

10:00 AM 2 hours
P-11

Room 228
Papers: Glaucoma & Optic Nerve
Moderator: Michael Sullivan-Mee, OD, FAAO, Diplomate,
Glaucoma

10:00 AM. GLAUCOMA MEDICATION ADHERENCE IN VETERANS AND INFLUENCE OF CO-EXISTING CHRONIC DISEASE (120956)

Baharak Asefzadeh, OD, MS, FAAO, Anthony A. Cavallerano, OD, FAAO, Doug Rett, Boston VA Healthcare System

RESULTS: Mean length of time on glaucoma drops was 3.5 +/- 1.4 years (range: 1.1 to 5.9 years). Subjects were 95% male and 86% white. Mean age of 73 +/- 9 years. Mean number of glaucoma medications was 2 +/- 1, with mean frequency of medications of 2 +/- 1. Mean number of concomitant chronic diseases was 11 +/- 5, while mean number of concomitant medications was 8 +/- 6. There were 44 people with PTSD/anxiety (27%), 46 with arthritis (28%), 14 with dementia (9%), and 56 with hearing loss (35%). Mean MPR for all subjects 0.70 +/- 0.22, while mean FUR was 0.85 +/- 0.20. Although MPR and FUR were higher in those with PTSD/anxiety, it was not statistically significant ($p = .18$, $p = .21$, respectively). Subjects with hearing loss had borderline higher MPR and significantly higher FUR than those without ($p = .05$, $p = .04$, respectively). FUR decreased as number of years with glaucoma increased ($p = .0003$), but increased with age ($p = .005$). MPR increased with number of concomitant chronic diseases ($p = .04$). There were no significant differences in MPR or FUR in those with dementia or arthritis vs those without.

PURPOSE: Glaucoma is a leading cause of blindness in people over age 40 in the U.S. In veterans, glaucoma medication adherence may be especially challenging since many patients are elderly or have multiple co-existing chronic conditions. The objectives of this study are to characterize adherence with glaucoma medication use and with follow-up live eye examinations at VA Boston, to define any barriers to adherence, and to examine the influence of co-existing chronic systemic conditions.

METHODS: This is a retrospective study involving 162 subjects on topical glaucoma medical treatment. Medication possession ratio (MPR) was calculated from pharmacy data. Follow-up ratio (FUR) for live eye exams was calculated from electronic medical records.

CONCLUSIONS: In assessing glaucoma medication adherence and adherence with follow-up live care, it is important to consider co-existing chronic disease, especially in older patients.

10:15 AM. LONGITUDINAL IMPACT OF DIABETES MELLITUS AND PROSTAGLANDIN ANALOGUE USE ON CENTRAL CORNEAL THICKNESS (120075)

Lauren Bobick, OD, Michael Sullivan-Mee, OD, FAAO, Denise Pensyl, OD, MS, FAAO, Kathy Halverson, OD, FAAO, Albuquerque VA Medical Center

RESULTS: In 221 eyes of 114 subjects, mean CCT decreased from 551.4um (?35.3) to 542.0um (?36.1) over a period of 40.4 ?4.7 months ($p < 0.001$). In multivariate regression

analysis, PGA use and higher baseline CCT were independently associated with a higher rate of CCT thinning while DM was independently associated with a reduced rate of thinning. Mean CCT reduction in eyes using (n=117) and not using PGA's (n=104) was 14.7µm (?13.3) and 3.4µm (?9.9) respectively (p<0.001), with 23/117 (20%) eyes using PGA's demonstrating CCT reduction of 25µm or more. In eyes with (n=92) and without DM (n=129), CCT thinned by 5.1µm (?11.6) and 12.4µm (?13.3) respectively (p<0.001). All of these results were repeated when only one eye was used per subject.

PURPOSE: To investigate three-year changes in central corneal thickness (CCT) and factors influencing that change.

