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Argon Laser Peripheral Iridoplasty

Eight-shot Laser Peripheral Iridoplasty

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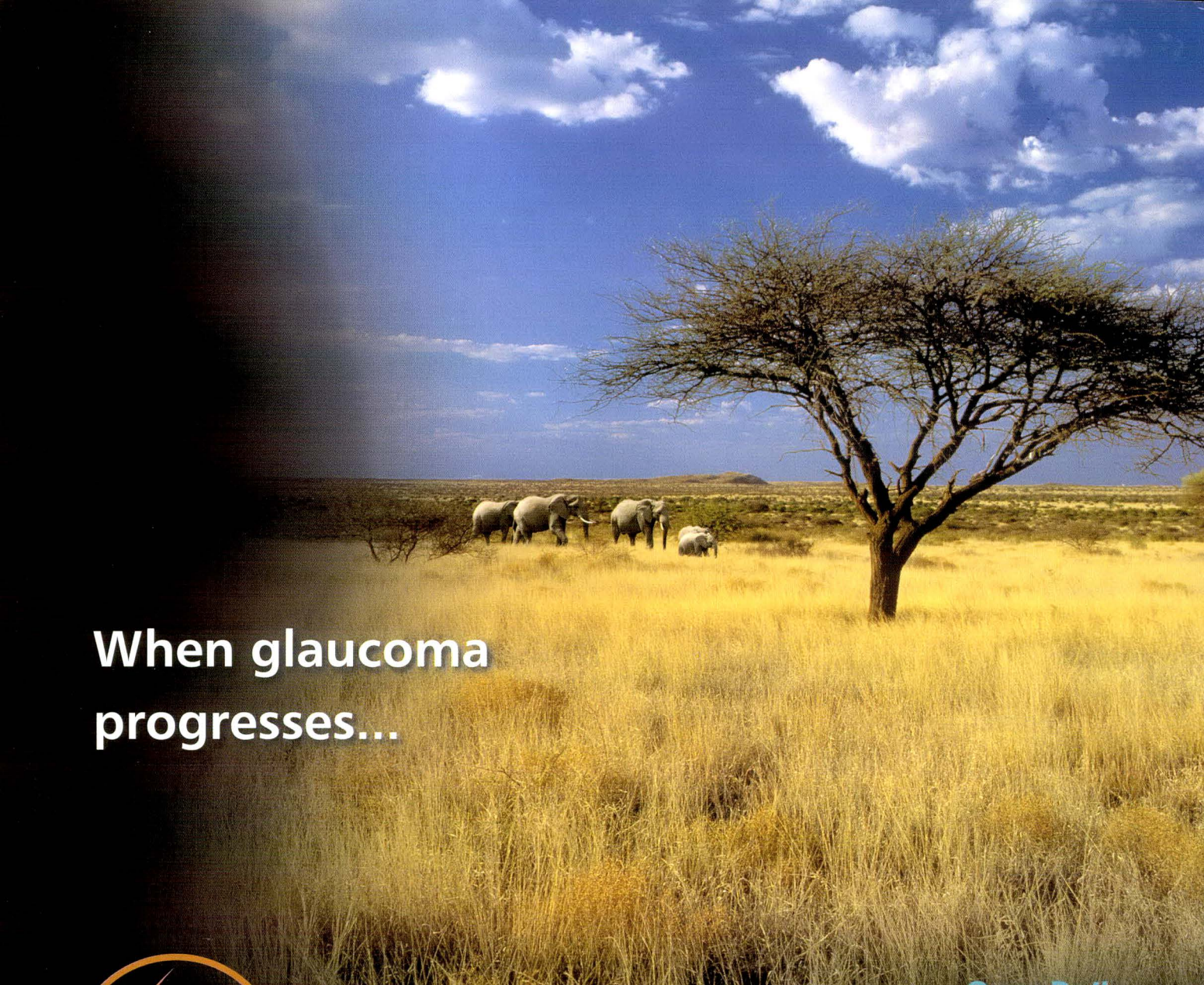
Table of Contents



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Argon Laser Peripheral Iridoplasty

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Birmingham and Midlands Eye Centre, Birmingham, UK

Argon laser peripheral iridoplasty (ALPI) has been used in the management of primary angle closure (PAC) for more than 10 years.[1,2] Argon laser burns are applied to the peripheral iris to flatten it and contract it away from the trabecular meshwork, thereby opening up the angle. Traditionally, 20 to 30 large low-power long-duration burns are used. However, the study by Loon et al published in this issue of Asian Journal of Ophthalmology demonstrates that the application of a small number of small-sized burns can be effective for opening up the angle.[3]

There are 2 subgroups of patients with angle closure for whom ALPI may be indicated. For patients presenting with acute angle closure who do not respond to topical and systemic medical treatment, ALPI is effective at breaking the acute attack and achieving rapid intraocular pressure (IOP) control and symptom relief. This was demonstrated by a randomised controlled trial conducted in Hong Kong.[4] The second indication for ALPI is for selected patients who have residual appositional angle closure following laser iridotomy due to plateau iris configuration. The evidence for the effectiveness of ALPI for these patients comes mainly from retrospective studies, such as the one published in this issue,[3] but is supported by ultrasound biomicroscopy (UBM) documentation of an increase in angle width and resolution of angle closure following treatment.[5] The available evidence supports restricting the use of ALPI to patients with UBM or gonioscopic evidence of plateau iris configuration, as these patients seem to respond best to treatment. Patients in whom there is predominantly a phacomorphic component and shallow anterior chambers are likely to respond better to lens extraction. Even in patients with plateau iris, iridoplasty may need to be repeated as the angle can close during follow-up.

Studies have suggested that ALPI may result in IOP-lowering in patients with chronic PAC and primary angle closure glaucoma (PACG), reducing the need for filtering surgery[2,6] but a randomised controlled trial is needed to confirm whether ALPI has a long-term benefit in the management of angle closure. A trial is currently in progress in Singapore.

Adverse effects of iridoplasty include corneal burns, which can occur if laser burns are applied to the iris when in close proximity to the corneal endothelium.[6] This can be avoided by applying initial burns more centrally to the iris where there is adequate space between the iris and corneal endothelium. Iris atrophy can occur if there are confluent iris burns of very high power. A few cases of a persistent dilated pupil lasting several months have been reported, and these can give rise to symptoms of glare, which may be quite distressing for the patient.[7] It has been hypothesised that this may be a form of Urrets-Zavalia syndrome resulting from denervation of the parasympathetic nerves to the iris muscles. Contraindications for iridoplasty include synechial angle closure, a flat or very shallow anterior chamber, and corneal opacity preventing an adequate view of the iris.

As Loon et al demonstrate, advances in anterior segment imaging such as UBM and anterior segment optical coherence tomography are helping us to better understand the various mechanisms contributing to angle closure, and the effectiveness of treatments.[3] More prospective studies evaluating the role of ALPI for angle closure and comparing this technique with other interventions would be helpful to determine how laser, medical, and surgical treatments should be used appropriately for the best long-term control of IOP and glaucomatous optic neuropathy. Despite the encouraging data on the beneficial effects of ALPI, it does not treat the pupil block mechanism of angle closure, so it is therefore essential that laser or surgical iridotomy is performed as first-line treatment for all patients before proceeding to implement ALPI or medical treatment.

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Eight-shot Argon Laser Peripheral Iridoplasty for Eyes with Primary Angle Closure

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Aim: *To investigate the effectiveness of 8-shot argon laser peripheral iridoplasty for treating Asian eyes with primary angle closure.*
Methods: *Eight laser shots, placed 2 shots per quadrant, were applied using the following parameters: power, 0.4 W to 0.7 W; duration, 150 ms to 200 ms; and spot size, 100 µ to 200 µ. Before treatment, all eyes had occludable angles with gonioscopic findings of grade 0 to 1 by the modified Shaffer system. Ultrasound biomicroscopy was performed to confirm angle closure in dark and light provocation tests. The degree of angle opening was measured using angle opening distance, angle recess area, and trabecular iris space area.*
Results: *The intraocular pressures measured by Goldmann applanation tonometry were within normal limits at 14 mm Hg to 19 mm Hg. There was strong evidence that the mean intraocular pressure was lower after the laser treatment ($p < 0.001$, $t_{38, 0.05} = 4.699$) with a mean decrease in IOP of 2.7 mm Hg. The angles opened up to an average of grade 2 at gonioscopy, and ultrasound biomicroscopy showed non-occludable angles. Ultrasound biomicroscopy images were analysed using ultrasound biomicroscopy Pro 2000 software. The majority of the ultrasound biomicroscopy measurements increased after laser treatment.*
Conclusion: *Eight-shot argon laser peripheral iridoplasty is effective for opening up the anterior chamber angles in Asian eyes with primary angle closure.*

Key words: *Glaucoma, angle-closure, Iridoplasty, Lasers*

Asian J Ophthalmol. 2008;10:212-4

Introduction

Argon laser peripheral iridoplasty (ALPI) was suggested as a treatment for chronic angle closure glaucoma (CACG) by Chew and Yeo in 1995.[1] ALPI involves the application of contraction burns to the peripheral iris. This action compacts and contracts the peripheral iris stroma, creating a space between the anterior iris surface and the trabecular meshwork, thus opening the angle.[2] Other researchers have also advocated the use of ALPI for relieving acute ACG, by enabling the contraction of the peripheral iris to change the configuration of the angle and to re-establish aqueous drainage.[3,4] Most researchers use up to 40 shots with an argon or diode laser to achieve this effect. However, this can result in complications, and research has shown that corneal decompensation requiring corneal transplant can occur following laser iridotomy.[5] The greater the number of laser burns and the higher the energy levels, the greater the likelihood of causing irreversible damage to the cornea. This study was performed to investigate whether the use of moderate energy levels with sub-stantially fewer shots could achieve the same effect.

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Methods

Patients

This was a retrospective study of patients with narrow angles who were treated at the Glaucoma Clinic, National University Hospital, Singapore. Patients with occludable angles were enrolled into the study. Occludable angles were identified as those for which gonioscopy without indentation failed to visualise the posterior pigmented trabecular meshwork for 2 or more quadrants — a Sussman-style 4-mirror gonioscope (Ocular Instruments, Bellevue, USA) was used. Ultrasound biomicroscopy (UBM; Model P40; Humphrey Instruments Inc, San Leandro, USA) with a 50 MHz transducer probe was then performed to confirm angle occludability. Patients with significant peripheral anterior synechiae were excluded from the study.

Clinical examination and grading of the angles followed the protocols of previous studies of the anterior segment.[6,7] Clinical

examinations were performed before treatment, during the first week after treatment, and within 1 month of the procedure. Gonioscopic and UBM findings were recorded at baseline and 1 month after treatment. UBM examinations were all performed by the same operator, who was masked to the results of the gonioscopy findings. No patients had undergone previous peripheral iridotomy.

Only patients with closed angles in both light and dark conditions at UBM examination were recruited. Three standard axial image sections per position were performed at 3, 6, 9, and 12 o'clock using standard lighting conditions in both photopic and scotopic conditions. A 5- x 5-mm field was imaged and analysed using dedicated analysis software (UBM Pro 2000; Paradigm, Salt Lake City, USA).[8] Parameters calculated included angle opening distance (AOD), angle recess area (ARA), and trabecular iris space area (TISA). Scans were performed in both light and dark conditions, and the findings for dark conditions were reported. Informed consent was obtained from all patients.

Procedure

ALPI was performed with topical anaesthesia using an Abraham lens, after 1 drop of pilocarpine 4% was administered. Argon blue-green laser settings, used for all patients, were as follows: power, 0.4 W to 0.7 W; duration, 150 ms to 200 ms; and spot size, 100 μ to 200 μ. Eight shots were delivered to 4 quadrants (360°), with 2 shots delivered to each quadrant. The laser beam was focused onto the peripheral iris, as close to the limbus as possible. The desired endpoint was localised contraction of the iris at the treated site for each laser application. The laser energy level was increased if there was no contraction response from the iris. One hour after laser treatment, the intraocular pressure (IOP) was measured to check for IOP spikes. Any corneal burns, anterior inflammation, and other complications were recorded. Patients instilled topical prednisolone phosphate 1% 4 times daily for 1 week after the procedure. Visual acuity, IOP, number of glaucoma medications, and angle grading (Shaffer system) documented by darkroom gonioscopy and UBM findings were recorded.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (version 14.0) and *t* test was used to test the differences in means; $p \leq 0.05$ was considered significant.

Results

Thirty seven eyes (19 right and 18 left eyes) of 20 patients received 8-shot ALPI. The mean age was 62.05 years (SD, 8.90 years; range, 34 to 72 years). There were 13 women and 7 men. Of the 37 eyes, 14 were primary angle closure suspects (PACS) with occludable angles, 15 had primary angle closure (PAC) and 8 eyes had CACG.

Table 1. Ultrasound biomicroscopy measurements before and after argon laser peripheral iridoplasty.

	Pre-ALPI	Post-ALPI
Mean AOD	45.280	68.260
Mean ARA_{500}	0.012	0.019
Mean ARA_{750}	0.046	0.076
Mean $TISA_{500}$	0.022	0.038
Mean $TISA_{750}$	0.064	0.111

Abbreviations: ALPI = argon laser peripheral iridoplasty; AOD = angle opening distance; ARA = angle recess area; TISA = trabecular iris space area.

