentations of systemic and ocular syphilis, this is necessary to begin timely and appropriate treatment and reduce the risk of permanent harm.

Case History: A 40-year-old Caucasian male presents with 3-week history of non-resolving and unilateral viral conjunctivitis presenting as a red, burning, and light-sensitive right eye. On further questioning, ocular and medical history are significant only for human immunodeficiency virus with normal CD4 T cell count (985) and undetectable viral load per blood test results at most recent physical.

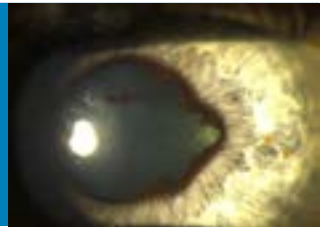
	OD	OS
VA	sc 20/30, ph 20/25	sc 20/20
Pupils	ERRL, no APD	ERRL, no APD
EOMs	SAFE	SAFE
Confrontation Fields	Full to finger counting	Full to finger counting
Lids & lashes	1+ MGD	1+ MGD
Conjunctiva & Sclera	White and quiet	White and quiet
Cornea	Trace diffuse MCE, no SPK/ infiltrates	clear
Angles	4+ nasal and temporal	4+ nasal and temporal
Anterior Chamber	2+ cells, 2+ flare	Deep and quiet
Iris	See photo	Normal
Lens	Clear	Clear
IOP	13 mmHg	12 mmHg
Posterior Segment	Per B-scan, grossly normal	Unremarkable

Ocular examination reveals that symptoms are secondary to an acute unilateral non-granulomatous anterior uveitis OD, with no associated history of trauma, infection, or systemic inflammatory disorder. B-scan ultrasonography was performed in lieu of binocular indirect ophthalmoscopy OD due to extensive posterior synechiae (see anterior segment photos) limiting efficacy of dilation. Upon recommending that the patient return to PCP for further blood testing, he presents 3 month-old laboratory results revealing positive RPR non-treponemal syphilis test, and subsequent results indicating positive response to treatment 2 months later. In the context of a subsequent, acute uveitis without alternative etiology, presumptive diagnosis of ocular, and likely neurosyphilis, was made. Treatment for uveitis was initiated with prednisolone acetate Q1hr OD while awake for 48hrs, then q2hrs, and atropine TID OD until follow-up 1 week later in an attempt to both control ocular inflammation and break the posterior synechiae. The patient was then tapered successfully over the course of 6 weeks. During this time, the patient was referred back to primary care physician for updated laboratory testing, including possible VDRL treponemal testing of cerebrospinal fluid to determine need for re-treatment according to neurosyphilis protocol.

B scan: "B-scan ultrasonography of the right eye performed to rule out obvious vitreous or posterior segment involvement in lieu of dilated exam due to extensive posterior synechiae."



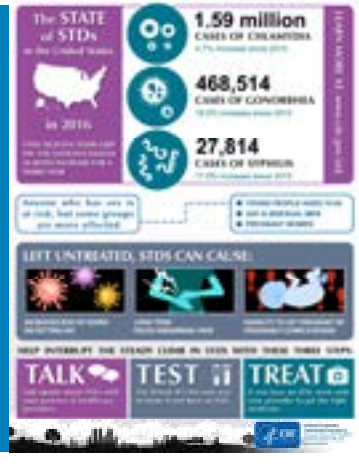
"Slit lamp camera photo of the iris OD revealing persistent anterior lens adhesions and few broken synechiae after 1 week of atropine therapy."



DISCUSSION

The patient in this case had already been diagnosed with syphilis infection, treated, and re-tested to confirm positive response to treatment (≥4-fold improvement on RPR titers) before presenting to our clinic with ocular symptoms. Despite the initial positive test results, the patient was manifesting ocular signs and symptoms after being treated according to the protocol for primary, secondary, and/or early latent stage syphilis: 1 intramuscular injection with Benzathine penicillin G. However, the CDC recommends that cases of ocular syphilis be treated according to the considerably more onerous but rigorous neurosyphilis protocol: 10-14 days of IV Benzathine penicillin G or intramuscular procaine penicillin with probenecid. Given the likelihood of under-treatment and timing of ocular onset long after conclusion of therapy, it was essential to educate the patient and his primary care doctor on the proper treatment regimen.

"Syphilis is only one of several sexually-transmitted diseases whose incidence is on the rise in the United States, highlighting the need for vigilant and educated primary care providers."



Furthermore, as primary care providers, it is important to note that if your testing makes the initial diagnosis of ocular syphilis, the case should be reported to state or local health departments within 24 hours of diagnosis. Recall that ocular syphilis is defined as any stage of syphilis presenting concurrently with ocular signs or symptoms, which can vary widely and include anterior and/or posterior uveitis, panuveitis, optic neuropathy, retinitis, vasculitis, interstitial keratitis, decreased vision, and others.

CONCLUSION

Incidence of infection with syphilis and other sexually transmitted diseases is on the rise in the United States. Due to a high index of suspicion and the patient's elevated risk secondary to immunocompromised status, an appropriate diagnosis of ocular syphilis with high likelihood of neurological involvement was made. Especially in light of the delicate subject matter, careful attention to case history, risk factors, and timeline of disease was essential for appropriate diagnosis and co-management.

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Things Aren't Looking Up: A Case Report of Progressive Supranuclear Palsy

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BACKGROUND

Progressive Supranuclear Palsy (PSP) is a very rare, but life threatening condition that can present with ocular complaints. PSP is a neurological disorder more prevalent in males than females. One of the first symptoms a patient will present with is vertical gaze palsy. Down gaze is most commonly affected first causing the inability to perform tasks such as reading or eating. Due to patient's symptoms they may first present to an optometrist for evaluation.

PERTINENT FINDINGS

48-year-old AAM presented new onset nystagmus in right gaze and abduction deficit in both eyes.

OCULAR HISTORY: (+) NPDR OD, (+) PDR OS, pyogenic granuloma OS

MEDICAL HISTORY: Type 2 Diabetes mellitus, hypertension, kidney disease, multiple bilateral strokes

MEDICATIONS: Humalog, Heparin, carvedilol, atorvastatin, amlodipine, metformin, valsartan, mirtazapine, aspirin

	OD	OS
VA	20/50	20/60
Pupils	Pupil round, reactive, no APD	Pupil round, reactive, no APD
CVF	FTFC	FTFC
EOM	Right gaze evoked nystagmus, (+)abduction/infraduction deficit	Right gaze evoked nystagmus, (+)abduction/infraduction deficit

ANTERIOR SEGMENT: WNL OD, pyogenic granuloma OS

DFE: NPDR OD, PDR s/p PRP OS

MRI: Atrophic appearance of the midbrain, "hummingbird sign"

FIGURE 1: MRI of normal brain, sagittal T1 weighted image.

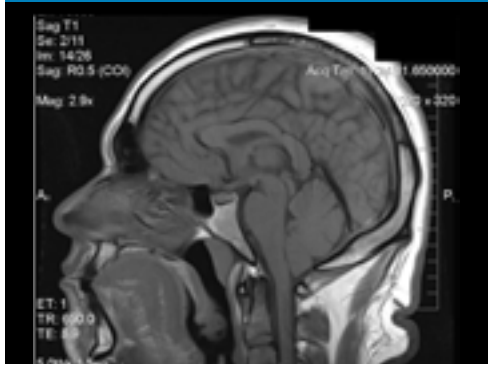


FIGURE 2: MRI of my patient, sagittal T1 weighted image.

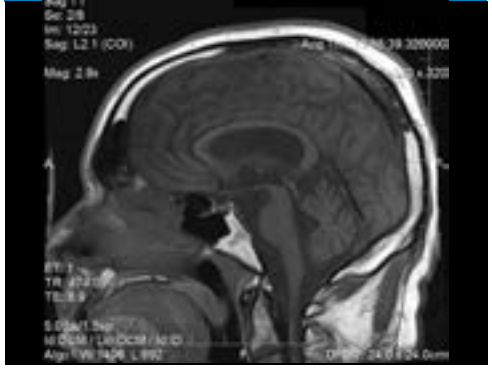
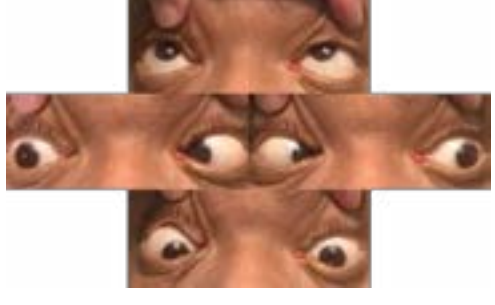


FIGURE 3: Motility in right, left, superior, and inferior gaze.



DIFFERENTIAL DIAGNOSIS: Progressive Supranuclear Palsy, Parkinson's disease, Corticobasal degeneration, Multiple System Atrophy, Cerebrovascular disease

DIAGNOSIS: Progressive Supranuclear Palsy

DISEASE COURSE

PSP is a neurological disorder characterized by the degeneration on the midbrain, basal ganglia, pyramidal tracts, cerebellum, and other structures of the frontal lobe. It is a sporadic disease classified as a "Tau-opathy". The main cause of PSP remains unclear, some theories include a neurofibrillary degeneration causing accumulation of abnormal deposits of tau proteins in nerve cells that cause the cells to not work properly and die. The superior colliculi are located in the midbrain and they control eye movements. As the midbrain becomes atrophic the patient will experience abnormal eye movements. Vertical gaze palsies are noted first and about one-third of patients present with nystagmus on abduction. They can present with a masked face and complications of dysphagia and dysarthria. Levodopa has shown temporary effect in reducing patient's symptoms of slowness, stiffness, and balance problems, but no effective treatment is known. After the diagnosis of PSP is made the life expectancy is about 6 years.

CONCLUSION

Progressive Supranuclear Palsy is a neurological disorder characterized by degeneration of several brain structures. Due to the short life expectancy and sporadic inheritance noted with Progressive Supranuclear Palsy it is crucial for the optometrist to recognize it as a differential diagnosis in elderly patient with infraduction deficits. It is often misdiagnosed as Parkinson's Disease due to overlapping characteristics in both conditions. Recent studies show thinner RNFL and macular thickness in patients with Progressive Supranuclear Palsy compared to Parkinson's Disease using SD-OCT. A "hummingbird sign" on MRI is indicative of Progressive Supranuclear Palsy in the appropriate clinical setting. It is imperative that the primary eye care provider identify abnormal clinical examination findings, order proper imagining, and provide supportive therapy (including prism in glasses) for patients that are diagnosed with Progressive Supranuclear Palsy.

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ARVO

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Results from 2016 National Survey of Children's Health (NSCH)

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PURPOSE

The 2016 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. The survey collects data on many aspects of the child's well-being and health. 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 were birth through 5 years of age were oversampled.

The survey included a new question on testing visual acuity (VA) requested by the National Center for Children's Vision and Eye Health (NCCVEH) to describe access to VA testing. 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.

METHODS

The survey was funded by the Health and Human Services, HRSA and MCHB and administered by the US Census Bureau. The initial invitation to participate in the 2016 NSCH survey was mailed to a sample of 364,150 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, if they prefer, on paper.

The 2016 data, released 2017, was 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. 50,212 surveys were completed reflecting approximately 985 surveys per state. This analysis will reflect the association of VA testing with age, SES, and child health status. "Don't know" and missing responses were denoted as missing. The NSCH is publicly available data and Institutional Review Board approval was not required for this study.

RESULTS

- 50,212 valid surveys representing all states and DC were included.
- One child per household was the chosen to be the subject for the survey questions.
- 51.2% of the children included in the analysis were male.
- The mean age of the children included in the analysis was 9.4 years ± 5.27

The original surveys (NSCH and NS-CSHCN) included two questions related to vision. The questions were worded to identify those children who were visually impaired or blind. The questions were also included in the 2016 NSCH survey. The results are:

Does the child have blindness or problem with seeing, even when wearing glasses?		
	Yes	No
% (C.I)	1.6 (1.3-1.9)	98.4 (98.1-98.7)
N	606	49,358
Population Estimate	1,143,997	71,713,349
DATA BY AGE GROUP		
Birth-5 years of age (n-110)	0.7 (0.5-1.0)	99.3 (99.0-99.5)
6-11 years (n-198)	1.6 (1.2-2.1)	98.4 (97.9-98.8)
12-17 years (n-298)	2.4 (1.8-3.1)	97.6(96.9-98.2)

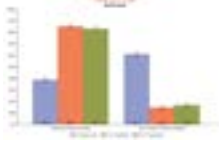
The challenge with this question is that it only focuses on the children with significant visual impairment and blindness.

The National Center for Children's Vision had the opportunity to suggest a new question for the 2016 NSCH with the intent to focus on all children. The goal of the question was to determine the extent of vision testing in children- not simply who has a severe visual deficit. The question that the NCCVEH developed was:

Has the child had his or her vision tested with pictures, shapes or letters ever (for children from birth to age 5 years) or during the past 2 years (for children from 6 – 17 years of age)?

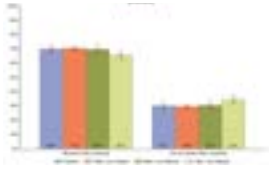
The question was written in an effort to try to determine whether children had received a vision screening or an eye examination in the time specified. The question, as written, does not discriminate between a vision screening or an eye examination. An additional challenge with the data is the respondent may not be aware of the vision screening if it took place in the academic setting and they were unaware of the testing. Following are the results of the question:

Has the child had his or her vision tested with pictures, shapes, or letters ever (Birth-5 years of age) or during the past 2 years (6-17 years of age)?		
n - 50,055	Yes	No
% (C.I)	69.6 (68.6-70.5)	30.4 (29.5-31.4)
N	34,272	13,783
Population Estimate	58,798,467	22,235,174
157 missing responses		
RESPONSES BY AGE GROUP		
Birth-5 years of age (n-14,443)	38.9% (37.2-40.6)	61.1% (59.4-62.8)
6-11 years (n-14973)	85.2% (83.7-86.6)	14.8% (13.4-16.3)
12-17 years (n-20,639)	83.2% (82-84.3)	16.8% (15.7-18.0)



All respondents birth – 17 years of age – sex:			
		Yes	No
Male	% C.I.	68.5 (67.2 - 69.8)	31.5 (30.2 - 32.8)
	Sample Count	18,589	7,255
	Pop. Est.	25,527,784	11,728,907
Female	% C.I.	70.6 (69.3 - 72.0)	29.4 (28.0 - 30.7)
	Sample Count	17,683	6,528
	Pop. Est.	25,270,683	10,506,267

Distribution of race for children who received a vision screening:



Comparison of age group and more detailed race responses are seen in the following tables (please note that data used for these tables is raw

Birth - 5 Years (%)

RACE	Yes	No
White alone	40.4%	59.6%
Black or African American alone	46.3%	53.7%
American Indian or Alaska Native alone	51.0%	49.0%
Asian alone	42.5%	57.5%
Native Hawaiian and other Pacific Islander alone	33.3%	66.7%
Some other race	43.4%	56.6%
Two or more races	41.6%	58.4%

6-11 Years (%)

RACE	Yes	No
White alone	88.1%	11.9%
Black or African American alone	84.5%	15.5%
American Indian or Alaska Native alone	83.6%	16.4%
Asian alone	82.2%	17.8%
Native Hawaiian and other Pacific Islander alone	84.8%	15.2%
Some other race	82.4%	17.6%
Two or more races	88.1%	11.9%

12- 17 Years (%)

RACE	Yes	No
White alone	83.7%	16.3%
Black or African American alone	85.6%	14.4%
American Indian or Alaska Native alone	78.9%	21.1%
Asian alone	83.7%	16.3%
Native Hawaiian and other Pacific Islander alone	67.6%	32.4%
Some other race	79.1%	20.9%
Two or more races	84.1%	15.9%

data and not weighted data):
The original new question led to follow up sub-questions if the respondent indicated that the child had their vision checked, they were ask:

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

- **Eye doctor or eye specialist (ophthalmology, optometry) office**
- **Pediatrician or other general doctor's office**
- **Clinic or health center**
- **School**
- **Other, specify:**

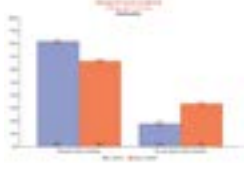
For the follow up of the primary questions, there were a significant number of respondents who indicated that the child did have their vision tested with pictures, shapes, or letters but did not indicate the location:

- Birth to 5 years of age: 8,574
- 6-11 years of age: 1,999
- 12-17 years of age: 3,521

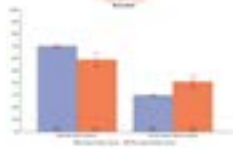
The review of the raw data reflected the following responses:

- For all age groups testing occurred in eye doctor or eye specialist-59.1%, pediatrician or other general doctor's office-39.6%, clinic or health center-3.3%, at school-23.1%.
- The likelihood of seeing an eye doctor increased with age (0-5yrs-32.5%, 6-11yrs-53.1%, 12-17yrs-72.9%).
- Children with neurodevelopmental problems (CP, ID, DS, DD, ADD/ADHD) and LD were found to have the VA checked in 79% or higher cases.

The following histogram reflects the difference of screening for children labeled as Children with Special Health Care Needs (CSHCN) as compared to those without being labelled as Children with Special Health Care Needs (non-CSHCN).



- Those children on food stamps, meal plans, or WIC had vision tested: 69.4%, 71.1% and 49.2%, respectively with age variations. The following reflects responses as it relates to insurance coverage.



- There was also the ability to compare the access to vision screening by federal poverty level (FPL). The following graph breaks it down to <200%, 200%-<300%, 300%-399%, 400% or greater.

CONCLUSIONS

Analysis of data from the 2016 NSCH indicates wide disparities exist in rates of VA testing and utilization of eye care by age, systemic condition, and socio-economic factors. Several important results have been seen with the responses to the new vision question that was suggested by the National Center for Children's Vision and Eye Health.

- Parents are less likely to respond to questions when the child is birth to 5 years of age and may not be aware of the role that vision health plays in development during this critical period.
- Less than 70% of children in the United States are receiving appropriate vision screening or eye examinations.
- Slightly more females received vision screening/examinations than males.
- White, non-Hispanics are the most likely to receive vision screening/ examinations followed by Hispanics, and Black children with minimal difference, Native Hawaiian and Pacific Islanders have a much lower rate.
- Children who are labeled as Children with Special Health Care Needs are significantly more likely to have received a vision screening or eye examination.
- Children with insurance are more likely to receive a vision screening/ eye examination.
- Children are more likely to receive a vision screening/eye examination as income increases from below the FPL to over the FPL.

On-going data collection will be critical for targeted interventions, revisions to health policy, and improved access to services resulting in improved vision health for children in the U.S.

http://childhealthdata.org

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Color Contrast Sensitivity in Age–Related Macular Degeneration

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PURPOSE

Age-related macular degeneration (AMD) is a leading cause of vision loss globally in elderly individuals. Sensitive methods to detect early disease progression may improve outcomes for these patients. Contrast sensitivity has been shown to be a high level measure of visual function.[1-3] In AMD, it has been established that contrast sensitivity function worsens with increasing drusen accumulation and progression of disease.[4] Similarly, color vision loss is one of the earliest manifestations of retinal disease. In particular, AMD has been shown to lead to a larger loss of blue-yellow sensitivity over red-green sensitivity.[5] Traditional methods of evaluating contrast sensitivity and subtle degenerative color vision changes involves testing that is time consuming and requires specialized equipment and subsequent interpretation, making them difficult to implement outside of an eye care practice or in a patient's home setting.

Previously studied in migraine headache,[6] Parkinson's Disease[7] and amyotrophic lateral sclerosis,[8] the King-Devick (K-D) Variable Color Contrast Sensitivity Chart (VCCSC) is an iOS platform application that offers portable tablet availability, variable contrast levels as well as color contrast presentations to allow simultaneous assessment of visual acuity, contrast sensitivity and color vision. This study aimed to determine which color contrast sensitivity differences exist in non-exudative AMD (NE-AMD) to develop a baseline for utilizing this technology in detecting AMD conversion particularly in high risk patients. This potential detection could result in earlier treatment and decreased progression of the disease before irreversible damage to sight occurs.

METHODS

All study procedures were approved by the Illinois College of Optometry Institutional Review Board and written informed consent was obtained from each study participant. NE-AMD patients (n=26) and controls (n=35) from both the Illinois Eye Institute and Chicago Eye Institute were recruited to perform a color contrast sensitivity test. Participants were excluded if there was any presence of macular pathology other than NE-AMD or any visually significant cataracts. In a single study visit, monocular best corrected visual acuity (BCVA) at 40cm with 100% black contrast was determined. Utilizing the BCVA line, the number of letters correctly identified (out of 5) was recorded for various color presentations (red, green, blue, yellow) and at decreasing contrast levels (75%, 50%, 25%). Accuracy of the patients near visual acuity was recorded as both color and contrast changed.

RESULTS

Data was analyzed using SPSS version v21 with a $p<0.05$ considered significant. All values are presented as means ± SEM. The control group (n=35) age 50 -79 years (46% male, 54% female). The NE-AMD (n=26) age 60 - 82 years (67% male, 33% female). A significant decrease in vision was noted in AMD patients for black 100% contrast (C: 36.0 ± 1.7 vs AMD: 109.9 ± 21.7 $p<0.001$), blue 75% contrast (C: 4.4 ± 0.2 vs AMD: 4.7 ± 0.1 $p<0.028$), yellow 75%(C: 3.2 ± 0.3 vs AMD: 4.1 ± 0.3 $p<0.023$), and blue 50%(C: 4.1 ± 0.2 vs AMD: 4.6 ± 0.1 $p<0.045$) contrast letters when compared to the control. Interestingly, difficulty reading all colors at 25% contrast was similar between NE-AMD and control patients.

