



CEM201 RELATIONSHIP BETWEEN CENTRAL CORNEAL THICKNESS AND VISUAL FIELD PROGRESSION IN PRIMARY OPEN -ANGLE GLAUCOMA

Chang-Sik Kim,¹ Jin-Ha Kim,¹ Tae-Min Baek,² Jong-Il Park²
¹Chungnam National University, 640 Daesa-Dong, Jung-Ku, Daejeon, Korea, ²Good Morning St Marie Eye Clinic, Busan, South Korea

Aim: To find the difference in the rate of visual field progression among the groups divided by the central corneal thickness (CCT).

Methods: Medical records of 87 primary open-angle glaucoma patients who have more than 5 years of longitudinal Humphrey visual field follow-up were reviewed retrospectively. The patients were divided into 3 groups by CCT and the change in mean deviation (MD), then the change in MD and difference in CCT were compared among each groups, respectively.

Results: Group with thin cornea (CCT <521 micron, n=27) showed faster visual field progression (MD change: -1.5 ± 2.4) than groups with average cornea (MD change: -0.5 ± 2.3 , n=31) and thick cornea (CCT >557 micron, MD change: -0.2 ± 3.6 , n=29) ($p=0.047$, Kruskal-Wallis test) Also, patients who showed fast MD progression (MD change < -2.12 , n=20) found to have thinner cornea (CCT: 526 ± 43) than average progression group (CCT: 537 ± 32) and slow progression group (MD change $>+0.72$, CCT: 553 ± 37) ($p=0.048$, Kruskal-Wallis test).

Conclusion: Among primary open-angle glaucoma patients, who were on regular treatment at referral hospital, patients with thin cornea showed faster visual field progression than patients with average and thick cornea.

CEM202 CLINICAL COMPARISON OF THE KEELER PULSAIR EASYEYE NON-CONTACT TONOMETER WITH GOLDMANN APPLANATION TONOMETER

M Chockalingam, K Manimozhi, Anup Chirayath
Ahalia Foundation Eye Hospital, Palakkad, Kerala, India

Aim: To compare the mean intraocular pressure (IOP) measurements between Pulsair Easyeye non-contact tonometer (NCT) with the Goldmann applanation tonometer (GAT) in a group of randomly selected individuals above the age of 40 years.

Methods: 150 subjects (all right eye) were included in the study. The IOP was measured by Pulsair Easyeye NCT followed by a single GAT measurement by two masked investigators. In 75

subjects, IOP was measured with only 1 reading of Pulsair Easyeye, while in the other 75 subjects, 4 consecutive NCT recordings of IOP were taken.

Results: In first group, the Mean \pm SD of the difference between GAT and single Pulsair NCT were 0.87 ± 3.9 . Pearson's correlation coefficient for GAT and one pulsair NCT was 0.832. 95% agreement limit between two methods by Bland-Altman plot lay between -6.7 and 8.5 mm Hg. On comparison of these, two methods 52.0% of readings were within ± 2.0 mm Hg difference and 68.0% within ± 3 mm Hg. In second group, the Mean \pm SD of the difference between GAT and average of Pulsair NCT readings were 0.86 ± 2.7 . Pearson's correlation coefficient for GAT and one Pulsair NCT reading was 0.746. 95% agreement limit between the two methods by Bland-Altman plot lay between -4.4 and 6.1 mm Hg. On comparison of these two methods, 53.3% of readings were within ± 2.0 mm Hg difference and 74.7% within ± 3 mm Hg.

Conclusion: Although the difference in the IOP reading between GAT and Pulsair Easyeye NCT methods was relatively small the percentage of readings with a difference greater than 2 mm Hg between the two methods was roughly 45%. This suggests that IOP measurement by Pulsair Easyeye NCT may not be sensitive enough for IOP measurements in epidemiological studies.

CEM203 CENTRAL CORNEAL THICKNESS – IS MEASUREMENT ACCURATE IN SITTING OR SUPINE POSITION?