Eight laser applications per eye were delivered. The mean energy level used was 643 mW (SD, 106 mW; range, 400 to 700 mW). The laser spot size was set between 100 μ and 200 μ and the mean duration was 163 ms (SD, 28 ms; range, 150 to 200 ms. Nine of 14 PACS eyes with Shaffer grade 0 to II opened to Shaffer grade II to III on gonioscopy after ALPI. UBM of these eyes showed improvement in dark-light provocation test, with the appositionally closed segment of the drainage angle opening up in the dark post-ALPI. The other 5 eyes remained unchanged at gonioscopy and UBM. Seven eyes with PAC had an improved drainage angle from Shaffer grade 0 to II to Shaffer II to IV post-ALPI. UBM of 5 of the 7 eyes revealed reduced or absent occludable angles in the dark, despite the narrow appearance. No notable changes were observed in the other 8 eyes with PAC. Drainage angles that were closing in the dark pre-ALPI opened up at post-ALPI UBM in 6 eyes with PACG. Table 1 shows the mean AOD, ARA, and TISA pre- and post-ALPI. Five of 8 eyes showed increased AOD and ARA_{500} post-ALPI, while ARA_{750}, $TISA_{500}$, and $TISA_{750}$ increased post-ALPI in 6 of 8 eyes. None of the eyes showed any worsening of the angle closure at UBM.

There was no statistically significant evidence of any deterioration in visual acuity after treatment ($p = 0.16$, $t_{38,\ 0.05} = 1.404$).

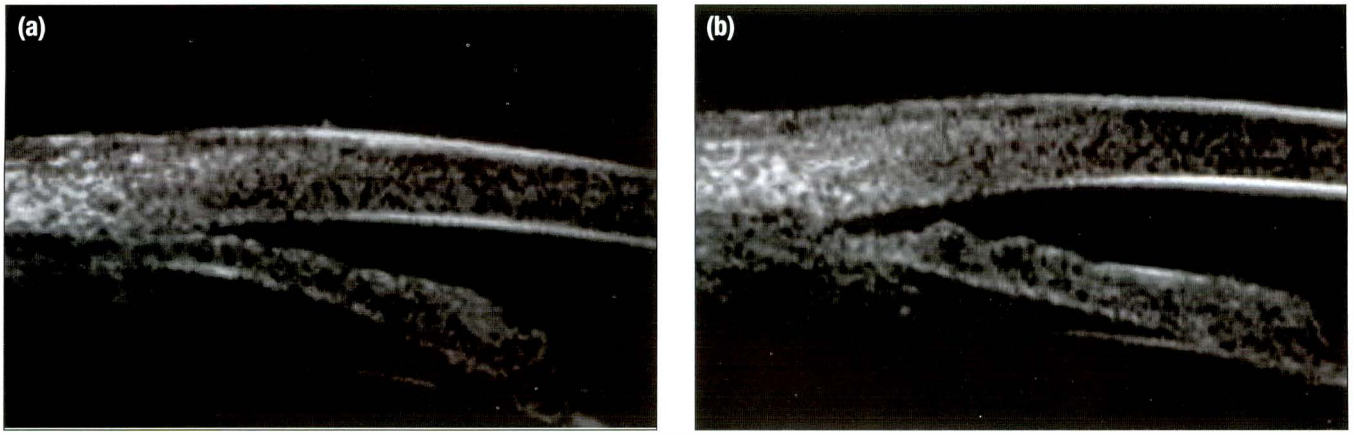
The mean IOP was significantly lower after ALPI ($p < 0.001$, $t_{38,\ 0.05} = 4.699$). The mean decrease in IOP was 2.7 mm Hg (95% confidence interval [CI], 1.6 to 3.9 mm Hg). There was no change in the number of medications used before and after treatment ($p = 1.0$, $t < 0.001$ with 38df; 95% CI, +0.1 to -0.1 medications).

There were no complications of IOP spikes, anterior chamber inflammation after 1 week, or corneal burns.

Discussion

In this small case series, a substantially reduced number of laser shots were used to open the angles of eyes with narrow angles (Figure 1). There were no complications or increase in the number of medications used, and there was a decrease in IOP. A smaller

Figure 1. Ultrasound biomicroscopy scan of (a) the angle of a patient with primary angle closure before argon laser peripheral iridoplasty; and (b) the same angle after argon laser peripheral iridoplasty.



spot size than for traditional ALPI was also used. Not only will this reduce the thermal damage to the adjacent structures, but is also more cosmetically acceptable.

There are limitations to this study. The study included a small number of eyes. The type and duration of angle closure, and whether these factors affect the treatment efficacy were not analysed. The follow-up period was short (1 month), so the long-term effectiveness of this new technique was not investigated. The results were not analysed according to sex or race.

This technique should be further tested in a large randomised controlled trial with a greater number of patients and a longer duration of follow-up (6 months to 1 year), with analysis of the AC subgroups of PACS, acute AC, and CACG.

The laser setting and number of shots can be altered to optimise success, depending on the patient population that is being treated. Reducing the number of shots, hence the damage to adjacent structures, is effective for angle widening. Possible modifications could include more shots with reduced power.

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Comparison of the Efficacy and Safety of Travoprost and Timolol throughout the Diurnal Curve

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Aim: *To evaluate the safety and intraocular pressure–lowering effects of travoprost 0.004% and timolol 0.5% throughout the diurnal curve in patients with primary open angle glaucoma or ocular hypertension.*
Methods: *The prospective clinical study included 60 patients (120 eyes) with primary open angle glaucoma and ocular hypertension. The patients were randomised into 2 groups to receive travoprost 0.004% (Travatan) once daily in the evening or timolol 0.5% (Glaumol) twice daily.*
Results: *Both medications significantly reduced intraocular pressure at all time points at all follow-up visits ($p < 0.001$). Intraocular pressure was significantly lower among patients receiving travoprost than among those receiving timolol at 8 of 12 visits. For all visits, the mean diurnal intraocular pressure was 17.57 mm Hg for the travoprost group and 19.17 mm Hg for the timolol group. The mean intraocular pressure reduction from baseline was significantly greater for travoprost (-6.06 mm Hg to -8.03 mm Hg) than for timolol (-4.20 mm Hg to -6.21 mm Hg) [$p < 0.001$]. The most frequent treatment-related adverse events were conjunctival hyperaemia and foreign body sensation in the travoprost group and dry eye sensation in the timolol group. Tolerance was better for the patients receiving timolol than for those receiving travoprost.*
Conclusions: *Travoprost 0.004% once daily was significantly superior to timolol 0.5% twice daily for lowering intraocular pressure. Travoprost resulted in an intraocular pressure reduction of up to 2.43 mm Hg greater than timolol. Both drugs were well tolerated and safe.*

Key words: *Glaucoma, open-angle, Ocular hypertension, Timolol, Travoprost*

Asian J Ophthalmol. 2008;10:215-20

Introduction

Primary open angle glaucoma (POAG) is characterised by chronic elevated intraocular pressure (IOP) and progressive optic neuropathy, with optic nerve damage and subsequent visual field loss. An estimated 67 million people have glaucoma, making it the second leading cause of blindness worldwide.[1] Elevated IOP is the most common risk factor for development and progression of the disease.[2] Progressive visual field loss occurs more frequently and to a greater degree in patients with glaucoma with increased IOP. Lowering IOP in patients with ocular hypertension (OH) may decrease their risk of developing glaucoma and preserve visual function.[3]

Non-selective β-blockers, such as timolol, have been used as first-line therapy for POAG and OH for the past few decades. The potential pulmonary and cardiovascular side effects of non-selective β-blockers are well known.[4,5]

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Prostaglandin analogues represent a class of potent ocular hypotensive agents that reduce IOP as effectively as non-selective β-blockers without the systemic side effects. The reduction in IOP is mostly a result of increased uveoscleral outflow of aqueous humour. The isopropyl ester prodrug is rapidly hydrolysed by an esterase in the cornea to the biologically active free acid, that is structurally similar to the other prostaglandin F2α analogues. The prodrug manifests preferential affinity and full agonist activity at the FP receptors in the Nan molar range, with no meaningful affinity for other receptors.[6] The activation of a ciliary smooth muscle FP receptor by prostaglandin analogues triggers a cascade of events, including increased uveoscleral outflow of aqueous humour, relaxation of the ciliary muscle, induction of matrix metalloproteinase activity, and subsequent degradation of extracellular matrix proteins.[7,8] Unlike travoprost and other prostaglandin analogues, β-blockers lower IOP by decreasing the production of aqueous humour.[9-11] The most common side effects associated with prostaglandin analogues are ocular hyperaemia, increased eyelash growth, and change in iris pigmentation.[12] Anterior uveitis and

cystoid macular oedema have been reported in some patients using prostaglandin analogues.[13]

The aim of this study was to evaluate the safety and IOP-lowering effects of travoprost 0.004% and timolol 0.5% throughout the diurnal curve in patients with POAG or OH.

Methods

This was a 3-month randomised controlled open-label prospective study that compared the safety and IOP-lowering efficacy of travoprost 0.004% (Travatan; Alcon-Couvreur SA, Puurs, Belgium) and timolol 0.5% (Glaumol, Galenika AD, Zemun, Serbia) in patients with POAG or OH at the Eye Clinic, Clinical Center Vojvodina, Novi Sad, Serbia.

Patients

The inclusion criteria were age 30 years or older, newly diagnosed POAG or OH, with or without pseudoexfoliation and pigment dispersion. Eligible patients were required to have an IOP of 22 mm Hg to 36 mm Hg in one or both eyes at 8.00 am at 3 eligibility visits.

Patients with IOP >36 mm Hg in either eye were excluded based on the potential safety risk. Other exclusion criteria were best-corrected visual acuity (BCVA) worse than 0.6 logMAR, cup-disc ratio >0.8, gonioscopy-measured angle grade <2 (Shaffer classification), severe central visual field loss, a history of chronic and recurrent inflammatory eye disease, severe retinal disease, any abnormality that prevented reliable applanation tonometry, ocular trauma or intraocular surgery within 6 months of screening, and laser surgery within 3 months of screening. Women of childbearing age, and patients with severe unstable or uncontrolled cardiovascular, hepatic, or renal diseases; bronchial asthma or chronic pulmonary disease; or hypersensitivity to prostaglandins, prostaglandin analogues, topical or systemic β-blockers, or any components of the study medications were also excluded. Safety assessments were introduced to examine the side effects associated with topical β-blockers, such as heart rate and blood pressure, and topical prostaglandins, such as ocular hyperaemia, iris pigmentation, and eyelash changes.

The following eligibility evaluations were conducted: BCVA, biomicroscopy, gonioscopy, dilated fundus examination, cup-disc ratio, and bilateral IOP measurements at 8.00 am, 10.00 am, and 4.00 pm at 3 eligibility assessments, using Goldmann applanation tonometry and automated perimetry; the IOP measurements were not masked to the examiner. The visual field evaluation was performed using the Humphrey field analyser program 24-2 or 30-2 (Carl Zeiss Meditec AG, Jena, Germany), equipped with STATPAC.

Design

Sixty patients were enrolled in the study. Each patient was assigned a number, and a computer randomisation program was used to delegate each patient to 1 of 2 groups to receive travoprost 0.004% once daily (n = 30) or timolol 0.5% twice daily (n = 30).

Patients were instructed in how to instil the medications. Patients in the travoprost group administered 1 drop into each eye once daily in the evening at 9.00 pm, and patients in the timolol group administered 1 drop into each eye twice daily at 8.00 am and 8.00 pm. Follow-up was done at 7, 21, and 45 days, and 3 months. IOP measurements were taken at each follow-up examination at 8.00 am, 10.00 am, and 4.00 pm. Ocular and systemic side effects of hyperaemia, foreign body sensation, blurred vision, dry eye sensation, pruritis, discomfort, iris pigmentation, eyelash changes, pulse rate changes, breathing difficulties, headaches, depression, and gastrointestinal problems were documented at each visit.

Statistical Analysis

Both eyes were taken into account for the statistical analysis. The data were coded and entered in a database. Statistical analyses were performed using the Statistical Package for the Social Sciences. Standard statistical parameters and methods (descriptive statistics and frequency distribution) were used. Numerical data were presented using mean values, standard deviation (SD), and 95% confidence interval (CI). Comparisons among groups were done using the *t* test. Chi-squared test was used to test the difference in frequency distributions of observed parameters; $p < 0.005$ denoted statistical significance.

Results

Of the 60 patients enrolled in the study, 2 patients from the timolol group were excluded; 1 had no treatment visit data and 1 had no qualifying IOP.

