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Program#/Poster#: 4028/A166

Abstract Title: Performance Evaluation on RTVue-100 Retinal Imaging in Normal and Pathological Eyes

Presentation Start/End Time: Wednesday, May 04, 2011, 8:30 AM -10:15 AM

Session Number: 413

Session Title: Posterior Imaging III (Techniques)

Location: Hall B/C

Reviewing Code: 245 imaging, posterior segment -RE

Author Block: Cheng-en Guo¹, Nalin J. Mehta², Michael Hee³, Ben Jang¹, Danny Leung¹, Michael Sinai¹. ¹Optovue Inc, Fremont, CA; ²Colorado Retina Center, Denver, CO; ³Pacific Eye Specialists, Daly City, CA.

Keywords: 412 age-related macular degeneration; 549 imaging/image analysis: clinical; 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound)

Abstract Body:

Purpose: To evaluate the performance of RTVue-100 retinal imaging in normal and pathological eyes.

Methods: The performance evaluation was conducted on the RTVue-100 MM5/EMM5 scans from three datasets: 1) DB1: 126 EMM5 scans from 42 eyes, in which 3 eyes have hard drusen, 8 eyes have soft drusen, 5 eyes have PED, 3 eyes have GA, 7 eyes have CNV, 8 eyes have CSME, 1 eye has DME and 7 eyes are normal. One EMM5 scan was chosen for each eye to be graded by a well-trained examiner who manually drew the retinal layer boundaries (manual segmentation) of ILM and RPE, in order to determine the segmentation algorithm accuracy; 2) DB2: 354 MM5 scans from 118 normal eyes, 3 scans each; 3) DB3: 144 EMM5 scans from 48 eyes from 3 different RTVue-100 machines by different operators. For each machine, 4 normal subjects and 4 patients with retinal diseases were enrolled and both eyes had 3 EMM5 scans each. The ETDRS 9-sector FRT measurements were investigated. The accuracy was computed from DB1 by comparing the automated segmentation results with the hand-drawn segmentation. The repeatability was computed for each individual dataset, DB1, DB2 and DB3. The reproducibility was computed from DB3.

Results: In DB1, the averaged accuracy (mean error \pm standard deviation) of the FRT for the 9-sector regions was 1.24 ± 3.62 μm ; and the averaged repeatability over the 9-sector regions for 7 normal eyes was 3.07 μm , for the 35 pathological eyes was 4.17 μm . In DB2, the averaged repeatability over the 9-sector regions for the 118 normal eyes was 3.65 μm . In DB3, the averaged repeatability and reproducibility over the 9-sector regions for the 24 normal eyes were 3.03 μm and 6.84 μm , and for the 24 pathological eyes were 3.97 μm and 3.97 μm respectively.

Conclusions: The performance of RTVue-100 retinal imaging was found to be excellent for both normal and pathological eyes. Segmentation accuracy was shown to be within 2 μm for normals and retina patients. Repeatability was also excellent and ranged between 3.07 μm and 4.17 μm from three large datasets. Reproducibility was also very good suggesting the RTVue can be used to monitor changes over time.

Commercial Relationships: Cheng-en Guo, Optovue, Inc (E); Nalin J. Mehta, Optovue, Inc (C, R); Michael Hee, None; Ben Jang, Optovue, Inc (E); Danny Leung, Optovue, Inc (E); Michael Sinai, Optovue, Inc (E)

Support: None

Program#/Poster#: 154/A408

Abstract Title: Simple Method Of Analysis Of Drusen Volume

Presentation Start/End Time: Sunday, May 01, 2011, 8:30 AM -10:15 AM

Session Number: 107

Session Title: Posterior Imaging I (AMD)

Location: Hall B/C

Reviewing Code: 245 imaging, posterior segment -RE

Author Block: Chiara M. Eandi, Camilla G. Alovisi, Alessandro Reineri, Federico M. Grignolo. Eye Clinic, University Torino, Torino, Italy.

Keywords: 504 drusen; 685 retina; 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound)

Abstract Body:

Purpose: To evaluate drusen volume with spectral domain OCT (SD-OCT) in patients with dry AMD.

Methods: We analyzed 30 eyes with drusen in dry AMD. Infrared (IR) and fundus autofluorescence (FAF) images (HRA, Heidelberg Engineering, Heidelberg, Germany) were recorded as well as the en-face SD-OCT scans using the drusen volume modality (RTVue, Optovue) . Visual acuity measurement with ETDRS chart and fundus examination were also performed.

Results: Drusen were visible with IR images in every patient, while FAF better revealed the presence of drusen in patients with medium or soft drusen. IR images and en-face SD-OCT scans can detect small drusen with more precision and details than FAF. The en-face SD-OCT images showed the presence of the drusen in all patients and we were able to record and measure their volume thanks to the drusen volume modality which gives more detailed informations about the progression of dry AMD than IR images and FAF .

Conclusions: The SD-OCT with the drusen volume modality is a non-invasive imaging technique that might help in the monitoring the progression of dry AMD.