Figure 1: Visual Acuity Comparison

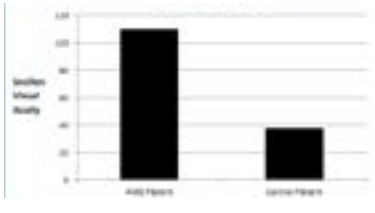


Figure 3: Yellow Color Contrast at 75%

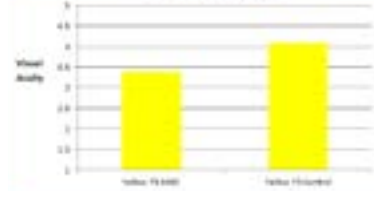


Figure 2: Blue Color Contrast at 75% and 50%

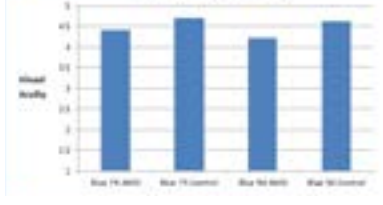
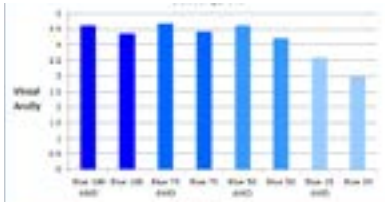


Figure 4: Blue Comparison



CONCLUSIONS

Our results show greater variability in color vision and color contrast in NE-AMD patients compared to healthy controls. Specifically, the colors blue and yellow seem to be more difficult for patients with NE-AMD compared to controls. Further testing is needed to determine what color and contrast best discerns NE-AMD patients from normal controls. For instance, our study reveals that both NE-AMD patients and normal controls have difficulty at 25% contrast level regardless of color. Therefore, a contrast that is too low is not helpful to separate patients with this specific macular pathology. If a specific color and contrast threshold can be identified, it may be possible to develop tools to diagnose AMD at an earlier stage and promptly initiate effective treatment.

The King-Devick (K-D) Variable Color Contrast Sensitivity Chart (VCCSC) is an iOS platform application that offers portable tablet availability, variable contrast levels as well as color contrast presentations to allow simultaneous assessment of visual acuity, contrast sensitivity and color vision. Testing distance can be varied between clinically standardized testing distances of 40cm, 2 meters or 3 meters. Sloan letter sizes are automatically adjusted based on testing distance and randomized for each presentation. Contrast can be varied to preset contrast levels for 75%, 50%, 25%, 2.5% and 1.25% contrast levels or manually changed in 1% increments using the sliding scale. Letters can be displayed in primary colors: red, green, blue and yellow to evaluate color vision and contrast can also be varied for these colored displays. For self-testing or if a tester is unsure of the correct letters displayed, the application will call out the displayed letters.

Figure 5: The King-Devick Variable Color Contrast Sensitivity Chart iPad Application

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Visual Outcomes with Scleral Lenses: SCOPE Study

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Affiliations: [1]Illinois College of Optometry, Chicago, IL; [2]Mayo Clinic, Rochester, MN; [3]The Ohio State University, Columbus, OH; [4]Korb and Associates, Boston, MA; [5]University of Illinois at Chicago, Chicago, IL

1760 - B0075

BACKGROUND

The number of individuals fitting scleral lenses is increasing.[1] Scleral lenses have been prescribed successfully for the management of corneal irregularity, ocular surface disease, and uncomplicated refractive error.[2] The therapeutic effects of scleral lenses are well documented.[2] With increased availability, it is important to understand the vision changes scleral lenses provide as previous reports have demonstrated they improve visual acuity and reduce higher order aberrations in corneal ectasia.[3,4]

PURPOSE

To describe changes in best-corrected visual acuity before and after scleral lens prescription for patients with corneal irregularity.

METHODS

- The SCOPE (Scleral Lenses in Current Ophthalmic Practice Evaluation) study team conducted an online survey of contact lens prescribers between December 13, 2016 and March 31, 2017 with approval from the University of Illinois' Institutional Review Board.
- Members of the Scleral Lens Education Society received direct e-mail invitations to participate in the survey, and links to the survey were included in two monthly online newsletters posted on the Scleral Lens Fitters Facebook page.
- Fitters were asked questions about the most recent established (> 6 months of lens wear) scleral lens patient they had evaluated.
- All surveys were anonymous and no identifiers were collected.
- Data was analyzed using paired t-test.

RESULTS

- 352 respondents completed the survey.
- 257 (age 43 ± 13, mean ± SD, n=251) were fit for corneal irregularity (keratoconus, pellucid marginal degeneration, post-surgical).
- 23 (age 60 ± 13) were fit for ocular surface disease.
- 14 were fit (age 40 ± 16) for refractive error.

FIGURE 1: Fitting Indication

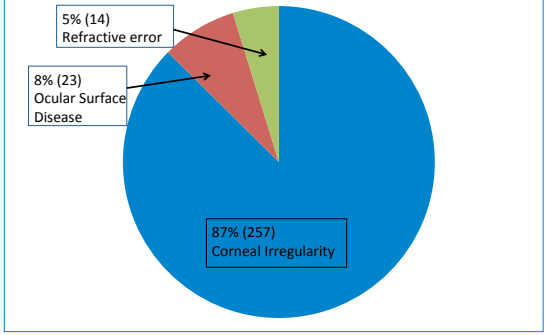
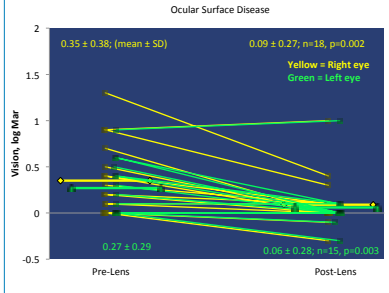
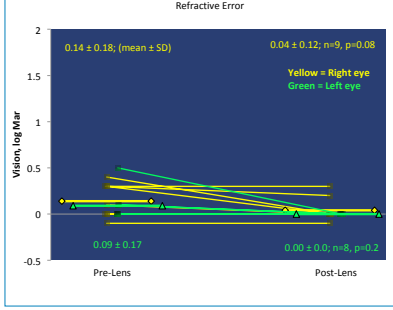


FIGURE 2: Patients with Ocular Surface Disease had a Statistically Significant Improvement in the Mean Best-Corrected Visual Acuity in Both Eyes



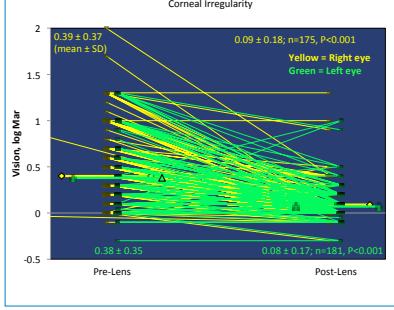
- Patients with ocular surface disease had an improvement in best-corrected visual acuity (BCVA) in the right eye from 0.35 ± 0.38 before lens wear to 0.09 ± 0.27 (logMar, n=18, p=0.02) after lens wear, and in the left eye from 0.27 ± 0.29 before lens wear to 0.06 ± 0.28 (n=15, p=0.003) after lens wear.

FIGURE 3: Patients with Uncomplicated Refractive Error Did Not Show a Statistically Significant Improvement in the Mean Best-Corrected Visual Acuity in Either Eye



- Vision did not change for those with refractive error in the right eye from before lens wear (0.14 ± 0.18) to after wear (0.04 ± 0.12, n=9, p=0.08) or in the left eye from before lens wear (0.09 ± 0.17) to after lens wear (0.00 ± 0.00, n=8, p=0.2).

FIGURE 4: Patients with Corneal Irregularity had a Statistically Significant Improvement in the Mean Best-Corrected Visual Acuity in Both Eyes



- For corneal irregularity BCVA improved in the right eye before lens wear from 0.39 ± 0.37 to 0.09 ± 0.19 (n=175, p<0.001) after lens wear, and in the left eye from 0.38 ± 0.35 before lens wear to 0.08 ± 0.17 (n=181, p<0.001) after lens wear.

CONCLUSIONS

- Visual acuity improved significantly for patients fit with scleral lenses for corneal irregularity (keratoconus, pellucid marginal degeneration, status-post penetrating keratoplasty and radial keratotomy), and for those with ocular surface disease.
- No significant improvements in visual acuity were noted in patients who wore scleral lenses for the correction of uncomplicated refractive error.

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DISCLOSURES

None: C.B. Nau, M.M.Schornack, A.Nau, D. Cao, and E. Shorter
J.S. Fogt: Allergan(F), Alcon (F), Shire (F,C), Contamac (F), Valeant (C)
J.S. Harthan: Allergan (F), Shire (F,C), Metro (F,C) , SynergEyes (F,C)

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Special Thanks to:
Scleral Lens Education Society
Scleral Lens Fitters FaceBook Group

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THREE YEARS OF THE SUNSHINE ACT:
An Analysis of Industry Payments to Eye Care Providers

Erik Mothersbaugh, OD, FAAO; Elizabeth Wyles, OD, FAAO • Illinois College of Optometry, Chicago, IL

PURPOSE

Financial relationships between physicians and companies within the medical industry, who desire to sell drugs and devices, can create conflicts of interest for doctors that potentially impact patient care. Studies consistently show that industry promotion influences prescribing behavior, despite doctors' belief that they are unaffected. Eye care providers take an oath to protect patients above personal gain, so increasing awareness and understanding of these financial relationships can improve patient care.

The Physician Payments Sunshine Act of 2010 requires payments from industry to physicians to be reported. Payments are publicly available on the Centers for Medicare & Medicaid Services (CMS) Open Payments website. The website provides transparency of these relationships beyond that of previous policies. To the authors' knowledge, no data has been analyzed for eye care providers with comparisons between optometry and ophthalmology.

METHODS

All General Payments in the CMS database to optometrists (ODs) and ophthalmologists (OMDs) from 2014 to 2016 are included in our retrospective data review. General Payments include cash or cash equivalent (e.g. consulting/ speaking fees, honoraria) and in-kind items and services (e.g. food/beverage, travel). Payments for research and ownership/investment dividends are not included.

RESULTS

From 2014 to 2016, a total of $63.9M in payments were made to 40,837 ODs (Mean $1.5K, Range $1.25-$1.2M), and a total of $172.2 M in payments were made to 21,784 OMDs (Mean $7.9K, Range $0.70-$12.4M). Payments were highly disproportional between providers, with $35.4M (55.4%) paid to 408 ODs (1%), and $116.5M (67.6%) paid to 218 OMDs (1%).

CONCLUSION

Voluntary financial relationships with industry are variable in eye care. Most providers (approximately 98%) accepted at least one transaction, but a majority of industry's financial investment went to a small minority of doctors in each profession. This may provide insight into the marketing strategies used by industry, such as the training and development of "thought leaders" who may have influence over other prescribers. Despite the majority of the payments going to a select few, research in social psychology suggests that even small gifts influence behavior. Presentation of these data can increase awareness of potential conflicts of interest and may be used as a reference when developing policies to improve patient care.

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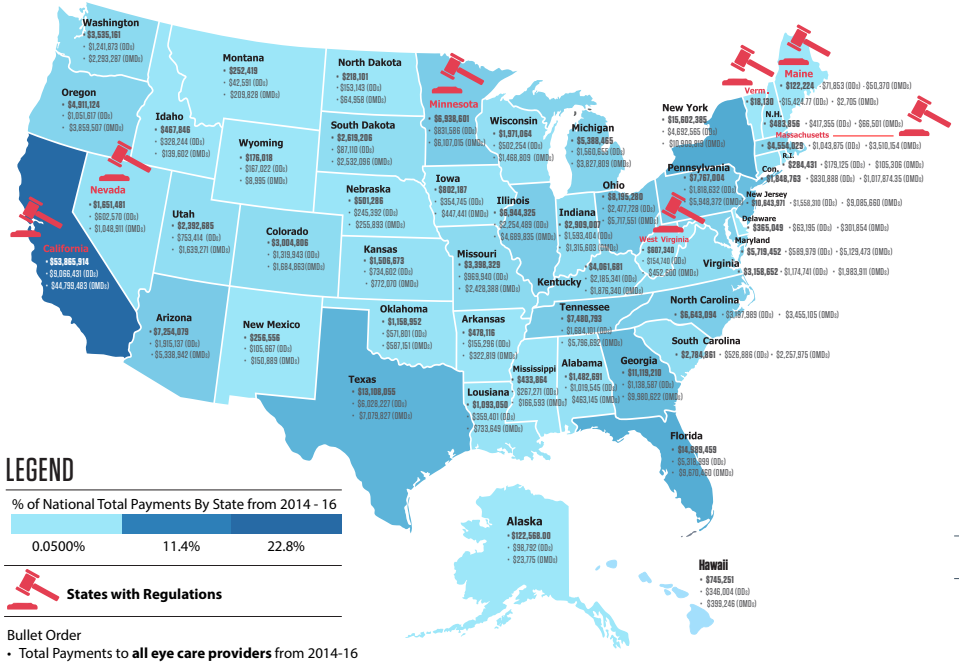
Elizabeth Wyles ewyles@ico.edu

$236 M was spent on Eye Care Providers from 2014-2016. How much did you receive?



LEGEND

% of National Total Payments By State from 2014 - 16

0.0500% 11.4% 22.8%

States with Regulations

Bullet Order

- Total Payments to **all eye care providers** from 2014-16
- Total Payments to **ODs** from 2014-16
- Total Payments to **OMDs** from 2014-16

Why are they spending this money?

NATIONAL DATA OPTOMETRY

Number of ODs who accepted at least one transaction:

40,837

Total Value of General Payments in U.S. Dollars:

$63.9 M

Range: $1.25 - $1.18 M

Amount Paid to Bottom 1%:

$4,063

(0.006%)

Amount Paid to Middle 1%:

$115.6 K

(0.18%)

Amount Paid to Top 1%:

$35.4 M

(55.4%)

NATIONAL DATA OPHTHALMOLOGY

Number of OMDs who accepted at least one transaction:

21,784

Total Value of General Payments in U.S. Dollars:

$172.2 M

Range: $0.70 - $12.4 M

Amount Paid to Bottom 1%:

$1,647

(0.001%)

Amount Paid to Middle 1%:

$70.3 K

(0.04%)

Amount Paid to Top 1%:

$116.5 M

(67.6%)

PAYMENT DEFINITIONS (WHAT IS A "PAYMENT")

PAYMENTS INCLUDED

CONSULTING/SPEAKING FEES | FOOD AND BEVERAGES | TRAVEL AND LODGING | EDUCATION

PAYMENTS NOT INCLUDED

RESEARCH-RELATED PAYMENTS | OWNERSHIP OR INVESTMENT PAYMENTS

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Impact of Affordable Care Act on Eye Care Compliance

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PURPOSE

The Affordable Care Act (ACA) or Obama care was the most monumental change in US health care policy since the passage of Medicaid and Medicare in 1965. The purpose of this study was to determine the impact of ACA on eye care and primary care exam visits compliance in patients who had no health insurance prior to ACA.

METHODS

Patients seen at the Illinois Eye Institute (an urban eye clinic) from April 1st to Feb 1st, 2018 were invited to participate this study. Patients were surveyed on how often they were seen by their eye care and primary care physicians before and after the implementation of ACA (Table 1). The following options were given to the patients regarding the frequency of doctor visits: more than once a year, every one to two years, once in 3 to 5 years, once in 5 to 10 year, never, not sure. The compliance was categorized into 3 levels: good (answer keys of "more than once a year and "every one to two years"), poor (answer keys of "3 to 5 years", "5 to 10 years" and "not sure"), and no compliance (answer key of "never"). Chi-square were performed to test the compliance difference between patient who were benefit from ACA and who were not as well as the compliance difference in patients before and after they received health insurance under ACA.

Table 1
Survey of Health Insurance and Compliance with Eye and Primary Care Exams.

1. Did you have health insurance before 2011?
   - ❑ Yes
   - ❑ No

   Deny survey

2. Before 2011/Obama care, how often did you see your eye doctor?
   - ❑ Never
   - ❑ Not sure
   - ❑ every 6-10 years
   - ❑ every 3-5 years
   - ❑ every 1-2 years
   - ❑ more than once a year

3. Before 2011/Obama care, how often did you see your PCP (primary care physician) for your general health checkup?
   - ❑ Never
   - ❑ Not sure
   - ❑ every 6-10 years
   - ❑ every 3-5 years
   - ❑ every 1-2 years
   - ❑ more than once a year

4. From 2011 to now, how often have you seen your eye doctor?
   - ❑ Never
   - ❑ Not sure
   - ❑ every 6-10 years
   - ❑ every 3-5 years
   - ❑ every 1-2 years
   - ❑ more than once a year

5. From 2011 to now, how often have you seen your PCP (primary care physician) for your general health checkup?
   - ❑ Never
   - ❑ Not sure
   - ❑ every 6-10 years
   - ❑ every 3-5 years
   - ❑ every 1-2 years
   - ❑ more than once a year

Table 2
Eye Care and Primary Care Compliance in non-ACA-Insured Patients (n = 5,259) and ACA-Insured Patients (n = 630)

Compliance (%)	Non-ACA-Insured Patients		ACA-Insured Patients			
	Eye Exam	Primary Care Exam	Eye Exam		Primary Care Exam	
			before ACA	After ACA	before ACA	After ACA
Good Compliance	79.5	94.7	32.0	59.5	55.4	76.3
Poor Compliance	17.3	4.7	37.3	22.9	26.8	13.8
No Compliance	3.1	0.6	30.8	17.7	17.9	10.0

Figure 1
Compliance of Eye exam Improved in Individuals Who Gained Health Insurance through ACA

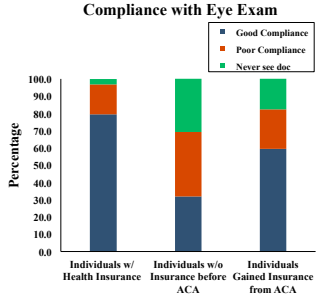
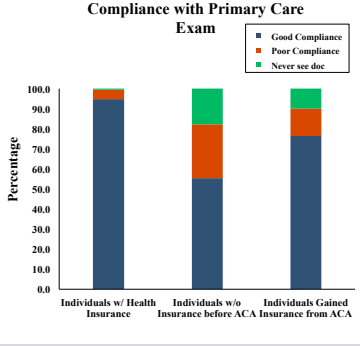


Figure 2
Compliance of Primary Care Exam Improved in Individuals Who Gained Health Insurance through ACA



RESULTS

A total of 5,889 patients were enrolled into the study, with 89.3% (n=5,259) patients who had health insurance before and after ACA (non-ACA-insured patient) and 10.7% (n=630) patients who received health insurance under ACA implementation (ACA-Insured patient). Table 1 shows the eye care and primary care compliance in those two groups. Prior to ACA, only 32.0% and 55.4% of ACA-Insured patients had good compliance in eye care and primary care respectively vs. 79.5% and 94.7% in non-ACA patients with statistically significant difference ($p < 0.001$). The percentage of good compliance in ACA-Insured patients increased to 59.5% and 76.3% in eye and primary care respectively after ACA. The change of compliance in ACA Insured patients was statistically significant ($p < 0.001$).

CONCLUSION

- Compliance of Individuals without health insurance on eye exam was significantly worse than those with health insurance.
- Compliance of Individuals without health insurance on primary care was significantly worse than those with health insurance.
- ACA expanded patient insurance coverage and significantly improved eye care exam compliance in individuals without health insurance.
- ACA expanded patient insurance coverage and significantly improved primary care compliance in individuals without health insurance.

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An Evaluation of an Automated ETDRS Low Contrast Acuity Measurement

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PURPOSE

With the recent advances in technology, computerized tests have been used to measure visual function, including visual acuity (VA) and contrast sensitivity (CS). Computerized equipment can generate similar results as gold standard charts if test distance and position of the test screen are correct and external glare are limited. However, many of those systems have not yet been validated. The purpose of this study was to determine the repeatability of an automated ETDRS low contrast acuity (LCA) measurement and its agreement with the gold standard chart-based measurements, Sloan LCA chart, in normal subjects and subjects with reduced visual acuity (VA).

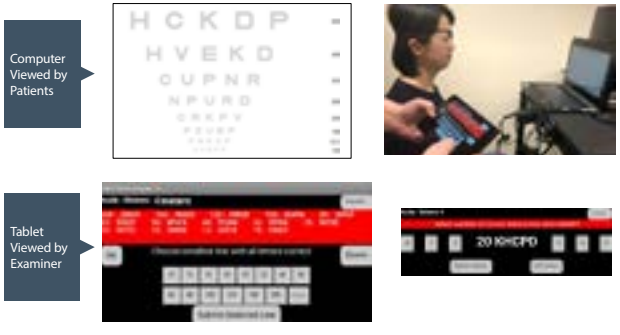
METHODS

Fifty-one subjects were tested (age 23 – 91 years), including 33 subjects with normal vision (VA of 20/25 or better) and 18 subjects with reduced vision (VA from 20/30 to 20/100). LCA at two contrast levels (2.5% and 10%) of one eye from each subject was measured in a random sequence with the Sloan LCA chart and automated tablet-computer system (Figure 1) (M&S Technologies, Inc., Niles, IL). Subjects were retested one week (± 3 days) later. Agreement between S-LCA and automated LCA (A-LCA) as well as repeatability between two visits were evaluated using the 95% limits of agreement (LoA).