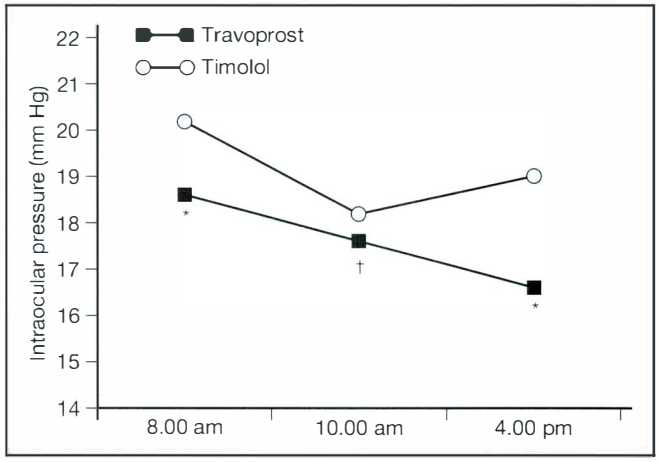
The mean age of patients in the travoprost group was 61.7 years (SD, 13.1 years; range, 35 to 83 years) and in the timolol group was 65.6 years (SD, 7.8 years; range, 39 to 80 years). There was no significant difference in the mean age between the 2 groups. The demographic characteristics are shown in Table 1. There were no statistically significant differences between the treatment groups for sex, diagnosis, horizontal cup-disc ratio, mean deviation, and pattern standard deviation, but there were significant differences for vertical cup-disc ratio ($p = 0.005$) and gonioscopy values ($p = 0.003$). There was no statistically significant difference for baseline IOP among the groups, which were 24.62 mm Hg for the travoprost group and 24.46 mm Hg for the timolol group. There was no statistically significant difference between the visual acuities in the 2 groups.

Table 1. Patients' demographics.

Variable	Travoprost	Timolol	p Value
Number of patients	30	28	
Age (years)			
Mean (SD)	61.7 (13.1)	65.6 (7.8)	0.053
Range	35-83	39-80	
Sex			
Men	16	12	0.593
Women	14	16	
Diagnosis			
Primary open angle glaucoma	17	10	0.182
Ocular hypertension	13	18	
Baseline intraocular pressure (mm Hg)	24.62	24.46	0.692
Best-corrected visual acuity			
Mean (SD)	0.922 (0.174)	0.925 (0.115)	0.904
Gonioscopy (Shaffer grade)			
Mean (SD)	3.02 (0.32)	2.84 (0.37)	0.003
Optic nerve head horizontal cup-disc ratio			
Mean (SD)	2.71 (1.29)	3.27 (1.31)	0.021
Optic nerve head vertical cup-disc ratio			
Mean (SD)	3.36 (1.59)	4.10 (1.19)	0.005
Mean deviation (dB)			
Mean (SD)	-1.34 (2.63)	-1.59 (1.72)	0.555
Pattern standard deviation* (dB)			
Mean (SD)	2.77 (2.71)	2.41 (1.79)	0.587

* Visual field indices.

Figure 1. Mean intraocular pressure at different time points (pooled data for all visits).
* $p < 0.001$.
† $p = 0.115$.



The IOP-lowering efficacy of travoprost was greater at all visits and time points than that of timolol, with the mean diurnal IOP ranging from 16.6 to 18.6 mm Hg for the travoprost group and 19.0 to 20.2 mm Hg for the timolol group (Figure 1). Travoprost was significantly superior to timolol for lowering IOP at 8 of 12 visits and equal to timolol at the other 4 visits (Table 2). For all visits pooled, the mean diurnal IOP was 17.57 mm Hg for the travoprost group and 19.17 mm Hg for the timolol group. The pooled data also demonstrated that the IOP-lowering efficacy of travoprost, relative to timolol, improved during the course of the day, with the greatest treatment differences occurring at 4.00 pm. The IOP-lowering of travoprost was 2.43 mm Hg greater than that of timolol at the

Table 2. Comparison of mean diurnal intraocular pressure achieved with travoprost 0.004% and timolol 0.5%.

Time	Treatment	Mean intraocular pressure (range) [mm Hg]	95% Confidence interval	p Value
Day 7				
8.00 am	Travoprost	19.48 (14-26)	18.78-20.18	0.002
	Timolol	21.14 (14-27)	20.33-21.96	
10.00 am	Travoprost	18.45 (9-23)	17.77-19.13	0.580
	Timolol	19.39 (13-25)	18.69-20.10	
4.00 pm	Travoprost	17.98 (13-24)	17.30-18.67	<0.001
	Timolol	19.96 (16-25)	19.38-20.55	
Day 21				
8.00 am	Travoprost	18.80 (15-29)	18.06-19.54	<0.001
	Timolol	20.59 (16-25)	19.97-21.21	
10.00 am	Travoprost	17.57 (14-26)	16.90-18.23	0.189
	Timolol	18.29 (10-23)	17.41-19.16	
4.00 pm	Travoprost	16,43 (12-21)	15.82-17.04	<0.001
	Timolol	19.36 (15-23)	18.73-19.98	
Day 45				
8.00 am	Travoprost	18.63 (14-24)	18.07-19.19	<0.001
	Timolol	20.00 (16-24)	19.53-20.47	
10.00 am	Travoprost	17.72 (12-24)	17.09-18.34	0.617
	Timolol	17.93 (14-22)	17.36-18.49	
4.00 pm	Travoprost	16.17 (11-21)	15.57-16.76	<0.001
	Timolol	18.95 (14-26)	18.37-19.53	
Month 3				
8.00 am	Travoprost	17.28 (12-25)	16.64-17.93	<0.001
	Timolol	19.29 (11-24)	18.64-19.93	
10.00 am	Travoprost	16.67 (13-25)	16.05-17.28	0.107
	Timolol	17.38 (10-21)	16.75-18.00	
4.00 pm	Travoprost	15.77 (9-22)	15.02-16.52	<0.001
	Timolol	17.80 (9-21)	17.17-18.43	

Table 3. Mean diurnal intraocular pressure at 3 months.

Time	Intraocular pressure (SD) [mm Hg]		p Value
	Travoprost	Timolol	
8.00 am	17.3 (2.5)	19.3 (2.4)	<0.001
10.00 am	16.7 (2.4)	17.4 (2.3)	0.109
4.00 pm	15.8 (2.9)	17.8 (2.4)	<0.001
Diurnal	16.6 (2.2)	18.2 (2.2)	<0.001
Minimum	15.2 (2.8)	17.2 (2.4)	<0.001
Maximum	17.6 (2.2)	19.3 (2.4)	<0.001

4.00 pm timepoint across all visits. The mean diurnal IOP at day 90 was 16.6 mm Hg (SD, 2.2 mm Hg) for patients treated with travoprost and 18.2 mm Hg (SD, 2.2 mm Hg) for those treated with timolol (Table 3).

Significant IOP reduction from baseline was achieved with both travoprost and timolol ($p < 0.001$). The mean IOP reduction ranged from -6.06 to -8.03 mm Hg for travoprost and from -4.20 to -6.21 mm Hg for timolol (Figure 2). IOP reduction was greater for travoprost than for timolol, and was statistically significant at all visits ($p < 0.001$) except for the 10.00 am visits.

IOP-lowering efficacy to <21 mm Hg was achieved in 100% of patients in the travoprost group and 87.5% of patients in the timolol group; 18.3% of patients in the travoprost group had a mean IOP of <15 mm Hg across all visits compared with 3.6% of patients in the timolol group.

The percentage of patients who responded to treatment was based on a ≥25% IOP reduction from baseline. The data were combined for all visits and time points to provide an overall view of how patients responded to treatment from the beginning to the end of the study. Using these criteria, 45.0% to 71.7% of patients who received travoprost had IOP reductions >25% at 8.00 am, 10.00 am, and 4.00 pm compared with 10.7% to 39.3% of patients receiving timolol ($p < 0.001$) [Table 4].

Figure 2. Mean intraocular pressure change from baseline between travoprost 0.004% and timolol 0.5%.
* $p < 0.001$.
† $p = 0.059$.

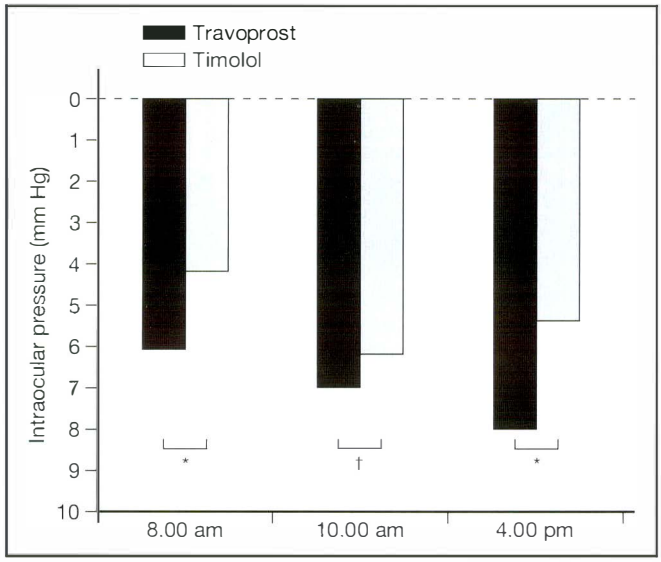


Table 4. Percent intraocular pressure change from baseline.

Percent change	Travoprost Number (%)	Timolol Number (%)
8.00 am		
<15%	11 (18.3)	23 (41.1)
≥15%-<25%	22 (36.7)	27 (48.2)
≥25%	27 (45.0)	6 (10.7)
10.00 am		
<15%	3 (5.0)	0 (0)
≥15%-<25%	24 (40.0)	34 (60.7)
≥25%	33 (55.0)	22 (39.3)
4.00 pm		
<15%	0 (0)	3 (5.4)
≥15%-<25%	17 (28.3)	40 (71.4)
≥25%	43 (71.7)	13 (23.2)

No serious treatment-related adverse effects were reported. The most frequent ocular effects of hyperaemia, discomfort, and foreign body sensation occurred among patients treated with travoprost. Hyperaemia was observed in 56.7% of patients in the travoprost group and 7.1% of patients in the timolol group ($p < 0.001$). Hyperaemia assessment was performed at all time points before instillation of fluorescein for IOP measurements. The most frequent ocular adverse effect among patients in the timolol group was dry eye sensation (21.4%), which occurred in 3.3% of patients in the travoprost group ($p = 0.087$). Discomfort was noted in 7.1% of patients in the timolol group and 46.7% of patients in the travoprost group ($p = 0.002$). Pruritis was reported in 7.1% and 10.0% of patients in the timolol and travoprost groups, respectively ($p = 1.000$). Blurred vision and foreign body sensation occurred in 3.3% and 16.7% of patients in the travoprost group, respectively. There were no observed iris pigmentation changes, eyelash changes, cystoid macular oedema, or systemic side effects.

Discussion

This 3-month prospective study evaluated the safety and efficacy of travoprost 0.004% and timolol 0.5% in patients with POAG and OH. The results show that both drugs reduced IOP at all time points at all visits ($p < 0.001$). The IOP-lowering efficacy of travoprost was up to 2.43 mm Hg greater than that of timolol. Other studies have also demonstrated greater IOP-lowering efficacy for travoprost,[14-17] with an average reduction of approximately 2.00 mm Hg. In this study, the mean IOP reduction from baseline was significantly greater with travoprost (-6.06 to -8.03 mm Hg) than with timolol (-4.20 to -6.21 mm Hg) [$p < 0.001$].

A difference in IOP-lowering of 2.61 mm Hg was achieved between the travoprost and timolol groups at 4.00 pm at all

follow-up visits (mean change of 8.02 mm Hg for travoprost and 5.41 mm Hg for timolol). The results of other studies have shown similar IOP reductions from baseline of 7 to 9 mm Hg for patients given travoprost.[15,18] The IOP reduction observed with timolol 0.5% was similar to a previous report.[19] This study indicated that travoprost significantly lowers diurnal IOP compared with timolol in patients with POAG and OH.

The 4.00 pm IOP measurement does not represent the peak or trough for either travoprost or timolol, so a comparison at this time point is more valid than at 8.00 am, which represents the peak for travoprost and the trough for timolol.[18] The lowest differences in IOP reduction between the 2 groups were observed at the 10.00 am time point at all treatment visits; 10.00 am represented the peak time for timolol (2 hours after instillation). Pooled results indicate that the IOP-lowering efficacy of travoprost was enhanced during the day from 8.00 am to 4.00 pm, and was significantly greater than timolol at 4.00 pm.

Using the criteria of ≥25% IOP reduction from baseline, more patients in the travoprost group responded to treatment than in the timolol group (45.0% to 71.0% and 10.7% to 39.3%, respectively). In another travoprost study, 62% to 65% of patients receiving travoprost achieved ≥25% reduction in IOP, compared with 38% to 48% of patients receiving timolol.[17]

Although the most frequent adverse event in the travoprost group was ocular hyperaemia (56.7%), the majority of patients had trace to mild hyperaemia. No patients discontinued the study because of ocular hyperaemia. Another study found a hyperaemia rate of 42%.[20] Discomfort occurred in 46.7% and foreign body sensation in 16.7% of patients in the travoprost group. These side effects did not appear to pose any safety issues or interfere with patients' daily activities.[18] Iris pigmentation changes and changes in eyelash characteristics, including length, thickness, density, and colour were not observed in patients receiving travoprost, although they have been observed in other studies.[15]

Cystoid macular oedema has been observed in some patients using prostaglandin analogues,[21,22] but cystoid macular oedema was not observed in any of the treatment groups in this study. This may be because of the stringent inclusion and exclusion criteria of this study, that was designed for the interpretation of the efficacy and safety without the introduction of other variables.