CommercialRelationships: Chiara M. Eandi, None; Camilla G. Alovisi, None; Alessandro Reineri, None; Federico M. Grignolo, None

Support: None

Program#/Poster#: 3650/D757

Abstract Title: Influence Of Pupil Dilation On Retinal Nerve Fibre Layer, Optic Nerve Head And Ganglionar Cell Complex Measurements With Spectral-Domain Optical Coherence Tomography (Rtvue-100)

Presentation Start/End Time: Tuesday, May 03, 2011, 3:45 PM - 5:30 PM

Session Number: 374

Session Title: Imaging of the Healthy and Diseased Retina II

Location: Hall B/C

Reviewing Code: 323 optical coherence tomography - MOI

Author Block: Lucia Tanga¹, Gianluca Manni^{1,2}, Francesco Oddone¹, Manuele Michelessi², Manuela Ferrazza¹, Gloria Roberti², Alessandra Acquistapace², Marco Centofanti^{1,2}. 1Fondazione GB Bietti-IRCCS, Rome, Italy; 2UOSD Glaucoma, University of Rome Tor Vergata, Rome, Italy.

Keywords: 626 optic nerve; 530 ganglion cells; 549 imaging/image analysis: clinical

Abstract Body:

Purpose: To evaluate the influence of pupil dilation on Retinal Nerve Fibre Layer (RNFL), Optic Nerve Head (ONH) and on Ganglionar Cell Complex (GCC) measurements with RTVue-100

Methods: Patients with glaucoma were included in the study procedures and imaged with RTVue-100 OCT (Optovue Inc., Fremont, California, USA). All patients underwent a complete ophthalmological examination and automated perimetry (24-2 SITA standard on Humphrey Visual Field Analyzer; Carl Zeiss Meditec Inc., Dublin, CA, USA). Moreover all subjects underwent RNFL 3.45, ONH and GCC assessment with the RTVue-100 before and 30 minute after pupil dilation with one drop of tropicamide 1%. Continuous data were expressed by mean and standard deviation (SD) of the values. Paired t-test pair test was used to evaluate differences between measurements and p-values lower than 0.05 were considered statistically significant

Results: Forty-seven glaucoma patients were included in the study procedures. Mean age was 52.00 ± 13.67 years; Mean deviation was -4.15 ± 6.44 dB and spherical equivalent was 1.76 ± 3.72 diopters. There was no statistically significant difference in signal strength index (SSI) in all scan protocol that we tested. RNFL 3.45 SSI was 58.08 ± 10.25 before and 57.41 ± 9.71 after pupil dilatation; ($p=0.31$). ONH SSI was 52.26 ± 8.46 before and 50.29 ± 8.47 after pupil dilatation; ($p=0.06$). GCC-SSI was 60.16 ± 8.86 before and 59.45 ± 9.90 after pupil dilatation. RNFL overall thickness measured by RNFL 3.45 scan were 89.59 ± 14.85 μm before and 89.10 ± 15.53 μm after pupil dilatation ($p=0.23$). There were no sectorial statistical significant differences before and after dilatation in RNFL 3.45 scan protocol. Disc area was 1.80 ± 0.45 mm^2 before and 1.75 ± 0.52 mm^2 after pupil dilatation ($p=0.15$). Cup area was 2.29 ± 12.84 mm^2 before and 2.69 ± 7.80 mm^2 after pupil dilatation ($p=0.45$). Rim area was 0.75 ± 0.41 mm^2 before and 0.70 ± 0.40 mm^2 after pupil dilatation ($p=0.11$). GCC average thickness was 87.73 ± 13.22 μm before and 87.97 ± 12.62 μm after pupil dilatation ($p=0.56$). There were no statistical significant differences before and after dilatation in the other parameters in ONH or in GCC scan protocol.

Conclusions: In conclusion the results show that RTVue SD-OCT signal strength is not affected by pupil dilatation and that measurements of RNFL, ONH and GCC parameters performed before and after pupil dilatation are equivalent.

Commercial Relationships: Lucia Tanga, None; Gianluca Manni, None; Francesco Oddone, None; Manuele Michelessi, None; Manuela Ferrazza, None; Gloria Roberti, None; Alessandra Acquistapace, None; Marco Centofanti, None

Support: None

Program#/Poster#: 2182/A152

Abstract Title: Choroidal thickness measurement with Fourier Domain Optical Coherence Tomography in Normal Eyes, Myopic Eyes, and Myopic Eyes with Choroidal Neovascularization

Presentation Start/End Time: Monday, May 02, 2011, 3:45 PM - 5:30 PM

Session Number: 282

Session Title: Posterior Imaging II

Location: Hall B/C

Reviewing Code: 245 imaging, posterior segment -RE

Author Block: Gabriel J. Coscas¹, Bruno Lumbroso², Qienyuan Zhou³, Florence Coscas¹, Marco Rispoli², Joel Uzzan¹, Maria C. Savastano⁴, Cheng-en Guo³. ¹Department of Ophthalmology, Creteil Eye Clinic Univ Hospital, Creteil, France; ²Centro Oftalmologico Mediterraneo, Rome, Italy; ³Optovue Inc., Fremont, CA; ⁴Department Ophthalmology, Catholic University, Sacro Cuore, Rome, Italy.

Keywords: 452 choroid; 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound); 604 myopia

Abstract Body:

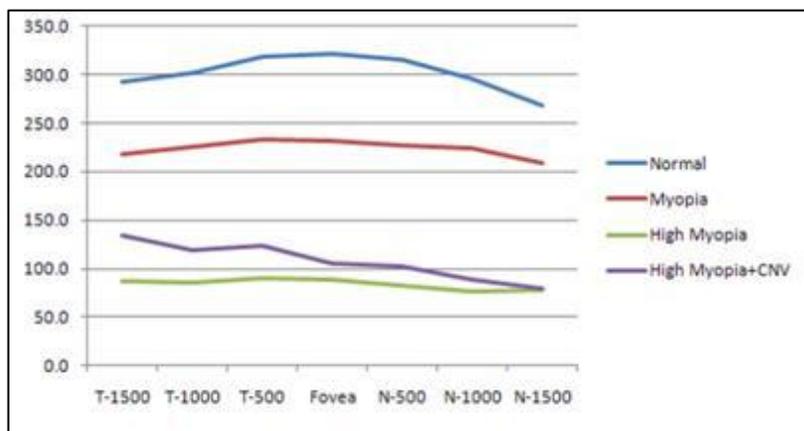
Purpose: To evaluate choroidal thickness at different distance from the fovea in normal eyes, normal myopic eyes, and myopic eyes with choroidal neovascularization (CNV).

