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Retinal Functional Imaging for Evaluating Blood Flow After Encircling Scleral Buckles

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Purpose:
To evaluate the effect of an encircling scleral buckle (SB) on retinal blood flow in eyes that underwent rhegmatogenous retinal detachment (RRD) repair utilizing the Retinal Functional Imager (RFI).

Methods:
A retrospective review was performed on 32 patients who had undergone retinal functional imaging of both eyes – the eye that had a RRD repair with SB and the un-operated fellow eye, serving as the control. The RFI is a novel non-invasive imaging system which allows for quantitative analysis of retinal blood flow.

Results:
Eighteen patients had lower arterial and venous blood flow velocities in the eye with the scleral buckle. The average age of the buckle for this group was 37 months.
Seven patients had higher arterial and venous blood flow in the buckled eye, with an average buckle age of 170 months.

Conclusions:
Scleral buckling affects the arterial and venous blood flow in the posterior pole.
This constrictive effect of the scleral buckle appears to resolve many months after surgery.

Title: Analysis of Anterior Chamber Angle Following Boston Keratoprosthesis Placement

Author: JF Panarelli, A. Ko, MR Banitt

Background: Boston Keratoprosthesis (K-Pro) insertion is a therapeutic alternative in patients who have failed multiple corneal and stem cell transplants. Unfortunately, the development of glaucoma following insertion of the Boston K-pro is a potential complication that is difficult to monitor. Digital palpation of intraocular pressure can be compromised due to changes in the dynamics of the scleral tissue induced by the presence of the prosthesis and by insertion of a glaucoma drainage implant (GDI). Although the development of angle closure is presumed to be one of the primary factors in the development of glaucoma in these patients, it has not previously been systematically evaluated. In this study, we qualitatively evaluated the anterior chamber angle before and after K-pro insertion using anterior segment optical coherence tomography (ASOCT).

Methods: A retrospective analysis of the pre- and postoperative ASOCT images acquired by a single examiner on eyes that underwent keratoprosthesis placement between May 2006 and June 2007 was performed to qualitatively evaluate angle width and development of synechial closure. Horizontal scans were acquired and for all patients the three and nine o'clock positions were examined and compared. For each case, the scleral spur was identified and it was determined whether the angle was open or closed at the time of the preoperative and postoperative scans. On average, the initial post-operative scan was obtained at 4.38 months from the time of K-pro placement; follow-up scans were then obtained at an average of 12.1 and 19.73 months post-operatively.

Results: Seven eyes were identified, of which six had pre-operative OCT. The preoperative diagnoses were Stevens-Johnson Syndrome (SJS) (n=2), chemical injury (n=2), granular dystrophy (n=1), uveitic glaucoma (n=1) and ocular amyloidosis (n=1). Mean follow-up time was 27.98 months. Five of seven eyes had an open angle preoperatively, including one patient who did not have preoperative OCT, but was shown to have an open angle by ultrasound biomicroscopy (UBM). Two eyes showed a closed angle at preoperative evaluation. Of the five open-angle eyes, three showed no change and none had a pre-existing diagnosis of glaucoma. The two eyes that developed angle closure postoperatively did so within 3 and 4 months. Repeat scans at 6 months and after 1 year confirmed progression of the initial findings. Of the two eyes that developed angle closure, one patient had ocular amyloidosis and a pre-operative diagnosis of glaucoma, which required placement of a GDI; the second had SJS but did not have a pre-existing diagnosis of glaucoma. In these cases of synechial angle closure, the initial sign of angle compromise was adherence of the iris to the keratoprosthesis back plate. Over time, further adhesion led to greater angle closure.

Conclusion: Keratoprosthesis placement may pose a risk of synechial angle closure due to adherence of the iris to the K-pro back plate in the months following surgery. Post-operative follow-up with serial vertical and oblique scans may be indicated in order to monitor patients for progressive angle closure and its utility should be further explored.

Title: **Outcomes Post Laser-In-Situ Keratomileusis in HIV+ Patient Population**

Authors: Gupta, A; Coad, C; Eviatar, J; Newberry, A

Purpose: To compare the rate of complications and outcomes post LASIK in a group of HIV+ patients and a control population.

Methods: A retrospective chart review of 71 patients (134 eyes) who underwent LASIK (customvue intralase) between 2006-2008, with a minimum 3 month follow up period, was performed. 35 patients (67 eyes) were HIV+. Post-op target visual acuity (Va) and complications such as dry eye syndrome, infectious keratitis and flap dislocation were identified.

Results: The mean age of the control and study group was 40.9 and 42.0 years respectively. The mean pre-op sphere and cylinder was -3.8/-0.9 for the control group and -2.7/-0.9 for the study group. The intended post-op Va was achieved in 65/67 eyes (97%) in the control group and 64/67 eyes (95.5%) in the study group ($p>0.5$). In each group 2 eyes (1 patient) had flap dislocations. In the study group, 3 eyes (2 patients) developed dry eyes ($p<0.5$) for a period of 1 year or less that was alleviated with the use of prescription dry eye medication or punctal plugs. There were no developments of infectious keratitis in either group.

Conclusion: In this series, there is no significant difference between the post-op Va outcome and rate of infectious keratitis in patients with HIV versus control patients but patients with HIV may have a higher incidence of developing dry eyes after LASIK.

Visual prognosis of penetrating eye injuries with posterior segment foreign body

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Purpose: To identify visual prognostic factors related to penetrating eye injuries with posterior segment foreign bodies. **Methods:** A retrospective review of 90 patients who underwent foreign body removal during a 14-year period with a mean follow-up of 10.4 months (range 1 to 67 months).

Results: Final visual acuity was worse in eyes with endophthalmitis ($p=0.044$), retinal tears ($p=0.002$), retinal detachments ($p=0.000001$), macular scars ($p=0.00000002$) and pre-operative vision of 20/400 or less ($p=0.006$). Positive cultures in general, lens rupture and delay in presentation did not impact vision ($p> 0.05$).

Conclusions: Visual prognosis in penetrating eye injuries with posterior segment foreign bodies is most heavily influenced by pre-operative vision and subsequent retinal sequelae.

Regional Age-related Changes on Retinal Nerve Fiber Layer Thickness as Measured by Spectral Domain Optical Coherence Tomography

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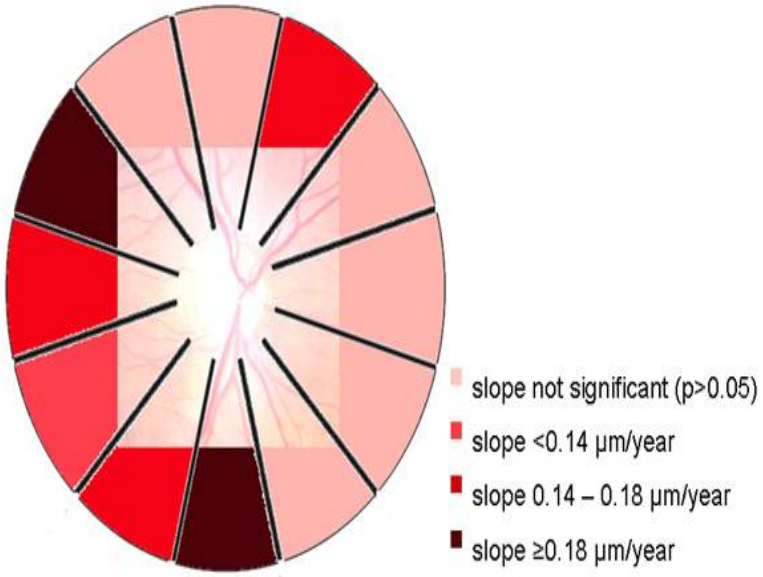
Abstract:

Purpose: To evaluate the relationship between age and peripapillary retinal nerve fiber layer (RNFL) thickness in normal subjects, as determined by spectral domain optical coherence tomography (SD-OCT). **Methods:** We prospectively enrolled 144 normal subjects (144 eyes), ranging from 16 to 84 years of age. After a complete ophthalmological examination, all patients underwent RNFL thickness measurement using SD-OCT (Spectral OCT/SLO, OPKO-OTI, Miami, FL). Two scans were performed per eye, each with 3 images analyzed (automatic tracking of the optic disc; diameter of 3.4 mm; resolution of 6 μm). The correlation between age and RNFL parameters (global and sectoral) was analyzed using linear regression analysis. The slope for each parameter was also calculated.

Results: The average RNFL thickness decreased significantly with increasing age, with a slope of -0.14 μm/year (r^2=0.04, p<0.01). Six of the 30-degree sectors (12 clock hours) were significantly and inversely correlated with age, with slopes ranging from -0.10 to -0.23 μm/year (r^2≥0.02, p≤0.04). While most (5/6) were localized in the inferior and temporal sectors, none of the nasal sectors correlated significantly with age (p≥0.06). **Conclusion:** Our data suggest that both global and regional RNFL thickness, as assessed by SD-OCT, decrease with age. This reduction seems to be more pronounced in the infero-temporal sectors, resembling that found in glaucomatous eyes. It suggests a possible age-related pattern of regional susceptibility that should be considered when assessing eyes over time.