Deepa VR Kothari, S Ve Ramesh, Ronnie George, M Baskaran, Vijaya Lingam
Medical Research Foundation, Sankara Nethralaya, Chennai, India

Aim: To assess the difference in Central Corneal Thickness (CCT) measurements in sitting and supine position and to ascertain whether the use of angled probes in CCT measurements in sitting posture is justifiable.

Methods: CCT of 48 patients was measured in sitting and supine positions in random sequence with an interval of 10 minutes to minimize corneal desiccation. A set of ten readings was taken for each position. Mean values of all readings and mean differences between readings in both positions were estimated. Agreement between the values was plotted on Altman-bland graph.

Results: Mean value of CCT was 529.23 microns in supine position and 529.52 microns in sitting position. Mean difference between them was 0.29 (-13.40 , 12.82 ; $p=0.965$).

Conclusion: Our study result shows that there is no major disagreement in the CCT values in the two positions. Hence the



values can be used interchangeably in clinical practice. The use of angled probe for measurement of CCT in sitting posture is justifiable.

CEM204 INTEROBSERVER AGREEMENT OF THE MODIFIED VAN-HERICK'S METHOD OF MEASURING PERIPHERAL ANTERIOR CHAMBER DEPTH

Devang T Shah, Ronnie George, Vijaya Lingam
Medical Research Foundation Sankara Nethralaya, Chennai, India

Aim: To assess the interobserver agreement in assessing the peripheral anterior chamber depth by the modified Van-Herrick's method.

Methods: 2 masked observers (Glaucoma consultant and a general ophthalmologist) graded anterior chamber depth in 51 patients (102 eyes) using modified van Herrick's criteria (6 criteria, Foster et al) using a photographic template. The anterior chamber depth is graded by keeping the slit beam at an angle of 60 under maximum illumination and high magnification and focusing on the temporal limbus. Depth of anterior chamber at temporal limbus was graded as a percentage fraction of peripheral corneal thickness (as 5%, 15%, 25%, 40%, 75%, and 100%). 57 eyes had modified Van Herick's grade of >40% and 45 eyes had modified Van Herick's grade as 40% or less.

Results: There was excellent agreement between the observers (weighted kappa=0.9096, $p=0.005\%$, 95% CI =0.8503 to 0.9689) for the right eye. There was substantial correlation between the 2 observers (weighted kappa=0.663, $p0.005\%$ SE= 0.056, 95% CI=0.553 to 0.774) for left eye.

Conclusion: Modified Van-Herrick's using a photographic template is a method of evaluating the peripheral anterior chamber depth with good inter-observer agreement.

CEM205 DIAGNOSTIC VALUE OF PUPILLARY RUFF LOSS AS A MARKER FOR ANGLE CLOSURE DISEASE

Devang T Shah, Ronnie George, Vijaya Lingam, Varsha Rathore, Murali Krishna, R Sherren, C Mallikarjun
Medical Research Foundation, Sankara Nethralaya, Chennai, India

Aim: To assess pupillary ruff changes as a clinical marker for the diagnosis of primary angle-closure disease.

Methods: A total of 120 cases (PACS, PAC, and PACG) and 30 controls were studied. Slit-lamp photographs of the pupillary ruff were taken under high magnification and photographs were studied by 2 masked observers pupillary ruff was graded as 0 (normal), 1 (uneven width of pupillary ruff for at least 2 clock hours), 2 (pupillary ruff completely absent for 2 clock hours).

Results: Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of pupillary ruff in diagnosing angle closure disease for both eyes for 2 observers were 0.15 (0.09-0.23), 0.93 (0.80-0.99), 0.89 (0.67-0.99) and 0.24 (0.17-0.33) respectively. Sensitivity, specificity, PPV and NPV for angle closure (PAC/PACG) for both eyes for 2 observers was 0.30 (0.18-0.43), 0.90 (0.86-0.98), 0.75 (0.52-0.90), 0.69 (0.60- 0.76). Interobserver agreement using weighted kappa was 0.76 (0.65-0.87).