Methods: Volunteer subjects were enrolled in the study with informed consent and divided into 4 groups: 3 normal groups (normal, myopic, and highly myopic) with different levels of refractive error and a 4th group of highly myopic eyes with CNV. Horizontal B-scan images through the fovea center were acquired with RTVue (Optovue, Fremont, CA), a FD-OCT device. Choroidal thickness was obtained from fovea center, 200 μ m, 400 μ m, 500 μ m, 1000 μ m, and 1500 μ m away from the fovea center for all study eyes with sufficiently clear choroid-sclera boundary.

Results: There are a total of 82 eyes enrolled in the study, of which 58 eyes (71%) yielded sufficient contrast for delineating the choroid-sclera boundary. The mean choroidal thickness and standard deviation directly under the center of the fovea are 321.0 \pm 78.7 (μ m) for the normal group (n=23), 231.4 \pm 44.7 (μ m) for the myopia group (n=7), 89.2 \pm 60.6 (μ m) for the high myopia group (n=19), and 105.3 \pm 67.3 (μ m) for the high myopia with CNV group (n=9).

There is an obvious and similar amount of reduction in choroidal thickness associated with myopia in all the locations evaluated. The choroidal thickness appears slightly thicker at the fovea center as shown in the plot.

Conclusions: Choroidal thickness can be easily measured using FD-OCT scans in normal and myopic eyes. Choroidal thickness across the macula shows a thicker choroid at fovea level, thinner nasally and temporally and a tendency to decrease with higher myopia.



Commercial Relationships: Gabriel J. Coscas, None; Bruno Lumbroso, Carl Zeiss Meditec (R), Optovue Inc. (R), OTI/OPKO (R); Qienyuan Zhou, Optovue Inc. (E); Florence Coscas, None; Marco Rispoli, None; Joel Uzzan, None; Maria C. Savastano, None; Cheng-en Guo, Optovue Inc. (E)

Support: None

Program#/Poster#: 3606/A429

Abstract Title: Peripapillary Retinoschisis : A Novel Clinical Entity Revealed By SD OCT

Presentation Start/End Time: Tuesday, May 03, 2011, 3:45 PM - 5:30 PM

Session Number: 372

Session Title: Retinal Diseases Epidemiology

Location: Hall B/C

Reviewing Code: 373 retinal diseases/signs: epidemiology - CL

Author Block: Jerome Sherman^{1,2}, Samantha Slotnick^{1,2}, Richard Madonna^{1,2}, Sanjeev Nath³, Raniah Hallal^{1,2}, Dan Epshtein^{1,2}. ¹Clinical Sciences, SUNY College of Optometry, New York, NY; ²SUNY Eye Institute, New York City, NY; ³Eye Institute and Laser Center, New York, NY.

Keywords: 685 retina

Abstract Body:

Purpose: To document the presence of peripapillary retinoschisis (PPRS), a new clinical entity seen more frequently in highly myopic eyes with the help of SD OCT.

Methods: A retrospective review of 600 eyes was performed with OCTs that contained several sections through and around the optic nerve head. SD OCTs were obtained with 1 of 4 systems (Zeiss Cirrus, Topcon 3D OCT, Heidelberg Spectralis, Optovue RTVue).

Results: Of the 600 eyes, 19 exhibited retinoschisis around the optic disc. 17 eyes were myopic with refractive errors ranging from -5 to -18. The 18D myopic eye had a 360° PPRS which did not extend into the macula but appeared to be responsible for the VA reduction to 10/400. The other 16 eyes had normal or near normal VA and none had a macula retinoschisis. 8 of these 17 eyes had one or more zones of vitreo-retinal traction (as revealed with SD OCT) and may be the etiology of the schisis (see image). The splits were variable in location and often appeared to exist in several layers, most often found in the inner and outer plexiform layers. One of the 2 eyes without myopia was a 4D hyperope (VA 20/40) with a PPRS that extended into the macula. The other was an emmetropic eye with a Morning Glory-like congenital disc anomaly but with 20/20 VA. The 2 eyes without myopia did not exhibit vitreo-retinal traction. Most eyes tested demonstrated field defects, most frequently enlargement of the blind spot. All 4 SD OCT systems utilized were able to delineate the PPRS.

Conclusions: PPRS appears to be a clinical entity more prevalent in high myopia. PPRS is generally invisible on ophthalmoscopy but can be detected with SD OCT images around the optic disc. Scans through the macula will miss the PPRS unless the peripapillary area is included in the scan.



Commercial Relationships: Jerome Sherman, Lecturer for Zeiss, Topcon, Optovue (C); Samantha Slotnick, None; Richard Madonna, None; Sanjeev Nath, None; Raniah Hallal, None; Dan Epshtein, None

Support: None

Program#/Poster#: 3204/A452

Abstract Title: Investigation Of Outer Retinal Differences In Amblyopic Eyes

Presentation Start/End Time: Tuesday, May 03, 2011, 1:45 PM - 3:30 PM

Session Number: 351

Session Title: Investigating the Outer Retina /

Location: Hall B/C

Reviewing Code: 103 adaptive optics: imaging and visual performance - VI

Author Block: Lindsey A. Wetherby, Elise Harb, Erik Weissberg, Nathan Doble, Stacey S. Choi. New England College of Optometry, Boston, MA.