Figure. Slopes of change for each clock hour (eyes were converted to right eye format for

analysis).


slope not significant (p>0.05)
slope <0.14 µm/year
slope 0.14 – 0.18 µm/year
slope ≥0.18 µm/year

Macular and Peri-papillary Retinal Blood Flow Velocities in Pseudoexfoliation Syndrome using the Retinal Functional Imager (RFI)

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PURPOSE: Pseudoexfoliation (PXE) syndrome is a systemic condition associated with secondary open angle glaucoma. In PXE, amyloid-like material coats ocular surfaces including the trabecular meshwork, lens and capsule, iris, and corneal endothelium. This material has also been shown to accumulate throughout the body including in the heart, kidneys, and lungs as well as in systemic vasculature. Previous studies used color Doppler imaging to show decreased retrobulbar blood flow velocities and increased vessel resistances in the ophthalmic and central retinal arteries.[1] Others have used scanning laser doppler flowmetry to show reduced optic nerve head and peri-papillary blood flow velocities compared to non-exfoliative fellow eyes and control eyes.[2] Thus far, no one has reported on peri-foveal blood flow in PXE patients. We hypothesize that deposition of PXE material in peri-foveal vasculature can result in decreased macular blood flow velocities. Deposition in the retinal circulation may contribute to the loss of retinal vascular auto-regulation that has been observed in eyes with glaucoma.

METHODS: Prospective, cross-sectional study. The Retinal functional imager (RFI) was used to quantitatively measure peri-foveal and peri-papillary arterial and venous blood velocities in eyes of patients with pseudoexfoliation syndrome. Control data was extrapolated from a previously published study using the same device.[3]
RESULTS:
This study included 25 eyes of 13 patients with PXE with or without associated glaucoma. The mean age was 70 ± 11 years, 54% were male, 15% were diabetic, 38% were hypertensive and 70% had PXE associated glaucoma. Mean arterial peri-foveal retinal blood flow velocities (RBFV) (mm/sec) were 4.19 ± 0.99 (Control[2]) and 3.96 ± 0.46 (PXE). The mean peri-foveal venous velocities were 3.03 ± 0.59 (Control[2]) and 3.28 ± 0.51 (PXE). In PXE, mean arterial peri-papillary RBFV were 6.73 ± 3.66 while venous RBFV were 6.68 ± 3.93. Student's t-test did not reveal a statistically significant difference between the mean peri-foveal arterial or venous velocities of control and PXE eyes.
CONCLUSIONS: Eyes with PXE did not have significantly different peri-foveal retinal arterial or venous blood velocities when compared to controls.

1 Martinez A, Sanchez M. Retrobulbar hemodynamic parameters in pseudoexfoliation syndrome and pseudoexfoliative glaucoma. Graefes Arch Clin Exp Ophthalmol. 2008 Sep;246(9):1341-9.

2 Ocakoglu O, Koyluoglu N, Kayiran A, Tamcelik N, Ozkan S. Microvascular blood flow of the optic nerve head and peripapillary retina in unilateral exfoliation syndrome. Acta Ophthalmol Scand. 2004 Feb;82(1):49-53.

3 Burgansky-Eliash, Z. Nelson, D. Pupko Bar-Tal, O., et al. Reduced Retinal Blood Flow Velocity in Diabetic Retinopathy. Retina. E-publish ahead of print. 2009.

Table 1: Demographics of Study Patients

	Control[3]	PXE
N=patients	32	13
Mean age ± SD, years	58 ± 9	70 ± 11
Male (%)	17 (53)	7 (54)
Glaucoma (%)	n/a	9 (70%)
Diabetes Mellitus (%)	0 (0)	2 (15)
HTN (%)	11 (34)	5 (38)

Table 2: Peri-foveal Arterial and Venous Blood Flow Velocities (mm/sec)

	Arterial Blood Flow Velocity		Venous Blood Flow Velocity	
	Control	PXE	Control	PXE
N=eyes	51	20	51	20
Mean (mm/sec)	4.19	3.833	3.03	2.7755
Standard Deviation	0.99	0.53	0.59	0.55

Table 3: Peri-papillary Arterial and Venous Blood Flow Velocities in PXE (mm/sec)

	Arterial Blood Flow Velocity	Venous Blood Flow Velocity
	PXE	PXE
N=eyes	25	25
Mean (mm/sec)	6.7276	6.6812
Standard Deviation	3.66081	3.937785

Figure 1: Sample image of peri-papillary arterial (red) and venous (purple) blood flow velocity measurements (mm/sec)

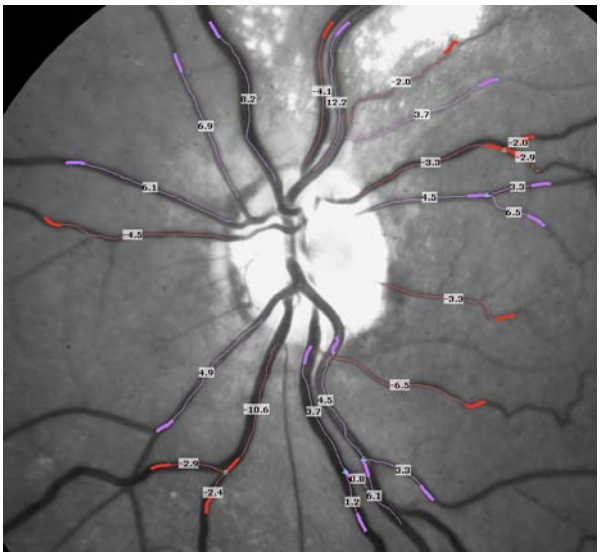
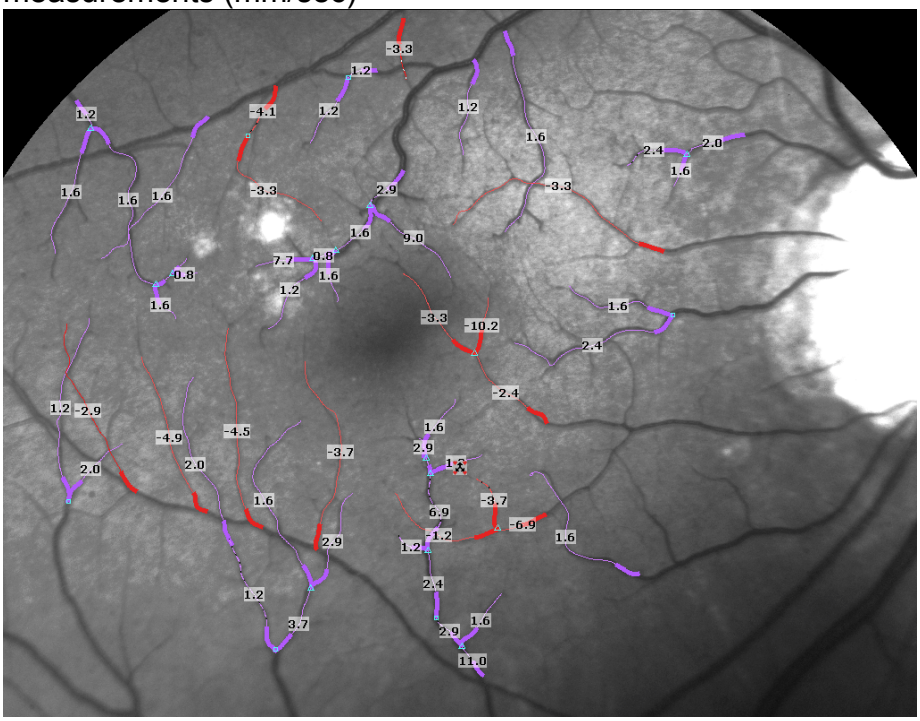


Figure 2: Sample image of macular arterial (red) and venous (purple) blood flow velocity measurements (mm/sec)



The Incidence and Implications of Preventable Ocular Foreign Bodies in a Major Urban Eye Trauma Center

Author: Joseph T. Nezgoda, MD, MBA; Jean-Paul J. Abboud, PhD; Leigh Spielberg, MD; Jon Kristan, BS; John Aljian, MD; Sanjay R. Kedhar, MD

Purpose: To examine the epidemiology and cost of preventable ocular foreign body (FB) injuries.

Methods: A retrospective review of Emergency Department (ED) logs, charts and billing data of a tertiary referral eye center for 2 calendar years (2008-09) for corneal and conjunctival FBs.

Results: 1,235 FB (988 corneal) cases composed 7.6% of ophthalmic ED visits (n=16,316), the third most common diagnosis. Mean age was 38.3+/-14.6 years, 78.7% were male, average ED visit cost was $380.75+/-$788.44). Total cost per incident (with medication, follow-up, estimated lost wages) is $1,035. Industry approved safety goggles cost $7.70.

Conclusion: Preventable eye trauma is a significant financial burden. For the cost of one incident nearly 135 workers could be protected.

RFI and CRAO

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Support: Supported by the Department of Ophthalmology Research Fund of the New York Eye and Ear Infirmary and the Norma Lazar Ophthalmology Research Fund.

Objective: To determine and characterize the the arterial velocity in eyes that have had central retinal artery occlusions.

Methods: A retrospective case series of eyes with a history of central retinal artery occlusion. All eyes underwent complete ophthalmic examination as well as fluorescein angiography, optical coherence tomography, and RFI evaluation.
Results: Seven patients were included (6 male, 1 female). Average age was 71 (range: 57 to 87). Arterial velocities in the affected eyes on average were 2.16 mm/second (range: 1.18 to 3.75). In the unaffected fellow eye of five patients the average arterial velocity was 3.28 mm/second (range 2.22 to 5.12).