TABLE 1: Demographic Characteristics of the Subjects(n = 51)

	Number of Subjects (%)
Visual Acuity	
20/25 or better	33 (64.7)
20/30 to 20/100	18 (35.3)
Gender	
Female	42 (82.4)
Male	9 (17.6)
Race	
Black	22 (43.1)
Hispanic	8 (15.7)
White	16 (31.4)
Asian	5 (9.8)
Age (years)	
Range	22.6-91.1
Mean (SD)	46.7 (17.5)

FIGURE 1: Automated ETDRS low contrast acuity measurement



RESULTS

Table 1 lists demographic characteristics of the subjects.

- **2.5% LCA (Figure2)**

The mean (±SD) difference between Sloan 2.5% LCA and M&S-2.5%-LCA was -0.05 (± 0.10) logMAR (0.5 line) with statistical significance (p = 0.005). The average difference between visit 1 and 2 was 0.05± 0.12 and 0.00 ± 0.13 logMAR respectively for Sloan 2.5% LCA and M&S-2.5%-LCA. The 95% LoA between M&S-LCA and Sloan LCA test was ± 0.19 logMAR at 2.5% contrast level. The repeatability of M&S-LCA (95% LoA = ± 0.26) was comparable to Sloan LCA (95% LoA = ± 0.23) at 10% contrast level.

- **10% LCA (Figure 3)**

The mean (±SD) difference between Sloan 10% LCA and M&S-10%-LCA was -0.12 (± 0.12) logMAR (about 1 line) with statistical significance (p < 0.001). The average difference between visit 1 and 2 was 0.00± 0.08 and 0.02 ± 0.11 logMAR respectively for Sloan 10% LCA and M&S-10%-LCA. The 95% LoA between M&S-LCA and Sloan LCA test was ± 0.24 logMAR at 10% contrast level. The repeatability of M&S-LCA (95% LoA = ± 0.22) was comparable to Sloan LCA (± 0.17 at 10% contrast) at 10% contrast level.

CONCLUSION

- The automated ETDRS LCA measurement shows good repeatability at both contrast levels of 2.5% and 10%.
- The agreement between automated ETDRS LCA measurement and Sloan LCA chart is good at 2.5% contrast level and fair at 10% contrast level.

FIGURE 2: Agreement between 2.5% Sloan and M&S-LCA and Repeatability of Sloan and M&S-LCA Test

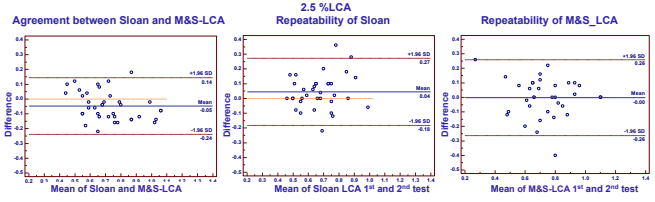
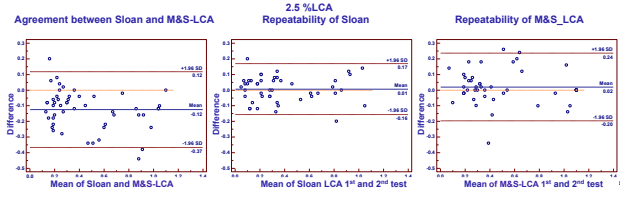


FIGURE 3: Agreement between 10 % Sloan and M&S-LCA and Repeatability of Sloan and M&S-LCA Test



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Cross–sectional Analysis of Relationship Between the Idiopathic Long Anterior Zonule Trait and Glaucoma or Ocular Hypertension in a Clinic Based Primary Eye Care Population

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PURPOSE

The long anterior zonule (LAZ) trait is characterized by zonular fibers extending central to the normal anterior capsular insertion zone (Fig. 1).[1-4] It is frequently accompanied by pigment dispersion signs, and is hypothesized to be associated with glaucoma.[5-11] Rarely, LAZ may be caused by a S163R mutation in the C1q tumor necrosis factor-related protein 5 gene (C1QTNF5/CTRP5) in association with late-onset macular degeneration,[6,12] but a more common variety is idiopathic with potential prevalence of 2% or higher.[8,13,14] The purpose of this analysis was to investigate the relationship between LAZ and glaucoma or ocular hypertension.

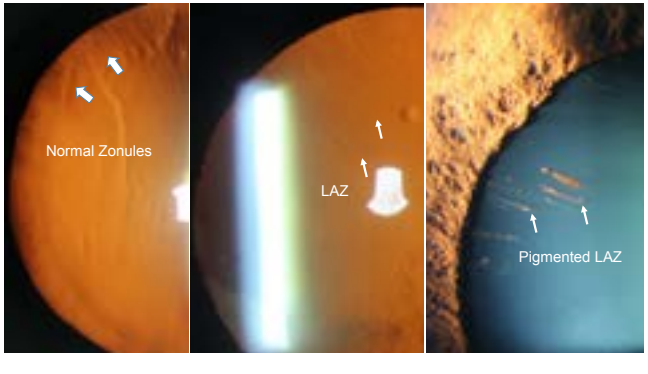
METHODS

As part of an ongoing investigation, ocular and general health information was collected during 2011-2017 on consecutive patients belonging to several practitioners in an urban academic eye care facility in Chicago, Illinois, USA.[11] All patients were examined for the LAZ trait, and information on ocular, systemic health, lifestyle, and other demographic variables was collected from the medical record as well as from a questionnaire administered at time of exam (Table 1). Patients were excluded if they were <18 years of age, refused consent, did not have pupil dilation, or if there was history of intraocular surgery, uveitis, or significant ocular trauma. Controlling for numerous factors, multivariate regression was used to explore the relationship between LAZ and presence of glaucoma or ocular hypertension. Right eyes were used for purposes of the analysis.

RESULTS

The initial analysis included 3,057 subjects (mean age=51.0 ± 15.3 years, 84% African-American, 64.8% female) (Table 2), with 94 of these people having >trace LAZ in the right eye (mean age=64.3 ± 11.0 years, 94.7% African-American, 78.7% female). Among non-LAZ eyes, 4.1% (N=119) were being treated with glaucoma medications, and among LAZ eyes, 14.9% (N=14) were taking glaucoma medications (P<0.0001) (Table 3). Controlling for other significant factors (P<0.05), including age, race, refractive error, body mass index, and history of smoking, LAZ subjects were 2.0x more likely (OR=2.0, 95%CI=1.1 to 3.9) to be using glaucoma medications than eyes not having LAZ (Tables 4, 5).

FIGURE 1
A. Normal zonules (arrows) at their insertion zone (left photo); Long anterior zonules (middle photo); Pigmented LAZ (right photo).



DISCUSSION

This analysis further suggests that people with the LAZ trait may have increased risk of developing glaucoma and ocular hypertension. This is consistent with anecdotal reports[5-7,10] and potentially important given that estimated prevalence for the idiopathic variety of LAZ may be near 2.0%.[13] It is also consistent with the finding that LAZ subjects who are not being treated for glaucoma or ocular hypertension have slightly higher intraocular pressure on average than non-LAZ subjects.[11] Should there be a true relationship between ocular hypertension and glaucoma, current mechanisms are unknown.

This study has significant limitations given its cross-sectional nature and the limited diversity of its subject population. Nonetheless, given the evolving suggestion of possible relationship to glaucoma and ocular hypertension, further study involving larger and more diverse populations is needed.

TABLE 1
Variables Explored/Controlled for in Regression Models

Demographic	Ocular	Systemic
Age	Rrefractive error	Body mass index
Gender	Krukenberg's spindle	Systolic / diastolic blood pressure
Race	Long zonule trait presence	Hypertension
Education	Corticosteroid use	Diabetes
		History of cancer
		Smoking
		Alcohol
		Cholesterol medication

TABLE 2
Subject Characteristics

Total Subjects	3,057
Age (years)	51.0 ± 15.3 (18-94)
Race	
African-American	2,657 (84.0%)
Hispanic	211 (6.9%)
White	180 (5.9%)
Asian	53 (1.7%)
Other	43 (1.5%)
Gender	
Female	1,982 (64.8%)
Male	1,075 (35.2%)

TABLE 3
Distribution of Variables Used in Final Models

Variable	Use Glaucoma Medication Yes (N=133)	No (N=2,842)
LAZ trait present (>trace)	14.9%	4.1%
African-American race	5.0%	1.6%
Ever-smoker	4.2%	4.7%
Age, mean ± SD in years	65.5 ± 12.7 (39-92)	50.1 ± 15.1 (18-94)
BMI, mean ± SD in kg/m²	29.0 ± 5.9 (16.6-50.6)	30.7 ± 7.8 (15.3-74.5)
Refractive error, mean ± SD in diopters	-0.67 ± 3.2	-0.88 ± 2.9

Abbreviations: BMI, body mass index; LAZ, long anterior zonule trait; kg/m², kilograms per meter-squared; SD, standard deviation

TABLE 4
Multivariate Analysis Testing Relationship Between Glaucoma Medication Use and Likelihood of Having LAZ

Variable	Coefficient	Standard Error	P-value	Odds Ratio	95% CI
Intercept	-7.3	0.75	--	--	--
LAZ trait present	0.71	0.33	0.03	2.0	1.1 to 3.9
Age (per decade)	0.81	0.08	<0.0001	2.2	1.9 to 2.6
Race (AA vs. Other)	0.78	0.38	0.04	2.2	1.0 to 4.6
Refractive error (SE, per D)	-0.09	0.03	0.004	0.9	0.9 to 1.0
BMI (per 10 units) (kg/m²)	-0.34	0.14	0.02	0.7	0.5 to 0.9
Ever smoke vs never smoke	-0.42	0.19	0.02	0.7	0.5 to 0.9

Abbreviations: AA, African-American; BMI, body mass index; CI, confidence interval; D, diopter; LAZ, long anterior zonule trait; SE, spherical equivalent; kg/m², kilograms per meter-squared;

TABLE 5
Relationship Between Glaucoma Medication Use and LAZ Trait - African-American Subjects Only

Variable	Coefficient	Standard Error	P-value	Odds Ratio	95% CI
Intercept	-6.3	0.74	--	--	--
LAZ trait present	0.75	0.33	0.03	2.1	1.1 to 4.1
Age (per decade)	0.80	0.08	<0.0001	2.2	1.9 to 2.6
Refractive error (SE, per D)	-0.10	0.03	0.002	0.9	0.9 to 1.0
BMI (per 10 units) (kg/m²)	-0.40	0.15	0.007	0.7	0.5 to 0.9
Ever smoke vs never smoke	-0.47	0.19	0.01	0.7	0.4 to 0.9

Abbreviations: AA, African-American; BMI, body mass index; CI, confidence interval; D, diopter; LAZ, long anterior zonule trait; SE, spherical equivalent; kg/m², kilograms per meter-squared;

CONCLUSIONS

This investigation further supports the hypothesis that eyes with the LAZ trait may have elevated risk of glaucoma and ocular hypertension. More study is warranted.

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Longitudinal Results of the Relationship Between Saccadic and Fixation Movements to Birth Order

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PURPOSE

The purpose of this longitudinal study was to evaluate the relationship that birth order may have in relationship to the development of eye movement skills prior to entering Kindergarten, and then again prior to entering later grades 3rd, 6th, & 9th. The relationship between IQ and birth order has been looked at in a number of studies in the past, with many finding that first born children scored higher on intelligence tests, as well as in behavioral development. In a study by Clark and Rice, they found that firstborn children were overrepresented in Nobel Prize winners. In a 2008 study by Price, he analyzed that first born children spend 3,000 more quality hours with their parents between the ages of 4 and 13 than the next born child in the family when going through the same age span. A 2001 study by Zick, et al also suggests that parents who read with their children more have children who attain better grades and display fewer behavioral problems.

Accurate eye movement skills are an essential part in the process of reading, and therefore learning in a classroom environment. In a study by Quaid and Simpson comparing 50 Canadian children with reading based Individualized Education Plans (IEP) with 50 children without reading complaints or IEPs, they found the children with reading difficulties showed statistically significant increased number of eye movements and decreased reading speed when compared with a control group. An Austrian study by Dusek, et al also showed a slower reading speed and a larger number of errors in children referred from an educational assessment center with reading difficulties versus those children with no reading difficulties. We previously reported on the results of 112 children (Allison C. Schlange D, ARVO 2014), concluding that first born children exhibit better saccades and fixation control prior to entering Kindergarten due to differences in the type of activities they pursue. This study investigates if the first born advantage continues after they are in school.

METHODS

145 children were examined the summer prior to entering Kindergarten. The average age of these children was 4.93, ranging from 4 to 6 years. 56 of the same children were examined again the summer prior to entering 3rd grade, 27 of the same children were examined during 6th grade, and then 5 of the same children examined before entering 9th grade. The number of children in this longitudinal study decreased due to children moving away, or unable to return for follow-up exams due to family time constraints. All children were given a full comprehensive eye examination including an ocular health evaluation. Parents completed a survey (Figure 1) regarding the number and ages of the siblings, prior school history, and the amount of time the children spent with a parent or playing near vision type games. A modified survey (Figure 2) with the addition of questions about participation in outside academic help programs and teacher determined reading ability, was completed by parents prior to children entering 3rd and 6th grade.

The subjects also received eye movement recordings using the Visagraph III (Taylor), an infra-red system with goggles worn while viewing computer generated targets (Figure 3). The system software and manual analysis evaluates the recordings. We used 3 procedures:

Fixation Control: Task I determines how successful our subject is at holding fixation on a target (20/30 letter, symbol or face target, 33 cm viewing dist.) for 10 seconds, inhibiting eye and head movement. Fixation drifts and off-target saccades are recorded. Figure 4.

Saccadic Speed: Task II determines how quickly the subject can complete horizontal saccades, alternating fixation between two targets separated 15 deg. for 15 sec. duration. Number of saccadic excursions is a speed score. Figure 5

Saccadic Accuracy: Task III determines saccadic accuracy by recording refixations (corrective saccades) required to regain fixation after completing a 15 degree saccade. Figure 6

Our cohort of 145 included: 24 only child (OC); 65 first born, 1 sibling (FB, 1 sib); and 56 Not first born, > 1 sibling (NFB, >1 sib).

FIGURE 1
Kindergarten Parent Survey

FIGURE 2
3rd Grade Parent Survey

FIGURE 3
Photo

FIGURE 4
Fixation Control During Sustained Target Viewing: Pre-Kindergarten Students

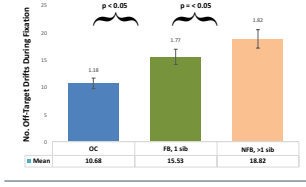


FIGURE 5
Speed of Horizontal Saccades: Pre-Kindergarten Students

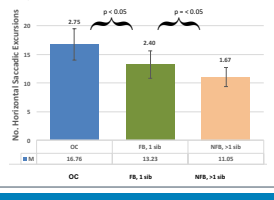


FIGURE 6
Saccadic Accuracy – Post-Saccadic Refixations: Pre-Kindergarten Students

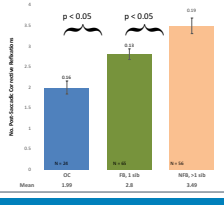


FIGURE 7
Fixation Control: 9-Year Longitudinal Study

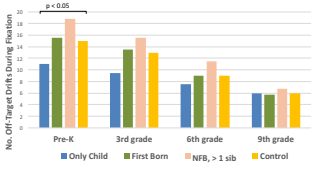


FIGURE 8
Saccadic Speed: 9-Year Longitudinal Study

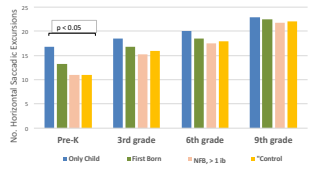
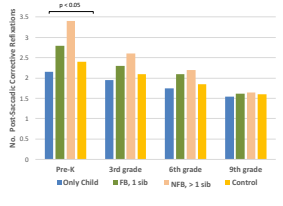


FIGURE 9
Saccadic Accuracy: 9-Year Longitudinal Study



RESULTS

Children who were first in birth order exhibited the following for tasks I, II, and III at Pre-Kindergarten.

1. Better fixation control ($p < 0.05$) with fewer off-target drifts. Figure 4
2. More efficient and faster horizontal saccades ($p < 0.05$). Figure 5.
3. More precise post-saccade refixations with fewer corrective saccades ($p = < 0.05$). Figure 6

Children first in birth order exhibited the following in this 9-year longitudinal study:

1. Fixation control, saccadic speed and saccadic accuracy are better ($p < 0.05$) at the Pre-K level.
2. No significant difference at 3rd, 6th and 9th grades. Figures 7, 8, 9.

CONCLUSIONS

First born children show better saccadic/fixation eye movements prior to K, that allows them to succeed in school and may contribute to early reading success. However, due to the consistency of near vision and eye movement tasks in a typical 1st through 3rd grade curriculum, this effect seems to plateau over time. By 3rd grade and continuing into the 6th and 9th grade, this effect diminishes and the first born children no longer exhibit better eye movement skills. The question then remains why do the first born children tend to have better eye movement skills upon entering Kindergarten? Is this a pre-determined effect of birth order? Are these children doing some type of activity that is benefiting these eye movement skills that we did not assess in our survey items? Repeating this study on a different group of children with another socioeconomic background or different ethnic background or different learning environment may help to answer this question. Perhaps the influence of school programs and the fact that the teachers give each child the same type and amount of learning activities throughout the day decreases the natural benefit that first born children have when they first enter school.

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Comparison of Head Borne Electronic Low Vision Devices in Patients with Visual Impairment

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PURPOSE

- With evolving technology and accessibility being applied to the field of low vision, patients are finding it easier to maintain independence and accomplish functional goals through the use of electronic magnification.
- Head borne video displays are a new category of wearable electronic magnifiers (WEMs) marketed for low vision.
- The purpose of this study was to provide comparative data on subject's objective and subjective responses with the latest models of WEMs: E-Sight (E), IrisVision (IV), and Jordy (J).

METHODS

- A within subject, randomized design, was used to evaluate 31 subjects with stable visual impairments.
- Patients were given a brief training demonstration with each device and measurements including distance and near VA and contrast sensitivity were obtained. Patients were then asked to read a short newspaper article and complete a 1-5 Likert based survey for each WEM on factors including: device comfort, image quality, cosmetic appearance, field of view, readability, focusing speed, and interest in purchasing the WEM. Subjects were also asked to rank the three WEMs in order of overall preference/performance and perceived cost of each WEM.
- Data was analyzed using SPSS v21 using a general linear model for repeated measures and non-parametric statistics where appropriate.

TABLE 1 - Demographic Data

Average Age (years ± SEM)	61 ± 4
Number of subjects <60 years	15 (48%)
Number of subjects >60 years	16 (52%)
Male (%)	20 (65%)
Female (%)	11 (36%)
Central Vision Loss (%)	23 (74%)
Peripheral Vision Loss (%)	8 (26%)
Median Baseline Best Corrected VA (Min, Max)	10/60 (10/450, 10/25)
Median Baseline Contrast (Min, Max)	0.96 (0.5, 1.68)

FIG 1. DVA Comparison from Baseline

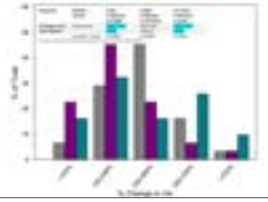


FIG 2. Percent Change in DVA

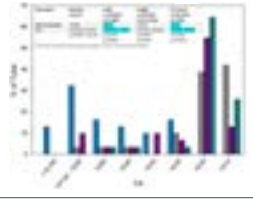


FIG 3. Comparison of Contrast from Baseline

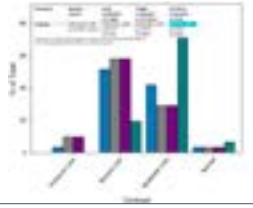


FIG 4. Device Image Quality

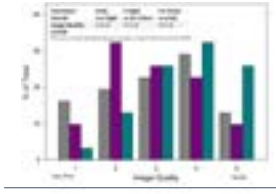


FIG 5. Device Comfort

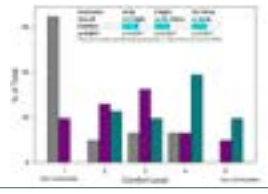


FIG 6. Device Appearance

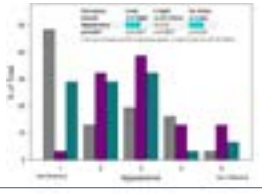


FIG 7. Device Field of View

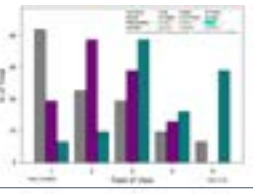


FIG 8. Device Focusing Speed

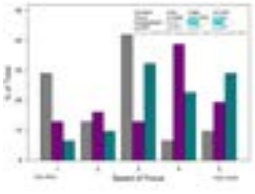


FIG 9. Ease of Reading with Device

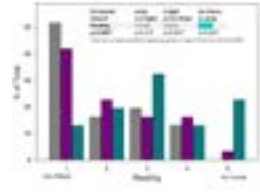


FIG 10. Overall Interest in Device

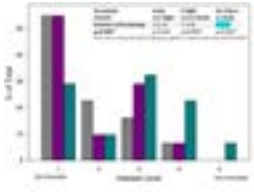


FIG 11. Rank of Perceived Device Cost

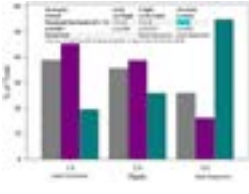
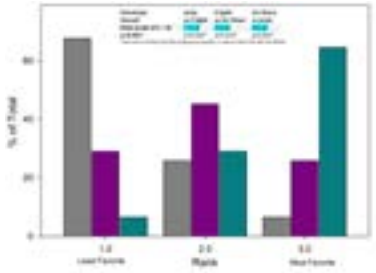


FIG 12. Rank of Device Preference



CONCLUSIONS

- The results of this study suggest that WEMs may allow individuals with low vision an enhanced ability to carry out activities of daily living.
- This pilot study provides practitioners with data to compare initial device outcomes and experiences in various patient subgroups in order to assist in recommending whether such devices are suitable for their patient's visual goals and demands. As a result, low vision practitioners should consider demonstrating these devices to their patients as a potentially useful tool to achieve greater independence in their daily lives.