METHODS: For all subjects completing the third year of a prospective, longitudinal glaucoma research study at the Albuquerque VA Medical Center, ultrasound pachymetry measurements at study entry were compared (using paired t-tests) with pachymetry measurements taken approximately three years after entry. All CCT measurements were obtained using the same pachymeter. The following factors were studied with regression analyses to determine whether they influenced CCT change over time: baseline age, ethnicity, glaucoma diagnosis, topical prostaglandin analogue (PGA) use, baseline CCT, axial length, corneal curvature, intraocular pressure, visual field parameters, retinal nerve fiber layer thickness (RNFL), and presence of diabetes mellitus (DM).

CONCLUSIONS: While CCT thinning over a three-year period appears to be modest in non-PGA users, it is substantial in PGA users with a mean rate of over 5µm per year in non-diabetics. Additionally, the rate of CCT thinning appears to be significantly reduced in diabetic subjects, though this effect cannot fully compensate for PGA-related thinning. These findings may have considerable implications for clinical interpretation of CCT.

10:30 AM. **A NEW AUTOMATIC METHOD FOR COUNTING MICROGLIAL CELLS IN HEALTHY AND GLAUCOMATOUS WHOLE-MOUNT MICE RETINAS** (120267)

Pablo De Gracia, BSc, MSc, Consejo Superior de Investigaciones Científicas, Instituto de Óptica, Beatriz Gallego-Collado, BOptom, MSc, Instituto de Investigaciones Oftalmológicas, Ramón Castroviejo, Universidad Complutense de Madrid

RESULTS: The automatic method detected the number and position of cells in each retinal layer(inner and outer plexiform layers). The number of Iba-1(+) microglia in the treated eyes and their contralateral untreated eyes increased in comparison to control (p<0.01 in both instances). Whereas the time required counting all the samples decreased significantly from the human guided to the program based counting method (one week vs a couple of hours) no statistically differences in the number of cells measured on the samples were observed between manual and automatic counting.

PURPOSE: Glaucoma is a neurodegenerative disease that is one of the principal causes of blindness in the world. Glial cells seem to play an important role in the pathogenic mechanisms of the disease. One of the most critical problems when analyzing big sets of data is the lack of automation of the process. In this study we present an automatic method that allows assessing the number and position of the microglial cells in healthy and glaucomatous whole-mount mouse retinas.

METHODS: A unilateral model of glaucoma was induced by laser in adult albino Swiss mice. Animals were divided in two groups: control (n=6) and lasered (n= 6). After 15

days of treatment mice were sacrificed and retinal whole-mounts were immunostained with anti-Iba-1 (a specific microglial marker). Images of Iba-1(+) cells were recorded with the ApoTome device coupled to a fluorescence microscope. New algorithms of segmentation and control of distances were implemented in Matlab and used to obtain the number of microglial cells and their position. Its results were compared with those obtained by direct human observation of the samples.

CONCLUSIONS: A new, reliable and much faster algorithmic was developed under Matlab to obtain the number and position of microglial cells in healthy and glaucomatous retinas.

ADDITIONAL COMMENTS: Irvin M. Borish Ezell Fellowship and CSIC I3P Predoctoral Fellowship to PDG. Universidad Complutense de Madrid predoctoral fellowship and RETICs (Grant ISCIII RD07/0062/0000) to BIG.

10:45 AM. **TRACKING SUBCLINICAL CHANGES OF RETINAL NERVE FIBER LAYER THICKNESS WITH OPTICAL COHERENCE TOMOGRAPHY IN MULTIPLE SCLEROSIS (120349)**

Han Cheng, OD, PhD, Divya Narayanan, BS, Karlie Moyer, BS, Rosa Tang, MD, Laura J. Frishman, PhD, FAAO, University of Houston College of Optometry

RESULTS: For no-ON eyes, the amount of RNFLT loss increased as a function of follow-up time with an average rate of 2.4 $\mu\text{m}/\text{yr}$ ($p=0.001$), 10 times the reported age-related loss of 0.2 $\mu\text{m}/\text{yr}$ in normal subjects¹. Average RNFLT loss for no-ON eyes with 2 to 4 yrs (median 2.3 yrs) follow-up interval ($n=15$) was $5.7 \pm 1.0 \mu\text{m}$, compared to $1.2 \pm 0.9 \mu\text{m}$ for those with <1 yr (median 0.5 yr) follow-up time ($n=29$) ($p=0.0007$). For ON eyes, RNFLT change was not affected by follow-up time ($p=0.17$), probably due to already reduced RNFLT at baseline.