Conclusion: Pupillary ruff photograph had poor sensitivity in diagnosing angle closure disease in our study.

CEM206 DETECTION OF BROWN STAGE PSEUDOEXFOLIATION IN PATIENTS WITH OCCLUDABLE ANGLES

Dhanaraj Rao AS, SK Sundaramurthy
Lotus Eye Care Hospital, Coimbatore, India

Aim: To evaluate the presence of brown stage pseudoexfoliation in patients with occludable angles.

Methods: Clinical records of all patients who were diagnosed to have occludable angles, between April 2006 to July 2006 (4 months duration), were reviewed. All patients had undergone Gonioscopy (4M Sussmann) under ideal conditions. The presence of brown stage pseudoexfoliation (defined as presence of pigment deposits in a radial pattern on the peripheral anterior lens capsule) after pupil dilatation was documented. Patients who already had obvious signs like white dandruff-like material on the pupil margin (8 patients, 14 eyes) were excluded.

Results: Of the 23 patients (44 eyes) who were diagnosed to have occludable angles, 17 patients (34 eyes) had Primary angle-closure disease (PACS, PAC and PACG) and 6 patients (10 eyes) had brown pseudoexfoliation.

Conclusion: Brown pseudoexfoliation was detected in a significant proportion of patients (35.3%) with occludable angles. Hence a careful examination of the anterior lens capsule after pupillary dilatation is important in all patients with occludable angles.



CEM207
COMPARISON OF GOLDMANN APPLANATION TONOMETER, NONCONTACT TONOMETER, AND TONOPEN FOR MEASURING INTRAOCULAR PRESSURE IN NORMAL AND DIFFERENT TYPES OF GLAUCOMA EYES

Eun Suk Lee,¹ Chan Yun Kim,² Gong Je Seong,² Yong Jae Hong²
¹Department of Ophthalmol, Inha University College of Medicine, Incheon, ²Department Ophthalmology, Yonsei University College of Medicine, Seoul, Korea

Aim: To compare intraocular pressure (IOP) measurements by Goldmann applanation tonometer, noncontact tonometer, and Tonopen XL in normal and different types of glaucoma patients with various central corneal thickness (CCT) in Korea.

Methods: IOP was measured by 3 different tonometers in random order; Goldmann tonometer, noncontact tonometer, and Tonopen XL. CCT was measured by ultrasound pachymetry.

Results: Patients previously diagnosed as primary open-angle glaucoma (POAG, n=258), normal-tension glaucoma (NTG n=138), and ocular hypertension (OHT, n=40), as well as non-glaucomatous patients (n=72) were involved in this study. There was significant correlation between 3 tonometers measurements (all $p < 0.0001$). Three tonometers gave different IOP readings ($P < 0.0001$). The measurements of noncontact tonometer (16.5 ± 0.2 mm Hg) were significantly higher than those of Goldmann and Tonopen (15.0 ± 0.1 and 15.0 ± 0.2 mm Hg, all $p < 0.0001$). Measurement difference between Goldmann and noncontact tonometer was affected by age, CCT, and glaucoma diagnosis, while difference between Goldmann and Tonopen was affected by age and glaucoma diagnosis. When subjects were divided into groups according to their glaucoma diagnosis, measurement difference between Tonopen and Goldmann was significantly different in OHT than that of healthy eyes ($p = 0.008$). When divided into three different IOP range groups, noncontact tonometer measurement was higher than that by Goldmann in all subgroups (all $p < 0.0001$) with its measurement difference highest in subgroup of IOP more than 21 mm Hg (4.0 ± 0.5 mm Hg, $p < 0.05$).

Conclusions: IOP measurement may not only filtered be affected by factors such as CCT and age, but also be influenced by types of glaucoma.