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Infection Control Modification to Include Keyboards in Eye Care Settings

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PURPOSE

Health care organizations continually strive to improve infection control standards. Despite widespread use of computers in health care, few studies have considered the importance of including keyboards in infection control protocols. To our knowledge, only one pilot study has been completed to investigate the value of proper keyboard disinfection in eye care settings. This study was an expansion of that pilot study. This investigation included a two-phase statistical analysis, with the intention of stressing the importance of infection control in eye care settings. The first half of this study looked at over 52 exam room keyboards at the Illinois Eye Institute in Chicago, Illinois. The purpose of this phase of the study was to show how critical it is to maintain the proper standards when it comes to disinfecting equipment, including keyboards, and provide a simple protocol. This phase determined the effectiveness of commercially available germicidal wipes on exam lane keyboards. Phase one also included laboratory identification of the cultured microorganisms to further assess risk of infection. Phase two looked at the difference in results five months later after a brief protocol modification announcement was made by the Compliance and Quality Improvement Office of the Illinois Eye Institute.

METHODS

Phase one of the project involved 52 exam lane keyboards from five different departments (advanced care/ER, primary care, pediatrics, geriatrics/low vision, cornea/contact lens) at the Illinois Eye Institute. To remain unbiased, the plates were numbered blindly and chosen at random for culture. A random plate was also swabbed with sterile saline alone to act as a control. The keyboards were swabbed with a sterile cotton-tip applicator and cultured in a colony-isolating pattern on 5% sheep's blood agar plates. The "F" key was swabbed before disinfection. Subsequently, the keyboards were wiped once in each direction with a commercially available germicidal cloth with n-Alkyl dimethyl ethylbenzyl ammonium cholorides and n-Alkyl dimethyl benzyl ammonium chlorides as the active ingredients (Figure 1). The "J" key was swabbed and cultured using the same technique after disinfection. Bacterial colonies were quantified at 24 and 48 hours of incubation (Figures 2-7). After 48 hours of incubation, ten plates were sent to a laboratory for bacterial identification. Phase two took place five months later, after a brief clinic-wide announcement that disinfecting keyboards should be included as part of the clinical infection control routine. The same 52 keyboards from phase one were cultured and quantified at 24 and 48 hours for comparison with phase one data to determine whether the announcement provoked a behavioral change resulting in improved infection control.

Figure 1
Equipment

Figure 2
Incubator thermometer showing 37°C for optimal microbial growth.

Figure 3
Incubating conditions

Figure 4
Example of agar plate growth at 48 hours. This growth was from the F key on an uncleaned keyboard.

Figure 5
Example of agar plate growth from the cleaned J key on the same keyboard as Figure 4, at 48 hours.

Figure 6
Example of agar plate growth at 48 hours. This growth was from the F key on an uncleaned keyboard.

Figure 7
Example of agar plate growth from the cleaned J key on the same keyboard as Figure 6, at 48 hours.

Figure 8
In Phase 1, the mean number of colonies before cleaning were 12.18, 17.27, 16.82, 9.417, 19.29 in Advanced Care, Primary Care, Pediatrics, Rosenbloom, and Cornea respectively with standard deviations 20.21, 20.58, 20.76, 11.18, and 15.48 (thin lines). There was no significant difference in pre-cleaned keyboard bacterial growth between departments at the start of the study (P = 0.7271).

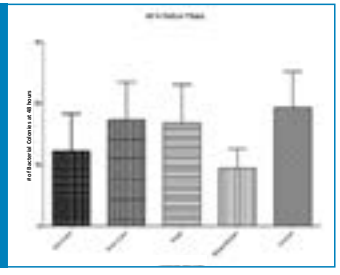


Figure 9
In Phase 1, the total mean number of colonies before cleaning was 15.02 with a standard deviation of 17.75 (thin line). The total mean number of colonies after cleaning was 0.7500 with a standard deviation of 1.169 (thin line). There was a significant difference in the 48 hour data when comparing cleaned to uncleaned keyboards (p = <0.0001).

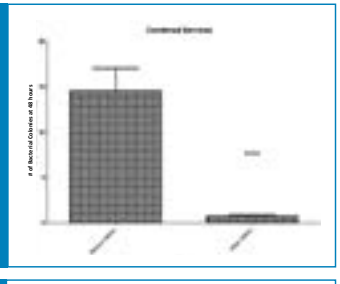
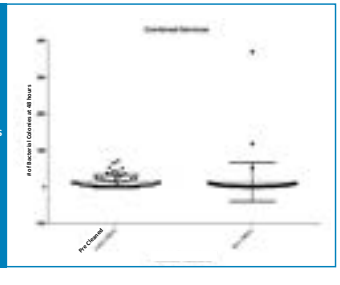


Figure 10
Compares the data from Phase 1 (pre-cleaned) and Phase 2. In phase 1, the mean number of colonies before cleaning was 15.02 with a standard deviation of 17.75 (thin line). The mean number of colonies in Phase 2 was 13.44 with a standard deviation of 53.33 (thin line). There was no significant difference in the Phase 1 data when compared to the Phase 2 data (p = 0.8401). However, 36 of the 52 keyboards showed individual improvement in quantified colonies.



RESULTS

The phase one data, revealed similar pre-cleaned findings throughout the clinic resulting in no statistically significant difference between any of the departments (Figure 8). Due to this finding the results were combined to represent the entire clinic. When evaluating the efficacy of the germicidal cloths, results yielded a statistically significant P values of less than 0.05 (Figure 9). The laboratory identification report listed bacteria known to cause ocular pathology. Identification included but was not limited to *Staph. epidermidis, Staph. aureus, Staph. hominis, Staph. capitis, Bacillus megaterium, Bacillus cereus, and Bacillus amyloliquefaciens.* When comparing the data from Phase 1 (pre-cleaned) and Phase 2 there was no statistically significant decrease in bacteria growth, with P values less than 0.05 (Figure 10). Despite these results, 36 of the 52 total keyboards had individual reductions in bacteria growth.

CONCLUSION

Phase one of this study suggests that keyboards in eye care settings that are not cleaned can harbor microorganisms which could be a source of risk for ocular infection. It also implies keyboards used during patient care should be included in infection control protocols and that simply using a commercially available germicidal cloth can improve cleanliness significantly. Phase two of the study demonstrated how a simple infection control announcement can result in the reduction of bacteria growth, suggesting the start of a behavioral change resulting in a cleaner healthcare environment. Based on the results of this study, The Illinois Eye Institute has instituted regular electronic reminders to further improve infection control. The authors suggest that all patient care facilities that use keyboards as a part of patient care consider following the Illinois Eye Institute's lead.

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DISCLOSURE INFORMATION

None to disclose

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COVD

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Convergence Spasm: A Case Report

Dominick M Maino, OD, MEd, FAAO, FCOVD-A *%; Stephanie Lyons OD %; Kelsey Frederick, OD %; Alaina Bandstra, OD *
Illinois College of Optometry *, Lyons Family Eye Care %

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BACKGROUND

Convergence spasm (CS) is a rare disorder of episodic, intense convergence, miosis and accommodative excess and often mimics an abducens palsy. The etiology may be psychogenic, metabolic, neurological and functional. No studies evaluating the effectiveness of vision therapy (VT) for this disorder were found.

Table 1
Etiologies of Convergence Spasm

Encephalitis	aromatic L-amino acid decarboxylase deficiency
tabes dorsalis	post-myelography
thyroid disease	primary failure of accommodation
vertebrobasilar ischemia	attempts to overcome vertical gaze palsy
metabolic encephalopathy	brain stem pathology
multiple sclerosis	psychogenic disorders

CASE REPORT

A 13 y/o WF (JA) with a history of Crones disease, Celiac disease, CS and diplopia was evaluated. She had a previous history of a large esophoria at near which would decompensate into a large but intermittent esotropia. No neurological, psychogenic or pathological etiology was present. All neurological scans were unremarkable. She was in acute distress, could not read, watch TV, use a computer, or study for tests, endured daily headaches and noted decreased mobility issues. JA's medications included Remicade and amoxicillin. Her VA was variable. An auto-refraction, subjective refraction and retinoscopy was not possible or extremely variable. Refractive error ranged from +1.00 to -9.00, miosis, erratic oculomotor skills, unremarkable ocular health and a 20-40PD convergent spasm.

Interventions included spectacles, vision therapy (VT), and atropine. VT was given to decrease the accommodative excess, which would then decrease the convergence spasm. After 16 therapy sessions, it was determine that a different approach was required. After considering surgical intervention, Botox injections and atropine, using atropine was most appropriate intervention at this time. JA instilled the atropine daily, then every other day, every third day, once a week, once every two weeks and now once every 3 weeks. We are continuing to taper until no drops are required.

Table 2
School Accommodations

frequent breaks from near point activity

every 10 to 20 minutes a 20 second *look up break*

Extended time on tests and doing homework

Use of audio-books and large print text

Table 3
Initial Complaints

Week long headaches	Diplopia	Lid spasm	Blurred vision
Inability to read	Pressure in temples	Upset stomach	Excessive blinking
Inability to use computer	Tired	Poor attention	Poor stereopsis

Table 4
Initial Clinical Findings

VA	Refraction	OM	Acc	Vergence	Fusion	Health
Variable	Up to -9.00	Convergent spasm IET Variable fixation +1 Pur/Sac	Acc excess	None	Alt Sup	NAP

Table 5
Vision Therapy Program (limited success after 16 visits)

Visual Acuity	Oculomotor	Accommodation	Vergence	2nd Fusion	Stereopsis
Variable	Very Difficult +2 Pur/Sac Poor Fixation	Could not clear	None	4 dots	Suppression

Table 6
Atropine/Post VT Clinical Findings

Complaints	Aided VA	Refraction	OM	Acc	Vergence	Fusion
None	20/30 D 20/60 N	OD +.50-25X082 PL (stable)	Mild jerkiness far right/left Gaze +3 Pur/Sac	MEM +25 OD/OS	NPC TN	Random Dot+ Randot 8/10

DISCUSSION

Convergence spasm is a rare, disabling disorder with no clear-cut etiology or treatment. Its characteristic features include sustained extreme convergence, accommodative spasm and miosis. It is not the same as convergence excess. Organic, functional and non-organic psychogenic disorders must be ruled out. Bifocal spectacles and vision therapy did not successfully treat the anomaly. Utilization of atropine, contact lenses and glasses (bifocals, dark tints, sun glasses) allowed the patient to function successfully. Atropine use was initially instilled once per day and then eventually tapered to once every 3 weeks. Optometrists should use all the tools available to us to improve our patient's quality of life, including an approach that uses pharmaceutical agents.

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Ocular Neuromyotonia in a 38 year Old Female Following Radiation Therapy

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BACKGROUND

Ocular neuromyotonia is a rare but often under diagnosed eye movement disorder. It involves transient episodes of ocular misalignment with accompanying diplopia. These spontaneous muscle contractions are classically seen following radiation therapy to the midbrain. The contraction may last seconds to minutes and can recur throughout the day. Anticonvulsants are an option to eliminate symptoms of ocular neuromyotonia.

CASE REPORT

A 38 year-old, white female presents with frequent, diagonal diplopia at distance and near. Reports it happens several times an hour and typically lasts 5-10 minutes. Onset noted after receiving several rounds of radiation therapy to the midbrain.

Medical History: Significant for medulloblastoma (Figure 1,) type-2 diabetes and hypertension. A partial resection of the tumor was completed in January 2017 in conjunction with chemotherapy and radiation.

Ocular History: unremarkable

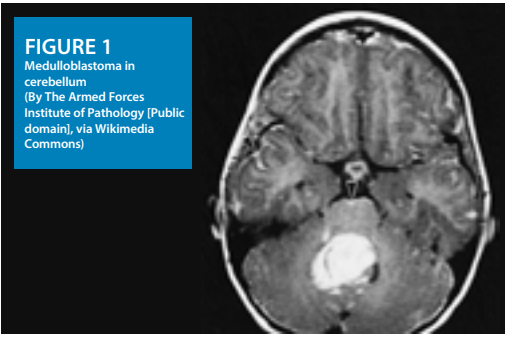


FIGURE 1
Medulloblastoma in cerebellum
(By The Armed Forces Institute of Pathology [Public domain], via Wikimedia Commons)

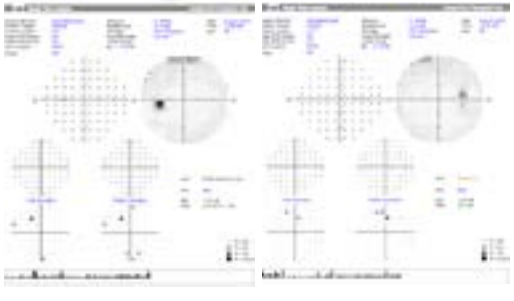
Clinical Examination: Visual acuities were 20/20 in each eye, pupils were normal and confrontation fields were full. A gaze-evoked nystagmus was noted on motility testing. The cover test revealed an unstable vertical strabismus. Manifesting as a right hypertropia during two appointments and a left hypertropia at another. These findings were confirmed with Maddox rod testing (Figure 2.)

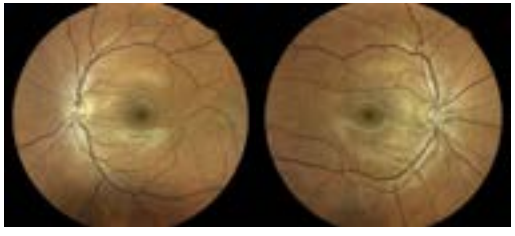
FIGURE 2
Summary of Cover Test Findings

Exam	1	2	3
Cover Test • Distance • Near	6 CRET / 10 CRHyperT 3XP / 10 RHyperP'	3 CRET / 5 CRHyperT 16 CRXT'/ 5 CRHyperT'	3 CRET / 2 CLHyperT 8 CRXT'/ 2 CLHyperT'
Maddox Rod	Right Hyper	Right Hyper	Left Hyper

Diagnostic Testing: Baseline testing showed no visual field loss or damage to the optic tract (Figure 3.)

FIGURE 3
Diagnostic Testing





DIAGNOSIS AND DISCUSSION

The patient was diagnosed with strabismus, diplopia and ocular neuromyotonia. The diagnosis of ocular neuromyotonia was made based on history and clinical manifestations alone. Prior to the diagnosis of ocular neuromyotonia, the primary treatment approach was vertical prism. Upon follow up, the patient described poor fusional ability with the prismatic glasses and discontinuation of wear. The variability of the ocular deviation became obvious at this appointment. With the persistence of symptoms and the inability to achieve stable fusion with prism, other more urgent and efficient treatment options are explored. Monocular occlusion with a high plus contact lens was the ultimate treatment option. This allowed immediate relief of symptoms and an overall improved quality of life.

The case study patient was on two anti-convulsant drugs at the time of diagnosis. A letter was sent to her primary doctor with the suspected diagnosis and considerations for additional anti-convulsant therapy. Her overall prognosis for survival was poor.

The mechanism behind ocular neuromyotonia is generally ephaptic neural transmission. Whereby damaged cranial nerve axons cause aberrant neural signaling. Other possible mechanisms include changes in neural transmission following denervation or axonal hyperexcitability due to malfunctioning calcium channels.

FIGURE 4
Occlusion for relief of diplopia (Used with patient consent)

CONCLUSIONS

Ocular neuromyotonia is a rare but often under diagnosed eye movement disorder. Practitioners specializing in binocular vision disorders should be alerted to this diagnosis when treating patients with diplopia following radiation therapy to the brain. Anticonvulsant therapy can often control these unwanted symptoms. Managing a patient with an unstable, terminal illness requires practitioners to focus on improving the patient's quality of life with what resources we have available.

REFERENCES

Available upon request

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GLOBAL SPECIALTY LENS SYMPOSIUM

5 ICO PRESENTATIONS

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Oblate Scleral Lenses for Intacs: A Case Series

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BACKGROUND

ntacs are implantable intracorneal ring segments (ICRS) that nay be a surgical option for some keratoconic patients. FDA pproved in 2004 for the treatment of keratoconus (KC), they re designed to flatten the cornea to reduce visual distortion. 'atients who have Intacs can be very challenging to fit with ontact lenses secondary to the oblate nature and irregularity f the cornea that they may create. This case series describes hree patients who underwent Intacs procedures and were uccessfully fit with oblate scleral lenses.

CASE SERIES

'atient 1, a 30- year-old Hispanic female presented with history of keratoconus, Intacs OU, and no previous ontact lens wear.

Entering uncorrected acuities:
- OD: 20/800
- OS: 20/400

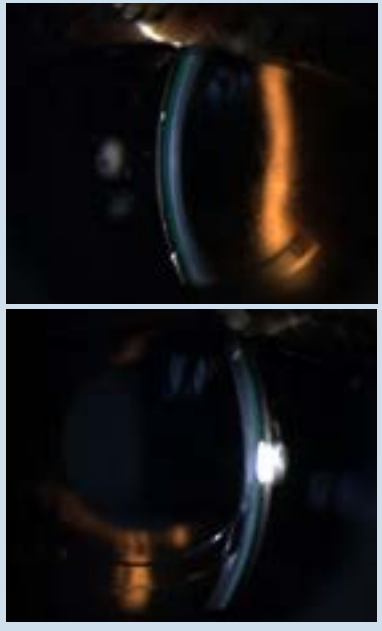
Manifest refraction:
- OD: -7.25-1.25x180, VA 20/100
- OS: -6.25-1.00x180, VA 20/125

Pentacam:
- OD: 2.50 diopters of corneal astigmatism, pachymetry 367 microns
- OS: 0.75 diopters of corneal astigmatism, pachymetry 347 microns

An oblate scleral lens design was selected to prevent corneal touch around the area of the inferior Intacs OU and improved her vision to 20/25 OD and 20/20 OS.

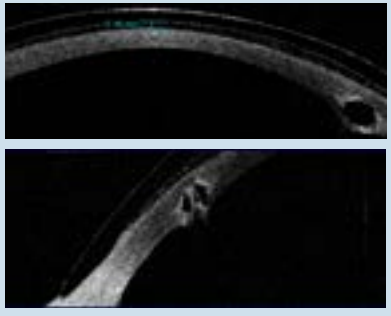
FIGURES 1A AND B

Patient 1: Oblate Scleral Lens Evaluation OD, OS Demonstrating Adequate Central and Inferior Clearance.



FIGURES 2A AND B

Visante OCT Images of Adequate Clearance Over the Intacs with the Oblate Lens Profile After 8 Hours of Wear.

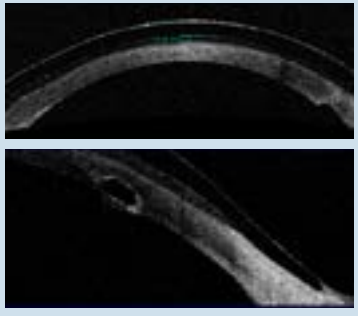


Patient 2, a 47-year-old African American male presented with a history of keratoconus OU, and was status-post PKP OD, and Intacs OS. He had previously worn corneal GPS but discontinued wear due to discomfort.

- Entering corrected acuities:
  - OD: 20/500
  - OS: 20/25
- Manifest refraction:
  - OD: -10.50-1.25x125, VA 20/80
  - OS: +1.50-3.25x085, VA 20/25
- Corneal Tomography:
  - OD: 3.50 diopters of corneal astigmatism, pachymetry 504 microns
  - OS: 0.66 diopters of corneal astigmatism, pachymetry 481 microns
- An oblate scleral lens design was selected to prevent any corneal touch around the Intacs OS and improved his vision to 20/25+ OD and 20/20 OS. The patient also noted marked improvement in comfort as compared to his previous corneal GPs.

FIGURE 3A AND B

Visante OCT Images of the Oblate Scleral Lens Design After 6 Hours of Wear OD (s/p PKP) and OS (s/p Intacs). Vault Over Intacs was Decreased by 75 Microns to Improve the Overall Fit.

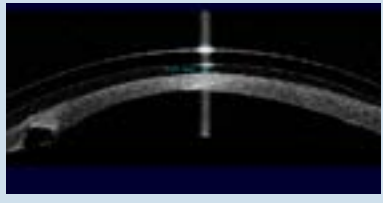


Patient 3, a 27-year-old Asian male presented with a history of keratoconus, no contact lens wear and Intacs OD.