PURPOSE: To investigate changes in retinal nerve fiber layer thickness (RNFLT) over time in eyes of relapsing-remitting multiple sclerosis (RRMS) patients without acute optic neuritis (ON).

METHODS: Medical records of MS patients from University of Houston MS Eye CARE clinic were retrospectively reviewed. 59 RRMS patients (mean age 45.0 ± 11.5 yrs) with RNFLT values from two different visits using Stratus-3 optical coherence tomography (OCT) were analyzed. Eyes with ON attacks within 6 months prior to the first visit or between the two visits were excluded. Time interval between the two visits ranged from 3 months to about 4 yrs (median 1 yr). 61 eyes had no history of ON (no-ON eyes). 30 eyes had a history of ON (ON eyes) and time from last ON attack to 1st visit ranged from 0.5 to 40 yrs (median 3 yrs). Generalized Estimating Equation (GEE) model which adjusted for intra-subject inter-eye correlations was used to examine whether change in RNFLT depended on age and follow-up time.

CONCLUSIONS: In RRMS patients, OCT demonstrated progressive subclinical loss of retinal ganglion cell axons over time in eyes without a history of ON. 1. Budenz D et al. Ophthalmology 2007;114:1046-1052.

ADDITIONAL COMMENTS: NIH P30 EY07551, T35 007088, National Multiple Sclerosis Society pilot grant, University of Houston GEAR grant, and Fight for Sight summer research support.

11:00 AM. **OPTICAL COHERENCE TOMOGRAPHY FINDINGS IN HOMONYMOUS HEMIANOPSIA (120559)**

Judy W. H. Tong, OD, FAAO, Mark H. Sawamura, OD, FAAO, Abby Brotherton, Southern California College of Optometry

BACKGROUND: Homonymous hemianopsia can be the result of insult to any portion of the retrochiasmal visual pathway. Use of specialized neuroimaging techniques may be able to identify the point of injury, but not all patients have access to these tests.

Conversely, optical coherence tomography (OCT) has been utilized in diagnosis of neuro-ophthalmic disorders and is more readily available and cost effective. Patterns of OCT nerve fiber layer thickness can help determine whether the injury lies in the pre or post-geniculate visual pathway.

CASE REPORT(S): We present the cases of 3 patients with complete homonymous hemianopsia due to traumatic brain injury. The patients were a 26 yr old male with a history of closed head injury 5 years ago, a 24 yr old female who sustained closed head injury as a result of being struck by a car 4 years ago, and a 26 yr old male who was involved in a motor vehicle accident 14 years previous. The last patient was assumed to have occipital lobe damage. All patients had a battery of tests including threshold fields, and posterior segment imaging. In all 3 instances, OCT RNFL thickness measurements showed superior and inferior arcuate bundle thinning in the eye with nasal field loss, and nasal radial and papillomacular bundle thinning in the eye with temporal field loss, localizing the point of injury to the optic tract. This finding constitutes complete asymmetry between the two eyes and appears as “inversion” of the TSNIT curves in relation to one another. In contrast, concurrent HRT and GDx imaging did not fair as well in identifying the structural changes.

CONCLUSIONS: OCT is valuable in evaluating homonymous hemianopsia patients prior to the use of neuroimaging. Optic tract pathology produces “inversion” of the TSNIT curves between the two eyes. Whereas, hemianopsia caused by occipital lobe involvement, more commonly seen in older patients with cardiovascular disease, would have normal OCT findings. Because of its ability to identify thinning 360 degrees around the optic disc, OCT is superior to GDx in evaluating patients with homonymous hemianopsia.