Conclusion: Eyes that have had central retinal artery occlusions appear to have decreased arterial velocities following the vascular event. Further studies are needed to evaluate the clinical significance of these findings.

Retinal Functional Imaging for the Evaluation of Peri-Foveal Blood Flow Velocities in Diabetic Retinopathy

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PURPOSE: Diabetes mellitus (DM) is a micro-angiopathic disease that has been associated with decreased arterial and venous retinal blood flow velocities (RBFV). This study investigates the use of a novel non-contrast angiographic imaging device, the Retinal Functional Imager (RFI), to measure RBFV in patients with both non-proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR).

METHODS: Prospective, cross-sectional study. The RFI device was used to quantitatively measure peri-foveal blood flow velocities in patients with NPDR and PDR. Control data was extrapolated from a previously published study using the same device.

RESULTS: The study included patients with NPDR (n=10, 20 eyes) and PDR (n=10, 20 eyes). The mean age was 58 ± 9.3 years, 45% were male, 55% were non-insulin dependent. 45% of eyes had clinically significant macular edema (CSME[2]). Mean duration of DM diagnosis was 12.3 years. Mean arterial RBFV (mm/sec) were 4.19 ± 0.99 (Control[1]), 3.83 ± 0.53 (NPDR), and 3.36 ± 0.33 (PDR). The mean venous velocities were 3.03 ± 0.59 (Control[1]), 2.78 ± 0.55 (NPDR), and 2.43 ± 0.35 (PDR). Compared to control eyes, PDR eyes had a lower arterial ($p<.001$) and venous ($p<.001$) velocities. When compared to NPDR eyes, PDR eyes had a lower arterial ($p<.001$) and venous ($p<.05$) velocities. Pearson's correlation coefficient analysis showed that RBFV were not closely correlated with age, gender, visual acuity, insulin use, presence of CSME, years of DM diagnosis, or history of pan-retinal or focal laser.

CONCLUSIONS: Eyes with PDR were shown to have a slower peri-foveal retinal arterial and venous blood velocities compared to healthy controls and NPDR.

[1] Burgansky-Eliash, Z. Nelson, D. Pupko Bar-Tal, O., et al. Reduced Retinal Blood Flow Velocity in Diabetic Retinopathy.
Retina. E-publish ahead of print. 2009.

[2] CSME as defined by Early Treatment Diabetic Retinopathy Study

Table 1: Demographics of Study Patients

	Control[1]	NPDR	PDR	Combined
N=patients	32	10	10	20
Mean age ± SD, years	58 ± 9	56 ± 9	60 ± 10	58±9.3
Male (%)	17 (53)	5 (50)	4 (40)	9 (45)
CSME (%)	0 (0)	6 (60)	7 (70)	13 (65)
Mean # yrs of DM Diagnosis	0	11.3	13.3	12.3
NIDDM (%)	0 (0)	5 (50)	6 (60)	11 (55)
IDDM (%)	0 (0)	5 (50)	4 (40)	9 (45)
HTN (%)	11 (34)	10 (100)	10 (100)	20 (100)

Table 2: Arterial and Venous Blood Flow Velocities

	Arterial Blood Flow Velocity				Venous Blood Flow Velocity			
	Control	NPDR	PDR	All Diabetics	Control	NPDR	PDR	All Diabetics
N=eyes	51	20	20	40	51	20	20	40
Mean (mm/sec)	4.19	3.833	3.357	3.595	3.03	2.7755	2.4285	2.602
Standard Deviation	0.99	0.53	0.33	0.50	0.59	0.55	0.35	0.49

Table 3: Statistical Significance of Mean Velocity Differences (Student's t-test)

	Arterial Blood Flow Velocity	Venous Blood Flow Velocity
	p – Value	p – Value
Control vs. NPDR	Not statistically significant	Not statistically significant
Control vs. PDR	<.001	<.001
Control vs. All Diabetics	<.001	<.001
NPDR vs. PDR	<.001	<.05
NIDDM vs. IDDM	Not statistically significant	Not statistically significant
History of focal laser vs. No focal laser	Not statistically significant	Not statistically significant

Analysis of drusen reduction in dry AMD patients in Copaxone study assessed by High Resolution Spectral Domain Optical Coherence Tomography.

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Purpose: Copaxone (Glatiramer acetate) has been recently used to treat dry AMD patients resulting in a reduction of total drusen area measured on color fundus photos in Copaxone treated versus sham treated patients. Using high resolution spectral domain optical coherence tomography (SD-OCT), it is possible to analyze various morphologic parameters of drusen such as shape, internal reflectivity, homogenicity, and presence of overlying foci of hyper-reflectivity. Our purpose was to determine which drusen parameters are more likely to result in drusen shrinkage or disappearance in Copaxone treated dry AMD patients.

Methods: Subjects with a clinical diagnosis of dry AMD were enrolled in the study. The subjects received either Copaxone or sham cutaneous injections weekly for 12 weeks. SD-OCT images were obtained prior to treatment and after 12 weeks of therapy to analyze morphologic parameters of drusen within the macular region. Pre and post treatment drusen were compared.

Results: 26 eyes of dry AMD patients were included in the study of which 14 eyes (7 patients) were treated with Copaxone and 12 eyes (7 patients) received sham treatment. Overall, between baseline and after 12 weeks of treatment, the percentage of drusen which disappeared/shrank in the Copaxone treated group was 19.1% versus 6.5% in the sham treated group (p=0.13). Convex shape and low/medium internal reflectivity were found to be favorable parameters in prediction of drusen reduction in Copaxone treated patients.

Conclusions: Dry AMD patients may benefit from Copaxone treatment which may result in drusen reduction. Drusen patterns demonstrating convex shape and low/medium internal reflectivity tend to shrink or disappear after Copaxone treatment. Further investigation is needed in order to determine statistical significance.

Bilateral Papillomacular Folds in Nanophthalmos: Advanced Retinal Imaging

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Purpose: To report the results of the retinal imaging of a rare case of bilateral partial-thickness papillomacular retinal folds in pediatric nanophthalmos.

Methods: A patient referred for nanophthalmos underwent advanced retinal imaging, including fundus exam, color fundus photography (CFP), scanning laser ophthalmoscopy and spectral-domain optical coherence tomography (SLO/OCT), retinal function non-contrast angiography, autofluorescence (AF) and perimacular retinal blood flow velocity using the retinal functional imager (RFI).

Results: Imaging report of a 9-year-old female with axial lengths of 18.2mm OD and 18.3mm OS, best-corrected visual acuity (BCVA) of 20/30 OD and 20/50 OS and refractive error of +14.00 OD and +15.00 OS. Fundus exam revealed bilateral papillomacular retinal folds and absent foveal light reflexes. CFP showed crowded optic discs and a normal macular pigment distribution. SLO/OCT revealed bilateral partial-thickness retinal folds and bilateral absence of the foveal depression. Non-contrast angiography showed a rudimentary foveal avascular zone in the left eye and an unusually small one in the right eye. AF and retinal blood flow velocity were normal bilaterally.

Conclusions: This is the first report of comprehensive imaging of bilateral papillomacular retinal folds in nanophthalmos. OCT revealed that the retinal folds are in fact partial-thickness and exclude the inner segment/outer segment junction. Non-contrast angiography confirmed previous reports of a rudimentary foveal avascular zone in nanophthalmos that, along with an absent foveal depression, may be the main limitation to obtaining an optimal visual acuity. In contrast to previous reports, the macula is not hyperpigmented. This report also highlights the utility of non-contrast angiography in unusual situations in which the patient is unable to get FA due to fear of allergic complications.
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Title: **Whole-body PET/CT in Staging and Post-radiation Therapy Surveillance of Orbital MALT-type Marginal B-cell Lymphoma**

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Abstract:

Purpose- We review the utility of PET-CT in staging, after radiotherapy, stratified according to sites of involvement for mucosa-associated lymphoid tissue (MALT) type marginal zone B-cell lymphomas.

Design- A retrospective case series

Participants- 22 patients who had biopsy-proven orbital lymphoma underwent hybrid whole body F^{18}-fluoro-deoxyglucose PET-CT for pre-therapy staging.

Methods- 8 of the patients underwent post-radiotherapy scans after receiving a mean dose of 30.6 Gy in 1-8 Gy fractions. Maximum standard uptake value was measured for each lesion.

Main Outcome Measures- Whole-body PET/CT maximum SUV in lesions, the contralateral site and systemic metastases

Results- There were 7 males and 15 females. The median age at presentation was 52.7 years (range 21.7-82.4 years). The median follow-up after radiation treatment was 14.8 ± 24.6 months after the end of radiation treatment. Based on PET/CT SUV threshold of 3.0, the accuracy of primary lesion detection on PET/CT was low, as sensitivity for biopsied conjunctival, eyelid and orbital lesions did not exceed 60%. PET/CT was adept at delineating systemic lesions, there is no definite advantage over CT imaging alone. Out of 25 reactive systemic lymph nodes, 8 were biopsy-positive. 4 out of those 8 lesions

were confirmed as lymphatic dissemination. Sensitivity was 100%, specificity 81%, with a 50% PPV and 100% NPV.
Two out of the 22 patients (9.0%) demonstrated metastases. Surveillance of primary and systemic lesions in 13 patients on post-radiotherapy PET/CT, with a median follow-up time of 21.5 ± 17.1 months, showed insignificant changes and no new metastases.