- Entering uncorrected acuities:
  - OD: 20/80
  - OS: 20/20-
- Manifest refraction:
  - OD: plano-1.00x065, VA 20/50
  - OS: plano, VA 20/20
- Pentacam:
  - OD: 1.25 diopters of corneal astigmatism, pachymetry 391 microns
  - OS: 0.41 diopters of corneal astigmatism, pachymetry 460 microns
- An oblate scleral lens design was selected to prevent any corneal touch around the area of the Intacs OD improving his vision to 20/15 OD. Both eyes also had corneal crosslinking performed. A scleral lens design enhanced comfort as he was only wearing one lens on one eye.

FIGURE 4

Visante OCT Image of the Oblate Scleral Lens Design Demonstrating Adequate Clearance Over Intacs. Vault Over Intacs was Decreased by 75 Microns to Improve the Overall Fit.



CONCLUSIONS

When fitting patients status-post Intacs with contact lenses, it is important to minimize stress to the cornea to prevent extrusion. High Dk materials are necessary to promote excellent oxygen transmission to reduce risk of corneal hypoxia and neovascularization. Oblate scleral lenses may be a successful option for these patients to restore vision and maintain optimal corneal health.

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SynergEyes® UltraHealth® Post–Trauma: A Case Report

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BACKGROUND

Most patients fully recover from corneal abrasions without permanent damage. However, in some instances, especially when deeper layers of the cornea are involved such as in ocular trauma, scarring may occur leading to irregular astigmatism. Long-term complications may also arise including corneal neovascularization and damage to the delicate limbal stem cells. Improper contact lens fits may exacerbate these complications. This case report describes a patient who developed corneal scarring, neovascularization and irregular astigmatism following ocular trauma from a motor vehicle accident. She subsequently developed corneal warpage and hypoxia from poor fitting contact lenses. She was successfully re-fit from a low Dk soft toric lens to a SynergEyes® UltraHealth® contact lens, ultimately improving vision and reducing signs of corneal hypoxia.

CASE REPORT

A 52-year-old Hispanic Female presented as a referral for a specialty contact lens fitting following trauma from a broken windshield that resulted in corneal scarring from multiple corneal abrasions OS. She presented wearing unknown soft toric contact lenses that she replaced every 6 months and stated she had constant ghosting and distortion OS.

Entering corrected acuities through these lenses were 20/20- OD and 20/60 OS. Keratometric readings were 43.33/46.78 OD and 43.52/47.15 OS. Topography revealed irregular astigmatism OS>OD and corneal warpage OU.

Slit lamp examination showed mild corneal neovascularization along the limbus OU and a vertical anterior stromal corneal scar in the visual axis OS.

FIGURES 1A AND B
Topographies of the right and left corneas demonstrating approximately 3.50 diopters of irregular astigmatism and corneal warpage.

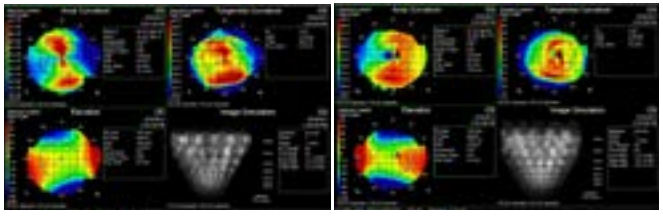

FIGURE 2:
Corneal neovascularization along the inferior limbus

Secondary to the patient's history, chief complaint, and examination findings, she was fit with the SynergEyes® UltraHealth® lenses OU.

The first pair of diagnostic lenses were fit and ordered following the SynergEyes® UltraHealth® fitting guide. Through these lenses, the patient's vision improved to 20/20, her image distortion significantly decreased, and she noted marked improvement in ocular comfort.

The right lens provided central clearance, had adequate movement, but ILZ bearing was observed. Due to bearing at the ILZ, a steep skirt was ordered to allow for improved clearance. An enhanced profile was ordered for the right eye to correct for the residual astigmatism in the over-refraction.

The left lens provided central clearance, had adequate movement and ILZ alignment was observed.

TABLE 1: Parameters of First Pair of SynergEyes® UltraHealth® Lenses

	Vault	Power	Diameter	Skirt	VA	Additional
OD	250	-13.00	14.50	Steep	20/20	Enhanced Profile
OS	150	-3.25	14.50	Flat	20/20	

FIGURES 3A AND B
First Pair of SynergEyes® UltraHealth® Lenses OD, OS

The patient returned one month later, reporting great comfort and vision through the UltraHealth® lenses.

The right lens provided central clearance, ILZ alignment, and adequate movement.

The left lens had a large insertion bubble at the base of the GP, and fluting of the skirt. The final lenses were ordered with Hydra-Peg to enhance patient comfort and a medium skirt OS to eliminate the bubble and fluting of the skirt.

FIGURES 4A AND B
Inferior insertion bubble and edge fluting noted with OS lens. The large central, linear scar of the left cornea is also observed.

FIGURES 5
Bubble leaves artistic impression of "third eye"!

TABLE 2: Parameters of Final SynergEyes® UltraHealth® Lenses

	Vault	Power	Diameter	Skirt	VA	Additional
OD	250	-13.00	14.50	Steep	20/20	Enhanced Profile, OR plano
OS	150	-3.25	14.50	Medium	20/20	OR plano

The patient has been able to wear the lenses comfortably for 14 hours per day noticing a marked improvement in vision and a decrease in image distortion. After 6 months of wearing lenses with improved oxygen transmission, regression of the inferior limbal neovascularization has been observed.

CONCLUSIONS

Contact lens patients with corneal scarring must be monitored closely for signs of hypoxia. The management of contact-lens related neovascularization and corneal warpage starts with discontinuation of lens wear and fitting the patient in a lens material with significantly higher Dk. The SynergEyes® UltraHealth® hybrid contact lens not only allows high oxygen transmission to promote tear circulation and reduce signs of hypoxia, the GP material also provides enhanced vision for those patients with irregular corneas. To enhance this patient's fit, an enhanced profile design was ordered to help correct for residual astigmatism. It is critical to review proper care and insertion and removal with patients, especially in the case of this patient, as bubbles were noted at the junction of the lens on follow-up examination. When application technique has been ruled out as the cause of the bubbles, a steeper skirt should be ordered. This case demonstrates that patients are often not aware of the serious complications that could arise from sub-optimal lens fitting and that their visual potential can be improved despite traumatic circumstances.

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From the Ground Up: Building a Soft Prosthetic Lens

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INTRODUCTION

Ocular prosthetics comprise a wide variety of lens types and designs. One main area of differentiation is whether the prosthetic is a hard material, such as a scleral shell, or a soft contact lens. Even within the realm of soft contact lenses, there are significant differences, and multiple lens designs by which to help alleviate patient symptoms. These lenses can be helpful functionally, to allow for visual comfort, cosmetically, or as a combination of the two. For cosmesis, these lenses are able to be tinted or painted in order to mask a scarred or abnormal eye appearance relative to the fellow eye. For patient comfort, this can include color differentiation and glare control. There are many forms of ocular conditions, making glare control and post-concussion a common use for prosthetics. Regardless of the symptom, soft prosthetic lenses have a plethora of uses and can help many patients live more comfortably and confidently with their day to day activities.

CASE REPORT

AF is an eighteen year-old hispanic male who presented to the Illinois Eye Institute with complaints of significant photophobia and glare, as well as poor cosmesis of his right eye.

Ocular History
The patient had a penetrating globe injury to the right eye at age five from a radio antenna. Subsequently, the patient has had multiple surgeries in Puerto Rico to repair the globe, as well as a cataract extraction with insertion of a posterior chamber intraocular lens (PCIOL). In addition, he has since been diagnosed with a cone dystrophy and optic atrophy of the left eye, accounting for an overall decrease in vision.

Medical History / Medications: Unremarkable

VA sc:
- OD: 20/400, PHNI
- OS: 20/80-1, 20/80+1 with PH

Slit Lamp Findings
- Traumatically dilated, non-reactive pupil OD. Pupil is peaked inferiorly, with an iridectomy at the 1:00 position
- 2.5mmx2.5mm sub-epithelial scarring OD at the 5:30 position (site of globe penetration)
- PCIOL: Clear, centered, with iris capture inferiorly OD
- All anterior segment structures unremarkable OS

Lens Design
With consultation, the lens parameters that would be most appropriate for the patient were created. The lens has a 15.0 diameter and 8.90 base curve due to his flatter corneal curvature. The lens has a 4.2 mm clear pupil and is built with the U2 (brown under print - see Figure 3) + 57V (orange) + 55V (pecan) colors, in that order to best match the fellow eye. Because of the patient's other ocular history, no improvement in vision was found on over-refraction, so the lens is Plano in power.

DISCUSSION

The patient's main complaints are photophobia and significant glare secondary to his non-reactive right pupil. Because of this complaint, the patient was fit into an Orion soft prosthetic - Biocolors soft contact lens. This particular lens is built from multiple lenses in tandem from the under print up to iris colors, and even details such as a limbal ring. At the diagnostic fitting visit, multiple lens options can be trialed on a patient by stacking the lenses on the eye in different sequences. The Orion prosthetic fitting set is designed so if you layer the lenses, specifically the iris colors and detail, in a particular order, it will look different than if the order was changed. There is significant creativity involved in designing the lens for each individual patient.

FIGURE 1:
Appearance of the right eye

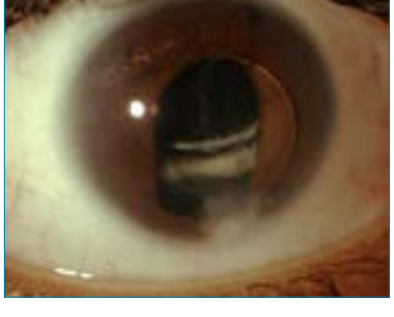

FIGURE 2: Pentacam topography and pachymetry of the right eye

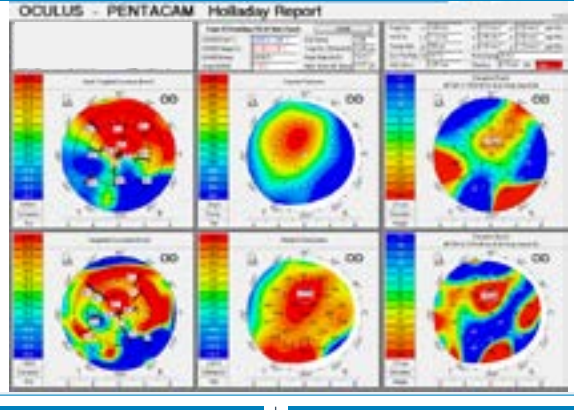

FIGURE 3:
Appearance of the soft prosthetic lens on the right eye (Under print only)

FIGURE 4:
Consultation suggestion for lens appearance (Under print plus two iris colors)

For our particular patient, during the diagnostic fitting visit, the patient experienced less glare complaints once an underprint was placed on the eye. By taking a photo of the fellow (left) eye and sending this to the consultants at Orion, they were also able to assist in determining which lens sequence would be most appropriate to best-match the cosmesis between the eyes.

CONCLUSION

As there are many different tissues that comprise the globe and orbit, ocular trauma, and specifically penetrating globe injury, can cause multiple complications and longlasting damage. When this occurs, or in any patient with an irregular pupil or complaints of glare and photophobia, ocular prosthetics can be a benefit to ameliorate their complaints. The Orion soft prosthetic lens makes many attempts to best match the cosmesis of the other eye, as well as offering many options to decrease the amount of light passing through the lens for patient comfort. Soft prosthetic lenses have the ability to significantly change a patient's daily life.

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ACKNOWLEDGEMENTS

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Scleral curvature in a young adult population

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BACKGROUND

Previous studies measuring normative values were gathered and angles of corneal scleral toricity of normal and keratoconic eyes were performed using OCTs. Results of these studies:

- Measurements made from 15mm chord length or less were essentially symmetrical.[1]
- Measurements made from 15mm chord length or further showed more asymmetry. Suggesting that scleral lenses larger than 15mm may require toric or quadrant-specific scleral designs.[2]
- The Pacific Scleral Lens Study demonstrated that variability of scleral angle at the 15mm chord vs. 20mm chord and they found the further away from the limbus the more asymmetry and variation present.[3]
- In both measurements from the 10-15mm chord and 15-20mm chord, the inferior quadrant is normally a "benchmark" with the temporal angle being steeper and the nasal being flatter. This seems to correlate with the extra-ocular muscle insertions.[3]
- Many studies have evaluated ocular parameters of Asians vs. Caucasians. Asians statistically have smaller palpebral fissures, smaller HVIDs, and their eyes are more prolate (steeper vertically/ flatter horizontally) than Caucasians.[4]
- The range of a mean radius of curvature of the cornea in a normal population tends to vary between 7.8 ± 0.25 mm (42.93D - 44.70D).[5]

PURPOSE

The purpose of the study was to evaluate scleral shape in a healthy young adult population. We hypothesized that there would be notable differences between genders, races, quadrants, and between eyes. The study was approved by our internal IRB.

METHODS

Thirty-seven third year students enrolled in the specialty contact lens laboratory volunteered to have their ocular surface evaluated by the sMap3D topographer. Of those only 33 had highly reliable scans that could be evaluated. One patient was excluded due to previous ocular surgery. Patient's ethnic distribution was Caucasian (n=12), Indian (n=10), and Asian (n=10). There were 21 females and 11 males included. Average age was 25.6 + 2.8 years.

Fluress™ was instilled in both eyes of each patient. Central, superior and inferior measurements were captured. The data was stitched by the system and analyzed at the 16mm chord. We then evaluated the reports for scleral curvature and scleral toricity. We compared for differences between gender, race, and right eye vs. left eye. (Figures 1 and 2)

RESULTS

Right eyes had less toricity compared to left eyes by 0.09 D. (Figure 3) Right eyes had average scleral toricity at a 16mm chord of 1.57D ±0.98D. For left eyes, the average toricity was 1.66 D± 1.28. There was a statistically significant difference between temporal curvature of OD vs. OS with a p=0.02, where OS had steeper curvature (Figure 4) When comparing races (Asian, Caucasian and Indian), there was a statistical trend showing a difference in the superior quadrant between Indians and Asians of the right eye with a p=0.05, where Indians were statistically steeper. (Figure 5) There were no other clinically significant points between races in any other quadrant. Comparing males vs. females, the superior quadrant of the right eye showed a statistical significance of p=0.02, with females being steeper than males. (Figure 6) All other quadrants between the genders were clinically insignificant. When comparing the total averages between quadrants for both right and left eyes the superior quadrant was the flattest followed by the nasal quadrant, in right eyes the inferior quadrant was the steepest, and in the left eyes the temporal quadrant was the steepest. The average base curve for our population was found to be 44.27D for the right eye and 44.07D for the left eye.

FIGURE 1 AND 2
The images were captured using Fluress™ in three fields of gaze then stitched together to create a three dimensional scleral shape.

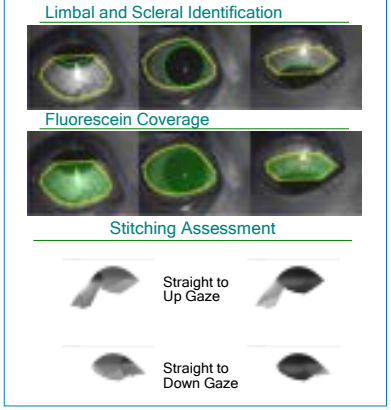


FIGURE 3
As in previous studies, we note toric asymmetry between the eyes.

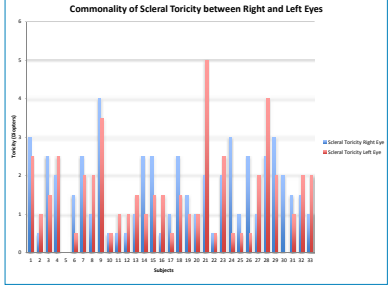
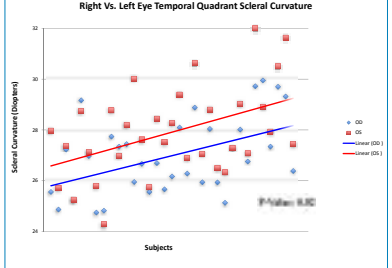


FIGURE 4
The temporal corneal curvature of the left eye was significantly steeper from that of the right eye.



DISCUSSION

Our findings support previous investigative studies. Specifically, the temporal scleral is steeper compared to the nasal sclera. It was previously noted that the inferior sclera was the bench-mark with having the temporal quadrant being steeper and the nasal quadrant being flatter in comparison; in our study this corresponds to the data of the left eye but for our right eye the inferior quadrant was actually the steepest followed by the temporal quadrants. Our analysis was only done at a 16mm chord so we cannot speak about chord diameter variability. However, our results do support the notion of asymmetry beyond 15mm.

FIGURE 5
We noted a statistical trend of steeper superior curvature in Indian vs. Asian populations (p=0.05). However, no difference was noted between Caucasians and Asians or Indians.

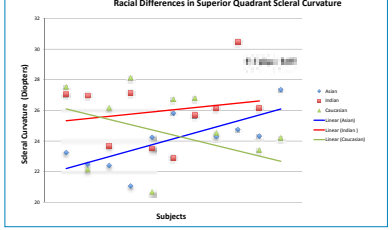
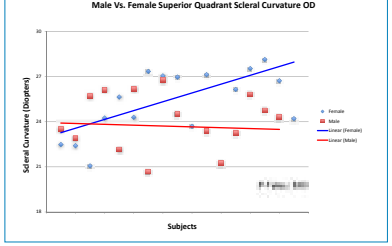


FIGURE 6
We found that women had steeper superior scleral curvature than men



We did find a statistically significant difference for the superior quadrant when comparing Indians and Asians; Asians are flatter in the superior quadrant. In previous studies most compared Asians to Caucasians; with significant findings of a more prolate shape in Asian eyes, our study saw no statistical significance when comparing Asians to Caucasians.

The range of a mean radius of curvature of the cornea in a normal population tends to vary between 7.8 ± 0.25 mm (42.93D - 44.70D); our subjects had an average of 44.27D in the right eye and 44.07D in the left, and thus the population used fits in the range of normal classified in previous research.

CONCLUSION

In conclusion, only temporal curvature between the right and left eyes, the superior quadrant of Asians compared to Indians, and the superior quadrant of men compared to women showed significant differences. Our results support previous studies suggesting differences in curvature/ elevation between the two eyes and the quadrants. Additionally, there are minor racial variances in scleral shape. These results support the recent development of lens designs that are eye specific and designed with these racial differences in mind.

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ORTHOKERATOLOGY AND MYOPIA CONTROL IN TWINS

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INTRODUCTION

Myopia is one of the most prevalent refractive errors, and increased amounts of myopia is a public health concern for young patients in particular as high myopia is associated with a number of ocular pathologies. Various methods have been deployed to attempt to slow the progression of myopia in children such as soft multifocal contact lenses, pharmaceutical patching and orthokeratology, with the latter continually gaining popularity[1]. Both genetic and environmental factors are known to influence the development of myopia, although the true extent of influence over myopic progression by each factor remains unclear[2]. Twin studies offer a unique opportunity to determine the role of genetics and environment on progression of myopia.

PURPOSE

This case report explores the differences in reduction of myopic progression when genetic factors and the method of myopia control are held constant by comparing the results of twin girls undertaking myopia control via orthokeratology.

CASE REPORT

Patients A and B are 9 year old twin females who presented to the Illinois Eye Institute with complaints of decreased vision. Their parents reported that the twins were experiencing significantly differing rates in refractive error change, and were interested in slowing the rate of myopic progression in both girls. Different myopia control options were presented to the family, including orthokeratology, soft multifocal lenses, and atropine patching, and they elected to try orthokeratology.

RESULTS

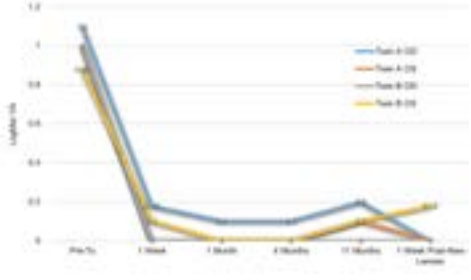
We analyzed changes in unaided visual acuities and corneal topographies over the course of a year of treatment to determine the efficacy of orthokeratology.

Table 1. Summary of pertinent patient data.

Twin A	OD	OS
Refractive Error	-4.25-0.75x103	-5.50 DS
Keratometry	45.25/45.25@116	45.50/46.00@048
Eccentricity / Shape Factor	0.57 / 0.32	0.53 / 0.28
1st Lenses Dispensed (Power/BC/Diameter)	Euclid Emerald +0.75/8.39/10.60	Euclid Emerald +0.75/8.60/10.20
Over-refraction	Plano DS	+0.25 DS
1 Week Post-fit Topo.	Well-formed, well-centered treatment (Tx) zones	
11 Month Post-fit Topo.	Mild central island	Decentered Tx zone
2nd Lenses Dispensed (Power/BC/Diameter)	Euclid Emerald +1.25/8.49/10.60	Euclid Topaz +0.75/8.60/10.20
Over-refraction	-0.25 DS	Plano DS

Twin B	OD	OS
Refractive Error	-3.00-0.50x090	-3.25-0.50x090
Keratometry	44.75/44.75@090	45.50/46.00@090
Eccentricity / Shape Factor	0.61 / 0.37	0.53 / 0.28
1st Lenses Dispensed (Power/BC/Diameter)	Euclid Emerald +0.75/8.23/10.60	Euclid Emerald +0.75/8.13/10.60
Over-refraction	Plano DS	Plano DS
1 Week Post-fit Topo.	Well-formed, well-centered treatment zones	
11 Month Post-fit Topo.	Stable, well-defined and centered treatment zones	
2nd Lenses Dispensed (Power/BC/Diameter)	Euclid Emerald +1.00/8.18/10.60	Euclid Emerald +0.75/8.23/10.60
Over-refraction	Plano DS	Plano DS

Figure 1. Change in unaided visual acuities for Twin A (OD, OS) and Twin B (OD, OS) over the course of one year of orthokeratology treatment.