Dry eye sensation was reported by 21.4 % of patients in the timolol group, which was significantly higher than for patients in the travoprost group (3.3%). Topical administration of non-selective β-blockers such as timolol is known to cause respiratory and/or cardiovascular complications. However, none of the patients in this study had serious systemic respiratory or cardiovascular effects.

Travoprost 0.004% given once daily in the evening was statistically superior to timolol 0.5% given twice daily for lowering IOP, with an IOP reduction of up to 2.43 mm Hg greater for travoprost than for timolol. Local tolerance was better for patients in the timolol group. Both drugs were well tolerated and safe for use in this study population.

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Safety and Efficacy of Manual Small-incision Cataract Surgery Combined with Trabeculectomy: Comparison with Phacotrabeculectomy

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Aim: To determine the safety and efficacy of mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy, and to compare the procedure with phacotrabeculectomy.
Methods: In this retrospective review, 55 eyes undergoing mitomycin-C–augmented manual small incision cataract extraction combined with trabeculectomy were compared with 52 eyes undergoing phacotrabeculectomy. Visual acuity, intraocular pressure, and postoperative complications were analysed.
Results: There were no significant differences in age, sex, laterality, glaucoma type, cataract type, preoperative intraocular pressure, and follow-up duration between the 2 groups. After an average 39.8 months (SD, 18.5 months) follow-up, the intraocular pressure decreased from a baseline of 19.9 mm Hg (SD, 7.47 mm Hg) to 13.9 mm Hg (SD, 3.81 mm Hg) in the manual small-incision cataract surgery group and from 18.0 mm Hg (SD, 6.45 mm Hg) to 13.9 mm Hg (SD, 3.54 mm Hg) in the phacotrabeculectomy group ($p < 0.05$ for both groups). Surgical success in terms of intraocular pressure <21 mm Hg, with or without antiglaucoma medication, at the end of the follow-up period was 89.1% for the manual small-incision cataract surgery group and 92.3% for the phacotrabeculectomy group. Intraocular pressure reduction was significantly better following mitomycin-C–augmented manual small incision cataract extraction combined with trabeculectomy for open angle glaucoma (7.4 mm Hg). Best-corrected visual acuity improved to ≥6/12 in 43 eyes (78.2%) undergoing manual small-incision cataract surgery and in 44 eyes (84.6%) undergoing phacotrabeculectomy ($p = 0.357$). The incidence of complications was numerically greater in the manual small-incision cataract surgery group but this was not statistically significant ($p = 0.32$). The most common complication was posterior capsule opacification, in 44.5% of eyes.
Conclusions: Mitomycin-C–augmented manual small-incision cataract extraction combined with trabeculectomy is safe, effective, and of equal efficacy in terms of intraocular pressure reduction, visual rehabilitation, and complications when compared with phacotrabeculectomy.

Key words: Cataract, Cataract extraction, Glaucoma, Phacoemulsification, Trabeculectomy

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Introduction

Ever since Spaeth and Sivalingam first described combined surgery for glaucoma and cataract,[1] the surgical management of these coexisting diseases has remained a subject of debate.[2-8] The surgical aim is intraocular pressure (IOP) reduction and visual improvement, with a formed anterior chamber, centrally placed intraocular lens (IOL), and filtering sclerostomy in the absence of ocular hypotony and inflammation. However, complications arising from 1 procedure can alter the success of the other procedure, and combining the 2 procedures increases the surgical time. Phacotrabeculectomy and extracapsular cataract extraction combined with trabeculectomy (ECCE-trabeculectomy) are accepted techniques for combined surgery, with phacotrabeculectomy being associated with higher success rates,[5,6] especially when combined with antifibrotic agents.[7,8]

Manual small-incision sutureless cataract surgery (SISCS) is now a widely accepted surgical procedure for cataract extraction,

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in which the nucleus is prolapsed into the anterior chamber and then expressed out through a self-sealing scleral tunnel wound with the help of an irrigating vectis or glide.[9-14] As the incision size is smaller than that for ECCE and is self-sealing, similar to phacoemulsification, this technique results in reduced surgically induced astigmatism and early visual rehabilitation can be achieved.[4-6] A study of combined small-incision cataract surgery and trabeculectomy (SICS-trabeculectomy) showed a favourable IOP reduction and visual recovery similar to phacotrabeculectomy.[14]

This study was performed to ascertain the long-term effectiveness of SICS-trabeculectomy and to compare the technique with phacotrabeculectomy for coexisting cataract and glaucoma.

Methods

Patients

Combined procedures for cataract and glaucoma were performed in 564 eyes at the Aravind Eye Hospital and Postgraduate Institute of Ophthalmology, Tirunelveli, Tamil Nadu, India, in 2000. ECCE-trabeculectomy was performed in 302 eyes, SICS-trabeculectomy was performed in 133 eyes, and 129 eyes underwent phacotrabeculectomy. All patients undergoing ECCE-trabeculectomy were excluded from the study.

To reduce outcome variability, all patients who had SICS-trabeculectomy (n = 95) or phacotrabeculectomy (n = 120) performed by a single surgeon were enrolled. Twenty three eyes with lens-induced, previous failed trabeculectomy, or neovascular or complicated glaucoma were excluded; 19 eyes with corneal opacities, mature or hypermature cataract, lens subluxation, and retinal conditions of age-related maculopathy, diabetic maculopathy, or high myopia, which can influence the surgical outcome, were excluded; and 67 eyes were excluded due to the short follow-up (<1 year). Detailed records of the remaining 108 eyes (55 SICS-trabeculectomy and 52 phacotrabeculectomy) were reviewed and analysed in December 2005.

Preoperative Evaluation

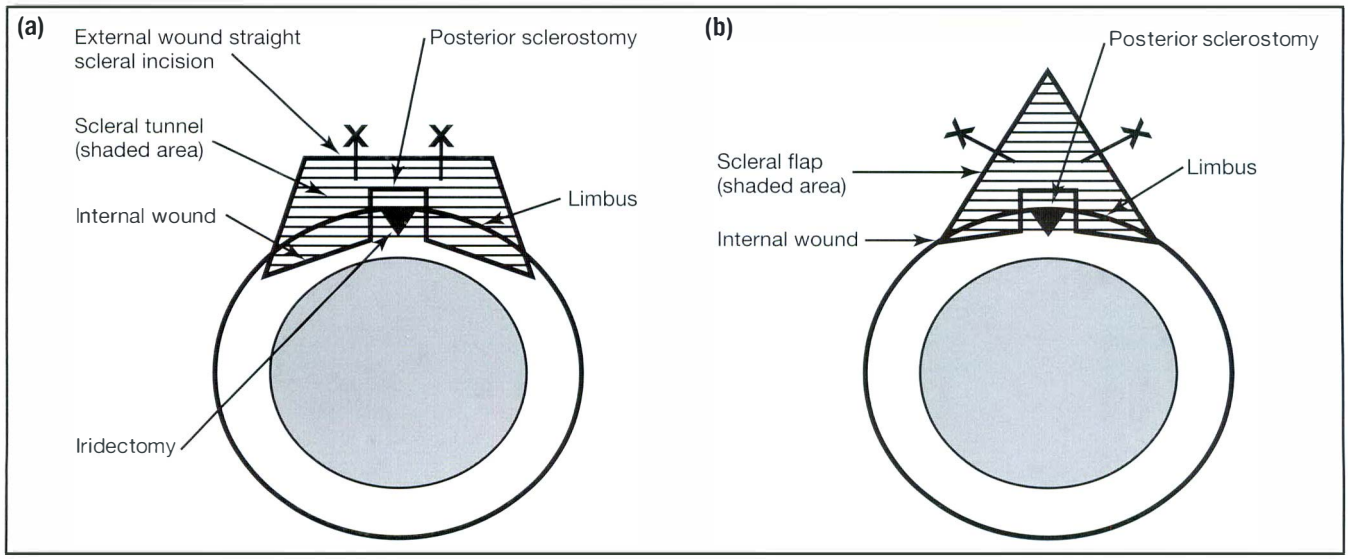
All patients underwent subjective refraction with Snellen optotypes at 6 m, slit-lamp biomicroscopy of the anterior segment, Goldmann applanation tonometry, gonioscopy, stereoscopic assessment of the optic disc by slit-lamp indirect ophthalmoscopy, and Humphrey visual field analysis (24-2 SITA-standard).

Surgical Procedure

All patients underwent a similar operative procedure. Infection prophylaxis of ciprofloxacin 0.3% eye drops was administered 1 hourly for 1 day before surgery and patients underwent povidone iodine 5% cleansing of the periocular area. Surgery was performed after adequate mydriasis with tropicamide 0.8%, phenylephrine 5%, and flurbiprofen 0.03%, 2 to 3 times before ocular anaesthesia was administered. Ocular anaesthesia and akinesia was administered by retrobulbar injection (xylocaine 2% with hyaluronidase 37.5 IU/mL) and facial akinesia was achieved by the O'Brien technique (xylocaine 2%). If the after-block IOP was >25 mm Hg by Perkins applanation tonometry, 20% mannitol (5 to 10 mL/kg) was given before proceeding with surgery.

For SICS-trabeculectomy, after placing the superior rectus bridle suture, a 6- to 8-mm fornix-based conjunctival flap was made. Tenon's capsule was cleared from the scleral surface and haemostasis was achieved with bipolar diathermy. A sponge soaked with mitomycin-C (MMC) 0.2 mg/mL was placed on the bare sclera, under the conjunctival flap, for 2 minutes, following which the area was thoroughly irrigated with balanced salt solution. Based on the approximate nucleus size, a 5.5- to 7.5-mm half-thickness straight scleral incision was made 2.5 to 3.0 mm from the posterior border of the superior limbus (Figure 1a). A scleral tunnel was fashioned with a crescent blade 0.5 to 1.0 mm into the clear cornea. Dissection was carried out along the limbus on both sides to create a funnel-shaped 'pocket' in the cornea. A paracentesis was made at 9 o'clock and viscoelastic was injected into the anterior chamber. The anterior chamber was entered through the scleral tunnel with a 3.2 mm keratome, by which a curvilinear oval-shaped capsulorrhexis of 6 to 7 mm was made. The inner lip of the scleral tunnel was enlarged to 7 to 9 mm with the help of the keratome and viscoelastic was injected into the anterior chamber. The nucleus was lifted off the cortex bed and prolapsed into the anterior chamber using either the horizontal seesaw technique with a Sinsky hook or the hydrodissection technique. Viscoelastic was injected both above and below the nucleus to cushion the site and avoid trauma to the corneal endothelium, underlying iris, and posterior capsule. A 3-port curved irrigating vectis was introduced under the nucleus. The nucleus was first trapped into the hollow of the vectis and then dragged outwards to engage it in the internal corneal pocket. The nucleus was extracted via the scleral tunnel by simultaneous injection of fluid into the anterior chamber, pulling out the vectis, and pressure on the posterior lip of the scleral tunnel by the vectis. Pulling on the bridle suture produced counter traction during the nucleus extraction. Irrigation and aspiration was done to remove the cortex and epinucleus. Viscoelastic was injected into the bag and a polymethyl methacrylate (PMMA) IOL (single-piece, optic diameter 5.5 or 6.0 mm, modified C loop with 10° angulation; Aurolab, Madurai, India) was placed in the bag, and rotated to the horizontal position. Sclerostomy was performed by excising a block of 2- x 1-mm tissue from the posterior lip of the scleral tunnel using a Kelly's Descemet's membrane punch. Peripheral iridectomy was

Figure 1. Wound construction. (a) The linear straight external opening (approximately 5.5 to 7.5 mm) of the scleral tunnel is smaller than the internal opening (7 to 9 mm) for mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy; and (b) the internal opening of the triangular scleral flap (5.0 to 5.5 mm) for phacotrabeculectomy. Posterior sclerostomy was performed at the sclero-corneal junction under the flap or within the tunnel.



performed. The scleral tunnel was approximated and closed with 2 radial interrupted 10/0 monofilament nylon sutures, the ends of which were buried towards the scleral side.

For phacotrabeculectomy, similar steps as for SICS-trabeculectomy were followed with the following differences. Instead of a scleral tunnel, a triangular partial-thickness scleral flap of 5.0 to 5.5 mm was raised at the 12 o'clock position, extending approximately 0.5 to 1.0 mm inside the cornea (Figure 1b). A paracentesis incision was made at 3 o'clock to assist the bimanual procedure. Hydrodissection and hydrodelineation was performed to separate the nucleus from the epinucleus. The nucleus was emulsified by the divide and conquer phacoemulsification technique. A PMMA IOL (single-piece, optic diameter 5.0 or 5.5 mm, modified C loop with 10° angulation; Aurolab, Madurai, India) was placed in the bag. Sclerostomy was performed under the scleral flap by excising a block of 2- x 1-mm tissue from the posterior lip of the entry incision. The scleral flap was approximated and closed with 3 interrupted 10/0 monofilament nylon sutures.