Conclusions- Pre-radiotherapy PET-CT is a poor modality for identifying most primary MALT lymphoma lesions, especially after biopsy. However, it was highly effective in detecting systemic involvement. In our series, which is the largest to date in the literature for MALT lymphomas and PET-CT, we found a lower incidence of systemic involvement, compared to prior reports. Post-radiotherapy PET-CT for the purpose of surveillance showed no new metastases or worsening of lesions.

Peripapillary Blood Flow Velocity in Glaucoma Evaluated by the Retinal Functional Imager (RFI)

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PURPOSE: To determine the mean peripapillar retinal blood flow (RBF) velocity in patients with various types of glaucoma, using the retinal functional imager (RFI).

METHODS: A prospective study was performed on 48 eyes of 24 subjects referred from an outpatient glaucoma clinic. Diagnoses included primary open angle glaucoma (POAG; n=6); glaucoma suspect (GS; n=9) and chronic angle closure glaucoma (CACG; n=5). Using the RFI and proprietary software processing, peripapillar vessels were visualized and their blood flow velocities measured. The main outcome measures were the mean RBF velocity in vessels within one disc diameter of the optic disc rim.

RESULTS: The mean age of subjects included was 65 ± 10.1 years. There were 14 females and 10 males. Mean peripapillary RBF velocity was 5.7±1.3 mm/s in CACG, 5.1±1.3 mm/s in POAG and 4.7±1.0 mm/s in GS. In subjects with IOP ≥ 16 mmHg, peripapillary RBF velocity was 5.4±1.8 mm/s; in those with IOP < 16 mmHg, arterial velocity was 4.8±1.4 mm/s. Similarly, mean peripapillary RBF velocity was 5.3±2.0 mm/s in patients whose cup disc (c/d) ratio was ≥ 0.6, whereas velocity was 4.9±1.7 mm/s in subjects with a mean c/d ratio <0.6.

CONCLUSIONS: The RFI is a novel, non-invasive imaging system that allows for quantitative analysis of RBF velocity. The results of this study suggest that mean peripapillary RBF velocity is correlated with glaucoma type, c/d ratio, and IOP, the main alterable glaucoma risk factor. This might be due to a steal phenomenon in which retinal vessels experience increased flow as retinal capillary perfusion decreases. The results of this study suggest that peripapillary RBF velocity might be a useful measure of glaucoma progression risk.

Comparative analysis between Preferential Hyperacuity Perimetry and Microperimetry test in detection of the change of retinal sensitivity in patients with a variety of retinal diseases.

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Purpose: The Preferential Hyperacuity Perimeter (PHP) is a noninvasive and noncontact exam, evaluating macular perimetry, based on the human visual function of hyperacuity. PHP has the capability of detecting functional changes and was designed for the early detection of central and paracentral alterations in the visual field. Microperimetry (MP) is a complementary diagnostic tool that aids in the assessment of the visual function and its relation to the structural changes of the retina and fovea. MP is an add-on feature of Spectral OCT/SLO (OPKO/OTI, Miami, FL, USA) and runs simultaneously with the SLO imaging and provides real time tracking of retinal movement and patient fixation, and performs mapping of the macular blind spots.

Methods: Patients with a variety of ocular diseases underwent PHP and MP tests on the same day. PHP results were superimposed on MP maps "Seen" distortions, representing metamorphopsia and "not-seen" distortions, representing scotoma were assessed and graded by PHP and afterwards were compared to corresponding loci of numeric MP values. Pearson's correlations were calculated between MP values and PHP values.

Results: 30 eyes were identified and categorized into 4 groups: Wet Age-related Macular Degeneration (AMD), Early Dry AMD, Advanced Dry AMD, and Inner Retina Edema. PHP data measuring metamorphopsias and scotomas were compared to MP data. The wet AMD group had the highest metamorphopsia correlation with a value of 0.4. The advanced dry AMD group had the highest scotoma correlation with a value of 0.62. In contrast the weakest correlation of 0.02 with metamorphopsia and 0.18 with scotoma values was found in the inner retina edema group.

Conclusions: Both devices, Preferential Hyperacuity Perimeter (PHP) and Microperimentry (MP) were found to be sensitive in detection of retinal functional pathology. A positive correlation exists between both modalities suggesting MP and PHP can provide complimentary data when used in concert. Both machines provided quantitative data of qualitative impairment of vision and can be used for close monitoring of functional retinal changes and for detection of progression in a variety of patients with retinal diseases.

Evaluation of Argon Laser Peripheral Iridoplasties Performed by Residents: Does It Really Work?

K. Eliasieh, S.K. Dorairaj, Y. Kashyap, J.T. Nezgoda, C.C. Teng

Purpose: To evaluate the efficacy of Argon Laser Peripheral Iridoplasty (ALPI) performed by second year ophthalmology residents at The New York Eye and Ear Infirmary on patients with Plateau Iris Syndrome (PIS), under the supervision of attending physicians.

Method: Eyes with PIS that underwent ALPI from 2002 to 2008 were evaluated. Prior to performing ALPI, second year residents had an instructional lecture but no clinical experience. Demographic data, refractive error, laser settings including duration, power, laser-spot number and size, complications, and length of follow-up were collected and evaluated. Data including intraocular pressure (IOP), best corrected visual acuity (BCVA), number of medications, and Shaffer angle grading on dark room gonioscopy (DRG), were compared between the pre-procedure and last recorded clinic examination. PIS was defined as an anteriorly positioned ciliary body causing irido-trabecular contact in spite of a patent iridotomy.

Results: Twenty-six eyes of 20 patients with a diagnosis of PIS were enrolled. There were 7 males and 19 females. Ages ranged from 42 to 79 years with an average of 58.6 years ± 10.2. Average refractive error was +3.00. The follow-up period ranged from 3 months to 6.4 years with an average of 19 ± 15 months. Laser settings were: power, which ranged from 140 to 550 mw, laser spot size of 500 um, and duration of 0.5 seconds. The mean number of spots was 31.1 (SD 6.4). The mean length of the procedure was 8.2 minutes with a range of 5-15 minutes. ALPI was associated with an increase in the number of open quadrants from 0.54 to 1.79 ($p < 0.001$). However, in 29% of eyes there was no increase in the number of open quadrants, and in 63% of eyes, only 0-1 quadrants were opened. There was no difference in IOP immediately after ALPI. There was a slight, clinically insignificant increase in IOP from 14.36 mmHg pre-procedure to 15.88 mmHg at the last clinic examination ($p=0.25$). BCVA declined by at least 1 Snellen line in 58% of eyes and was stable or improved in 42%. There was no significant change in the mean number of pressure-lowering medications pre-procedure (0.72) as compared with the last clinic examination (0.68), $p= 0.89$. The failure rate for ALPI was 15.4%. Six (27%) eyes had progressive angle closure and had PAS noted on the last DRG.

Conclusions: Results of this study suggest that although resident performed ALPI can result in the opening of closed angles in patients with PIS, there is room for improvement in resident training for this challenging procedure.

In-vivo Imaging of the Trabecular Pathway and Schlemm´s Canal with Anterior Segment Fourier-Domain (AS FD OCT) Optical Coherence Tomography

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Abstract

Purpose: To describe and compare the *in vivo* morphology of the trabecular meshwork (TM) and Schlemm´s canal (SC) area in normal, glaucoma suspect and glaucomatous eyes using anterior segment Fourier-domain optical coherence tomography (ASFDOCT).

Methods: One hundred and ten consecutive subjects, were imaged at the four limbal quadrants of either eye using the Angle Scan Mode of the AS FD OCT (Optovue, Inc., Fremont, CA). The highest quality images in which SC and the TM morphology could be outlined for each of the quadrants were selected and analyzed by a masked investigator (AC) using the standard automated software of the device. Based on the information collected from the patients' charts, 220 individual images were assigned to one of the following groups: normals (N), glaucoma suspect (S) and glaucoma (G) eyes. The area, width and length of SC, as well as the length and width of the TM were assessed for every image. A qualitative assessment of the images was done by two masked investigators (AC, SD), who evaluated for the presence of a prominent Schwalbe's line, intrascleral vessels or channels, and communications between the TM and the suprachoroidal space

Results: Normal patients were younger, had a larger area, longer width and length of SC, as well as a smaller portion of non filtering meshwork when compared to either the suspect or glaucoma groups ($p<0.05$) . However, when the S and G groups were compared, we found no statistical differences in any of the variables assessed between these two groups. Only the Total TM length remained similar among the three groups. The area ($p<0.05$) and the mean length of SC ($p<0.05$) were statistically different among quadrants but the width was not ($p=0.81$).

Conclusions: The anatomy of the trabecular pathway structures including SC can be visualized and objectively measured using ASFDOCT. There was a significant decrease in SC area related to age but not to glaucoma.

Planned Argon Laser Suture Lysis in Baerveldt Glaucoma Drainage Devices

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Purpose: To evaluate the safety and efficacy of planned argon laser ligature suture lysis in optimizing aqueous flow in Baerveldt glaucoma drainage devices (GDD).