DISCUSSION

Due to the nature of this retrospective study, we were unable to collect all the data necessary to determine the amount of myopic progression that had occurred since treatment. However, for future studies, progression can be quantified by axial length measurements, over-refractions over old lenses, or temporarily discontinuing treatment to evaluate the refractive error after allowing a wash-out period for the corneal reshaping effects of orthokeratology.

CONCLUSION

Orthokeratology is an effective myopia control method. Current reports have shown that the type of myopia control selected between twins can alter the course of their myopic progression dramatically[3].

This case report compares the factors that can contribute to the success of slowing myopic progression between twins using the same method of myopia control – in this case, with orthokeratology. Although the twins did not start treatment with the same refractive error, it appeared that orthokeratology led to a similar rate of reduction in myopic progression. It is unclear as to what caused the initial differences between the rate of myopic progression between the twins, however, since the twins appear to have experienced similar rates of slowing of progression of myopia, this report suggests that the factors that initially contributed to the difference in myopic progression between the girls do not have the same effect on the slowing of progression through orthokeratology when genetics, age, gender, and home environment are held as constants.

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HEART OF AMERICA

6 ICO PRESENTATIONS

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Bullous Keratopathy: Current Management and What's On The Horizon

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INTRODUCTION

Bullous keratopathy is a painful and vision-threatening condition caused by corneal endothelial dysfunction. The corneal endothelial pump mechanism, among others, is the main regulator of corneal clarity and thickness. Once the mechanism breaks down, corneal edema and characteristic bullae formation ensues. The most common primary cause of bullous keratopathy is Fuch's endothelial dystrophy. Secondary causes include intraocular surgery, and with the increase in cataract extractions, more corneal decompensation and cases of pseudophakic bullous keratopathy is seen. Because there are a variety of ways in which to treat bullous keratopathy, practitioners can personalize each treatment plan to their specific patient, while taking visual potential, degree of pain, cosmesis, age, and cost into consideration.

CASE REPORT

PR is a 92 year-old female who presented with a blind, painful right eye. She had been previously diagnosed 6 months prior with pseudophakic bullous keratopathy, and was being treated with 5% sodium chloride drops four times daily and ointment at night, with minimal improvement.

OCULAR HISTORY

- Cataract extraction with phacoemulsification and PCIOL implantation in 1995 OD and 1996 OS
- Primary open-angle glaucoma: OD - severe stage, OS - moderate stage

MEDICAL HISTORY/ MEDICATIONS

Medical

- History of breast cancer in 2012, in remission
- Hypertension: Treatment with Losartan and Hydrochlorothiazide, as per primary care provider

Ocular

- Dorzolamide BID OD and OS
- Travatan qHS OD and OS
- 5% Sodium chloride drop QID OD only, ointment qHS OD only

EXAM FINDINGS

Vision

- OD: Light perception
- OS: 20/60-1, 20/60+1 with pinhole

Slit Lamp Findings

- Smaller lid aperture OD versus OS
- Multiple sub-epithelial cystic spaces in the inferior half of the cornea, with haze 360
- Prominent Sodium-Fluorescein staining of cystic spaces
- Superiorly displaced / peaked pupil OD, non-reactive to light. Reverse APD noted
- PCIOL OD and OS, clear / centered to extent seen

TREATMENT

A bandage contact lens was placed on the patient's right eye, allowing for immediate comfort. The patient was prescribed polymyxin B / trimethoprim drops four times per day as a prophylactic antibiotic. She has successfully discontinued the 5% sodium chloride (drops and ointment) and Dorzolamide in the right eye only.

FIGURE 1
External appearance of the right eye, at first examination

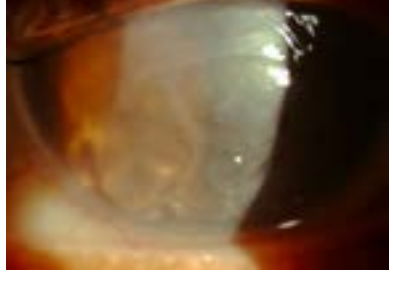


FIGURE 2
Anterior segment OCT of the right eye, at first examination

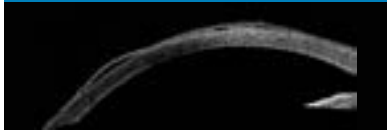


FIGURE 3
Global pachymetry of the right eye, at first examination

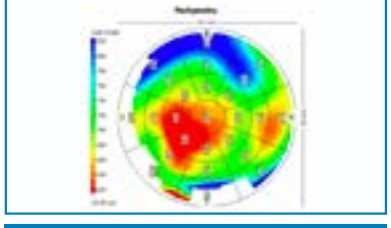


FIGURE 4
External appearance of the right eye, 1 month follow-up

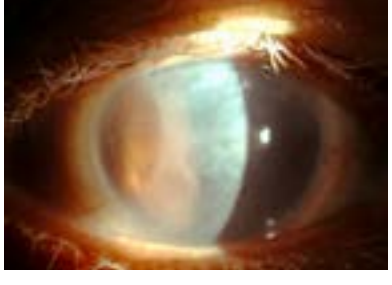
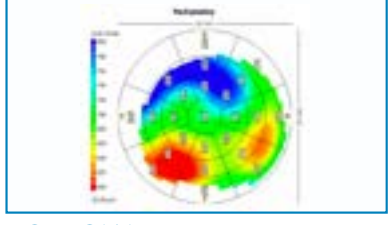


FIGURE 5
Anterior segment OCT of the right eye, 1 month follow-up

FIGURE 6
Global pachymetry of the right eye, 1 month follow-up



FOLLOW–UP

Upon follow-up the patient was doing well and reporting no pain with extended wear of the bandage contact lens and polymyxin B / trimethoprim drops. Although vision was unaffected, slit lamp biomicroscopy, external slit lamp photos, anterior segment OCT, and global pachymetry all indicated improvement. See figures.

DISCUSSION

Bullous keratopathy patients are more effectively managed with specialized imaging equipment. Specifically, slit lamp photos, anterior segment OCT, global pachymetry, and, if edema is not too significant, specular microscopy are all of use. Not only can these instruments help assess for improvement from visit to visit, but they can also assist in determining which surgical or medical treatments are optimal for each individual patient. These options may also differ depending on whether the eye has visual potential or not.

Treatment Options	No Visual Potential	Visual Potential
First line treatments	- Hyperosmotic Therapy - Bandage Contact Lens - Cycloplegic Agents	- Hyperosmotic Therapy - Bandage Contact Lens - Cycloplegic Agents
Advanced interventions	- Autologous Serum Tears - Amniotic Membrane	- Autologous Serum Tears - Amniotic Membrane - Rho-Kinase Inhibitors *
Surgical management	- Gunderson flap with scleral shell prosthesis	- Penetrating keratoplasty - Descemet's stripping endothelial keratoplasty (DSEK) * - Descemet's membrane endothelial keratoplasty (DMEK) *

* Newer treatment options

Newer treatment options such as corneal transplants that are not full thickness, namely DSEK and DMEK, are rising in popularity secondary to the fact that isolated corneal layers can be targeted. These corneal transplant methods allow for improved visual potential, faster healing times, and less transplant rejection. In addition, Rho-kinase inhibitors are actively being studied in Japan, with preliminary studies showing significant results of corneal clearing with potential for endothelial regeneration.

CONCLUSION

Although the endothelium is thought not to regenerate, many new treatment options are looking for ways to circumvent this fact to eliminate the signs and symptoms of bullous keratopathy. With the increase of patients with bullous keratopathy and new treatments on the horizon, understanding which options are available for each patient, and creating personalized treatment plans is essential to every doctor.

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Available upon request

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Sarcoidosis with Recurrent Uveitis Masked by Preexisting Autoimmune Treatment

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ABSTRACT

A patient with recurrent anterior uveitis is later diagnosed with sarcoidosis based on cutaneous lesions.

CASE HISTORY

Chief complaint

redness and photophobia OU with stable vision

Associated symptoms

Cough x 1 week, night sweats on and off for a few months, periodic spontaneous sweating, and 50lb weight loss over past year.

Ocular History

Dry eye and Meibomian gland disorder secondary to Sjogren's syndrome

Plaquinil use x 5 years without retinopathy OU

Relapsing uveitis in both eyes for the past 4 years with transitory responses to systemic and topical steroid therapy with recrudescence following withdrawal

Medical History

Unspecified Connective Tissue Disorder (UCTD) with rituxin infusions in 5/16, 12/16, and 6/17, Sjogren syndrome diagnosed by submandibular gland biopsy, IGG4 associated autoimmune pancreatitis, HTN, HL, Asthma, GERD, Diabetes

Ocular Medications

Ketotifen, Restasis, Refresh artificial tears, Celluvisc, and lubricating ointment

Systemic medications

Plaquenil, methotrexate and prednisone 7mg tapered from 20mg over 8 months.

Previous Work Up for Anterior uveitis

Lab work: 11/13-12/13

CBC demonstrated mild granulocytosis and lymphocytopenia. ANA, lysozyme, ESR, MHATP, RPR, ACE, HLA B27, RF, Lyme, Quantiferon gold all within normal limits.

Chest XRay: 10/10/17

Normal findings repeated

PERTINENT FINDINGS AT EXAMINATION

BCVA	20/20 OD, OS
Pupils, EOMS, CVF	NL OU
Anterior Segment	1-2+ cells and flare OU
Posterior Segment	unremarkable OU

Of note: pt demonstrated subcutaneous nodules on both arms at exam

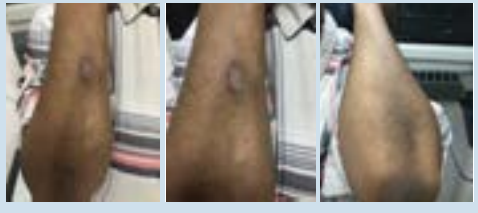
DIFFERENTIAL DIAGNOSIS FOR CHRONIC BILATERAL UVEITIS

- Sarcoidosis
- Herpes simplex/Herpes Zoster
- Syphilis
- Tuberculosis
- HLA B27 syndromes including ankylosing spondylitis, reactive arthritis, inflammatory bowel disease, and psoriatic arthritis
- Rheumatoid arthritis
- Lyme disease
- Leprosy
- Brucellosis

ASSESSMENT AND PLAN

Recurrent anterior uveitis OU likely secondary to UCTD vs sarcoidosis vs other. Order repeat lab work, ACE and Lysozyme, and Chest XRay. Refer to rheumatology and dermatology.

- Biopsy of the subcutaneous nodules demonstrated granulomatous changes consistent with sarcoidosis. Prednisone 20mg daily was reinitiated with continued follow up by Rheumotology.



DISCUSSION

- Sarcoidosis is a systemic granulomatous disease of unknown etiology most commonly affecting lungs (>90%) and mediastinal lymph nodes (90%) and less commonly other organs including eyes (15-20%) and skin (15%).[1]
- Diagnosis is one of exclusion based on histological evidence of noncaseating, epithelioid granulomas in association with appropriate clinical features and absence of infection.[2]
- Clinical morphology of cutaneous sarcoidosis have been well described, including papules, plaques, nodules, scars, and lupus pernio.[3]
- Standard lab testing was not suggestive of sarcoid in this patient due to prior steroid treatment, and although 90 to 98% of sarcoid patients demonstrate lymphadenopathy or lung involvement respectively, this patient had a negative chest X-ray. However, high resolution CT is the optimal means of detecting lung involvement and mediastinal lymphadenopathy.[1]
- Current studies show soluble interleukin-2 receptor (sIL-2R) is a useful diagnostic marker for sarcoidosis and is slightly more valuable than ACE[4], however both ACE and sIL-2R are nonspecific and therefore unsuitable for confirming the diagnosis[1].

RITUXIN AND UVEITIS

A few case reports in literature demonstrate successful treatment of ocular sarcoidosis with Rituximab with ability to taper or even discontinue systemic and topical steroids,[5,6] however one published case suggests Rituximab can induce sarcoidosis.[7]

In this patient, ocular signs of sarcoidosis started years before Rituximab infusions were utilized, so it is unlikely the infusions had a causative effect.

CONCLUSIONS

In patients with chronic uveitis of unknown etiology, careful and repeated monitoring through lab work, imaging, and review of systems can reveal an underlying cause. In this patient, treatment for preexisting autoimmune disease masked earlier sarcoid diagnosis through traditional lab work.

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CONTACT INFORMATION

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When Pseudopapilledema Is More Than Just Pseudo

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Background Key clinical features are confounded in patients with confirmed optic disc drusen when papilledema is suspected. An accurate diagnosis is vital to avoid unnecessary and invasive procedures.

CASE HISTORY

76 yo AAM

Chief Complaint: Glare & hazy vision

HPI: Headache, tinnitus, loss of appetite, nausea/vomiting (recent flu)

Ocular History:
- Optic disc drusen OU
- Inferior hemiretinal vein occlusion OS s/p PRP

Medical History: CKD, DM, HTN, HL, CAD, Follicular lymphoma s/p chemotherapy

Medications: Finasteride, Rosuvastatin, Valtrex, Fosinopril, Nifedipine, ASA, Acetaminophen

PERTINENT FINDINGS

Test	OD	OS (stable)
VA	20/20	20/50
Pupils	RRL	RRL, 1+ APD
Color	WNL	WNL
Ant Seg	Unremarkable	Unremarkable
IOP	16	16

FIGURE 1 AND 2: POSTERIOR SEGMENT

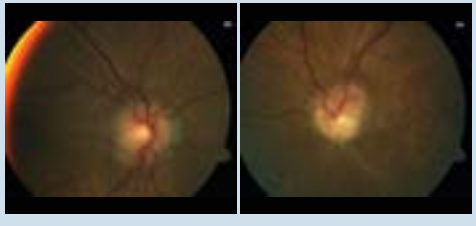


FIGURE 3: OCT RNFL

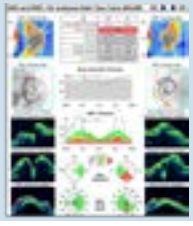


FIGURE 4 AND 5: B-SCAN

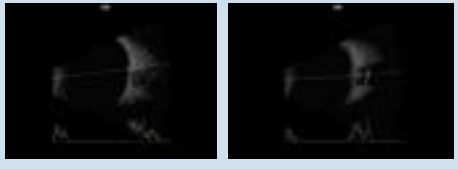
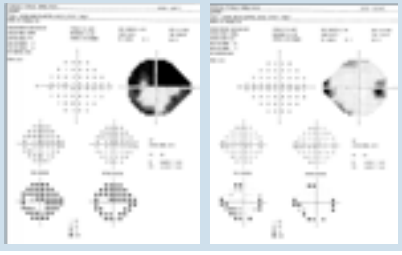


FIGURE 6 AND 7: HVF (STABLE OU)



DIFFERENTIAL DIAGNOSIS

Disc Edema OU
- Papilledema, idiopathic intracranial hypertension, infectious optic neuropathy, inflammatory optic neuropathy, autoimmune optic neuropathy, optic neuritis, compressive optic neuropathy

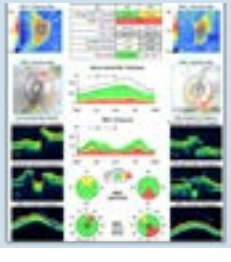
PATIENT'S MANAGEMENT

Lab Testing & Imaging
Neurology consulted
1. GCA: ESR/CRP NL
2. Syphilis: CIA (+), TPPA (+), RPR (-)
3. TB: Quant Gold (-)
4. Sarcoid: ACE/lysozyme NL
5. Autoimmune: ANA NL
6. Urgent MRI: unremarkable with the exception of a **partially empty sella**
7. MRV: unable to r/o venous thrombus
8. CT Venogram: **no venous thrombus**
9. Lumbar puncture
   a. Opening Pressure: **400 mmH$_2$O**
   b. Analysis: NL

PATIENT'S TREATMENT

1. Acetazolamide 250mg BID po, unable to maintain dosing 2/2 CKD
2. Ventricular catheter shunt

FIGURE 8: OCT RNFL (1 YEAR AFTER)



DISCUSSION

Idiopathic Intracranial Hypertension (IIH) Diagnosis[4,5]
1. Signs/symptoms (if present) representing increased ICP or papilledema
2. Elevated ICP by LP measured in the lateral decubitus position
3. Normal CSF composition
4. No evidence of ventriclomegaly, mass, structural, or vascular lesion on MRI or contrast enhanced CT scan for typical patients; MRI and MRV for all others
5. No other cause (including medication) of intracranial hypertension identified

Increased Prevalence of Optic Disc Drusen after IIH[1]
Observational retrospective review of 372 participants with optic disc drusen or resolved papilledema from IIH
- Prevalence of optic disc drusen with resolved papilledema was approximately 10x higher and significantly increased suggesting a non-coincidental relationship

Use of A-scan Ultrasound and SD-OCT to Differentiate Papilledema from Pseudopapilledema[3,2]
- Pseudopapilledema eyes showed:
  - Focal, hyperreflective, subretinal mass with discrete margins on OCT
  - ONL smoothly covering the drusen leading to hyporeflective boot shaped area adjacent to drusen
  - RNFL thicker temporally, but not nasal
- Papilledema eyes showed:
  - Larger mean optic nerve sheath diameter (ONSD) (5.4 vs 4.0)
  - Greater change of ONSD reduction at lateral gaze (22.4% vs 2.8%)
  - ONL remains unchanged
  - Thicker RNFL in all sections
- Nasal RNFL thickness is the most important factor for differentiation
- A-scan may further assist differentiation of mild papilledema

CONCLUSIONS

1. IIH is a diagnosis of exclusion
2. A diagnosis of pseudopapilledema does not preclude a patient from presenting with papilledema.
3. A-scan and SD-OCT may be useful in differentiating papilledema from pseudopapilledema.

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Differentiating Stage IV Hypertensive Retinopathy vs. CRVO in a Patient with Severe Hypertension

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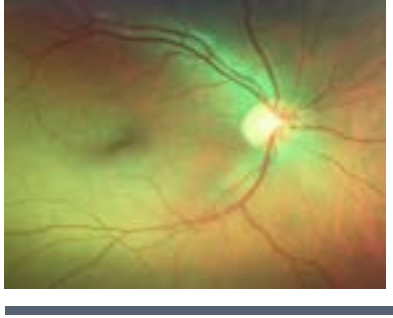
BACKGROUND

A CRVO may present similarly to hypertensive crisis in patients with uncontrolled hypertension. The goal of this poster is to differentiate between the overlapping, yet distinct diagnoses to best manage the patient's condition.

CASE PRESENTATION

A 47 year old white male presented to the urgent care eye clinic complaining of a "smudge" in his vision, OS only. He noted sudden, painless onset three days prior with worsening of symptoms. No previous episodes had been noted, and no previous ocular history was on file, as the patient had not had an eye exam in over ten years. His medications included 40mg tablet Atorvastatin Calcium, 81mg tablet aspirin, and 100mg tablet metoprolol succinate. No known allergies were noted. The patient had labile hypertension with recent tachycardic episodes, hypercholesterolemia, migraines, and a query of familial hypercoagulable conditions. Previous blood work performed by his primary care physician indicated no Factor V Leiden abnormalities. However, suspicion of familial linkage remained, as the patient's brother had died at age 52 of a stroke, his paternal grandfather died of an MI, and the patient's paternal uncle died of an MI in his late 50's.

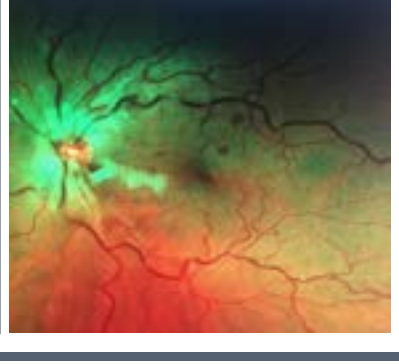
FIGURE 1
OD posterior pole with minimal hypertensive changes.



CLINICAL TESTING

Blood pressure was 140/110mmHg: right arm seated. Uncorrected visual acuities were 20/20 $^{-0}$ OD, 20/25 $^{+2}$ OS. EOMs and CVF were full without defect, and pupils were equal, round and reactive without an APD. A reliably performed 30-2 Humphrey visual field indicated early blind spot enlargement OS. Red cap desaturation testing indicated 10% reduction OS versus OD. A longstanding and mild deutan color deficiency was noted on HRR color plates and equal OD/OS. The entirety of the anterior segment was unremarkable OD/OS. Gonioscopy indicated angles open to ciliary body 360 degrees OD/OS with no signs of neovascularization of the angle or iris, and no angle recession. Dilated fundus examination using 1% tropicamide found mild vessel crossing changes and mild arterial attenuation of the right eye. No hemorrhages, cotton wool spots (CWS), or exudates were noted. The optic nerve head (ONH) was flat, well perfused, and had distinct margins (Figure 1). The left eye exhibited ONH edema with mixed flame and blot hemorrhages in all four quadrants with dilated and tortuous veins. Neural-retinal rim obscuration was noted with a drance heme temporally (Figure 2). No macular edema was noted OD/OS on Zeiss macular cube OCT.