Keywords: 417 amblyopia; 686 retina: distal (photoreceptors, horizontal cells, bipolar cells); 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound)

Abstract Body: Purpose: Traditionally, amblyopia has been characterized by neural disruptions rather than anatomical changes in the subject's retina. Recently, optical coherence tomography (OCT) has been used to investigate changes in retinal thickness in amblyopic eyes, without a clear consensus. The purpose of our study is to use two in vivo ultrahigh resolution imaging modalities, namely, a Fourier-domain (FD) OCT system and an adaptive optics (AO) fundus camera, to investigate the integrity of the outer retina, including cone photoreceptors, between amblyopic, fellow and age-matched emmetropic eyes.

Methods: 6 subjects (n=4 amblyopes and n=2 emmetropes) were imaged with a FD-OCT system (RTVue) and 3 subjects (n=1 amblyope and n=2 emmetropes) were imaged with the NECO AO fundus camera at horizontal retinal positions up to 4 degrees away from the fovea. All subjects were young adults (age range 22-27) and underwent a basic ophthalmic evaluation with assessment of binocular function and color vision. All amblyopes were mixed and had a history of treatment, which was assessed by a questionnaire. Cone density was analyzed from the AO cone mosaic images using a Matlab program and compared to outer retinal thickness (defined as layers from ELM to RPE) from the FD-OCT images at the same retinal locations.

Results: Outer retinal thickness values in amblyopic eyes, as measured by the FD-OCT, do not appear to differ significantly from their fellow or emmetropic eyes (difference <10%). Moreover, we found no difference in the cone density, by AO imaging, at eccentricities up to 4 degrees from the fovea between amblyopic and emmetropic eyes (difference <15%).

Conclusions: Although preliminary, the outer retina appears to be unaffected in the eyes of mixed amblyopes, supporting the assertion that the anatomical organization of the outer retina is not affected by amblyogenic factors. Continued investigation is being performed to further study this hypothesis.

CommercialRelationships: Lindsey A. Wetherby, None; Elise Harb, None; Erik Weissberg, None; Nathan Doble, None; Stacey S. Choi, None

Support: NEI T35 Grant EY007149

Program#/Poster#: 3207/A455

Abstract Title: Relative Thickness Of Inner And Outer Retinal Layers In Myopia As Measured With Spectral Domain Optical Coherence Tomography

Presentation Start/End Time: Tuesday, May 03, 2011, 1:45 PM - 3:30 PM

Session Number: 351

Session Title: Investigating the Outer Retina /

Location: Hall B/C

Reviewing Code: 310 ocular imaging: structure and function - VI

Author Block: Stephanie X. Shao, Nancy J. Coletta. New England College of Optometry, Boston, MA.

Keywords: 604 myopia; 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound); 685 retina

Abstract Body:

Purpose: Recent studies have used optical coherence tomography (OCT) to investigate retinal thickness in myopes, and most studies indicate that the retina is thinner in the perifoveal region in myopic eyes than in emmetropic eyes. Using time-domain OCT, Wolsley et al. (Vision Research, 2008; 48: 1554-61) reported that retinal thinning in myopia was primarily associated with thinning of the middle to inner retina. The current study examined the proportion of inner to outer retinal layer thickness, using spectral domain OCT, in a group of eyes with varying refraction.

Methods: Measurements were made on 102 eyes with a range of spherical equivalent refractive error from +1.25 D to -14.00 D, with less than 1.50 D of astigmatism. Axial lengths ranged from 21.8 mm to 30.2 mm as measured by a Zeiss IOL Master biometry system. Retinal thickness was measured with an Optovue RTVue spectral domain OCT, using the MM6 scan pattern that consists of twelve 6-mm long scans that rotate through the fovea at 15° intervals. Retinal thickness was analyzed for the central 1 mm, parafovea (1-3 mm diameter ring) and perifovea (3-6 mm diameter ring). The RTVue software segments the retinal layers at the inner plexiform layer (IPL) into outer retina, from retinal pigment epithelium (RPE) to IPL, and inner retina, from IPL to inner limiting membrane (ILM).

Results: Full retinal thickness significantly decreased with increasing myopia and axial length in both the parafoveal ($p < 0.002$) and perifoveal ($p < 0.0001$) rings. The thickness of the central 1 mm region increased significantly with myopia ($p = 0.009$) and also increased with axial length but not significantly ($p = 0.23$). The proportion of the inner retinal thickness to the outer retinal thickness decreased with increasing myopia in both the parafoveal ($r = 0.195; p = 0.049$) and perifoveal ($r = 0.282; p = 0.004$) rings. Similarly the inner/outer retinal thickness proportion decreased with increasing axial length in both parafoveal and perifoveal regions although this effect was significant only in the perifoveal ring ($r = 0.28; p = 0.004$). The inner/outer retinal thickness ratio did not vary significantly with either refraction or axial length over the central 1 mm region.

Conclusions: Myopic eyes exhibit relatively more thinning of the inner retinal layers in the parafoveal and perifoveal regions, which correspond to angular eccentricities of about 1.7 to 10 deg from the fovea. These results are consistent with those of Wolsley et al. who showed selective thinning of the inner retina in myopes at slightly larger retinal eccentricities.