In both techniques, the conjunctival flap was closed with an 8/0 vicryl suture in a watertight manner. The patency of the trabeculectomy was tested by injecting Ringer's lactate through the side port. Subconjunctival gentamycin sulphate 0.5 mL and dexamethasone 0.4% 0.5 mL was injected into the inferior fornix.

Statistical Analysis

The records of all eyes were available for uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), IOP, optic disc changes, complications, and the management of complications for each visit. Measurements performed 1 day before surgery were considered baseline. The surgical success of glaucoma surgery was defined as complete (IOP <21 mm Hg without medication), qualified (IOP <21 mm Hg with a single medication), or failure (IOP ≥21 mm Hg with a single medication). Success was also considered on the basis of achieving a target IOP (Jampel's formula[15]) of IOP <baseline and IOP <16 mm Hg. The surgical success of cataract surgery was based on achieving visual acuity of 6/12 or better. Other study parameters that defined success were reduction in antiglaucoma medication and surgical complications.

Follow-up was done at 1 week, 1, 3, and 6 months, and annually until the end of follow-up. Data for IOP, UCVA, BCVA, and additional medication use are presented in mean, SD, and percentages. Paired Student *t* test was used to compare pre- and postoperative IOP change and independent Student *t* test was used to compare subgroups. Chi-squared test was used to test associations between categorical variables. Significance values of <0.05 were considered significant.

Results

Demographic Profile

No significant differences in age, sex, laterality, glaucoma type, cataract type, preoperative IOP, or follow-up were noted between the 2 groups (Table 1). SICS-trabeculectomy was performed more commonly after failure of initial medical management ($p = 0.07$, χ^2). This was probably due to the greater severity of optic disc damage of patients undergoing SICS-trabeculectomy ($p = 0.033$, χ^2) requiring IOP control with multi-drug regimens (≥2 drugs used in 18 eyes of the SICS-trabeculectomy group compared with 8 eyes in the phaco-trabeculectomy group). The mean follow-up was 36.1 months (SD,

Table 1. Demographic profile of patients undergoing mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy or phacotrabeculectomy.

	SICS-trabeculectomy	Phacotrabeculectomy	p Value
Number of eyes/patients	55/47	52/46	
Age (years)			
Mean (range)	64.13 (41-80)	66.11 (49-83)	0.215*
Sex			
Men	34	33	0.860
Women	21	19	
Laterality			
Right	24	28	0.291†
Left	31	24	
Glaucoma type			
Open angle	43	38	0.640†
Angle closure	10	10	
Combined	2	4	
Pseudoexfoliation	7	6	0.851†
Cataract type			
Nuclear sclerosis	13	7	0.254†
Cortical	3	4	
Combined	39	41	
Preoperative intraocular pressure (mm Hg)			
Mean (SD)	19.89 (7.47)	18.0 (6.45)	0.420*
Surgery type			
Primary	18	26	0.070†
Secondary	37	26	
Medications			0.070
Number of patients	58	34	
Number of medications (SD)	1.19 (0.89)	0.67 (0.74)	
Optic neuropathy			
Early (CDR, <0.6)	5	7	0.033†
Moderate (CDR, 0.6-0.7)	8	19	
Severe (CDR, >0.7-0.9)	40	24	
Advanced (CDR, >0.9)	2	2	
Follow-up (months)			
Mean (SD)	36.1 (16.8)	42 (16.8)	0.128*

Abbreviations: CDR = cup-disc ratio; SICS-trabeculectomy = mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy.
* Student *t* test between averages.
† Chi-squared test between categorical values.

16.8 months) for the SICS-trabeculectomy group and 42.0 months (SD, 16.8 months) for the phacotrabeculectomy group (p = 0.128).

Glaucoma Control

There were no differences in mean IOP and IOP reduction between the 2 groups at baseline or at follow-up. A significant reduction in mean IOP from baseline was noted at all follow-up visits for both groups (Table 2). The mean IOP at the end of follow-up decreased from 19.9 mm Hg (SD, 7.47 mm Hg) to 13.9 mm Hg (SD, 3.81 mm Hg) in the SICS-trabeculectomy group and from 18.0 mm Hg (SD, 6.45 mm Hg) to 13.9 mm Hg (SD, 3.54 mm Hg) in the phacotrabeculectomy group. The significant reduction in IOP after 1 month was maintained, with or without medications, until the end of follow-up for both groups. Following surgery, the average number of antiglaucoma medications used increased from 0.07 (SD, 0.26) after 6 months to 0.56 (SD, 0.69) at the end of follow-up in the SICS-trabeculectomy group and from 0.14 (SD, 0.41) after 6 moths to 0.48 (SD, 0.64) by the end of follow-up in the phacotrabeculectomy group. This result indicates that the effectiveness of the surgical procedure on IOP control declined with time and eventually required medical management.

In terms of IOP control for all patients, complete or qualified success (IOP <21 mm Hg) at the end of follow-up was achieved for 49 eyes (89.1%) in the SICS-trabeculectomy group and 48 eyes (92.3%) in the phacotrabeculectomy group. No significant difference in glaucoma control was noticed between groups, even when changing the criteria for success (Table 3).

IOP reduction for angle closure glaucoma (ACG), open angle glaucoma (OAG), pseudoexfoliation, early, moderate, and severe optic neuropathy, and primary and secondary surgeries was significant and comparable between the groups (Table 2). The results for eyes with OAG were significantly better than for eyes with other glaucoma types when SICS-trabeculectomy (p = 0.003) was performed compared with phacotrabeculectomy (p = 0.55).

Table 2. Mean intraocular pressure at various timepoints, within categories, and comparison between mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy or phacotrabeculectomy.

Category	Number of eyes	Intraocular pressure Mean (SD)				p Value*
		Baseline	1 month	1 year	Final follow-up	
All						
SICS-trabeculectomy	55	19.89 (7.5)	12.5 (5.5)	13.09 (3.2)	13.73 (3.8)	<0.001
Phacotrabeculectomy	52	18.79 (6.5)	13.6 (4.6)	12.94 (2.9)	13.87 (3.5)	<0.001
p Value†		0.42	0.271	0.8	0.84	
Open angle glaucoma						
SICS-trabeculectomy	43	20.4 (7.9)	12.6 (4.3)	13.1 (3.2)	13.0 (3.0)	<0.001
Phacotrabeculectomy	38	18.4 (5.4)	13.2 (4.9)	12.6 (2.80	13.8 (3.7)	<0.001
p Value†		0.18	0.55	0.49	0.30	
Angle closure glaucoma						
SICS-trabeculectomy	10	17.6 (6.1)	12.7 (9.3)	12.6 (3.1)	15.7 (5.4)	0.196
Phacotrabeculectomy	10	17.6 (5.5)	14.6 (3.2)	12.7 (2.3)	14.6 (1.5)	0.143
p Value†		1	0.55	0.93	0.55	
Pseudoexfoliation						
SICS-trabeculectomy	7	23.3 (4.1)	13.4 (4.5)	13.2 (2.5)	13.0 (4.0)	0.011
Phacotrabeculectomy	6	26.7 (10.0)	17.5 (5.7)	14.3 (1.6)	14.2 (1.6)	0.029
p Value†		0.47	0.188	0.39	0.50	
5-year follow-up						
SICS-trabeculectomy	15	19.2 (8.5)	11.7 (3.1)	11.7 (2.8)	13.5 (3.9)	0.01
Phacotrabeculectomy	21	19.1 (6.0)	13.2 (5.0)	13.4 (3.3)	15.4 (3.8)	0.024
p Value†		0.97	0.28	0.11	0.15	
Early						
SICS-trabeculectomy	5	15.4 (3.0)	11.0 (3.6)	11.0 (2.9)	14.8 (3.3)	0.43
Phacotrabeculectomy	7	17.9 (6.1)	13.5 (4.8)	12.6 (1.9)	14.6 (1.5)	0.32
p Value†		0.377	0.316	0.329	0.889	
Moderate						
SICS-trabeculectomy	8	18.9 (5.7)	13.3 (4.0)	12.6 (1.6)	11.9 (2.2)	0.005
Phacotrabeculectomy	19	20.0 (7.8)	14.4 (5.0)	13.1 (3.1)	14.2 (3.1)	0.004
p Value†		0.696	0.525	0.643	0.038	
Severe						
SICS-trabeculectomy	40	21.0 (8.0)	12.6 (6.0)	13.4 (3.3)	14.0 (4.1)	<0.001
Phacotrabeculectomy	24	18.2 (5.6)	12.7 (4.1)	13.2 (2.9)	13.6 (3.7)	0.001
p Value†		0.107	0.926	0.858	0.71	
Advanced						
SICS-trabeculectomy	2	13.0 (1.4)	11.5 (6.4)	15.0 (5.7)	14.0 (1.4)	0.71
Phacotrabeculectomy	2	18.0 (5.6)	16.0 (8.5)	10.0 (2.8)	11.5 (4.9)	0.55
p Value†		0.421	0.614	0.413	0.603	
Primary surgery						
SICS-trabeculectomy	18	17.6 (6.8)	11.8 (4.2)	13.0 (3.7)	12.8 (2.9)	0.007
Phacotrabeculectomy	26	20.8 (7.5)	14.0 (5.1)	12.6 (2.5)	13.8 (3.7)	<0.001
p Value†		0.15	0.13	0.7	0.34	
Secondary surgery						
SICS-trabeculectomy	37	21.0 (7.6)	12.8 (6.0)	13.1 (2.9)	14.2 (4.0)	<0.001
Phacotrabeculectomy	26	16.8 (4.6)	13.1 (4.2)	13.2 (3.2)	13.9 (3.0)	0.014
p Value†		0.008	0.8	0.87	0.79	

Abbreviation: SICS-trabeculectomy = mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy.

* Paired Student *t* test used to compare intraocular pressure change at the end of follow-up with baseline.

† Unpaired Student *t* test comparison of intraocular pressure within categories.

Eyes that completed 5 years of follow-up showed a significant IOP reduction of 5.67 mm Hg in the SICS-trabeculectomy group and 3.67 mm Hg in the phacotrabeculectomy group (Table 2). The mean antiglaucoma medication use decreased from 1.2 medications at baseline to 0.73 medications at follow-up for the SICS-trabeculectomy group (p = 0.068) and increased slightly from 0.67 medications to 0.76 medications for the phacotrabeculectomy group (p = 0.6); there was no difference in mean reduction of medications between the 2 groups (p = 0.098). Complete or qualified success for eyes that completed 5 years follow-up was 86.67% for the SICS-trabeculectomy group and 80.95% for the phacotrabeculectomy group.

Vertical cup-disc ratio significantly increased in both groups (from 0.773 [SD, 0.147] to 0.790 [SD, 0.149] in the SICS-trabeculectomy group [p = 0.034] and from 0.722 (SD, 0.143] to 0.749 [SD, 0.124] in the phacotrabeculectomy group [p = 0.014])

Table 3. Glaucoma surgical success at the end of follow-up for patients undergoing mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy or phacotrabeculectomy.

Criteria	Success Number of eyes (%)			p Value*
	Complete	Qualified	Failure	
<Baseline intraocular pressure				
SICS-trabeculectomy	27 (49.1)	17 (30.9)	11 (20.0)	0.264
Phacotrabeculectomy	24 (46.2)	11 (21.2)	17 (32.7)	
<21 mm Hg				
SICS-trabeculectomy	30 (54.5)	19 (34.5)	6 (10.9)	0.801
Phacotrabeculectomy	31 (59.6)	17 (32.7)	4 (7.7)	
<16 mm Hg				
SICS-trabeculectomy	28 (50.9)	15 (27.3)	13 (23.6)	0.820
Phacotrabeculectomy	29 (55.8)	14 (26.9)	9 (17.3)	
<Jampel's target intraocular pressure				
SICS-trabeculectomy	21 (38.2)	14 (25.5)	20 (36.4)	0.434
Phacotrabeculectomy	23 (44.2)	8 (15.4)	21 (40.4)	

Abbreviation: SICS-trabeculectomy = mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy.
* Chi-squared test.

by end of follow-up and there was no significant difference in cup-disc ratio change between the 2 groups (p = 0.47).

Cataract Rehabilitation

UCVA and BCVA improved significantly for both groups following surgery and there were no statistically significant differences in visual function between the groups before and after surgery (Table 4). BCVA ≥6/12 was seen in 42 eyes (76.4%) of the SICS-trabeculectomy group and in 47 eyes (90.4%) of the phaco-trabeculectomy group immediately after surgery, which further improved by 3 months and stabilised thereafter. Posterior capsular opacification (PCO) was seen in 27 eyes in the SICS-trabeculectomy group and in 21 eyes in the phacotrabeculectomy group.

Complications

Eight eyes had tight bleb sutures within the first month after surgery, for which they underwent argon laser suture lysis. Two of 3 eyes with tight bleb sutures in the SICS-trabeculectomy group were classified as surgical failure, 1 of whom developed corneal decompensation (Table 5). Only 1 of 5 eyes with tight bleb sutures in the phacotrabeculectomy group was classified as surgical failure.