FIGURE 2
OS posterior pole with ONH edema, tortuous veins and hemorrhaging.



PLAN

The diagnosis of CRVO OS was made, given the unilateral and asymmetric presentation. The patient's primary care physician (PCP) was notified of the patient's presentation and a recommendation for immediate blood pressure management was discussed. The patient was seen the same day by his PCP and medication adjustments were made to increase the metoprolol succinate dosage. He was also referred to a retinal ophthalmologist for fluorescein angiography to determine the presence or absence of ischemia with the CRVO. The fluorescein angiogram was completed the next day.

TREATMENT/ MANAGEMENT

The angiography indicated no areas of ischemia, so monitoring with follow-up in one month was appropriate (Figure 3). The patient would be followed monthly for the next three months to ensure no neovascularization was taking place. Continued hypertensive management under the care of his PCP was warranted, and his blood pressure normalized to 126/72mmHg (right arm seated) within one week. When the patient returned for his one-month retinal follow-up, complete resolution of the optic nerve edema was noted by the retinal ophthalmologist. Vision returned to 20/20 OD/OS. The appearance of the left eye mirrored the appearance of the right eye, and no trace of the hemorrhages, vessel tortuosity, or ONH edema remained. Upon gonioscopy, no neovascularization was seen. The patient returned for his two and three-month follow-ups without incident and the findings remained the same as the one-month follow-up. The patient will be seen monthly for the first six months, and then gradually tapered to one year visits.[1]

FIGURE 3
A fluorescein angiogram of OS indicating retinal perfusion.

DISCUSSION

Hypertension is the most common underlying factor in both CRVO and malignant hypertensive retinopathy. It is thought that chronic hypertensive insult can change the endothelial vasculature lining, leading to the formation of a thrombus. Thrombi may become caught at the crossings of the attenuated arteries and dilated veins, resulting in an occlusive event.[2] ONH edema, hemorrhaging, vessel changes, and blurred vision are commonalities of both conditions, and differentiation between the two may be difficult. Table 1 lists the most common findings of each condition, providing a side-by-side comparison of each diagnosis. Of note, a CRVO has distinct venous dilation with tortuosity, and all findings primarily occur unilaterally.[2] In contrast, malignant hypertensive retinopathy most commonly presents bilaterally and exhibits exudative leakage. Symmetry between OD/OS is expected with this condition. If the patient had more severe retinal vascular changes OD, hypertensive retinopathy would be the more likely diagnosis. Given the very asymmetric presentation, the diagnosis fit the CRVO category more cleanly. If by chance, malignant hypertensive retinopathy occurs unilaterally, the patient should be sent for carotid imaging, as the carotid may be obstructed on the side with the normal appearing retina.[1] This patient had recently undergone carotid imaging under the care of his PCP which had come back normal.

TABLE 1
The most common findings associated with hypertensive crisis[1]

Malignant Hypertensive Retinopathy	CRVO
Bilateral presentation	Unilateral presentation
Scattered retinal flame hemorrhages	Four quadrants of retinal flame hemorrhages
Veins generally not tortuous	Dilated, tortuous veins
Optic nerve head edema	Optic nerve head edema
Cotton wool spots	Cotton wool spots
Retinal edema	Macular edema
Hard exudates – star pattern possible	
Choroidal infarcts from previous episodes	

When the patient's blood pressure is taken in office, hypertensive crisis is frequently noted in patients with malignant hypertensive retinopathy. A systolic pressure greater than or equal to 180mmHg and a diastolic greater than or equal to 110mmHg qualifies as hypertensive crisis.[3] Although the patient in this case does qualify for hypertensive crisis given his systolic readings, his retinal findings more closely match that of a classic CRVO. This is likely because hypertension is the most common underlying cause of CRVO.[1] While hypertensive crisis is an emergency, his primary care physician felt she could manage the situation more quickly than sending him to the emergency room, which could take hours to be seen.

CONCLUSION

Optometrists have an important role in detecting systemically dangerous conditions that may be life or death for patients. Checking blood pressure in office is key to determining if the patient is in emergent need of hypertensive management. Patients may not be aware of the severity of their uncontrolled hypertension, and may first present to an optometrist with visual changes. It is the responsibility of the optometrist to coordinate proper care, whether it be sending the patient to the emergency department or their primary care physician for management.

Key Words: central retinal vein occlusion (CRVO), hypertensive crisis, hypertensive retinopathy, optic nerve head edema, flame hemorrhage, drance hemorrhage

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Update on Preferred Practice Patterns for Retinal Artery Occlusions

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BACKGROUND

Central retinal artery occlusion (CRAO) is a rare, but visually devastating condition. Prior to September 2016, only one-third of doctors sent patients with CRAO to the emergency department for immediate evaluation. Recent research has shown close association between CRAO and increased risk of ischemic stroke, especially within the first 1-4 weeks.

CASE PRESENTATION

78-year-old black male presented with sudden vision loss in the right eye. Medical history was positive for hypertension under control with medication and prostate cancer.

	OD	OS
VA	LP, PHNI	20/20-3
EOM	FROM	FROM
Pupils	3+ APD	Pupil round, reactive, no APD
CVF	Unable to see fingers	FTFC
Anterior Segment	WNL	WNL

PLAN

Patient was sent for immediate referral to nearest Emergency Department for stroke work up.

TREATMENT

Patient was admitted into the hospital and started on medications for cholesterol control and additional medications for hypertension control after ruling out immediate stroke.

FIGURE 1
OD posterior pole showing retinal whitening, cherry red spot, cilioretinal sparing and inferior temporal arteriolar plaque

FIGURE 2
OS posterior pole showing normal retina and optic nerve with mild vascular tortuosity

FIGURE 3
Horizontal OCT through the macula demonstrating retinal thickening

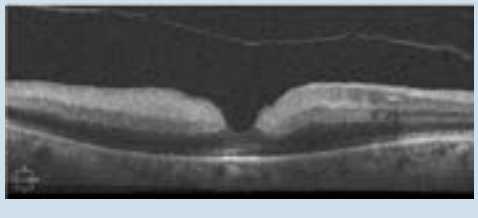
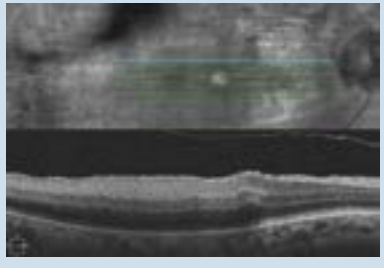


FIGURE 4
5-line raster through normal and abnormal retina, showing the end of the cilioretinal artery's supply to the retina



DISCUSSION

Patients presenting with CRAO should be educated on stroke risk factors present and promptly referred to a stroke center or Emergency Department if stroke center is unavailable. The risk for stroke in these patients is up to 20-25%. There is no proven treatment for visual recovery after a CRAO. Frequent follow up is needed to ensure vison preservation and prevention of neovascular glaucoma.

CONCLUSION

Our patient was not found to have an ischemic stroke while at the Emergency Department. However, cholesterol lowering medication, aspirin and an additional blood pressure medication were initiated. This patient, and others diagnosed with central retinal artery occlusions, will need to be closely monitored for ischemic stroke as well as neovascularization of the iris, retina and angle.

Eye care providers need to be aware of this recent update in management of retinal artery occlusions. Prompt referral to a stroke center or emergency department can prevent a stroke or limit the severity if treated quickly.

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Anterior Uveitis Associated with Cidofovir Treatment of BK Virus Nephropathy

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BACKGROUND

Cidofovir, a nucleotide analogue, selectively inhibits viral DNA polymerase. It is commonly used for treatment of AIDS-related CMV retinitis but it can also be used for treatment of Betapolyomavirus (BKV) nephropathy, a polyomavirus-associated nephropathy (PVAN), to prevent renal dysfunction or graft loss after kidney transplant.

BKV infection is a latent infection, most commonly of the kidneys, occurring in half the population, and typically occurring in early childhood. There is an 82% seroprevalence in adulthood. PVAN after kidney transplant is an increasing concern. In most cases, the donor kidney is BKV positive. The potency and effectiveness of current immunosuppressants reduce rates of acute rejection and improve graft survival but make way for viral replication. The infection occurs in the epithelial cells of the renal tubules. It manifests similar to tubule-interstial nephritis or graft rejection. This inflammatory component makes it difficult to distinguish the difference between PVAN and graft vs. host disease.

Cidofovir, in conjunction with immunosuppressants, is used to treat PVAN. Side effects include renal toxicity, hypotony, and anterior uveitis. Epithelial cell damage results in renal and aqueous production dysfunction. The reason for anterior uveitis is not yet clear. Anterior uveitis occurs after multiple systemic injections, suggesting that toxicity build-up occurs. In most cases, discontinuation of the cidofovir, and topical steroid are sufficient treatment.

CASE

59 year old Black male presented to our clinic with bilateral redness, 10/10 dull pain, moderate photophobia, and tearing.

Past Ocular History: Mild NPDR s CSME OU

Past Medical History: ESRD s/p DD kidney transplant (07/16) c/b PVAN, HTN, HL, Hepatitis C, IDDM x1987, PTSD, OA, OSA, ED, PVD, Fibromyalgia, Pancytopenia

Medications: Cidofovir, Leflunomide, Sirolimus, Prednisone, Lisinopril, Metropolol, Atorvastatin, Pentoxifylline, Hydroxyzine HCL, Sildenafil, Insulin, Testerosterone CYP

Exam Findings:

Visual Acuities (cc):	OD: 20/30+2PH 20/25+1 OS: 20/25+1 PH NI	
Pupils:	ERRL OU, minimal reaction, extreme photophobia OU	
EOMs:	FROM OU	
CVF:	Full OU	
Anterior Segment:	Cornea:	OU: few small KP inferiorly
	Anterior Chamber:	OU: 3+ WBC, 2+ pigment cell, 2+ flare
	Iris:	OU: multiple posterior synechiae
Intraocular Pressure:	OU: 10mmHg @ 10:02 by GAT	
Posterior Segment:	OU: few scattered MAs & dot hemes, (-)CSME	

Differential Diagnoses:

1. Acute anterior uveitis secondary to cidofovir use
2. Immune recovery uveitis
3. Acute anterior uveitis secondary to systemic pathology

Labs:

CIA, RPR, ANA, Quant Gold: Negative
ACE: Low, but ACEI use
Lysozyme: Normal limits
CBC: Low RBC, HGB, HCT, MCV, & MCH consistent with anemia
A1c: 7.0%

Timeline of events:

FIG. 1

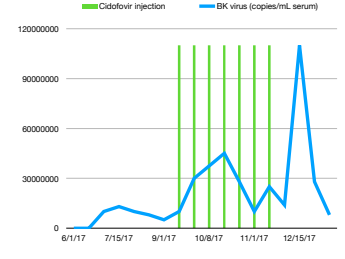


FIG. 2

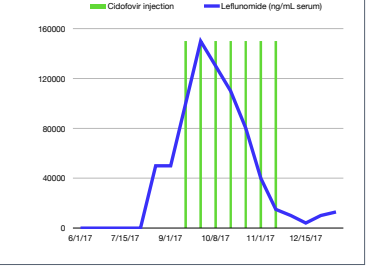


FIG. 3

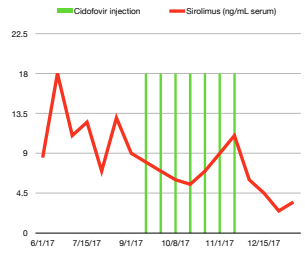
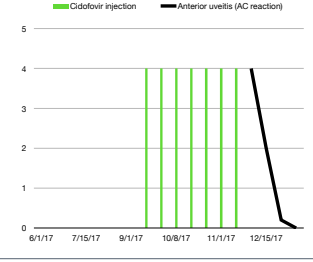


FIG. 4



Assessment:

1. Acute anterior uveitis secondary to cidofovir use
2. Mild NPDR s CSME OU

Plan:

1. Consulted nephrology & recommended discontinuing cidofovir injections. Start topical steroids and mydriatics OU.
2. Monitor annually.

DISCUSSION

Anterior uveitis is a known complication in patients treated with systemic cidofovir injections for CMV retinitis but limited data is available on its association during PVAN treatment. The uveitis onset is typically seen after multiple injections and resolution is often achievable with suspension of cidofovir and topical treatment alone.

Cidofovir can cause nephrotoxicity, decreasing renal excretion and thus increasing toxic accumulation of drug with chronic use.

Immune recovery uveitis typically manifests as an intermediate or posterior uveitis, most often characterized by vitritis and cystoid macular edema.

In our patient, this management was sufficient for anterior uveitis resolution. Consultation with the patient's nephrologist is important in balancing the patient's systemic & ocular health.

CONCLUSION

Drug induced uveitis is a possible complication of cidofovir treatment of PVAN however other uveitis etiologies must be ruled out. Topical management is often sufficient.

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Validation 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 and contrast decreased at 0.1 log step. 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 (A. B.) and the examiner (D.). C shows compute and tablet together.

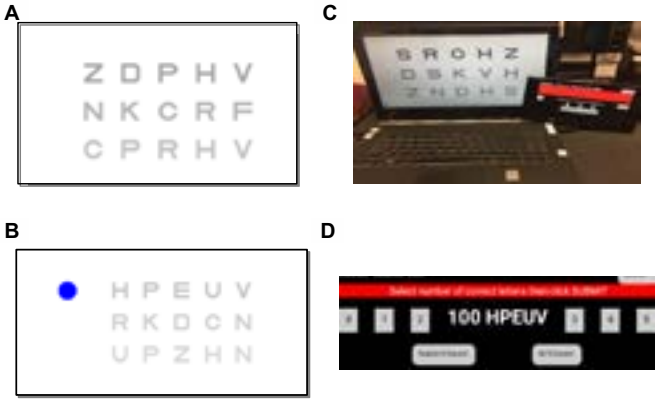
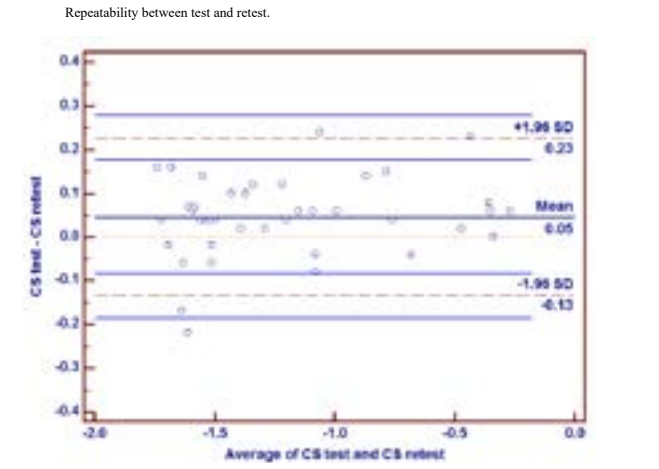


FIGURE 2
Automated ETDRS contrast measurement viewed by the subjects (A. Phase I; B. Phasell with a blue dot) and the examiner (C. Phase I: D. Phase II).



RESULTS

The mean (± SD) difference between the two measurements was -0.05 (± 0.09) logMAR (0.5 line) 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 0.5 logMAR line better than the first measurement, which could be due to learning effect of subjects.

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Bilateral Choroidal Neovascular Membrane in Ehlers Danlos Syndrome

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BACKGROUND

Ehlers Danlos Syndrome (EDS) is a rare, inherited spectrum of connective tissue disorders characterized by joint hypermobility, and fragile, soft hyper-extensive skin. There also can be other widespread disorders of the skin, ligaments and joints, blood vessels and internal organs. Its presentation varies clinically from mild skin and joint disorders to severe physical disability and life-threatening vascular complications. EDS manifests in the eyes as angioid streaks in 1-2% of EDS patients. These breaks in bruch's membrane can develop choroidal neovascular membranes resulting in significant vision loss.

CASE SUMMARY

- 25-year-old African American female presented with sudden painless vision loss OU x 1 month
- Visual acuity: 20/200 OD, OS.
- Fundus examination (see Figures 1 & 2): subtle, angioid streaks OU; dense, subretinal blood with fibrosis temporal to the optic nerve and extending to macula in each eye from choroidal neovascular membrane (CNVM)
- Upon further questioning, the patient reported she had always been "double jointed," "very flexible," and bruised easily
- Dermatology diagnosed Ehlers Danlos Syndrome and she was referred for genetic counseling
- Retina specialist treated with intravitreal injection of bevacizumab (Avastin®, Genentech, San Francisco, CA) OU. Visual acuities remained stable but did not improve due to the long-standing presence of subretinal blood and fibrosis.

FIGURE 1
Right Eye Subtle Angioid Streaks with Subretinal Blood and Fibrosis

FIGURE 2
Left Eye Angioid Streaks with Subretinal Blood and Fibrosis

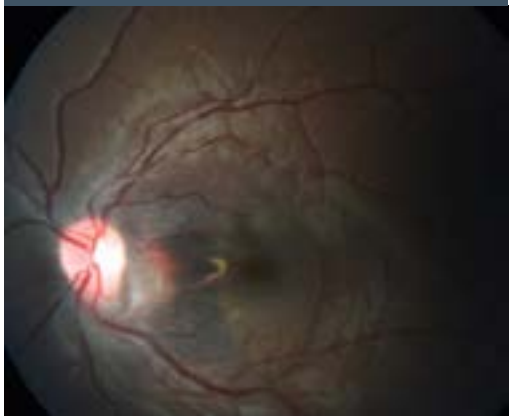

TABLE 1
The Beighton Scale for Joint Hypermobility (1)

Joint/Finding	Negative	Unilateral	Bilateral
Passive dorsiflexion of 5th finger > 90°	0	1	2
Passive flexion of thumbs to the forearm	0	1	2
Hyperextension of the elbows beyond 10°	0	1	2
Hyperextension of the knees beyond 10°	0	1	2
Forward flexion of the trunk with knees fully extended and palms resting on the floor	0	Present = 1	

Total Score ≥ 5 indicates hypermobility

TABLE 2
Major and Minor Diagnostic Criteria for Classic EDS (2)

Major Diagnostic Criteria	
Skin Hyperextensibility	Tested at a neutral site (where no mechanical forces or scarring). Measured by pulling up skin until resistance felt. Difficulty may be encountered when assessing young children due to the abundant subcutaneous fat.
Widened Atrophic Scarring	Manifestation of tissue fragility
Joint Hypermobility	Can affect both large and small joints and range from mild to severe. Joint hypermobility is noted when a child starts to walk and is assessed using the **Beighton scale**
Family History	Positive
Minor Diagnostic Criteria	
Skin Texture	Smooth & velvety to touch. Extends easily and snaps back after release
Mulluscoid Pseudotumors	Fleshy, heaped up lesions associated with scars over pressure points (e.g. elbows, knees)
Subcutaneous Spheroids	Small, hard cyst-like nodules, freely moveable over the bony prominences of the legs and arms.
Complications of joint hypermobility	Sprains, dislocations, subluxations
Bruising	Often manifests as spontaneous ecchymosis and frequently recurs in the same areas that cause characteristic brownish discoloration of the skin, especially at exposed areas like the shin and the knees. Bleeding tends to be prolonged despite a normal coagulation status.
Manifestations of Tissue Extensibility and Fragility	Skin is very fragile. Wound healing takes longer and stretching of scars after primary healing is characteristic. Scars often are wide with a "cigarette paper" appearance. Includes hiatal hernia, anal prolapse in childhood, and cervical insufficiency
Surgical Complications	E.g. post-operative hernias
Facial Features	Typical facial features include: epicanthal folds, excess skin on eyelids, dilated scars on the forehead and chin, and pale, premature facial aging
Neurologic Features	Muscle hypotonia can cause delayed motor development, problems with ambulation, and mild motor disturbance. Fatigue and cramping of muscles are frequent. Cerebral spinal fluid may leak to cause headaches and postural hypotension.
Cardiovascular Manifestations	Mitral valve prolapse, tricuspid valve prolapse, aortic root dilation, spontaneous rupture of large arteries intracranial aneurysms, and arteriovenous fistulae
Pregnancy-related Manifestations	Prematurity occurs often due to premature rupture of the membrane. Due to hypotonia, breech presentation is more common which can lead to dislocation of the hips or shoulder of the newborn. For the mother, increased risk for extension of episiotomy incisions, tearing of perineal skin, and prolapse of the uterus/bladder may occur during delivery.

CONCLUSION

Angioid streaks in young patients can be subtle and result in CNVM. Due to their association with connective tissue disorders dermatologic referral is important for diagnosis as some subtypes of EDS are life threatening. Patient education on potential ocular complications of CNVM is imperative and regular ocular examinations with home amsler grid monitoring is recommended in attempts to catch CNV development early to prevent further vision loss.

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MINNESOTA OA

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Punctate Inner Choroidopathy: A Clinical Case

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Kevy Simmons, OD, Med-VFL, FAAO, Trevor Fosso, OD, FAAO

Introduction:

Punctate inner choroidopathy (PIC) also called idiopathic multifocal choroiditis describes a non-infectious, idiopathic bilateral disease that is chronic in nature. PIC predominately affects healthy myopic women and presents with multiple lesions ranging from 50 to 350 microns in size within the posterior pole to midperiphery with minimal ocular inflammation[1]. The lesions commonly localize within the retinal pigmented epithelial layer (RPE) and outer retinal spaces. Other common associated clinical manifestations include peripapillary atrophy, scarring, and curvilinear chorioretinal streaks located in the far periphery[2]. Associated complications include a high risk of choroidal neovascularization resulting in chorioretinal atrophy and subretinal pigmented fibrotic scars.