CEM208
RELATIONSHIP OF INTRAOCULAR PRESSURE MEASUREMENTS BY DYNAMIC CONTOUR TONOMETRY AND GOLDMANN APPLANATION TONOMETRY WITH GLAUCOMATOUS DAMAGE IN OPEN-ANGLE GLAUCOMA

Jaewan Choi,¹ Soo Hyun Kim,² Joo-Eun Lee,¹ Chang Hwan Lee,¹ Michael S Kook¹
¹Asan Medical Center, Seoul, Korea, ²Kangnam BS Eye Center, Seoul, Korea

Aim: To investigate the relationship between intraocular pressure (IOP) measurements by dynamic contour tonometry (DCT) and by Goldmann applanation tonometry (GAT) and functional and structural glaucomatous damage in the eyes with open-angle glaucoma (OAG).

Methods: Seventy-seven eyes with OAG were evaluated at their initial examination. IOP was measured by DCT and by GAT for each eye. Visual field was evaluated with the 24-2 full threshold program on Humphrey visual field analyzer (HVFA) and the AGIS score was calculated for each visual field. Retinal nerve fiber layer (RNFL) was evaluated with GDx-VCC. Pearson correlation coefficient was obtained between IOP measurements by DCT or by GAT and HVFA and GDx-VCC parameters. Subsequently, univariate and multivariate regression analysis was performed.

Results: IOP measurements by DCT were correlated with superior average, TSNIT standard deviation (SD), and nerve fiber indicator (NFI) of GDx-VCC parameters. IOP measurements by GAT were correlated with superior average and TSNIT SD of GDx-VCC parameters. Neither IOP measurement by DCT nor by GAT was correlated with any of HVFA parameters. Multivariate regression analysis revealed that IOP by DCT was the significant independent variable for TSNIT SD and NFI, whereas IOP by GAT was the significant independent variable only for superior average.

Conclusion: IOP measurements by DCT or GAT were correlated with structural RNFL damage, but not with functional damage on HVFA in the eyes with OAG. IOP measurement by DCT may have enhanced efficacy in revealing the pressure-dependent structural damage mechanism in OAG.



CEM209 THE RESULTS OF CATARACT SURGERY IN PATIENTS WITH ADVANCED GLAUCOMA

Jong Woon Park, Won Suk Noh
Sil Lo Arm Hospital, Seoul, Korea

Aim: To evaluate the results of the cataract surgery in patients with advanced cataract and glaucoma.

Methods: A retrospective review was conducted of 98 eyes (84 patients) diagnosed with any type of glaucoma who underwent cataract surgery. We enrolled 14 eyes (13 patients) with a cup-disc ratio (CD) of 0.8-1.0 and marked visual field defects (MD > -12dB) with partially preserved central function who underwent cataract surgery. We assessed the visual acuity, the intraocular pressure, the degree of visual field defects preoperatively and postoperatively.

Results: All patients were performed with cataract surgery under topical anesthesia. 2 eyes of 14 eyes were treated with phacotrabeculectomy procedure, whereas the others were performed with phacoemulsification alone. The mean visual acuity and the mean deviation (MD) improved. And intraocular pressure reduction was observed additionally.

Conclusion: Although marked visual field defects were present, patients with cataract and advanced glaucoma can benefit from cataract surgery by the results of an increase in visual acuity and a decrease of intraocular pressure.

CEM210 EFFECT OF CATARACT SURGERY ON MEASUREMENT OF RETINAL NERVE FIBER LAYER THICKNESS BY OPTICAL COHERENCE TOMOGRAPHY

Joon Mo Kim,¹ Hae Ran Chang,¹ Jae Woong Koh,² Ja Heon Kang,²
Ki Ho Park¹

¹Department of Ophthalmology, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, Korea,

²Department of Ophthalmology, East-West Neo Medical Center, School of Medicine, Kyung Hee University, Seoul, Korea

Aim: To analyze the retinal nerve fiber layer in normal eyes, before and after cataract surgery using OCT (Zeiss-Humphrey Ophthalmic system, Dublin California, USA) and to evaluate the effect of lens opacity on retinal nerve fiber layer analysis.