Commercial Relationships: Stephanie X. Shao, None; Nancy J. Coletta, None

Support: NEI grants T35 EY007149 and R24 EY 014817

Program#/Poster#: 3209/A457

Abstract Title: Retinal Thickness In Myopia After Adjustment For Axial Length Variation

Presentation Start/End Time: Tuesday, May 03, 2011, 1:45 PM - 3:30 PM

Session Number: 351

Session Title: Investigating the Outer Retina /

Location: Hall B/C

Reviewing Code: 307 ocular imaging: image processing - VI

Author Block: Nancy J. Coletta. Vision Science, New England College of Optometry, Boston, MA.

Keywords: 604 myopia; 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound); 549 imaging/image analysis: clinical

Abstract Body:

Purpose: Studies using optical coherence tomography (OCT) to investigate retinal thickness generally indicate that the retina is thinner in the perifoveal region and thicker in the central foveal region in myopic eyes than in emmetropic eyes. A potential factor in interpreting OCT data gathered from myopic eyes is that the transverse magnification of an OCT varies with the eye's axial length. Lateral retinal dimensions are affected by OCT magnification (Johnson et al., ARVO, 2009). The purpose of this study was to explore whether magnification adjustments would alter the pattern of retinal thickness results in the macular region.

Methods: Measurements were made on one eye of 50 subjects; spherical equivalent refractive error ranged from +0.50 D to -12.00 D and axial lengths (AL) ranged from 21.9 mm to 29.2 mm. Retinal thickness was measured with an Optovue RTVue spectral domain OCT, using the MM6 scan pattern that consists of twelve 6-mm B-scans that rotate through the fovea. Retinal thickness was analyzed for the central 1 mm, parafovea (1-3 mm diameter ring) and perifovea (3-6 mm diameter ring). Comparisons of magnification adjustment were made for two sets of data: 1) unadjusted RTVue data were compared to RTVue values adjusted for the eye's AL using an Optovue software upgrade; and 2) retinal thickness values calculated from the raw B-scan data were compared to adjusted B-scan data in which the transverse range in each of the twelve B-scans was shifted by an artificial eye calibration of the OCT.

Results: The unadjusted RTVue retinal thickness significantly decreased with increasing myopia and axial length in both the parafovea ($p < 0.05$) and perifovea ($p < 0.001$), while the central 1 mm thickness increased significantly with myopia ($p = 0.02$) but not with axial length ($p > 0.05$). The difference in retinal thickness with vs. without magnification adjustment was plotted as a function of AL. Both the Optovue software and artificial eye adjustments reduced thickness in the fovea and increased thickness in the perifovea compared to their respective unadjusted data. The Optovue and artificial eye adjustments per mm AL were 0.32 and 0.39 micron in the fovea and 0.61 and 0.70 micron in the perifovea, respectively. However the adjusted data from both the Optovue software and the artificial eye did not change the overall pattern of results from their respective unadjusted data.

Conclusions: Adjustment for variation in axial length did not alter the pattern of retinal thickness results in the macular region in this group of eyes. Adjustment provided by an artificial eye calibration was similar to that provided by an upgrade to the Optovue RTVue software.

CommercialRelationships: Nancy J. Coletta, None

Support: NEI grants R24 EY014817 and U10 EY011756

Program#/Poster#: 4384/A217

Abstract Title: Therapeutic Efficacy Using Retinal Pigment Epithelium Elevation Maps in Retinal Angiomatous Proliferation

Presentation Start/End Time: Wednesday, May 05, 2010, 1:45 PM - 3:30 PM

Session Number: 449

Session Title: Clinical Retinal Imaging¹

Location: Hall B/C

Reviewing Code: 323 optical coherence tomography (Poster Only) – MOI

Author Block: H. Iwami¹, M. Yamamoto¹, T. Kohno¹, M. Kaida¹, N. Miki¹, M. Hirabayashi², A. Hamaguchi³, K. Shiraki¹. ¹Ophthalmology and Visual Science, Osaka City Univ. Medical School, Osaka, Japan; ²Shiraniwa Hospital, Nara, Japan; ³Osaka Ekisaikai Hospital, Osaka, Japan.

Keywords: 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound), 698 retinal pigment epithelium, 697 retinal neovascularization

Abstract Body:
Purpose: To investigate the therapeutic efficacy of combined antivascular endothelial growth factor and photodynamic therapy (PDT) in retinal angiomatous proliferation (RAP) using a retinal pigment epithelium (RPE) elevation map (REM) with Spectral Domain Optical Coherence Tomography (OCT).
Methods: Subjects comprised 4 eyes in 4 patients (2 men, 2 women; mean age, 81.3 years) with stage 2 RAP examined in the Department of Ophthalmology at Osaka City University in whom REM measurement was possible. All subjects have received prior treatment for the condition. Combined intravitreal bevacizumab and PDT were administered to patients 1 and 2, while combined intravitreal ranibizumab and PDT were administered to patients 3 and 4. Visual acuity (logMAR) assessment, fluorescein and indocyanine green angiography (FA and IA), and OCT were performed preoperatively and 3 months postoperatively. REM was generated using an RTVue® (Optovue, Inc, Fremont, CA) MM5 protocol and the mean and standard deviation of RPE elevation height (µm) were investigated. If automatic analysis of the REM was insufficient, it was manually adjusted.
Results: Mean visual acuity improved from 0.52 preoperatively to 0.27 postoperatively. Postoperatively, neovascularization disappeared on IA and leakage decreased in FA, and there was a marked reduction in macular edema and RPE detachment on OCT. Decrease of mean and standard deviation of RPE elevation height: from 19.7 to 0.9 and from 38.0 to 2.7 in patient 1, from 168.3 to 16.5 and from 122.5 to 26.5 in patient 2, from 9.3 to 2.3 and from 26.5 to 5.1 in patient 3, from 11.3 to -0.1 and from 35.6 to 2.4 in patient 4, respectively.
Conclusions: REM enabled to evaluate RPE elevation height objectively, suggesting the usefulness of REM in investigating therapeutic efficacy in RAP.