One eye in the SICS-trabeculectomy group developed bleb infiltration after 1 year, which remitted after administration of ofloxacin 0.3% eye drops. The BCVA after 5 years was 6/12 and the IOP was 18 mm Hg controlled with topical timolol maleate 0.5%. One eye in the SICS-trabeculectomy group developed choroidal detachment during month 2, for which sclerostomy was performed to drain the subchoroidal fluid. The BCVA after 1 year was 6/12.

Discussion

Numerous modifications of combined cataract and glaucoma surgeries have been reported.[4-8,16-30] Several studies have concluded that phacotrabeculectomy[5,6] with adjunctive antifibrotic agents[7,8,16] (especially MMC[17]) has the most favourable surgical outcome.

Table 4. Best-corrected visual acuity and incidence of posterior capsular opacification for patients undergoing mitomycin-C–augmented manual small-incision

Time	Number of patients		6/6-6/12	
	SICS-trabeculectomy	Phacotrabeculectomy	SICS-trabeculectomy	Phacotrabeculectomy
Baseline	55	52	32 (58.2)	33 (63.5)
3 months	55	52	49 (89.1)	52 (100)
6 months	55	52	49 (89.1)	52 (100)
1 year	55	52	50 (90.9)	50 (96.2)
2 years	50	45	43 (86.0)	44 (97.8)
3 years	34	36	29 (85.3)	35 (97.2)
4 years	24	28	21 (87.5)	27 (96.4)
5 years	15	21	15 (100)	20 (95.0)
Final follow-up	55	52	43 (78.2)	44 (84.6)

Abbreviation: SICS-trabeculectomy = mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy.
* Chi-squared test.

Making single or separate incisions,[18,19] fornix- or limbal-based flaps,[20,21] peripheral iridectomy,[22] insertion of IOLs[23-25] or sutures,[26] or varying the scleral flap size[27] or shape,[28] incision length,[4,29,30] or sclerostomy dimensions[27] does not influence the surgical outcome in terms of IOP control.

Comparison of SICS-trabeculectomy using the Blumenthal cataract extraction technique with phacotrabeculectomy provides favourable IOP control for both groups, with no difference in IOP outcome between the 2 groups.[14] The 89.0% success rate with a single medication after 3 years for SICS-trabeculectomy in this study is comparable with the 88.4% success with a single medication (<21 mm Hg) found by Thomas et al after 11 months.[14] In this study, the MMC application time was 1 minute less than in the study by Thomas et al,[14] and no patients received 5-fluorouracil (5-FU); in the study by Thomas et al, 62.8% of patients received an average of 3.7 postoperative injections of 5-FU.[14] However, surgical outcome variation is likely when surgeries are performed by different surgeons compared with the outcomes for surgeries performed by a single surgeon. Other studies have reported complete and qualified success rates with or without a single medication (<21 mm Hg) ranging from 47.6% to 96.4%[4,6,7,25,31,32] and 85.7% to 100%,[4,6,7,14] respectively. The IOP reduction of 31% and complete and qualified success rate of 89% achieved in this study shows that SICS-trabeculectomy is effective for IOP control for 5 years.

In this study, vision improved significantly after surgery, and was similar to that reported in previous studies.[4,6,14,29] Reports suggest that 70.2% to 88.2% of eyes had BCVA of ≥6/12 following surgery.[4,6,14,29] Inflammation and astigmatism determine visual outcome immediately after surgery. Post-surgical astigmatism stabilises within 3 months of surgery, resulting in stable refraction and visual acuity thereafter.[25,33] As this was a retrospective study, with no keratometric data, the change in astigmatism could not be measured. As the incision size was larger for the SICS-trabeculectomy group than for the phacotrabeculectomy group, the expected change in astigmatism would be larger,[4,6,29,30] therefore, a delay in visual recovery is expected following SICS-trabeculectomy (Table 4). Absence of scleral flap extensions and radial placement of the sutures for SICS-trabeculectomy help to reduce induced astigmatism. In this study, there was no difference in BCVA between the 2 groups after 6 months, and PCO was the major factor related to vision impairment. PCO formation depends on multiple factors such as duration and dosage of MMC, corticosteroids, IOL design and placement, and surgical technique.[34] PCO occurred most often in the third postoperative year and was noted in 49.1% eyes, compared with a reported incidence of 16.1% to 59.0%.[6,22,23,35] PCO occurred most frequently in the SICS-trabeculectomy group (p = 0.37). UCVA and BCVA improved in all patients for whom Nd:YAG capsulotomy was done (SICS-trabeculectomy, n = 25; phacotrabeculectomy, n = 21). In the phacotrabeculectomy group, the percent of eyes with UCVA and BCVA ≥6/12 was 71.4% and 100%, respectively, for patients who underwent Nd:YAG capsulotomy and 52.4% and 76.2%, respectively, for those who did not; for patients in the SICS-trabeculectomy group, UCVA and BCVA ≥6/12 were 44.0% and 96.0%, respectively, for patients who underwent Nd:YAG capsulotomy, and 28.0% and 84.0%, respectively, for those who did not.

Intraoperative small pupils were managed by stretch pupilloplasty (Table 5), and postoperative complications of fibrinous uveitis, cystoid macular oedema, bleb infiltration, and choroidal detachment were managed medically or surgically; all patients experiencing complications had a good outcome in terms of vision and IOP reduction. Complications of posterior capsular rupture, zonular dialysis, Descemet's membrane detachment, hyphaema, and wound leak were not noted. Postoperative complications (excluding PCO) were numerically higher in the SICS-trabeculectomy group than in the

cataract surgery combined with trabeculectomy or phacotrabeculectomy.

Best-corrected visual acuity Number of patients (%)				p Value*	Posterior capsular opacification Number of patients (%)	
6/18-6/60		<6/60				
SICS-trabeculectomy	Phacotrabeculectomy	SICS-trabeculectomy	Phacotrabeculectomy		SICS-trabeculectomy	Phacotrabeculectomy
13 (23.1)	16 (30.8)	10 (18.7)	3 (5.7)	0.134	—	—
5 (9.6)	0 (0)	1 (1.3)	0 (0)	0.05	0 (0)	0 (0)
4 (7.7)	0 (0)	2 (3.2)	0 (0)	0.05	3 (5.5)	3 (5.8)
4 (7.7)	2 (3.9)	1 (1.4)	0 (0)	0.08	5 (9.1)	4 (7.7)
4 (8.0)	1 (2.2)	3 (6.0)	0 (0)	0.10	10 (20.0)	5 (11.1)
4 (11.4)	1 (2.8)	1 (3.3)	0 (0)	0.19	6 (17.6)	3 (8.3)
3 (12.0)	1 (3.6)	0 (0)	0 (0)	0.48	2 (8.3)	4 (14.3)
0 (0)	1 (5.0)	0 (0)	0 (0)	0.69	1 (6.7)	2 (9.5)
5 (9.6)	1 (1.9)	7 (12.2)	7 (13.5)	0.27	27 (49.1)	21 (40.4)

Table 5. Intraoperative and postoperative complications for patients undergoing mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy or phacotrabeculectomy.

	SICS-trabeculectomy Number (%)	Phacotrabeculectomy Number (%)
Small pupil	4 (7.3)	1 (1.9)
Fibrinous membrane	3 (5.5)	1 (1.9)
Cystoid macular oedema	1 (1.8)	0 (0)
Pupillary capture	2 (3.6)	0 (0)
Tight bleb	3 (5.5)	5 (9.6)
Failed bleb	2 (3.6)	1 (1.9)
Corneal decompensation	1 (1.8)	0 (0)
Bleb infiltrate	1 (1.8)	0 (0)
Choroidal detachment	1 (1.8)	0 (0)
No postoperative complication	44 (80.0)	46 (88.5)

Abbreviation: SICS-trabeculectomy = mitomycin-C–augmented manual small-incision cataract surgery combined with trabeculectomy.

phacotrabeculectomy group (25.9% vs 13.4%; p = 0.32), but were lower than in previous reports of phacotrabeculectomy.[4,6-8] There were no significant complications associated with the use of MMC.[4,6-8,17]

Although the retrospective design of this study was a limitation, the results suggest that despite differences in scleral wound dissection, size and shape of the scleral tunnel, nucleus expression technique, IOL size, and scleral wound closure, both procedures were effective for IOP control and visual rehabilitation, and the outcomes were comparable. Possible bias could be expected to be reduced as there was no variation in type of cataract and glaucoma between the 2 groups, and complicated surgical cases were excluded from the study. In addition, the evaluation of surgical results of a single surgeon reduces the chance of variation in surgical technique, so variation between the groups is also likely to be reduced.

Combined manual SICS-trabeculectomy is a safe and effective alternative to phacotrabeculectomy for eyes in which phacoemulsification is not recommended,[11] for patients who cannot afford phacoemulsification,[36] and in locations where complex instrumentation is not available.

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Open Angle Glaucoma in a Patient with Weill-Marchesani Syndrome

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Weill-Marchesani syndrome is a rare systemic connective tissue disorder with features of short stature, short stubby hands and feet, and stiff joints, and may be associated with heart defects and mental retardation. The main ocular features are microspherophakia, ectopia lentis, severe myopia, and angle closure glaucoma. This report is of an 18-year-old woman who presented with short stature, short stubby fingers and toes, coarse skin, and pansystolic murmur. Ocular examination revealed microspherophakia with high myopia and open angle glaucoma in both eyes. Trabeculectomy with 5-fluorouracil was performed for both eyes. The intraocular pressure normalised in both eyes after 3 months. The association of open angle glaucoma with Weill-Marchesani syndrome has not been mentioned previously in the literature.

Key words: *Glaucoma, open-angle, Microspherophakia, Weill-Marchesani syndrome*

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Introduction

Weill-Marchesani syndrome is a multi-system disorder that was first described by Weill[1] in 1932 and further delineated by Marchesani[2] in 1939.[3] Inheritance of the condition may be autosomal dominant or autosomal recessive with partial heterozygotic expression.[4] Weill-Marchesani syndrome is characterised by short stature, short stubby fingers and toes, and stiff joints. In a review of 128 patients with Weill-Marchesani syndrome, Faivre et al found short stature and brachydactyly in 98% of patients and 62% had joint limitations.[5] The syndrome has been associated with other systemic conditions of thick skin and muscular build (present in most patients), cardiac abnormalities (24%), and mental retardation (13%). Ocular associations include microspherophakia (84%), ectopia lentis (73%), severe myopia, glaucoma (80%), and cataract.[4] The mechanism of glaucoma in these patients is usually angle closure, due to microspherophakia or ectopia lentis.[5-7]

This report is of a patient with Weill-Marchesani syndrome with microspherophakia and open angle glaucoma.

Case Report

An 18-year-old woman presented to the Department of Ophthalmology, BP Koirala Institute of Health Sciences, Ghopa Dharan, Nepal, in 2007, with defective vision in both eyes for the previous 5 years, which was gradually progressive in nature. She had no history of pain, redness, watering, coloured haloes, or trauma. Her birth history and family history were unremarkable.

Figure 1. Short stubby fingers of a patient with Weill-Marchesani syndrome.

At physical examination, she had short stature (height, 132 cm), brachydactyly, short phalanges, and thick rough skin (Figure 1). At cardiovascular examination, she had pansystolic murmur. At ocular examination, visual acuity was 2/60 in the right eye, improving to 6/24 with -14 DS/-1 cyl at 180°. Her visual acuity in the left eye was 1/60, improving to 6/36 with the same correction. Slit-lamp examination revealed grade IV (van Herick) anterior chamber depth, microspherophakia (Figure 2), and minimal superonasal displacement of the lens in both eyes. The anterior chamber

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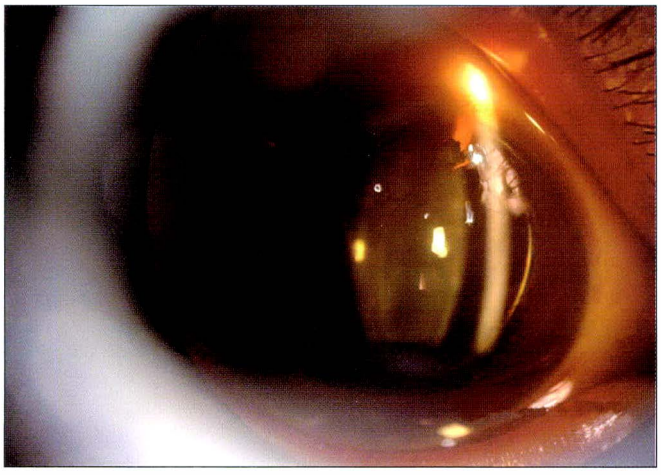
Figure 2. Slit-lamp view of microspherophakia in a patient with Weill-Marchesani syndrome.



angles were open at gonioscopy. She had advanced glaucomatous optic nerve damage in both eyes (cup-disc ratio, 0.9:1). Retinal examination, including the macula, was normal. Keratometry values were 48.5/50 at 65° and 48.5/50 at 140° in the right and left eye, respectively, which is a sign of a steep cornea. Central corneal thickness by optical pachymetry was 0.53 mm and 0.54 mm in the right and left eye, respectively. Axial length was 21.78 mm and 21.75 mm in the right and left eye, respectively. Intraocular pressure (IOP) measured by Goldmann applanation tonometry was 45 mm Hg in both eyes. Visual field examination using the Humphrey visual field analyser showed advanced visual field loss with sparing of the central field in both eyes (Figure 3).