Patients typically exhibit the idiopathic lesions with minimal signs of intraocular inflammation despite recent research indicating an underlying association with identical interleukin-10 and tumor necrosis factor RNF haplotypes. These genotypes are typically associated with non-infectious uveitis and increased susceptibility of autoimmune function[3].

The morphological characteristics of most stable lesions can be observed with Spectral Domain (SD) OCT. This implies the lesions are localized below RPE and in the outer retinal spaces, whereas active lesions are associated with RPE elevation and photoreceptor compression[4].

Patients are able to maintain good visual acuity during the acute phases of the lesion while the fovea remains spared and there is no presence of choroidal neovascular membrane (CNVM). Current methods of treatment include systemic corticosteroid therapy in conjunction with immunomodulatory therapy (anti-VEGF) to reduce inflammatory infiltrates into the subretinal spaces[5]. Ocular Anti-VEGF therapy has been used in cases with presence of CNVM to reduce edema and inflammation.

Case Presentation:

A 25 year old Caucasian female presented with a complaint of blurred vision at distance with the right eye worse than left, more noticeable when driving. She was previously diagnosed with punctate inner choroidopathy (PIC) in both eyes and choroidal neovascular membrane (CNVM) in the left eye. The patient was treated with 20mg oral prednisone and azathioprine for one year. She is currently receiving repeated Avastin injections in the left eye for the past year.

The patient was sent for blood work one year prior and was positive for HLA-B51, but remains uncertain of underlying diagnosis. Patient was also referred and has established care with a rheumatologist.

She has a medical history of migraines, and current medications include amitriptyline, compazine, and sumatriptan.

Figure 1. Color fundus photographs of right eye (A) illustrated peripapillary atrophy with multiple small, yellow-white lesions within the posterior pole to midperiphery consistent with multifocal choroiditis
Left eye (B) revealed peripapillary atrophy with peripheral punched out lesions in closer proximity to the macula

Figure 4. Cirrus OCT imaging through macular thickness of both right and left eye, indicating macular thinning of the RNFL in the left eye resulting from chorioretinal lesion.

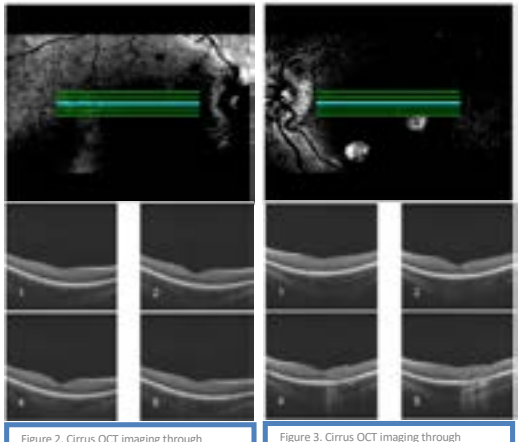

Figure 2. Cirrus OCT imaging through macula OD, showed no appearance of lesions within the RPE.

Figure 3. Cirrus OCT imaging through macula OS, showed lesion with RPE elevation and photoreceptor compression.

Clinical findings:

BCVA: 20/20 OD, 20/20 OS
Pupils: PERRLA (-)APD
Confrontational visual fields: FTFC OD, OS
Extraocular muscles: FROM OU
IOP: 15 mmHg OD and OS with GAT
Anterior segment: unremarkable OD, OS
Posterior segment: see Figures 1, 2, 3, and 4

Assessment/Plan:

The patient was diagnosed with PIC in both eyes one year prior and continues to remain stable without signs of vitreal inflammation.

She was re-educated about her ocular condition and recommended to continue care with rheumatologist and ophthalmologist

Discussion:

The most severe vision-threatening complications of PIC include choroidal neovascularization, subretinal fibrosis, and secondary glaucoma. As a result, close monitoring of the condition regularly is necessary. Blood work had been previously assessed to determine any underlying systemic conditions. This included tests to determine associations to HLA B7 with histoplasmosis, HLA-A29 with birdshot chorioretinopathy, and HLA-DR2 with acute posterior multifocal placoid pigment epitheliopathy. Laboratory and imaging evaluation for evidence of autoimmune and infectious disease were negative.

Diagnostic techniques:

- IV Fluorescein Angiography (IV FA) reveals hyperfluorescent lesions[4]
- Indocyanine Green Angiography (ICG) lesions appear hypofluorescent in both early and late phases[4]
- Spectral Domain - OCT showed presence of focal elevations of RPE with underlying hyporeflective space[4]

Conclusion:

Patients with this condition should be educated on the potential of vision-threatening complications including CNVM in the affected eye(s). Yearly follow up with dilated fundus examination with fundus imaging and OCT is recommended. Additionally, further evaluation with IVFA and ICG should be done to determine the presence of CNVM. Patients with CNVM should be managed directly with an ophthalmologist for anti-VEGF therapy.

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Color Contrast Sensitivity in Age–Related Macular Degeneration

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INTRODUCTION

As the global population ages, prevalence of age-related macular degeneration (AMD) is rapidly increasing. The burden of vision loss due to progression of disease has a profound effect on quality of life and ability to function independently. Although revolutionary treatments now exist for AMD, many patients still suffer irreversible vision loss due to late presentation to their eye care providers. Sensitive methods to detect early disease progression can improve outcomes. Contrast sensitivity has been shown to be a sensitive measure of visual function.[1-3] In AMD, it has been established that contrast sensitivity function worsens with increasing drusen accumulation and progression of disease.[4] Similarly, color vision loss is one of the earliest manifestations of retinal disease. In particular, AMD has been shown to lead to a larger loss of blue-yellow sensitivity over red-green sensitivity.[5] Traditional methods of evaluating contrast sensitivity use research protocols for retro-illuminated high and low contrast visual acuity charts. Measuring subtle degenerative color vision changes involves using complex tests such as the Farnsworth-Munsell 100 hue test. Despite evidence supporting the usefulness of these tools in detecting and monitoring AMD progression, these assessments are time consuming and require specialized equipment and interpretation, making them difficult to implement into a busy eye care practice. Previously studied in migraine headache,[6] Parkinson's Disease[7] and amyotrophic lateral sclerosis,[8] the King-Devick (K-D) Variable Color Contrast Sensitivity Chart (VCCSC) is an iOS platform application that offers portable tablet availability, variable contrast levels as well as color contrast presentations to allow simultaneous assessment of visual acuity, contrast sensitivity and color vision. This pilot study aimed to determine which color contrast sensitivity differences exist in non-exudative AMD (NE-AMD) to develop a baseline for a larger study utilizing this technology in detecting AMD conversion particularly in high risk patients.

METHODS

NE-AMD patients (n=13) and controls (n=31) with no ocular pathology were recruited to participate. Participants were excluded if there was any presence of macular pathology other than NE-AMD or any visually significant cataracts. In a single study visit, monocular best corrected visual acuity (BCVA) at 40cm with 100% black contrast was determined. Utilizing the BCVA line, the number of letters correctly identified (out of 5) was recorded for various color presentations (red, green, blue, yellow) and at decreasing contrast levels (75%, 50%, 25%). Written informed consent was obtained from each study participant. All study procedures were approved by the Illinois College of Optometry Institutional Review Board.

RESULTS

NE-AMD patients demonstrated approximately 2 lines worse visual acuity under 100% black letter presentation as compared to controls (median: 0.5 Log MAR [range: +0.09 to +1.4] (20/63 Snellen equivalent [range: 20/25 – 20/500) vs. 0.3 Log Mar [0 to +0.7] (20/40 Snellen equivalent [range: 20/20 – 20/100]), p=0.0028). At BCVA, there was no significant difference between controls and NE-AMD patients in the number of letters identified at various contrast and color settings, however blue at low contrast levels (25% and 75%) trended toward greater worsening in NE-AMD compared to other color and contrast combinations.

CONCLUSION

In this cohort, no statistically significant color contrast differences were demonstrated between controls and NE-AMD patients. This may be due to the relatively small sample size of NE-AMD patients within this initial study. Despite this, the pilot study provides informative data to focus on evaluating blue color contrast for an upcoming larger investigation using this technology in a comparative study between controls, NE-AMD and the more severe form of AMD, Exudative AMD (E-AMD). Given the results of the current study, we hypothesize that E-AMD patients will have decreased contrast sensitivity compared to both normal controls and NE-AMD patients supporting the widespread use of the K-D VCCSC to detect early conversion to E-AMD in all elderly individuals.

FIGURE 1

Age-related macular degeneration affects an estimated 11 million individuals in the United States. Owing to the rapid aging of the US population, this number is expected to increase to 22 million by 2050.[1] Global projections estimate 196 million will be affected with macular degeneration by 2020, increasing to 288 million in 2040.[2]

1 Bright Focus Foundation. Macular Degeneration: Facts & Data. www.brightfocus.org/macular/infographic/look-macular Accessed: Jan 17, 2018.

2 Wong et al. Global Prevalence of age-related macular degeneration and disease burden projection for 2020 and 2040: a systematic review and meta-analysis. Lancet Glob Health. 2014; 2(2): e106-16.

FIGURE 2

The King-Devick Variable Color Contrast Sensitivity Chart iPad Application.

The King-Devick Variable Contrast Sensitivity Chart is a tablet based software that allows for assessment of visual acuity, contrast sensitivity and color vision in an easy-to-use mobile application. Testing distance can be varied between clinically standardized testing distances of 40cm, 2 meters or 3meters. Sloan letter sizes are automatically adjusted based on testing distance and randomized for each presentation. Contrast can be varied to preset contrast levels for 75%, 50%, 25%, 2.5% and 1.25% contrast levels or manually changed in 1% increments using the sliding scale. Letters can be displayed in primary colors: red, green, blue and yellow to evaluate color vision and contrast can also be varied for these colored displays. For self-testing or if a tester is unsure of the correct letters displayed, the application will call out the displayed letters.

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National Academy of Practice in Optometry (NAPO)

http://www.napractice.org/About-NAP/Academies/Optometry

The Role of the Profession of Optometry in Interdisciplinary Health Care

- Doctors of Optometry (O.D.s / Optometrists) are primary health care professionals.
- As licensed, independent health care professionals, Doctors of Optometry play a primary and integral role in inter-disciplinary health care by examining, diagnosing, treating, and managing diseases, injuries, and disorders of the visual system, the eye, and associated structures.
- Doctors of Optometry are involved in the coordination of care of associated systemic diseases and zoonotic diseases, and serve a sentinel role in the identification of ocular side effects of systemic medications.
- Doctors of Optometry are defined as physicians under Medicare, and are an essential part of the national health care delivery system providing direct patient access to health care in nearly 6,500 communities across the country. In 3,500 of these communities, Doctors of Optometry are the only providers of vision and eye health care services.



Doctors of Optometry (O.D.s / Optometrists):

- Practice in many different healthcare settings that include private and group practice, within hospitals, Accountable Care Organizations, Federally Qualified Health Centers, School Based Health Centers, Rural Health Clinics, Certified Nursing Facilities, Rehabilitation Facilities, U.S. Armed Forces, Veterans Health Administration, Indian Health Service, Civil Service, and other settings.
- Assist with improving overall population health and quality of life through prevention and early diagnosis of vision and eye health problems and prevention of chronic disease.
- Detect systemic diseases through identification of associated eye findings during a comprehensive face-to-face eye examination. There are over 275 systemic conditions with ocular involvement.
- Participate in Physician Quality Reporting System (PQRS) and Merit-Based Incentive Payment System (MIPS) and other quality initiatives to improve patient outcomes and wellness by enhanced disease prevention and patient education for behaviors that have been linked to systemic diseases with known vision and eye findings including but, not limited to hypertension, obesity, diabetes, smoking, and UV exposure.
- Are essential to the implementation of the comprehensive pediatric vision care benefit mandated by the Affordable Care Act and attending regulations.
- Coordinate the vision, eye health, and wellness of their patients with fellow Optometrists and other health care providers.
- Offer services to assist individuals with functional vision problems, traumatic brain injury, visual impairment and blindness. Treatments may include vision therapy or tools to address functional vision problems or vision rehabilitation for those with vision impairment with the goal to optimize vision and maintain independence and quality of life.
- Provide a continuum of patient-centered care for people of all ages focused on prevention, health maintenance, acute care, chronic care, habilitation, and/or rehabilitation, with special emphasis on minimizing life-long impacts and the burden of visual impairment on at-risk populations that include aging adults and the very old, as well as infants and children.



Images: "True Stories Brochure," Association of Schools and Colleges of Optometry www.opted.org and the American Optometric Association www.aoa.org

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SOCIETY FOR NEUROSCIENCE

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Eponymous Women in Neuroscience and Medicine

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INTRODUCTION

Eponyms, terms based on the name of a person or persons, are commonly used throughout the English language. This is especially true for the medical and neuroscience fields. These terms can be derived from a variety of sources. Some eponyms are linked with a location (Lyme disease) or a famous patient (Lou Gehrig disease). Still others are associated with fictional characters (Oedipus complex). The majority of eponymous terms are associated with the person(s) involved in discovering the subject of the term, usually as an honorific. There is no official process in creating an eponym, although the most common source of new eponyms is someone, oftentimes a colleague or former student, names something after a mentor, e.g., aqueduct of Sylvius.[1] There are examples where a more famous person than the original discoverer has the eponymous term, e.g., Meyer loop.[2] Sometimes the original discovery was lost in obscurity, e.g., Vater-Pacini corpuscle,[3] and there are examples where this seemingly unfair situation gets rectified, e.g., line of Gennari.[4] Fairly recently it was suggested that language be standardized to use the non-possessive form of the eponym,[5] but this trend has not yet been universally accepted.[6] Also, it has been proposed by others that the use of eponyms be abandoned altogether.[7] One place that there seems to be a disparity is in the number eponyms in the neuroscience and medical fields named after women.

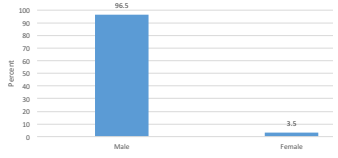
MATERIALS AND METHODS

The website: whonamedit.com has one of the largest collections of medical eponyms in a single place. This website was searched for the number of women's names that were associated with eponyms. The number of eponymous terms from these names was determined, since some names are sources for more than 1 term. If there was more than 1 eponym for a specific entity, this website indicated which eponym was most commonly used and which were alternatives. It was also determined which eponymous terms associated with women used only 1 name and which used more than 1 name. If more than 1 name appeared in the eponym, then the place in the order of the names in which the female's name appeared was ascertained along with whether the names appeared in alphabetical order or not. Pertinent publications were searched for the author order to see if this correlated with non-alphabetically ordered names in the eponym.

RESULTS

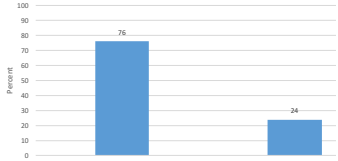
Of the 2894 names associated with eponyms on this website, 102 were women's, and 3 of these were fictional (Alice-in-Wonderland, Cinderella, and Mona Lisa (Figure 1). From these names, 143 eponymous terms were identified. Of these, the woman's name appeared in 109 of the most commonly used eponym and 34 of the alternative term(s) (Figure 2). The woman's name appeared alone in 58 eponyms. Of the 85 eponymous terms that contained more than 1 name, 49 of them had the names in alphabetical order. If the names were not in alphabetical order, the woman's name appeared first about one-quarter of the time (Figure 3). The non-alphabetical pattern of name order most commonly reflected author order in the pertinent publication. There were 5 blended names by marriage, 4 of which the husband's name came 1st, and 1 in which the wife's name appeared 1st (Olendorff-Curth).

Figure 1



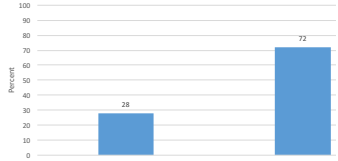
Percentage of eponymous names by gender

Figure 2



Percentage of female names in main versus alternate eponyms

Figure 3



Percentage of female name order in eponyms

Virginia Apgar

Virginia Apgar, (born June 7, 1909, Westfield, N.J., U.S.—died Aug. 7, 1974, New York, N.Y.), American physician, anesthesiologist, and medical researcher who developed the Apgar Score System, a method of evaluating an infant shortly after birth to assess its well-being and to determine if any immediate medical intervention is required.[8]

Apgar graduated from Mount Holyoke College in 1929 and from the Columbia University College of Physicians and Surgeons in 1933. After an internship at Presbyterian Hospital, New York City, she held residencies in the relatively new specialty of anesthesiology at the University of Wisconsin and then at Bellevue Hospital, New York City, in 1935–37. In 1937 she became the first female board-certified anesthesiologist. The first professor of anesthesiology at the College of Physicians and Surgeons (1949–59), she was also the first female physician to attain the rank of full professor there. Additionally, from 1938 she was director of the department of anesthesiology at Columbia-Presbyterian Medical Center.

An interest in obstetric procedure, and particularly in the treatment of the newborn, led her to develop a simple system for quickly evaluating the condition and viability of newly delivered infants. As finally presented in 1952, the Apgar Score System relies on five simple observations to be made by delivery room personnel (nurses or interns) of the infant within one minute of birth and—depending on the results of the first observation—periodically thereafter. The Apgar Score System soon came into general use throughout the United States and was adopted by several other countries. In 1959 Apgar left Columbia and took a degree in public health from Johns Hopkins University. She headed the division of congenital malformations at the National Foundation-March of Dimes from 1959–67. She was promoted to director of basic research at the National Foundation (1967–72), and she later became senior vice president for medical affairs (1973–74). She co-wrote the book *Is My Baby All Right?* (1972) with Joan Beck.

Gerty Theresa Cori

Gerty Theresa Cori (née **Radnitz**; August 15, 1896 – October 26, 1957) was a Jewish Czech-American biochemist who became the third woman—and first American woman—to win a Nobel Prize in science, and the first woman to be awarded the Nobel Prize in Physiology or Medicine.[9]

Cori was born in Prague (then in the Austro-Hungarian Empire, now the Czech Republic). Gerty was not a nickname, but rather she was named after an Austrian warship. Growing up at a time when women were marginalized in science and allowed few educational opportunities, she gained admittance to medical school, where she met her future husband Carl Ferdinand Cori; upon their graduation in 1920, they married. Because of deteriorating conditions in Europe, the couple emigrated to the United States in 1922. Gerty Cori continued her early interest in medical research, collaborating in the laboratory with Carl. She published research findings coauthored with her husband, as well as publishing singly. Unlike her husband, she had difficulty securing research positions, and the ones she obtained provided meager pay. Her husband insisted on continuing their collaboration, though he was discouraged from doing so by the institutions that employed him.

With her husband Carl and Argentine physiologist Bernardo Houssay, Gerty Cori received the Nobel Prize in 1947 for the discovery of the mechanism by which glycogen—a derivative of glucose—is broken down in muscle tissue into lactic acid and then resynthesized in the body and stored as a source of energy (known as the Cori cycle). They also identified the important catalyzing compound, the Cori ester. In 2004, both Gerty and Carl Cori were designated a National Historic Chemical Landmark in recognition of their work in clarifying carbohydrate metabolism.

In 1957, Gerty Cori died after a ten-year struggle with myelosclerosis. She remained active in the research laboratory until the end. She received recognition for her achievements through multiple awards and honors. The Cori crater on the Moon and the Cori crater on Venus are named after her.

Henrietta Lacks

Henrietta Lacks (born **Loretta Pleasant**; August 1, 1920 – October 4, 1951) was an African-American woman whose cancer cells are the source of the HeLa cell line, the first immortalized cell line and one of the most important cell lines in medical research. An immortalized cell line will reproduce indefinitely under specific conditions, and the HeLa cell line continues to be a source of invaluable medical data to the present day.[10]

Lacks was the unwitting source of these cells from a tumor biopsied during treatment for cervical cancer at Johns Hopkins Hospital in Baltimore, Maryland, U.S., in 1951. These cells were then cultured by George Otto Gey who created the cell line known as HeLa, which is still used for medical research. As was then the practice, no consent was obtained to culture her cells, nor were she or her family compensated for their extraction or use.

Lacks grew up in rural Virginia. After giving birth to two of their children, she married her cousin David "Day" Lacks. In 1941 the young family moved to Turner Station, near Dundalk, Maryland, in Baltimore County, so Day could work in Bethlehem Steel at Sparrows Point. After Lacks had given birth to their fifth child, she was diagnosed with cancer. Tissue samples from her tumors were taken without consent during treatment and these samples were then subsequently cultured into the HeLa cell line.

Even though some information about the origins of HeLa's immortalized cell lines was known to researchers after 1970, the Lacks family was not made aware of the line's existence until 1975. With knowledge of the cell line's genetic provenance becoming public, its use for medical research and for commercial purposes continues to raise concerns about privacy and patients' rights.

DISCUSSION

Most of the eponyms associated with women in neuroscience and medicine are relatively rare genetic disorders, but a few are rather famous including (Virginia) Apgar score, (Gerty) Cori cycle (for which she shared the Nobel Prize with her husband, Carl), and HeLa cells (Henrietta Lacks). Maybe as gender equality in the workplace increases, there will be less disparity in eponymous terms associated with women.

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