Commercial Relationships: H. Iwami, None; M. Yamamoto, None; T. Kohno, None; M. Kaida, None; N. Miki, None; M. Hirabayashi, None; A. Hamaguchi, None; K. Shiraki, None.

Support: None

Program#/Poster#: 80/A127

Abstract Title: **Intravitreal Injections of Ranibizumab (Lucentis) for Treatment of Wet AMD**

Presentation Start/End Time: Sunday, May 02, 2010, 8:30 AM -10:15 AM

Session Number: 105

Session Title: AMD I 

Location: Hall B/C

Reviewing Code: 354 retinal degeneration: clinical – RE

Author Block: *E. Smirnov*. Novosibirsk Affiliate, S N Fyodorov's Eye Microsurgery Complex, Novosibirsk, Russian Federation.

Keywords: 685 retina, 584 macula/fovea, 606 neovascularization

Abstract Body:
Purpose: To evaluate the effectiveness of intravitreal injections of ranibizumab (Lucentis) in treatment of wet form of age-related macular degeneration (AMD).
Methods: Study included 40 patients, aged 77 ± 6.5 years, with wet AMD complicated by choroidal neovascularization (CNV). All patients received three intravitreal injections of ranibizumab 0.5 mg, once a month for three months. Patients were followed for 4-6 months, with best-corrected visual acuity (BCVA) measurements, slit-lamp eye exam, fundoscopy, Humphrey visual field (HVF) 10-2 test, stimulus size III (Carl Zeiss Ophthalmic Systems, Inc, Dublin, CA), Fourier-domain RTVue optical coherent tomography (OCT; **RT-100, Optovue Inc, Fremont, CA**) to measure central retinal thickness (RT), and fluorescein angiography (FA) to follow with neovascular membrane. Mean BCVA was 0.1 ± 0.206 . Mean retinal thickness (RT) was 449 ± 131 μm . Retinal sensitivity on the HVF was decreased by 20-22 dB in all patients.
Results: During this follow-up period, no inflammatory complications were observed. At 4-month time-point after the first injection, mean BCVA improved to 0.3 ± 0.2 ($p<0.05$), RT reduced to 248 ± 100 μm ($p<0.05$). HVF showed decrease of retinal sensitivity by 16-18 dB. FA showed partial regression of CNV in 28 patients (70%) and complete regression of CNV in 6 patients (15%).
Conclusion: Intravitreal injection of ranibizumab is relatively safe, well-tolerated surgical procedure with low risk of postoperative complications and is an effective treatment of wet AMD, providing significant improvement of visual functions and partial or complete resolution of the macular edema and regression of choroidal neovascular membrane.

Commercial Relationships: **E. Smirnov**, None.

Support: None

Program#/Poster#: 1047/A610

Abstract Title: **Spectral-Domain Optical Coherence Tomography in Resolved Uveitic Cystoid Macular Edema: Features Associated With Permanent Vision Loss**

Presentation Start/End Time: Sunday, May 02, 2010, 2:45 PM - 4:30 PM

Session Number: 150

Session Title: Novel Imaging Technologies and Functional Imaging 

Location: Hall B/C

Reviewing Code: 311 ocular imaging: structure and function – VI

Author Block: *P.Y. Chang¹, V. Diaz², D.M. Hinkle¹, J. Mauro¹, C.S. Foster¹, C.M. Samson².* ¹Massachusetts Eye Research and Surgery Institution, Cambridge, MA; ²Ophthalmology, New York Eye & Ear Infirmary, New York, NY.

Keywords: 742 uveitis-clinical/animal model, 549 imaging/image analysis: clinical, 584 macula/fovea

Abstract Body:
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 attempted 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 170.3 μ m in Study and 232.6 μ m in Control, with a difference of 62.4 μ m ($p < 0.001$). 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 180 μ m, 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.

Commercial Relationships: **P.Y. Chang**, None; **V. Diaz**, None; **D.M. Hinkle**, None; **J. Mauro**, None; **C.S. Foster**, None; **C.M. Samson**, None.

Support: None

Program#/Poster#: 341/D694

Abstract Title: **Macular Inner Retinal Layer Thinning in Diabetic Patients Without Retinopathy Measured by Fourier Domain Optical Coherence Tomography**

Presentation Start/End Time: Sunday, May 02, 2010, 8:30 AM -10:15 AM

Session Number: 112

Session Title: Posterior Imaging II 

Location: Hall B/C

Reviewing Code: 249 imaging, posterior segment –RE

Author Block: *V.C. Lima^{1,2}, T.S. Prata^{1,2}, M.A. Pacheco², M. Hosoume^{1,2}, N. Unonius², M. Dimantas², J.M. Lee².*
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Keywords: 498 diabetes, 530 ganglion cells, 549 imaging/image analysis: clinical