Methods: A retrospective chart review was conducted on all patients undergoing Baerveldt GDD implantation by a single surgeon (CT) at our institution between September 2008 and August 2009. Pre- and postoperative IOPs and the presence of perioperative complications were recorded. Hypotony was defined as IOP <6.0 mmHg.

Results: 35 eyes of 34 patients underwent Baerveldt implant with 7-0 polyglactin suture ligature to provide complete occlusion. All patients were scheduled for argon laser ligature suture lysis (LSL) at 5-weeks. 27 eyes (77.2%) had elevated IOP at the week 5 visit and underwent LSL at that time. Mean IOPs before and after LSL were 24.3±4.5 mmHg and 5.9±2.9 mmHg respectively. All eyes with IOP <9.0 mmHg were managed with intracameral viscoelastic injection to elevate IOP to a low teens target. The mean IOP after injection was 12.7±2.3 mmHg. Mean IOP at the week 6 visit was 12.1±7.0 mmHg. In this group, 14.8% presented with hypotony one week post-injection. The five week follow-up visit was delayed in eight patients (22.8%), in whom the ligature biodegraded spontaneously. 25% of these eyes developed hypotony.

Discussion: Hypotony-related complications, choroidal effusion and shallow anterior chamber, occur in 16% and 11% of Baerveldt GDD recipients respectively. Planned laser suture lysis with viscoelastic injection for immediate hypotony can aid in controlling these problems.

Conclusions: Planned LSL after Baerveldt GDD placement is an effective method to optimize aqueous flow, decrease morbidity, and potentially decrease complications associated with spontaneous hypotony..Our data suggest that frequent follow up after LSL should maximize detection of hypotony after tube opening.

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Lower Corneal Hysteresis Predicts Laterality in Asymmetric Open Angle Glaucoma

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Glaucoma Fellow

Purpose: To investigate the association of corneal biomechanical parameters with asymmetric primary open angle glaucoma (POAG) using the Ocular Response Analyzer (ORA).

Methods: In a prospective cross-sectional study, ORA parameters were measured in 117 POAG patients with asymmetric visual fields (VF). The asymmetry in VF was defined as a five point difference between the eyes using the Advanced Glaucoma Intervention Study (AGIS) scoring system. Subjects with previous intraocular or refractive surgery, ocular co-morbidities and diabetes were excluded.

Results: In worse eyes, mean AGIS scores were significantly higher (8.1±4.3 vs. 1.0±1.6, $p<0.001$) and mean corneal hysteresis (CH) was significantly lower (8.2±1.9 vs. 8.9±1.9 mmHg, $p<0.001$). Median ORA-corrected intraocular pressure was higher in the worse eyes (IOP_{cc}, 17.4 mmHg vs. 16.9 mmHg, $p<0.001$). Worse eyes had a slightly lower mean corneal resistance factor (CRF) ($p=0.04$) and more myopic mean spherical equivalent ($P=0.02$). No difference was seen in the corneal thickness (CCT) ($p=0.63$) and Goldmann applanation tonometry (GAT) ($p=0.32$). On multivariate analysis, only CH retained association with the worse eye (OR: 25.9, 95% CI: 10.1-66.5). ROC curves showed that only CH and IOP_{cc} had a discriminative ability for the eye with worse VF (AUC: 0.82 and 0.70, respectively).

Conclusions: Asymmetric POAG was associated with asymmetry in ORA parameters but not in CCT and GAT. Lower CH was associated with worse eyes independently of its effect on IOP measurement, and was the best predictor for the eye with the worse VF.

Evaluation of Laser Iridotomy Performed by Ophthalmology Residents in a Teaching Institution

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PURPOSE: To evaluate the efficacy of Laser Iridotomy (LI) performed on patients with anatomically narrow angles, with appositional closure on dark room gonioscopy (DRG), by second year ophthalmology residents under the supervision of attending physicians at a teaching institution.

METHODS: A retrospective chart analysis of LI's performed by different second year residents between 2007 and 2009. Demographical data, refractive error, pre- and post-procedure intraocular pressure (IOP), laser settings with duration, best corrected visual acuity (BCVA), Shaffer angle grading on DRG of all 4 quadrants, complications, and time of follow-up were collected and evaluated.

RESULTS: We enrolled fifty-five eyes (31 patients), average age 64+/-8.9yrs, majority were Hispanic, 81% were females, and 85% of eyes were hyperopic (average refractive error +1.37 +/-1 diopter). The follow up period ranged from 1 week to 25 months with an average of 10.27+/-7.8 months. Both Argon and Yag lasers were used. Laser settings were on average 661mw (range: 300 to 1350mw), with spot size of 50um and duration of 0.02 seconds. The mean number of burns was 66.5+/- 65. The average duration of procedure was 8+/-4 minutes with a range of 3-26 minutes. Upon comparison of the number of open angle quadrants using the Shaffer angle grading, there was an increase in the number of open angle
quadrants from 0.17 (pre-procedure) to 2.81 (one week post-procedure) ($p < 0.001$). There was no significant difference between the mean IOP pre and immediate post procedure, from 15.4mmHg to 14.8mmHg ($p>0.2$). BCVA on average improved by 0.6 Snellen line. There was a 29% failure rate defined as persistent closed angles (Shaffer grade 0 or 1). Of these failures, non patent opening requiring touch up LI occurred in 5 eyes (29%), plateau iris syndrome requiring PICP occurred in 5 eyes (29%), phacomorphic narrow angle requiring cataract extraction occurred in 4 eyes (23.5%), and one eye developed PAS needing surgical intervention with glaucoma drainage implant in addition to IOP lowering medications.

CONCLUSIONS: Results of this study suggest that although residents have no prior experience in performing laser iridotomy, they are successful in opening a closed angle in majority of patients with relative pupillary block without any complications.

Anisotropy and Macular Radiation Exposure in Eyes Plaqued for Melanoma.

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Purpose

To compare the macular radiation exposure in eyes treated for intraocular melanoma with plaques that have seeds oriented in traditional configuration versus oriented radially to the macula to determine tumor positions and thicknesses where this method can be effective in limiting the incidence of radiation maculopathy.

To examine the effect of orienting radioactive seeds radially to the macula in plaques used for treating intraocular melanoma on macular radiation exposure and determine its feasibility as a method to limit the incidence of radiation maculopathy.

To determine intraocular tumor positions and thicknesses where exploiting anisotropy in radioactive plaque construction can be an effective method of limiting the incidence of radiation maculopathy.

Methods

Bebig Plaque Simulator X 5.3.6 was used to determine macular radiation exposure in eyes with 12 mm tumors of varying thickness and location and compare the difference between plaques with traditional seed distribution and those with seeds oriented radially towards the macula. Tumor thicknesses used were 2.5, 5 and 7.5mm. Locations were tumors centered on the ciliary body, equator, fovea and half way between the equator and the fovea. Plaques were tested with gold seed guides and silastic inserts and with Pd 103 and I 125 seeds. Seed strength was set to deliver 85 Gy to the tumor apex over a 7 day period.

Results

For a plaque with a gold seed guide insert loaded with I 125 seeds treating a 5mm thick tumor located at ciliary body there was a decrease in macular radiation exposure of 1.3% when the seeds were oriented radially to the macula. At the equator position it was 3.6%, the half equator position 15% and at the fovea 0.5%. When the plaque was loaded with Pd 103 seeds the magnitude of decrease at these four locations was 2.3%, 8.7%, 24% and 4.3%, respectively. Similar degrees of decrease were found with tumor thicknesses of 2.5 and 7.5 mm as well as when the plaques were fitted with silastic inserts.

Conclusion

Orienting radioactive seeds radially towards the macula when treating intraocular melanoma produces the greatest effect when tumors are located near but not directly under the macula. It is precisely at this distance where exposure approaches the threshold that causes radiation maculopathy with certainty and therefore the 15 -25% reduction found can produce clinically significant differences.

Use of mdivi-1 and nutlin-3 to block apoptosis in cybrids containing Leber Hereditary Optic Neuropathy (LHON) mutation

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Purpose: To investigate the use of mdivi-1 and nutlin-3 to block apoptosis in cybrids containing LHON mutation. Mdivi-1 is a dynamin related protein(Drp) inhibitor which plays a key role in mitochondrial fission and mitochondrial permeability transition(MPT) pore formation. Nutlin-3 is a MDM2 antagonist on the p53 apoptosis pathway but may also block Bax/Bak oligomerization on mitochondria surface.

Methods: LHON cybrids derived from osteosarcoma cell line with LHON patient-derived mitochondria containing mtDNA mutation (G11778A) is cultured in multi-well culture plates with Dulbecco Modified Eagle Medium(DMEM). Upon reaching 80% confluence, cybrids were switched to a glucose-free galactose (GFGM) media, which induced apoptosis. Mdivi-1 at concentrations of 5μM, 10μM and 20μM and nutlin-3 at 3μM and 5μM were added. After 2 days of incubation, cell survival was estimated by morphological inspection and MTT assay and results were compared to controls on glucose-rich and glucose-free media without treatment. Analogous experiments were performed with uveal melanoma M21 and ARPE-19 cell lines.