11:15 AM. **A PROSPECTIVE STUDY OF OCULAR CHARACTERISTICS OF PATIENTS WITH OPTIC NERVE HYPOPLASIA (120568)**

Yi Pang, PhD, OD, FAAO, Kelly A. Frantz, OD, FAAO, FCOVD, Illinois College of Optometry

RESULTS: There were 19 female and 9 male patients with an age range of 4 to 60 years (mean= 21.74±16.96). Nineteen subjects were African American, 4 Caucasian, 2 Asian, and 3 Hispanic. Eleven of 28 subjects had bilateral ONH and 17 had unilateral ONH (15 with ONH in the left eye and 2 in the right eye), which resulted in 39 eyes with ONH. VA varied from 20/20 to no light perception in the 39 ONH eyes. Seven subjects had strabismus and 2 had nystagmus. Spherical equivalent RE in ONH eyes was -1.32±4.44 diopters versus -0.06±3.33 diopters in the sound eyes, without statistically significant difference. The average DM: DD ratio was 4.05±1.22 in ONH eyes and 2.91±0.32 in

sound eyes, which was statistically significant ($p=0.0006$).

PURPOSE: Optic nerve hypoplasia (ONH) is a developmental disorder that is characterized by a small optic nerve. The purpose of this study was to evaluate the ocular characteristics in patients with ONH.

METHODS: A total of 28 patients with ONH were recruited. All patients underwent a complete eye examination, including visual acuity (VA), cover test, refraction, slit lamp and fundus examination. Refractive error (RE) of the ONH eyes was compared to that of the sound eyes. The ratio of the distance between the center of the optic nerve head and the center of the macula to the mean optic nerve head diameter (DM: DD) was calculated based on fundus photos and the ratios of ONH eyes were compared to those of the sound eyes.

CONCLUSIONS: To the best of our knowledge, this prospective study reports on ocular characteristics for the largest number of ONH patients to date. No significant difference in RE was detected comparing the ONH eyes to the sound eyes, though there was a trend toward increased myopia.

11:30 AM. **VEP AND OBJECTIVE PUPILLARY TESTING CORRELATES** (120187)

Daniel Epshtein, Sanjeev Nath, Elizabeth Yusupov, Jerome Sherman, OD, FAAO, State University of New York (SUNY) College of Optometry

BACKGROUND: Measurement of Visually Evoked Potentials (VEPs) is an objective method of testing the visual pathway from the retina to the occipital lobe. Evaluation of VEP amplitudes and latencies are useful in the diagnosis of myriad optic neuropathies. In addition to visual pathway assessment, testing of pupils for a Relative Afferent Pupillary Defect (RAPD) is a benchmark of neuro-optometry testing. Though clinical testing of pupils for RAPDs is extremely important, the swinging flashlight test owes much of its usefulness to the clinician's expertise which varies widely. The RAPDx (Konan Medical Inc.) is an objective test of pupillary function which is based on the swinging flashlight test but all measurements are automated and 15,000 data points are acquired in about 1 minute.

CASE REPORT(S): 15 patients (with optic neuropathy or suspected of optic neuropathy based on traditional clinical diagnosis) were evaluated with both the Diopsys VEP and RAPDx. Patients were tested under standard Diopsys NOVA-DN conditions which include: 32 by 32 sized checks reversed 2 times a second for 15 seconds, under both 15% and 85% contrast, and tested OD, OS. Additionally, several patients were also run under custom test conditions. Patients were also evaluated with the RAPDx system the same day. In all patients, VEPs displayed a reduction in amplitude, increase in latency, or both in at least one eye. RAPDx values were noted as abnormal when the amplitude of constriction or latency of constriction was greater than 0.3 (based on previous research conducted by Konan Medical Inc.). All patients with unilateral or asymmetric optic neuropathy were flagged as abnormal with the RAPDx. Of the 15 patients, 2 patients had a RAPD noted with the RAPDx system which was not detected clinically.

CONCLUSIONS: In this case series, unilateral or asymmetric optic neuropathy were equally identified by the RAPDx and Diopsys VEP. These findings present a correlation between VEPs and a new, quick, noninvasive, and objective method for confirming cases

of asymmetric or unilateral optic neuropathies.