Methods: Ocular examination and OCT analysis (Fast RNFL thickness map) were performed one month before and after cataract

surgery on 40 eyes of 40 patients, and every surgery was performed without any specific complication. OCT was performed twice and parameters were gained with their mean values. We compared and analyzed the preoperative factor including lens thickness, and type of lens opacity classified by LOC III system.

Results: The parameters of the OCT RNFL analysis especially inferior, nasal, temporal and average RNFL thickness were increased after cataract surgery by 6.2 ± 19.1 mm, 5.0 ± 15.1 mm, 3.9 ± 11.0 mm, and 4.8 ± 11.3 mm each other ($p < 0.05$). There were no significant differences regarding the type of lens opacity, lens thickness, anterior chamber depth, change of intraocular pressure before and after cataract surgery ($p > 0.05$).

Conclusion: Our results showed that lens opacity has a subtle effect on OCT parameters and thus the OCT parameters should be analyzed with a caution in the patients who have cataract opacity.

CEM211 COMPARISON OF OPTICAL COHERENCE TOMOGRAPHY AND HEIDELBERG RETINAL TOMOGRAPHY PARAMETERS IN OCULAR HYPERTENSIVE PATIENTS

Meenal Antrolikar, Mallikarjun Chatnalli, Ronnie George, Preeti Patil,
Vijaya Lingam
Medical Research Foundation, Sankara Nethralaya, Chennai, India

Aim: To compare the optical coherence tomography (OCT) and Heidelberg retinal tomography (HRT) parameters in ocular hypertensive patients.

Methods: 109 eyes with ocular hypertension were analyzed. Diagnosis of ocular hypertension was done on the basis of IOP and field changes. Analysis of the parameters on OCT and HRT was done.

Results: Of the 109 eyes analyzed the average thickness on OCT was found to be more than 95 percentile in 102 (94.5%), 5 (4.6%) were within 1-5 percentile while only 1 (0.9%) was <0.5 percentile of the population. Mean RNFL thickness was within normal limits in 68 eyes (62.4%), cup shape measure in 74 eyes (67.9%), rim volume in 51 (46.8%) and rim area in 45 (41.3%) eyes. The rim area and rim volume was found to be below the normal limits in 36 (35%) and 35 (34%) while cup shape measure was less than normal in 2 (1.9%) and mean RNFL in 15 (15.8%).

Conclusion: HRT parameters among OHT were more likely to show abnormal values compared to OCT parameters.



CEM212 STRUCTURE-FUNCTIONAL REGRESSION ANALYSIS OF RETINAL NERVE FIBER LAYER THICKNESS AND OPTIC DISC TOPOGRAPHIC MEASUREMENTS BY OPTICAL COHERENCE TOMOGRAPHY

Soo Hyun Kim,¹ Jaewan Choi,² Chang Hwan Lee,² Michael S Kook²
¹Kangnam BS Eye Center, Seoul, Korea, ²Asan Medical Center, Seoul,
Korea

Aim: To evaluate the structure-functional relationship between the retinal nerve fiber layer (RNFL) thickness and optic disc parameters measured by optical coherence tomography (OCT) and visual sensitivity in glaucomatous and healthy eyes.

Methods: Fifty-six eyes with glaucomatous eyes and 65 healthy eyes were enrolled. RNFL thickness and optic disc parameters were measured using OCT, and visual field (VF) was examined using Humphrey field analyzer (HFA). The relationship between RNFL thickness and optic disc parameters and visual sensitivity were sought globally and regionally with linear and logarithmic regression models. Coefficient of determination (R²) was calculated and compared between each regression model.