Results: The MTT assay results reveal that after 2 days of incubation with glucose-free medium, the LHON cybrids survival rate was 40%. The mdivi-1 treated cybrids at concentrations of 5μM, 10μM and 20μM survived at 37%, 33% and 24% respectively. The nutlin-3 treated cybrids at concentrations of 3μM and 5μM survived at 45% and 43% respectively. LHON cybrids treated with a combination of 20μM mdivi-1 + 5μM nutlin-3 survived at 25%. After 2 days of incubation with glucose-free medium, the M21 uveal melanoma cell line survival rate was 53%. The mdivi-1 treated M21 at concentrations of 5μM, 10μM and 20μM survived at 51%, 51% and 38% respectively. The ARPE-19 cell line after 2 days of incubation with glucose-free medium was 79%. The mdivi-1 treated ARPE-19 at concentrations of 5μM, 10μM and 20μM survived at 83%, 79% and 69% respectively.

Conclusion: Our study shows that mdivi-1 demonstrates dose-dependent cytological toxicity on LHON cybrids and ARPE cell lines and offers preliminary evidence for anti-tumor effects in M21 uveal melanoma cell line. Nutlin-3 demonstrates mild dose-dependent protective effects for LHON cybrids. Further studies are needed to evaluate the efficacy of nutlin-3 as a neuroprotective agent and mdivi-1 as a chemotherapeutic agent.

Exfoliation Syndrome, Intraocular Pressure and Disc Hemorrhage

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Purpose: To assess the relationship of unilateral disc hemorrhage (DH) and ocular parameters in subjects with bilateral exfoliation syndrome (XFS).

Methods: The medical records and disc photographs of all patients seen in a glaucoma referral practice between January 2009 and October 2009 were reviewed by two glaucoma specialists. Age, ethnicity, presence or absence of XFS, CCT, visual field MD, intraocular pressure (IOP), the location of the DH, and number of clock hours of beta-zone parapapillary atrophy (β PPA) were recorded.

Results: We identified 40 subjects with unilateral DH and bilateral XFS. Mean age was 75.4±8.9 yrs, 27 (66%) were female, and 39 (98%) were of European descent. The majority of DH (25 eyes, 63%) occurred inferotemporally. There was no significant difference in spherical equivalent refractive error (-0.77±2.40 vs. -0.97±2.59, p=0.4 diopters), visual field mean deviation (-8.84±8.9 vs. -8.48±7.5 dB, p=0.6), or CCT (535.2±36.9 and 536.4±40.2 µm, p=0.7) in eyes with or without DH. Mean IOP prior to DH (17.2±3.7 vs. 15.9±3.7, p=0.004) and IOP at the time of DH detection (17.16±4.25 vs.15.08±5.08, p=0.001) were higher in the DH eyes. DH eyes also had a significantly greater amount of β PPA than fellow eyes (5.1±3.1 vs. 3.5±2.6, p,0.001). There was a 45% (p=0.8) concordance between the eye with DH and the eye with the worse visual field MD, a 55% (p=0.9) concordance between the location of the DH with the worse visual field hemifield, a 43% (p=0.6) concordance between the eye with DH and the eye with worse XFS, and a 65% (p=0.07) concordance between the eye with DH and the larger disc size.

Conclusions: The development of DH in XFS patients is strongly associated with elevated IOP and size of β zone PPA. Other ocular covariates did not reach statistical significance to explain DH laterality in patients with a systemic disease known to increase the risk of glaucoma onset and progression. These findings may suggest more aggressive IOP lowering if DH is detected in XFS.

Supported in part by Lionel Harwood Research Fund of the New York Glaucoma Research Institute, New York, NY.

Title: Late capsulorhexis with small gauge high speed vitrectomy: A new technique for optic capture of dislocated IOLs

Author: Richard J. Mackool Jr., Richard J Mackool Sr.

Purpose: Late capsular fixation of dislocated IOL's

Methods: Ten patients (10 eyes) with dislocated posterior chamber IOL's and irregular posterior capsular openings underwent pars plana vitrectomy with a high speed (2500 cuts/minute), 23 gauge vitrectomy system. The posterior capsular openings were enlarged to form a continuous capsulorhexis and the IOL optic was then captured through the opening.

Results: IOL position has remained stable in all patients for up to 2 years, with no recurrent or induced episodes of IOL decentration/dislocation, uveitis, glaucoma or hyphema.

Conclusions: High speed pars plana vitrectomy can be used to create a capsulorhexis that allows capsular fixation of the optic of subluxated posterior chamber lenses. This technique eliminated the need for suture fixation of the IOL or IOL exchange in these patients with sufficient posterior capsule.

Lysyl Oxidase-like 1 Polymorphisms in Adult Children of Patients with Exfoliation Syndrome.

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Purpose:
Single nucleotide polymorphisms (SNPs) in the *LOXL1* gene have been implicated as the principal genetic risk factor for exfoliation syndrome. We investigated and compared the *LOXL1* polymorphisms in adult children of patients diagnosed with exfoliation syndrome.

Methods:
We recruited 30 adult children (12M, 28F) of 21 patients (4M, 17F) diagnosed with exfoliation syndrome/glaucoma. *LOXL1* gene polymorphisms (R141L, G153D, and Intron-1) were genotyped in all 51 subjects by direct sequencing. Association studies were carried out with kappa inter-rate agreement test.

Results:

Parent-child genotypic comparisons of R141L(.766, κ=.40) and G153D (.733, κ=.45) were significant for strong hereditary correlations and Intron-1(.387 κ=.04) was not. The allelic frequencies for R141L were .667 for both parents and children. The allelic frequencies for G153D were .667 and .850 for parents and children respectively. In view of this observation, clinically significant correlations were established in both R141L and G153D between parent and offspring. *LOXL1* genotyping can be used to detect the presence of *LOXL1* SNPs as a significant risk factor for glaucoma.

Drusen Characteristics Revealed by Spectral Domain OCT and Their Corresponding Fundus Autofluorescence Appearance in Dry AMD. Drusen.

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Abstract

Purpose: To analyze the relationship between drusen morphology revealed by Spectral domain optical coherence tomography (SD-OCT) and corresponding fundus autofluorescence features (FAF) of the same drusen using the Heidelberg Retina Angiograph 2 (HRA2), in dry AMD patients.

Methods: Dry AMD patients were imaged with SD-OCT and HRA2 on the same day. SD-OCT B-scans were then precisely overlaid onto the HRA2 images and the SD-OCT morphologic characteristics of the drusen were correlated with the corresponding FAF appearance. The morphologic features of the drusen which were analyzed included: size, status of IS-OS junctional layer above the drusen, shape of the drusen, internal reflectivity, homogeneity, and presence of overlaying hyperreflective foci. The fundus autofluorescence characteristics of each druse were rated as hyperautofluorescent, hypoautofluorescent or normal autofluorescent. Spearman's correlation coefficient was used to analyze the correlation between the two primary outcomes: SD-OCT morphology of the drusen and their autofluorescent appearance.

Results: 431 drusen in 32 eyes of 16 dry AMD patients were evaluated. Of the seven morphologic characteristics assessed by SD-OCT, only drusen size and the status of IS-OS layer above the drusen appeared to be strongly correlated with the autofluorescent appearance ($r=0.78$; $p<0.001$ and $r=0.58$; $p<0.001$, respectively). The strength of correlation with other features appeared less robust: homogeneity ($r=0.38$; $p=0.001$), shape ($r=0.29$; $p=0.004$), reflectivity ($r=0.28$; $p=0.004$), presence of overlaying foci ($r=0.25$; $p=0.12$).

Conclusions: The findings of this study suggest that autofluorescent changes most strongly correlate to drusen size and disruption of the IS/OS layer. This suggests that autofluorescent appearance may be useful as an additional functional-morphologic feature by which drusen and their impact upon overlying photoreceptors may be judged.

Rates of Visual Field Progression in Pigmentary Glaucoma and Primary Open Angle Glaucoma in Younger Patients.

Author Block *A. Vaccaro[1,2], E. Kim[1], C.G.V. de Moraes[1,2], C.C. Teng[1,3], C. Tello[1,3], R. Ritch[1,3], J.M. Liebmann[1,2].* [1]Ophthalmology, Einhorn Clinical Research Center, NY Eye and Ear Infirmary, New York, NY; [2]NYU School of Medicine, New York, NY; [3]Department of Ophthalmology, New York Medical College, Valhalla, NY.

Abstract:
Purpose: To compare the rates of VF progression in treated patients with pigmentary glaucoma (PG) and primary open angle glaucoma in younger patients (YPOAG).

Methods: The charts of all patients seen in a glaucoma referral practice between 1999 and 2009 were reviewed. Only treated eyes with ≥8 SITA Standard 24-2 VF tests with a diagnosis of PG or YPOAG were included. Age at initial diagnosis, sex, refractive error, central corneal thickness (CCT) and IOP were recorded. Eyes with underlying conditions known to affect the VF were excluded. Automated pointwise linear regression analysis determined global and localized rates (dB/yr) of change. A VF series was considered progressing by two criteria: A) sensitive criterion: when at least one point showed a threshold sensitivity decline at a rate of ≥1.0 dB/yr with p<0.01; B) specific criterion: two adjacent points in the same hemifield using the above (A) criteria.