Abstract Body: **Purpose:** Diabetes may lead to ischemia and retinal tissue injury even in early stages of diabetic retinopathy. We aimed to compare values of macular inner retinal layer (MIRL) thickness obtained by a Fourier Domain Optical Coherence Tomography (FD-OCT) device between diabetic patients without retinopathy and healthy subjects. **Methods:** We prospectively enrolled 26 type-II diabetic patients without clinical signs of retinopathy and 27 healthy subjects. Patients with other ocular or systemic diseases were excluded. All patients underwent MIRL thickness measurement by FD-OCT (7x7 mm macular grid; RTVue). The macular inner retinal layer thickness is provided by the Ganglion Cell Complex scan (comprised by the retinal nerve fiber, ganglion cell and inner plexiform layers). If both eyes were eligible, one was randomly selected. **Results:** Mean age was similar between diabetic (53.6±12.3 years) and non-diabetic patients (59.2±11.5 years; p=0.12). There were no significant differences regarding optic disc area and cup-to-disc ratio between groups (p>0.08). Average MIRL was significantly thinner in diabetic patients compared to controls (91.8 vs 96.2 μm; p=0.04). Regional analysis revealed superior MIRL to be significantly thinner in diabetic patients than controls (p=0.04). No difference was found when considering inferior MIRL values (p=0.08). In 75% of the diabetic eyes classified as abnormal (p<1%) by the device software, the juxtafoveal area was the affected (thinned) one. **Conclusions:** Diabetic patients without retinopathy have reduced average MIRL values when compared to normal subjects. This difference seems to be more pronounced in the superior macula, mainly juxtafoveally. Possible implications of these findings require further investigation.

CommercialRelationships: **V.C. Lima**, None; **T.S. Prata**, None; **M.A. Pacheco**, None; **M. Hosoume**, None; **N. Unonius**, None; **M. Dimantas**, None; **J.M. Lee**, None.

Support: None

Program#/Poster#: 4933/A550

Abstract Title: **Evaluation of the Retinal Ganglion Cell Complex With Spectral-Domain (Fourier-Domain) OCT in Patients Undergoing Anti-VEGF Therapy With Ranibizumab and Bevacizumab for Exudative Age-Related Macular Degeneration**

Presentation Start/End Time: Wednesday, May 05, 2010, 3:45 PM - 5:30 PM

Session Number: 477

Session Title: AMD - Assessment, Pathology and Therapy 

Location: Hall B/C

Reviewing Code: 115 age-related macular degeneration: pathology – RC

Author Block: *N.J. Mehta¹, H. Quiroz-Mercado², A.M. Pinero-Rodriguez³, J.M. Jimenez-Sierra⁴, L. Lopez-Ramos⁴.* ¹Colorado Retina Center, Denver, CO; ²Denver Health Medical Center, University of Colorado, Denver, CO; ³Clinica Pinero, Sevilla, Spain; ⁴Clinica Oftalmologica Anzures, Mexico City, Mexico.

Keywords: 412 age-related macular degeneration, 688 retina: proximal (bipolar, amacrine, and ganglion cells), 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound)

Abstract Body:
Purpose: To determine how the retinal ganglion cell complex (GCC), composed of the inner retinal layers, is affected by pan-VEGF inhibition in patients undergoing treatment for exudative age-related macular degeneration (AMD).
Methods: 13 eyes from 11 patients diagnosed with AMD and choroidal neovascularization (CNV) from 2007-2009, with visual acuities between 20/25 and 20/400, were enrolled, along with 4 control eyes (untreated contralateral eyes with dry AMD); none of the patients had glaucoma. All patients with CNV were treated with between 2 and 13 intravitreal injections of either ranibizumab or bevacizumab. Patients were imaged with Fourier-domain (FD) OCT both before receiving treatment and on the most recent follow-up. GCC thickness was measured in 8 sectors surrounding the fovea and extending out to 5 mm; the central 2 mm fovea was not analyzed because there are no ganglion cells in the foveola.
Results: There was an average decrease of 17.2 microns in pre-treatment vs. post-treatment GCC thickness, averaged across all sectors. There was a slight increase in GCC thickness of 2.2 microns on average for the control group. Follow-up averaged 8.4 months in the treated group and 6.5 months in the control group. The treated group received on average 5.8 injections over the course of the follow-up. There was a significant correlation between the number of injections and the amount of GCC thinning ($r=0.50$; $p<0.05$). We also compared the GCC thickness both pre-and post treatment against the FD-OCT normative database. In the treatment group there were 25 sectors (24.0%) that were below normal limits ($p<0.05$) before treatment, and 61 sectors (59.0%) below normal limits ($p<0.05$) after treatment. In the control group, there were 5 sectors (15.6%) below normal ($p<0.05$) on the first visit, and 3 sectors (9.4%) below normal ($p<0.05$) on the last visit.
Conclusions: The present study demonstrates that pan-VEGF AMD treatment may lead to GCC thinning. These results are consistent with previous animal studies demonstrating possible VEGF dependence of the GCC. The effect on visual function is unknown. Limitations of this study include a small sample size, and limited follow-up in some cases. Additional studies with larger sample sizes and longer follow-up are necessary to validate these findings.

CommercialRelationships: **N.J. Mehta**, Optovue, C; Optovue, R; **H. Quiroz-Mercado**, None; **A.M. Pinero-Rodriguez**, None; **J.M. Jimenez-Sierra**, None; **L. Lopez-Ramos**, None.