Results: The visual sensitivities were strongly correlated with RNFL thickness ($r^2=0.24-0.33$) and optic disc topographic measurements ($r^2=0.23-0.36$). The logarithmic regression coefficient of some optic disc parameters versus visual sensitivity was higher than that of the linear regression ($r^2=0.15-0.26$ by linear regression versus $r^2=0.26-0.33$ by logarithmic regression; $p<0.05$). Similarly, the logarithmic regression of some RNFL thickness parameters showed higher association with visual sensitivity than the linear regression.

Conclusion: The RNFL thickness and optic disc topographic measurements by OCT revealed strong structure-functional association with visual sensitivity. The higher association of optic disc parameters with VF suggests that the optic disc algorithms with OCT may be a useful method for evaluating the structure-functional relationship in glaucomatous and healthy eyes.

CEM213 RECORDING OF DIURNAL VARIATION OF INTRAOCULAR PRESSURE IN PATIENTS WITH PSEUDOEXFOLIATION — IS IT NECESSARY?

Swetha Philip, Andrew Braganza
Christian Medical College, Vellore, India

Aim: To evaluate the need for recording of diurnal variation of

intraocular pressure (DVT) in patients with pseudoexfoliation.

Methods: We prospectively studied patients with pseudoexfoliation in one or both eyes with or without evidence of glaucoma. All patients underwent a complete ophthalmologic evaluation including recording of DVT and visual field assessment. In those who underwent cataract surgery, a postoperative recording of DVT was also done.

Results: 100 patients were included in the study. The male:female ratio was 1.2:1. Majority of the patients (47%) were in the 60-69 yrs age group. In 84% of patients, IOP was in the range of 10-21 mm Hg and 54% had CDR of 0.3-0.4:1. Three patients were found to have PEX glaucoma by IOP and disc criteria. Field assessment was unreliable in the majority of the patients. In patients who underwent cataract surgery, there was no significant lowering of intraocular pressure postoperatively ($p>0.05$). DVT did not lead to any additional diagnosis of PEX glaucoma.

Conclusions: Routine recording of diurnal variation of intraocular pressure in patients with pseudoexfoliation did not additionally contribute to diagnosis of glaucoma compared to presenting IOP and disc appearance.

CEM214 INTER OBSERVER AGREEMENT FOR GONIOSCOPISTS — CAN OPTOMETRIST BE TRAINED TO DO GONIOSCOPY?

Varsha Rathore, B Shantha, V Vijayalakshmi, M Divya, M Baskaran,
Vijaya Lingam
Medical Research Foundation, Sankara Nethralaya, Chennai, India

Aim: To assess the inter observer agreement between gonioscopists for various angle parameters and assess the reliability of trained optometrists for gonioscopic assessment in a tertiary care set up.

Methods: Gonioscopy was performed in 100 eyes of 100 patients by a glaucoma specialist and a trained optometrist. Parameters assessed for agreement were: Occludability (visibility of the 180 degree posterior trabecular meshwork closure for 180 degrees), angle structures, peripheral anterior synechiae (PAS), Shaffer grading, iris configuration and trabecular meshwork pigmentation grading. One eye was randomly selected for analysis. Agreement was assessed using kappa and Kendall tau-b statistics.

Results: 100 eyes (100 patients) agreement for traditional Van Herick grading ($k=0.225$), trabecular meshwork pigmentation ($k=0.200$ to 0.337) and Shaffer's grading ($k=0.293$) were fair; occludability ($k=0.463$) and iris configuration ($k=0.435$) were



moderate; quadrant-wise assessment of angle structures varied between fair to good ($k=0.274$ to 0.575); while for PAS the agreement was poor ($k=0.194$).

Conclusion: Assessment of angle structures and occludability using gonioscopy by a trained optometrist can be satisfactory for clinical purposes. However, we recommend follow up assessment on gonioscopic parameters to be done by a single observer.