Results: 59 YPOAG and 24 PG eyes were enrolled. YPOAG patients were younger (35.7±9.2 vs 47.5±12.0, p<0.01) and more often female (58% vs 38%, p=0.15, but refractive error (-3.6±3.4 vs -4.2±4.0 D, p=0.49), number of VF tests (10.5±3.0 vs 11.3±3.1, p=0.27), f/u time (105±47 vs 117±56 months, p=0.3), mean CCT (549.4±39.8 vs 530.5.±41.6 µm, p=0.06), mean IOP (15.4±3.5 vs 14.5±3.2 mmHg, p=0.3), and peak IOP (mean 20.3±4.8 vs 18.9±4.8 mmHg, p=0.23) were similar. In the univariate analysis, PG eyes showed faster global rates of VF change (mean -0.40±0.4 vs -0.20±0.6 dB/yr, p=0.02) and similar localized rates (mean, -2.2±0.7 dB/yr vs -2.0±0.7 dB/yr, p=0.45) compared to YPOAG eyes (Mann-Whitney rank test), but the difference in global rates became non-significant after adjusting for age and CCT (p=0.5, ANCOVA). The numbers of eyes reaching a progression endpoint using both the sensitive (PG, 11/24 vs YPOAG, 18/59, p=0.21) and specific (PG, 7/24 vs YPOAG, 12/59 p=0.39) criteria were statistically similar between groups.

Conclusions: PG and YPOAG share similar epidemiological features (age of onset, myopia) despite different pathogeneses. Yet when treated, both diseases tend to behave similarly regarding rates of VF progression.

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A comparison of the *in-vitro* susceptibility profile of Ceftobiprole against Methicillin Resistant *Staphylococcus aureus* (MRSA) ocular isolates.

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Purpose: To study the in-vitro susceptibility profiles of ceftobiprole, a novel 5th generation cephalosporin against ocular isolates of Methicillin Resistant *Staph aureus* (MRSA).

Methods: 15 MRSA, 3 Methicillin Sensitive *Staph aureus* (MSSA), 3 *Staph epidermidis*, 1 *Strep viridans* group, and 1 each of *Serratia marcescens, Haemophilus influenzae*, and *Pseudomonas aeruginosa* isolates from cases of corneal ulcers were tested for *in vitro* susceptibility against ceftobiprole, moxifloxacin, gatifloxacin, gentamicin, and vancomycin using a Kirby Bauer method.

Results: Ceftobiprole was active against all 15 MRSA strains tested with zones of inhibition ranging from (18 to 38 mm). Moxifloxacin and Gatifloxacin had 8/15 resistant and 10/15 resistant MRSA strains respectively. Gentamicin had 3/15 resistant MRSA organisms. All 15 MRSA strains were sensitive to vancomycin. In addition ceftobiprole was active against all the other isolates.

Conclusions: Ceftobiprole is the first of a new class of broad-spectrum anti-MSRA cephalosporins with activity against methicillin-resistant *Staphylococcus aureus* and gram negative organisms. With increasing concern of resistance among MRSA ocular isolates to currently available antimicrobials ceftobiprole may be a promising new therapeutic alternative.

In-Vivo Microstructural Anatomy of Beta-Zone Parapapillary Atrophy in Glaucoma

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Purpose: To assess the microstructural anatomy of clinical beta-zone parapapillary atrophy (ßPPA) using Fourier-domain optical coherence tomography (FD-OCT).
Methods: Color photographs and horizontal cross-sectional FD-OCT images of the optic disc and parapapillary retina were obtained from 24 eyes (24 glaucoma patients or suspects) with ßPPA. The distances between the temporal disc margin and parapapillary landmarks (clinical ßPPA margin and the edges of retinal pigment epithelium [RPE], Bruch's membrane [BM], and photoreceptor inner/outer segment [IS/OS] junction) were measured in 5 equally-spaced horizontal meridians (total 120 meridians).
Results: Mean age was 56±13 (SD) years. Mean distances from the temporal disc margin to the temporal ßPPA margin and the edges of RPE, BM, and IS/OS junction in the 5 meridians were 388±173, 371±174, 214±204, and 502±167 µm, respectively. The RPE edge corresponded to the ßPPA margin in 78/120 (65%) meridians and ended within the ßPPA in 42/120 (35%) meridians. The BM edge corresponded to the RPE edge in 13/120 meridians (11%) and was closer to the disc in 107/120 meridians (89%). The disc margin corresponded to the BM edge in 20/120 meridians (17%) and to the edge of the border tissue of Elschnig in 100/120 meridians (83%). The IS/OS junction edge was further from the disc than the temporal ßPPA margin in all 24 eyes.
Conclusion: The ßPPA was not completely denuded of RPE and there was a crescent-shaped area of photoreceptor degeneration or atrophy peripheral to ßPPA. The termination of the border tissue of Elschnig constituted the temporal disc margin in most eyes with conspicuous ßPPA.

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Microperimetry and Spectral Domain-Optical Coherence Tomography in Patients with Retinal Vein Occlusion

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Purpose: The aim of the study was to investigate the correlation between the retinal sensitivity tested by Microperimetry (MP) and structural abnormalities of the outer retina, assessed by Spectral Domain Optical Coherence Tomography (SD-OCT) in patients with retinal vein occlusion.

Methods: Thirteen patients with retinal vein occlusion were included in the study. Six patients had a branch vein occlusion and 7 had a central retinal vein occlusion. All patients underwent MP and SD-OCT imaging. Microperimetry results were superimposed on retinal topography maps (SD-OCT). Point-to-point analysis between microperimetric retinal sensitivity and underlying integrity of Inner segment-Outer segment (IS-OS) junctional layer was performed. Nine patients had a fluorescein angiogram (FA) and these findings were correlated with the MP and SD-OCT results.

Results: Decreased mean retinal sensitivity weakly correlated with the disruption of the IS-OS layer both in branch and central retinal vein occlusion (correlation coefficient (r) – 0.2, weak inverse correlation). Ischemia on FA correlated positively with decreased retinal sensitivity but had no significant relation with the integrity of the IS-OS junction.

Conclusions: In patients with retinal vein occlusion, retinal sensitivity and ischemia do not correlate with the integrity of the underlying IS-OS junctional layer. As retinal vein occlusion is a disease of the inner retina, structural disruption of the outer retinal layers may not be seen as observed in this study. A larger study to evaluate the functional and structural changes in the retinal layers in central and branch retinal vein occlusion is warranted.

Outcomes of Large White-to-white Corneal Transplants

Author: Glenn W Thompson, MD, David C Rittrband, MD, John A Seedor, MD, Ryan P Conley, DO

Purpose:
Classical teaching states that large white-to-white grafts are highly prone to rejection and failure. This study looks at outcomes of all large grafts from a single surgeon.

Methods:
Retrospective chart review of all patients undergoing penetrating keratoplasty by a single surgeon since 2004 that were 10.0 mm or larger. Clarity of graft at most recent follow-up was evaluated. Additionally, uncorrected and best-corrected visual acuity was evaluated, as well as the need for additional procedures. Indication for large graft was also identified.

Results:
Sixteen patients satisfied the inclusion criteria. Most recent follow-up visits ranged from 3 to 39 months. Nine patients (56%) had clear grafts at most recent follow-up.

Six patients (38%) had 20/30 best corrected visual acuity (BCVA) or better. Three patient's (19%) BCVA was 20/50 - 20/60. The remaining seven patients (44%) had 20/400 or worse BCVA. Of those better than 20/400, the average manifest cylinder was 2.47 diopters.

Ten patients (63%) required additional surgery varying from PRK to cataract extraction to repeat keratoplasty.

Conclusion:
Results of large white-to-white corneal transplants are mixed. Approximately half of patients had excellent visual acuity after completion of therapy; however, the other half had very poor outcomes. The poor outcomes have to be evaluated in the context of the severity of the disease requiring the emergent transplant.

A prospective evaluation of the relationship between multifocal visual evoked potentials latency values and visual field loss progression on achromatic automated perimetry. A preliminary analysis.

1. Grippo TM, Hood DC, Kanadani FN, Ezon I, Greenstein VC, Liebmann JM, Ritch R. A comparison between multifocal and conventional VEP latency changes secondary to glaucomatous damage. Invest Ophthalmol Vis Sci 2006; 47:5331-5336

PURPOSE: To evaluate the relationship between latencies of the multifocal visual evoked potentials (mfVEPs) and progression of visual field loss over time. We report a subgroup of these patients that were prospectively followed over time with the HVF and describe the relationship between baseline latency values and visual field loss progression over time.

METHODS: Seventeen patients (34 eyes) with glaucoma and 4 patients (8 eyes) with suspected glaucoma were followed over a mean period of 36.6 months (range 21.4 to 52.7) with the static automated perimetry (SAP). Chosen from a group of 93 previously studied patients with mfVEP latency analysis.(1) Three to 8 (mean 4.3) visual fields were measured with SAP (24-2 program, Zeiss). Patients with other ocular conditions known to affect the visual fields or with fewer than 3 fields were excluded. Point-wise linear regression analysis (Progressor®) was used to calculate global rates of progression. A test point was identified as progressing if the slope of sensitivity over time exceeded 1 dB loss/year with $p<0.01$. The mfVEP stimulus was a scaled dartboard with 60 sectors; each sector was a pattern-reversing checkerboard. The average latency of the initial mfVEP was determined.(1)

RESULTS: Seventeen patients showed visual field loss progression in either eye while 4 did not. For 64.7 % (11/17) of the patients with visual field loss progression, the eye with the more delayed latency value showed a higher rate of progression. For 64.7 % (11/17 patients); the eye with the more negative baseline mean deviation on the HVF showed a higher global rate of progression. No significant correlation was found between monocular average latencies and rate of global progression ($p>0.05$).