Support: Non

Program#/Poster#: 1791/A540

Abstract Title: **Taking the Machine Out of the Equation: Measuring Macular Thickness From Different OCT Capture Systems in a Reading Centre**

Presentation Start/End Time: Monday, May 03, 2010, 1:45 PM - 3:30 PM

Session Number: 261

Session Title: Image Post Processing 

Location: Hall B/C

Reviewing Code: 323 optical coherence tomography (Poster Only) – MOI

Author Block: *W.P. Patton, K.A. Muldrew, M. Stevenson, U. Chakravarthy.* Centre for Vision Science, Queen's University Belfast, Belfast, United Kingdom.

Keywords: 549 imaging/image analysis: clinical, 412 age-related macular degeneration, 465 clinical (human) or epidemiologic studies: systems/equipment/techniques

Abstract Body:
Purpose: To compare manually-assessed retinal thickness measurements on OCT in a reading centre in healthy and diseased eyes captured by different commercially available OCT instruments.
Methods: Three different OCT instruments (Stratus OCT [Carl Zeiss Meditec, Inc. Dublin, CA], RTVue [Optovue Corp., Fremont, CA], Spectralis HRA OCT [Heidelberg Engineering, Inc., Heidelberg, Germany]), were used to capture radial line scans (or equivalent) in healthy or diseased eyes. The scans from each system were exported into JPEG format and imported into custom reading centre software, iP Reading Centre (Digital Healthcare, Cambridge UK). Scans were calibrated in the vertical plane and scrutinised side by side to identify common features. A single scan from each of the different capture systems was chosen at the same orientation and manual measurements were taken from the inner limiting membrane to the visible pathology or the RPE-choriocapillaris complex, whichever was more pronounced.
Results:
Twelve eyes were included in the study. Using each patient-eye as a block effect to test each machine, a 2-way ANOVA showed that there were no significant differences between the machine mean measurements of retinal thickness across the three OCT capture systems. The mean thickness measurements for Spectralis, Stratus and RTVue were 0.150, 0.149 and 0.136 respectively.
Conclusions:
The three OCT systems provided similar results for retinal thickness measurements. This has important consequences for reading centres and their approach to perform manual measurements for OCT thickness rather than relying on capture system software. This study has several limitations. Although the scan orientation chosen was the same for each system, there can be no guarantee that the same location was used in each image to perform the measurement, or that the scan intersects the same anatomical region in all systems. However, the images were scrutinised in advance to determine common features and the thickness lines were drawn on all scans before the measurements were known. The sample size is also quite small which may result in a type II error and thus the study will be extended to a larger set of patients and will include reproducibility assessments.

CommercialRelationships: **W.P. Patton**, None; **K.A. Muldrew**, None; **M. Stevenson**, None; **U. Chakravarthy**, None.

Support: None

Program#/Poster#: 2556/A135

Abstract Title: **Microperimetric Outcomes After 25-G Pars Plana Vitrectomy for Stage III/IV Macular Hole: A Prospective Study**

Presentation Start/End Time: Tuesday, May 04, 2010, 8:30 AM -10:15 AM

Session Number: 313

Session Title: Vitreoretinal Surgery II

Location: Hall B/C

Reviewing Code: 417 vitreoretinal surgery – RE

Author Block: *G. Besozzi, F. Boscia, R. Provenzano, L. Sborgia, N. Recchimurzo, C. Furino, G. Sborgia, N. Cardascia, A. Montepara, C. Sborgia.* Ophthalmology, University of Bari, Bari, Italy.

Keywords: 585 macular holes, 758 vitreoretinal surgery, 551 imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound)

Abstract Body:

Purpose:
To evaluate tomographic results, visual acuity (VA) and microperimetric outcomes after 25-g pars plana vitrectomy (25gPPV) for stage III/IV macular hole (MH)

Methods:
Ten eyes of 10 patients with stage III/IV MH underwent 25gPPV with ICG-assisted ILM peeling. They were evaluated at baseline, and at 1 and 3 months postoperatively. Anatomical outcomes were evaluated by spectral domain OCT (SDOCT) (RTVue-100, Optovue Inc, Fremont CA, USA). Functional outcomes were evaluated by measuring visual acuity (VA) and retinal sensitivity, fixation point stability (2° and 4°) by microperimetry (MP1, Nidek Technologies, Padova, Italy).

Results:
All the MHs were closed and flat at the end of follow-up, as confirmed by SDOCT. VA was significantly improved from baseline (0.97±0.35 Log MAR) at month 1 and 3 (0.58±0.33 and 0.51±0.31 LogMAR respectively; p<0.001). Retinal sensitivity did not improve significantly from baseline to month 1 (from 9.52±2.63 dB to 9.51±3.6 dB, p=0.98), but it was significant at month 3 vs baseline (12.29±3.45 dB vs 9.52±2.63 dB, p=0.006) and vs month 1 (12.29±3.45 dB vs 9.51±3.6 dB, p=0.039). Fixation stability into the central 2° did not change significantly at any point, Fixation stability into the central 4° improved significantly at month 3 vs baseline (97% vs 88%, p=0.01) and vs month1 (97% vs 92%, p=0.049). At baseline, the fixation point was located in all eyes at the edge of the hole, superonasally. After surgery the fixation point shifted centripetally toward the foveal center.

Conclusions:
Successful surgery for stage III/IV MH lead not only to VA improvement, but also to retinal sensitivity and fixation stability improvements and to the restoration of foveal fixation.

CommercialRelationships: **G. Besozzi**, None; **F. Boscia**, None; **R. Provenzano**, None; **L. Sborgia**, None; **N. Recchimurzo**, None; **C. Furino**, None; **G. Sborgia**, None; **N. Cardascia**, None; **A. Montepara**, None; **C. Sborgia**, None.

Support: None



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