The patient underwent trabeculectomy with 5-fluorouracil in both eyes. The postoperative period was uneventful. At 3 months, the IOP in both eyes was 10 mm Hg and best-corrected visual acuity was 6/24 and 6/36 in the right and left eyes, respectively.

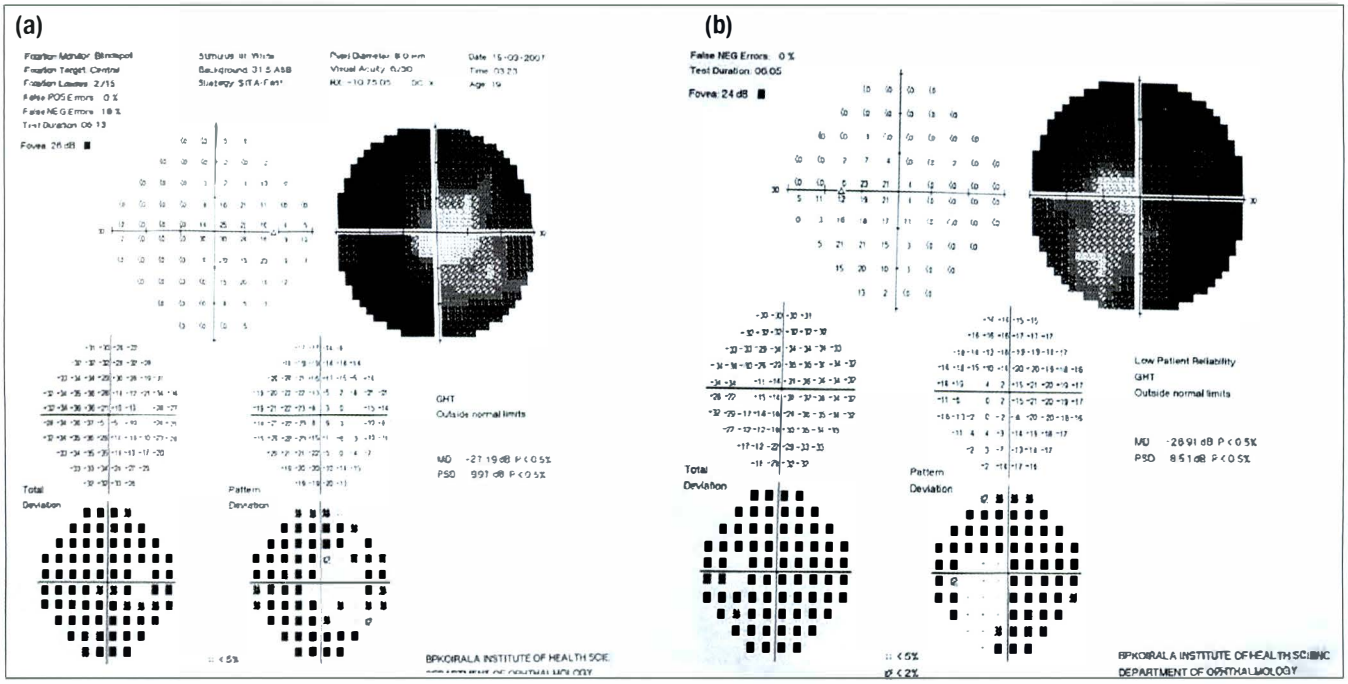
Discussion

The mechanism of glaucoma in Weill-Marchesani syndrome is angle closure or pupillary block due to microspherophakia or ectopia lentis.[6,7] Glaucoma may develop because of maldevelopment of the anterior chamber, resulting in narrow anterior chamber angles, thus making it unclear when the glaucoma develops.[8] Regular gonioscopy may be helpful as open angle glaucoma may not be a rare mechanism in Weill-Marchesani syndrome, but could be a stage in the glaucomatous progression in these patients. This patient had normal anterior chambers (van Herick grade IV) and open angles at gonioscopy.

Open angle glaucoma associated with microspherophakia and ectopia lentis in Weill-Marchesani syndrome is not a common presentation. Common clinical characteristics of juvenile-onset primary open angle glaucoma include increased IOP, optic nerve head damage, visual field loss, and a normal iridocorneal angle at gonioscopy.[9] Histological analysis of the angle structures may show varying developmental abnormalities that are less obvious as age of onset increases.

Recent studies have shown autosomal dominant transmission with variable penetrance for 1 type of juvenile glaucoma and location of the defective gene on chromosome 1q.[10] Faivre et al

Figure 3. Visual fields of (a) the right eye; and (b) the left eye.



have reported clinical homogenecity and genetic heterogenecity in Weill-Marchesani syndrome.[5,11]

This patient had features of juvenile open angle glaucoma, (deep anterior chamber, open angle at gonioscopy, high IOP, advanced glaucomatous optic nerve damage, and visual field defects). This presentation of open angle glaucoma could be one of the associated ocular features of Weill-Marchesani syndrome.

Fujiwara et al have studied the histology of the lens in Weill-Marchesani syndrome.[12] Histopathological analysis of the trabecular meshwork may help to ascertain the pathogenesis of glaucoma for these patients. Further genetic analysis would be helpful for identifying genes causing Weill-Marchesani syndrome that may be responsible for a developmental abnormality of angle structure.

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Successful Treatment of *Aspergillus flavus* Sclerokeratitis 8 Years after Pterygium Excision

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This report is of a patient with Aspergillus flavus *sclerokeratitis noted 8 years after pterygium excision. A 61 year-old man with diabetes mellitus was referred to the Department of Ophthalmology, Hospital Kuala Lumpur, Kuala Lumpur, Malaysia, with right eye pain and redness for the previous 2 weeks. He had no history of trauma, but had had pterygium excision and cataract surgery performed 8 years previously. Examination of the right eye revealed right nasal scleral necrosis with calcification and a stromal abscess suggestive of fungal keratitis adjacent to the lesion. Corneal scraping revealed* Aspergillus flavus. *The patient responded well to treatment with topical and oral fluconazole and topical amphotericin B 0.15% and, after 5 weeks, the scleral necrosis had become epithelised, and the stromal abscess and plaque regressed. Early diagnosis is important, and aggressive medical treatment will improve the outcome.*

Key words: Aspergillus flavus, *Cornea, Eye infections, fungal, Pterygium, Sclera*

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Introduction

Approximately 5% to 10% of cases of anterior scleritis are infective in origin. Infectious sclerokeratitis should be suspected in patients with a history of severe endophthalmitis or primary corneal infection, ocular trauma, ocular surgical procedures, including retinal detachment surgery, cataract surgery, and pterygium excision, and in association with systemic fungal infection.[1] Infectious scleritis or sclerokeratitis should be suspected after surgery when there is no history of autoimmune disease and when the disease characteristics are atypical of immune-mediated scleral inflammation. The management of infectious scleritis and sclerokeratitis is difficult, and the outcome is generally poor, due to poor penetration of antibiotics into the avascular sclera, and the ability of microbial organisms to persist in the avascular intrascleral lamellae for long periods without inciting an inflammatory response. Reynolds and Alfonso reported that once infectious keratitis spreads into adjacent sclera, medical management alone is ineffective.[2] This report is of a patient with *Aspergillus flavus* sclerokeratitis 8 years after pterygium excision, which was successfully treated with aggressive antifungal chemotherapy.

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Case Report

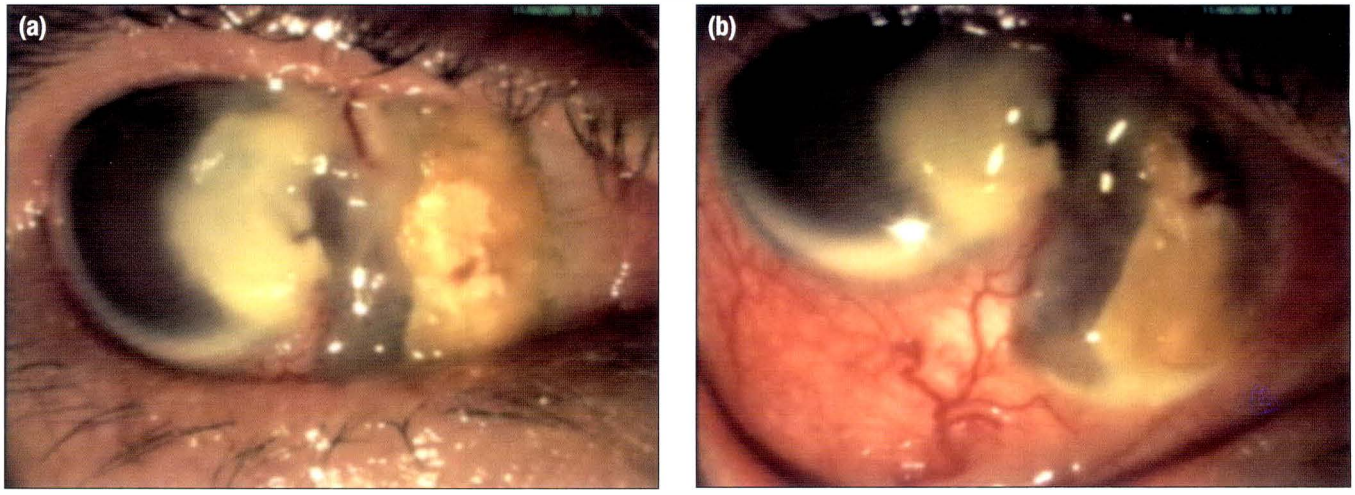
A 61-year-old man with diabetes mellitus was referred to the Department of Ophthalmology, Hospital Kuala Lumpur, Kuala Lumpur, Malaysia, in July 2005 with right eye pain and redness for the previous 2 weeks. He also had blurred vision in his right eye. He had no history of trauma to the eye, but had undergone uncomplicated cataract surgery and right nasal pterygium excision in his right eye 8 years previously. The postoperative recovery was uneventful.

Visual acuity was hand movement in the right eye and 6/6 in the left eye. Slit-lamp examination revealed right nasal scleral necrosis with calcification. There was a stromal abscess with plaque and a satellite lesion, measuring 5.2 x 3.8 mm (Figure 1), and hypopyon measuring 1.4 mm. The anterior chamber and fundus were not visualised.

Culture of corneal scraping found *Aspergillus flavus*. Extensive laboratory evaluation for systemic aetiologies, including complete blood count, erythrocyte sedimentation rate, antinuclear antibody, Venereal Disease Research Laboratory, and rheumatoid factor, had negative results.

The patient was treated with oral and topical medication; oral medication included fluconazole 200 mg daily, indomethacin 25 mg 3 times daily, doxycycline 100 mg twice daily, and ciprofloxacin 250 mg twice daily, and topical medication included fluconazole 0.2% hourly, amphotericin B 0.2% hourly, and ciprofloxacin 0.3%

Figure 1. Right eye showing (a) the area of scleral necrosis and calcification; and (b) an adjacent area of stromal abscess with a satellite lesion.

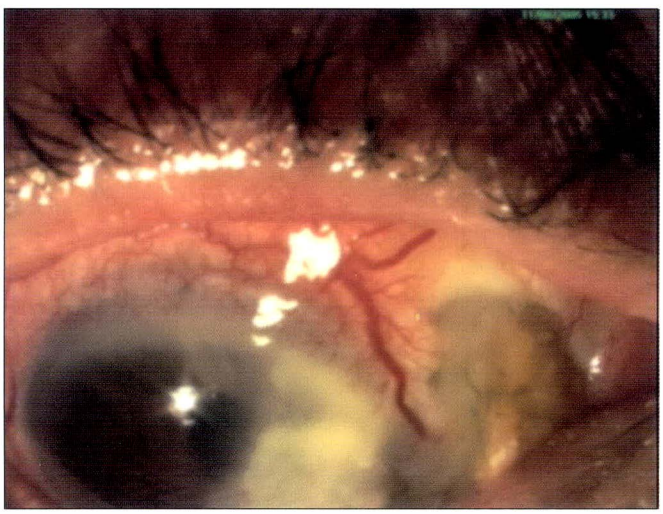


hourly. Five weeks after treatment started, the stromal abscess and plaque were regressing (Figure 2). The area of scleral necrosis became epithelised. At subsequent follow-up, the vision in his right eye remained hand movements due to scarring, but there was no further progression of scleral melting.

Discussion

Infectious scleritis is a serious ocular disorder. Bacteria, fungi, viruses, and parasites can cause infectious scleritis, and the condition has been reported as a complication of pterygium excision, particularly with adjunctive β-irradiation, mitomycin C (MMC) application, and excessive cauterisation.[2] The overall incidence of scleral necrosis (non-infectious or infectious) after pterygium surgery has been reported to be 0.2% to 4.5%, and higher rates have been associated with adjunctive use of MMC or β-irradiation.[3] The use of adjunctive MMC or β-irradiation may destroy conjunctival and episcleral tissues and vessels, resulting in reduced ability to resist infection, while excessive cauterisation promotes an avascular state. The clinical appearance of scleral melting at the previous site of pterygium excision may be similar to necrotising scleritis caused by autoimmune conditions. Therefore, it is important to rule out systemic autoimmune disease and to identify the aetiology in such patients.