CONCLUSIONS:
The latency of the monocular mfVEP was not helpful in identifying eyes at risk of glaucomatous progression

Descemet's Stripping Automated Endothelial Keratoplasty: Clinical Outcomes and Post-operative Visual Improvement

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Purpose: To report clinical experience in best corrected visual outcomes after Descemet's stripping automated endothelial keratoplasty (DSAEK).

Methods: A retrospective review of the medical records of 125 consecutive eyes that underwent DSAEK was commenced. Data collected included patient demographics, indication for surgery, prior surgeries, presence or absence of co-morbid diseases, pre- and postoperative refraction, and pre- and postoperative visual acuity. Visual acuity was recorded in Snellen and logMAR forms.

Results: Patients ranged in age from 32-93 with a mean age of 71.05. The majority of cases were performed for Fuch's endothelial dystrophy (51) or pseudophakic bullous keratopathy (49). Other indications included: aphakic bullous keratopathy, previously failed PK or DSAEK, unspecified corneal edema, corneal edema secondary to a glaucoma implant and Descemet's rupture. Preoperative vision (logMAR) was 1.152±0.580. The average month of BCVA was 5.735 with a mean BCVA of 0.562±0.449. In a statistical analysis with a paired sample t test, the mean difference was 0.5917 (95%CI = 0.4840 to 0.6995) with a p-value < 0.0001, indicating a statistically significant improvement in vision after DSAEK. At POM2, we found that patients gained an average of 2.056±3.749 Snellen lines or 0.322±0.689 logMAR lines. At the month of best-corrected visual acuity, we found that Snellen lines gained were 4.040±3.694 and logMAR lines gained were 0.581±0.644.

Conclusion: Our study documents a statistically significant improvement in visual acuity in patients who underwent DSAEK. Further analysis is currently underway to determine factors correlated with improvement in post-operative visual acuity.

VISUAL OUTCOMES:			
	All Patients	**Without posterior pole pathology**	**With posterior pole pathology (retinal disease, optic nerve disease)**
Pre-op Snellen Vision			
Mean	20/150-20/200	20/100-20/150	20/200
Range	20/40-HM	20/40-HM	20/40-HM
Pre-op LogMAR			
Mean	1.152	1.025	1.274
Range	0.3-2.2	0.3-2.2	0.3-2.2
StDev	0.580	0.568	0.578
POM 2 Snellen Vision			
Mean	20/80	20/70	20/100
Range	20/20-HM	20/30-HM	20/20-HM
POM2LogMAR			
Mean	0.811	0.676	0.944
Range	0-2.2	0.18-2.2	0-2.2
St Dev	0.549	0.526	0.543
Number of lines gained @ POM2 (Snellen VA)			
Mean	2.056	2.435	1.677
St Dev	3.749	4.112	3.338
Range	-1-9	-9-9	-3-9
Number of lines gained @ POM2 (LogMAR)			
Mean	0.322	0.316	0.330
St Dev	0.689	0.722	0.659
Range	-1.9-1.8	-1.9-1.8	-1.0-1.6
Month of Best VA (month#)			
Mean	5.735	4.818	6.637
Range	1-21	1-16	1.5-21
Best Month Snellen Vision			
Mean	20/60-20/70	20/50-20/60	20/70
Range	20/20-HM	20/20-HM	20/20-CF
Best Month LogMar			

Mean	0.562	0.480	0.639
Range	0-2.2	0-2.2	0-1.9
St Dev	0.449	0.464	0.423
Number of lines gained @ Best Month (Snellen VA)			
Mean	4.040	4.355	3.726
St Dev	3.694	4.110	3.230
Range	-8-13	-8-13	-3-10
Number of lines gained @ Best Month (logMAR)			
Mean	0.581	0.527	0.634
St Dev	0.644	0.705	3.230
Range	-1.9-1.9	-1.9-1.9	-3-10

Role of Early Patching on Visual Outcomes in Pediatric Ruptured Globes

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Purpose: To evaluate visual outcomes after early patching in pediatric patients in both the amblyogenic and non-amblyogenic ages after a ruptured globe repair.

Methods: Retrospective chart review. We reviewed the charts of patients under the age of 15 that presented between the years 1990-2000 with severe globe trauma.

Results: Thirty-three charts were analyzed. Mean patient age was 5.5 ± 3.5 years. Average length of follow up was 19.7 months. Of the 33 cases, 24 were in the amblyogenic period (≤ 7 years of age in our study) and 9 were ≥8 years of age. Of the 24 eyes in the amblyogenic period, 82% of patients that received early patching achieved Snellen VA of 20/20-20/60 compared to 43% of those that were not patched. 57% of those that were not patched had VA of 20/200 or less. Of the 9 patients ≥ 8 years, 8 had a visual acuity (VA) between 20/20-20/60 while one eye required enucleation.

Conclusion: In the amblyogenic period, early patching of the non-affected eye after a ruptured globe injury can improve visual outcomes when compared to children who were not patched ($P<0.05$).

Table 1: Final Visual Outcomes of Affected Eye after Pediatric Ruptured Globes

Visual acuity in patients ≤7 years of age		Visual acuity in patients > 7 years of age	
Final Va	N	Final Va	N
20/20-20/60	15	20/20-20/60	8
20/70-20/200	1	20/70-20/200	0
≤20/200	6	≤20/200	0
Enucleation	1	Enucleation	1

Table 2: Final Va of Ruptured Globes in the Amblyogenic Period Classified by Use of Patching

	20/20-20/60	20/70-20/200	≤20/200	Enucleation
No patching	3	0	4	
Patching	9	1	1	1
Unknown	4	0	1	

Spectral-domain Optical Coherence Tomography in Resolved Uveitic Cystoid Macular Edema: Features Associated With Permanent Vision Loss.

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Purpose: Cystoid macular edema (CME) is a common complication of uveitis, resulting in significant vision loss. Vision typically recovers with the resolution of CME. However, a subset of patients experience permanent decrease of central vision despite resolution of CME and absence of pathology in other ocular structures. Using spectral-domain optical coherence tomography (OCT) imaging technology, we intended to identify retinal features that may be associated with the vision loss.
Methods: This is a case-control retrospective comparative series. We reviewed medical records of patients with uveitic CME and identified two groups of patients: 1) Study group consisted of patients who failed to regain pre-CME BCVA following resolution of CME, and the vision loss could not be accounted for by other ocular pathologies; 2) Control group consisted of patients who regained their pre-CME BCVA following resolution of CME. Once all patients were identified, we reviewed the OCT scans obtained from the RTVue (Optovue Inc, Fremont, CA) of each patient. Patients were excluded if macular cystic space, epiretinal membrane, or distorted macular anatomy was noted. Two variables were then assessed in the qualified subjects: 1) *Photoreceptor inner/outer segment (IS/OS) junction*, hypothesized to be represented by the highly reflective band immediately inner to the retinal pigment epithelium; is graded as intact, partially intact, or absent by two observers who are masked to the patient grouping. 2) *Foveal thickness*, as calculated by the software program included with the RTVue. Pre- and post-CME BCVA were also recorded.
Results: There were 7 subjects (8 eyes) in Study and 8 subjects (8 eyes) in Control. The mean pre-CME BCVA were 20/25 in Study and 20/20 in Control. The mean post-CME BCVA were 20/75 in Study and 20/20 in Control. The mean foveal thickness were 170.3μm in Study and 232.6μm in Control, with a difference of 62.4μm ($p<0.01$). IS/OS junction was graded as intact in 2, partially intact in 4, and absent in 2 of the Study eyes, while it was graded as intact in all 8 Control eyes. All Study eyes had a foveal thickness of less than 180μm, a non-intact IS/OS junction, or a combination of both.
Conclusions: This preliminary study suggests that reduced foveal thickness and disrupted photoreceptor IS/OS junction as seen on spectral-domain OCT may be associated with permanent vision loss following CME resolution in uveitic patients.

Title: Comparison of Anterior Segment Time and Fourier Domain Optical Coherence Tomography (AS OCT) in the Evaluation of Patients with Narrow Angles

Author: V. Trubnik, S Kiumehr, A. R Castillejos, R Ritch.

Purpose: To assess the reproducibility of Time (TD) and Fourier domain (FD) AS OCT and their correlation with gonioscopy grading in the evaluation of eyes with narrow angles.

Methods: Twenty four eyes of fourteen patients (age 61±9 years, 71% women) with a Schaffer's classification grading of ≤2, were imaged on the horizontal quadrants under standardized dark conditions using AS TD and FD OCT. The angle opening distance (AOD 750µ), trabecular-iris space area (TISA 750µ) and angle width were compared between the two devices using a Wilcoxon's test. Afterwards, the agreement between the angle values of both devices and the gonioscopy grading obtained from the patients' existing charts and done by a masked observer, were assessed using a Kappa (k) test.

Results: No statistically significant differences was found in the parameters assessed with the two devices, while interclass correlation coefficients confirmed a strong correlation (ICC=0.66) between them. However, k values showed a low agreement when either TD (k=.02) or FD (k=.03) were compared to gonioscopy grading.

Conclusions: Precise and reproducible measurements can be obtained using either TD or FD OCT in the evaluation of eyes with narrow angles; however they may differ from those values obtained with clinical gonisocopy grading.