Figure 2. Right eye showing the regressed stromal abscess and plaque, and the epithelised area of scleral necrosis.



This patient had a history of cataract surgery and pterygium excision 8 years previously. It was likely that pterygium excision was performed by the bare sclera technique. Necrotising scleritis, therefore, might have occurred at the site of the pterygium excision, as pterygium excision alone can induce the condition.[4,5] Enzymatic degradation may play a part in the development of a scleral ulcer immediately after pterygium excision. Tissue destruction during the pterygium operation and prolonged exposure of bare sclera may stimulate enzymatic degradation by collagenases. Host-derived proteoglycolytic enzymes may be extensively involved. After the initial lysis, a defective epithelial defence mechanism can predispose to invasion by micro-organisms, and tissue lytic enzymes delivered from micro-organisms aggravate the process. Invading polymorphonuclear leukocytes and degenerating cells have been proposed as possible sources of various hydrolytic enzymes.[6]

In this patient, the trigger mechanism for the development of scleral ulcer after a long latent period remains unknown. However, it is clear that necrotising scleritis can be activated after surgery, and the latent period between surgery and the onset of scleritis can be as long as 40 years.[7] The mechanism that induces necrotising scleritis may be a prodromal factor to induce the infectious scleral ulcer. It can therefore be postulated that, after initiation of the necrotising scleritis, the micro-organisms invaded and caused the late-onset post-pterygium excision infectious scleral ulcer. In

this patient, the infectious scleritis would have started first, before spreading into the cornea. Another hypothesis is that the infectious scleritis could have started after a primary corneal infection. However, this patient denied a history of trauma or injury.

Fungal scleritis may remain undiagnosed for months, and scleral biopsy is recommended for patients with progressive scleritis when infection is suspected. Bernauer et al have reported 3 patients with *Aspergillus* scleritis for whom a combination of surgical and medical intervention was needed, for both establishing the diagnosis and successful management.[8] The outcome for patients with infectious scleritis is usually disappointing. It is believed that poor penetration of antimicrobial drugs into the sclera is responsible for the failure of medical therapy. In 1991, Reynolds and Alfonso reviewed 28 cases of infectious scleritis and suggested that cryotherapy, corneoscleral graft, and intensive antibiotic therapy may improve the outcome for patients with infectious keratoscleritis.[2]

In 1995, Rodriguez-Ares et al reported that infectious sclerokeratitis was successfully treated with antifungal drugs, cryotherapy, and dura mater grafting.[9] However, the patient in this report was treated with topical and oral antifungal drugs after corneal scraping revealed *Aspergillus flavus*. After 5 weeks of treatment, he had responded well, with regression of signs and symptoms and no further progression of scleral melting.

Fungal sclerokeratitis remains a therapeutic challenge for practicing ophthalmologists. Necrotising scleritis can occur years after pterygium excision. With early diagnosis and aggressive antifungal chemotherapy, the outcome for patients with sclerokeratitis can be improved.

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Congenital Eversion of the Upper Eyelids

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This report is of a neonate with bilateral asymmetrical congenital upper eyelid eversion, which was worse in the right eye. No other anomaly was detected. Conservative management of this rare ocular condition with topical antibiotics and patching of the right eye was commenced within 24 hours of birth. There was complete resolution of the eversion within 2 weeks. Health professionals working in the fields of neonatal care and obstetrics should be educated about this ocular condition in view of its amenability to treatment, especially if commenced early.

Key words: *Congenital, Ectropion, Eyelids, Nigeria, Rare diseases*

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Introduction

Congenital eversion of the upper eyelids is a rare condition, the exact cause of which remains unknown. It has been suggested that an appreciable overlapping of the lower eyelid margin by the upper eyelid is a predisposing factor for this condition.[1] Congenital upper eyelid eversion is more frequently associated with Down's syndrome and black race.[2] The condition was first described by Adams in 1896, who defined it as ''double congenital ectropion".[3] In 1992, Sellar et al reviewed the literature and found 51 reported cases.[4] Since then 3 more patients have been reported in the literature.[5-7] There have been no previous reports of this condition occurring in Ondo State, Nigeria.

Case Report

A 1-day-old boy was referred to the Department of Ophthalmology from the Obstetric Unit at Federal Medical Centre, Owo, Nigeria, in November 2007 with eversion of the right upper eyelid and partial eversion of left upper eyelid (Figure 1). The mother was a 32-year-old woman with 3 other children. The pregnancy was uneventful and she had spontaneous labour at 40 weeks and 6 days of gestation, when she underwent assisted vaginal breech delivery after a 12-hour uneventful labour.

The Apgar scores were 7 and 9 at 1 and 5 minutes, respectively. Examination of the baby revealed complete eversion of the right upper eyelid with marked conjunctival chemosis. Attempts to reposition the right upper eyelid proved abortive. Although the left upper eyelid was partially everted, it was easily repositioned. The 2 eyeballs were normal and intact. No other systemic anomaly was detected.

Figure 1. Congenital upper eyelid eversion before commencement of management.

Conservative management was commenced immediately. Chloramphenicol ointment 1% was applied copiously to both eyes and the right eye was patched. By day 4, the right upper eyelid could be easily repositioned, but there was spontaneous eversion whenever the baby cried. The baby was subsequently discharged home while continuing treatment. After 2 weeks, both upper eyelids were in the normal position, so treatment was discontinued. At the last clinic visit, when the child was 5 weeks old, the eyelids were normal (Figure 2) and the corneas of both eyes were clear.

Discussion

Congenital eversion of the upper eyelid is usually present at birth, but late onset has been described,[8] with the age of onset ranging

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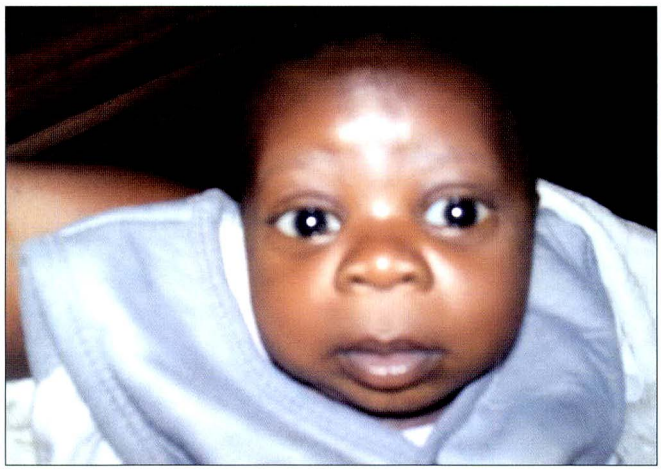
Figure 2. Normal eyelids 5 weeks after treatment.



from infancy to 11 years.[4] The incidence appears to be high in infants born with collodion skin disease.[9] The condition is typically bilateral and asymmetrical, but may also be unilateral. Once the upper eyelid is everted, orbicularis spasm may act as a sphincter leading to a cycle of conjunctival strangulation and oedema secondary to venous stasis.[10] The chemotic conjunctiva usually protects the cornea from exposure, so corneal complications are rare.

The goal of management is to prevent desiccation of the exposed conjunctiva and enable spontaneous inversion of the lid. If recognised early, the condition can be managed conservatively without recourse to surgery.[7] Congenital upper eyelid eversion usually resolves with either conservative management or surgical intervention such as subconjunctival hyaluronic acid, tarsorrhaphy with excision of redundant conjunctiva, fornix suture, and full thickness skin graft to the upper eyelid.

This patient responded to conservative measures, which could be related to the early detection and institution of management within 24 hours of life. As congenital upper eyelid eversion is amenable to treatment, especially if detected early, this report highlights the need to create awareness about this rare condition amongst health professionals involved in the fields of neonatal and obstetric care. It is also important to reassure the parents of affected babies to avoid undue apprehension.

Acknowledgements

The authors acknowledge the contribution of the obstetricians and paediatricians who were involved in the management of this patient. Special thanks to the management of Federal Medical Centre, Owo, Nigeria, for their support.

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2. Maheshwari R, Maheshwari S. Congenital eversion of upper eye lids: case report and management. Indian J Ophthalmol. 2006;54: 203-4.
3. Adams AL. A case of double congenital ectropion. Med Fortnightly. 1896;9:137-8.
4. Sellar PW, Bryars JH, Archer DB. Late presentation of congenital ectropion of the eyelids in a child with Down's syndrome: a case report and review of the literature. J Pediatr Ophthalmol Strabismus. 1992;29:64-7.
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8. Silverstone B, Hirsch I, Sternberg I, Berson D. Late onset of total eversion of the upper eye lids. Ann Ophthalmol. 1982;14:477-8.
9. Shapiro RD, Soentgen ML. Collodion skin disease and everted eye lids. Postgrad Med. 1969;45:216-9.
10. Raab EL, Saphir RL. Congenital eye lid eversion with orbicularis spasm. J Pediatr Ophthal Strabismus. 1985;22:125-8.

OCTOBER 2008

16-19
Laser Congress Korea 2008
Seoul, Korea
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Tel: (82 25) 113 713
Fax: (82 25) 173 713
E-mail: khg000@unitel.co.kr

18-19
Glaucoma Meeting Basel 2008 — 'Glaucoma Therapy: State of the Art'
Basel, Switzerland
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E-mail: info@glaucoma-meeting.ch

18-20
Annual Conference of Strabismological Society of India
New Delhi, India
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NOVEMBER 2008

15-16
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27-30
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DECEMBER 2008

5-6
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Note to Readers
This section is intended to highlight activities of interest to glaucoma specialists and ophthalmologists in Asia. Please let us know of any forthcoming activities that you may be organising or wish to feature on this section.

Asia Pacific Glaucoma Guidelines 2nd Edition Launch Symposium

Friday September 26, Ornyx Room,
17.00 - 17.30 PM

Introduction
Ivan Goldberg

Epidemiology of Glaucoma in Asia
Paul Healey

Section 1
1.1 Patient Assessment
Jonathan Crowston

1.2 Risk Categories and Treatment Targets
Jonathan Crowston

Section 2
2.1 Initiation of Treatment
Manny Agulto

2.2 Medical Treatment

2.3 Laser Treatment
Prin RojanaPongpun

2.4 Surgery
Aung Tin

Section 3
3.1 Follow-up
Paul Chew

3.2 Screening
Paul Healey

3.3 Frequently Asked Questions
Clement Tham

Section 4
4.1 Appendices
Makoto Araie

Conclusion
Ivan Goldberg

Asian Journal of OPHTHALMOLOGY

SUPPLEMENT 2

Volume 10 Number 4 August 2008

2008 SEAGIG/AACGC Joint Congress

Seoul, Korea, 25-27 September 2008

SEAGIG 2008

AACGC Seoul 2008

ABSTRACT BOOK

Scientific Communications International

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Asian Journal of
OPHTHALMOLOGY

Volume 10 Number 4 August 2008
Supplement 2

2008 SEAGIG/AACGC Joint Congress

Seoul, Korea, 25-27 September 2008

ABSTRACT BOOK

The Abstract Book is divided into 8 sections. Each section is labelled by a prefix (letter) and a number series. Each Abstract is identified by a unique Abstract Number (number not repreated).

Sections	Abstract Number
(1) Plenary Lectures	PL1 to PL2
(2) SEAGIG Symposia	SS1.1 to SS7.6
(3) AACGC Symposia	AS1.1 to AS3.10
(4) Instruction Courses	IC1 to IC3
(5) SEAGIG Free Papers	SF001 to SF018
(6) AACGC Free Papers	AF001 to AF009
(7) SEAGIG Posters	SP001 to SP086
(8) AACGC Posters	AP001 to AP009

(Example: Abstract PL1 denotes the abstract of Plenary Lectures Paper No 1)

Foreword

Message from the Organising Committee

The 5th Congress of the South East Asia Glaucoma Interest Group (SEAGIG) and the 6th Meeting of the Asian Angle-Closure Glaucoma Club (AACGC) is jointly held in Seoul, Korea, from 25 to 27 September 2008. This is the first joint congress of SEAGIG and AACGC.

SEAGIG was established to facilitate contact among glaucoma specialists in the region, to encourage collaborative research and service projects, to increase the opportunities for exchange of skills and knowledge in this rapidly advancing field, and to assist comprehensive ophthalmological colleagues and other eye care workers (whether medically trained or not) to be up to date with advances in all aspects of glaucoma diagnosis and management.

Angle-closure glaucoma is prevalent in South East Asia, and it is estimated that half of all glaucoma patients might have primary angle-closure glaucoma. The aim of the AACGC is to establish a scientific network for Asian glaucomatologists who are interested in exchange of knowledge about angle-closure glaucoma.

We hope that this collaboration of the 2 major glaucoma interest groups in Asia will help to promote excellence in the care of patients with glaucoma and to preserve or enhance vision by supporting glaucoma specialists and scientists through the exchange of scientific knowledge and clinical experience, as well as through encouraging scientific research in the Asian region.

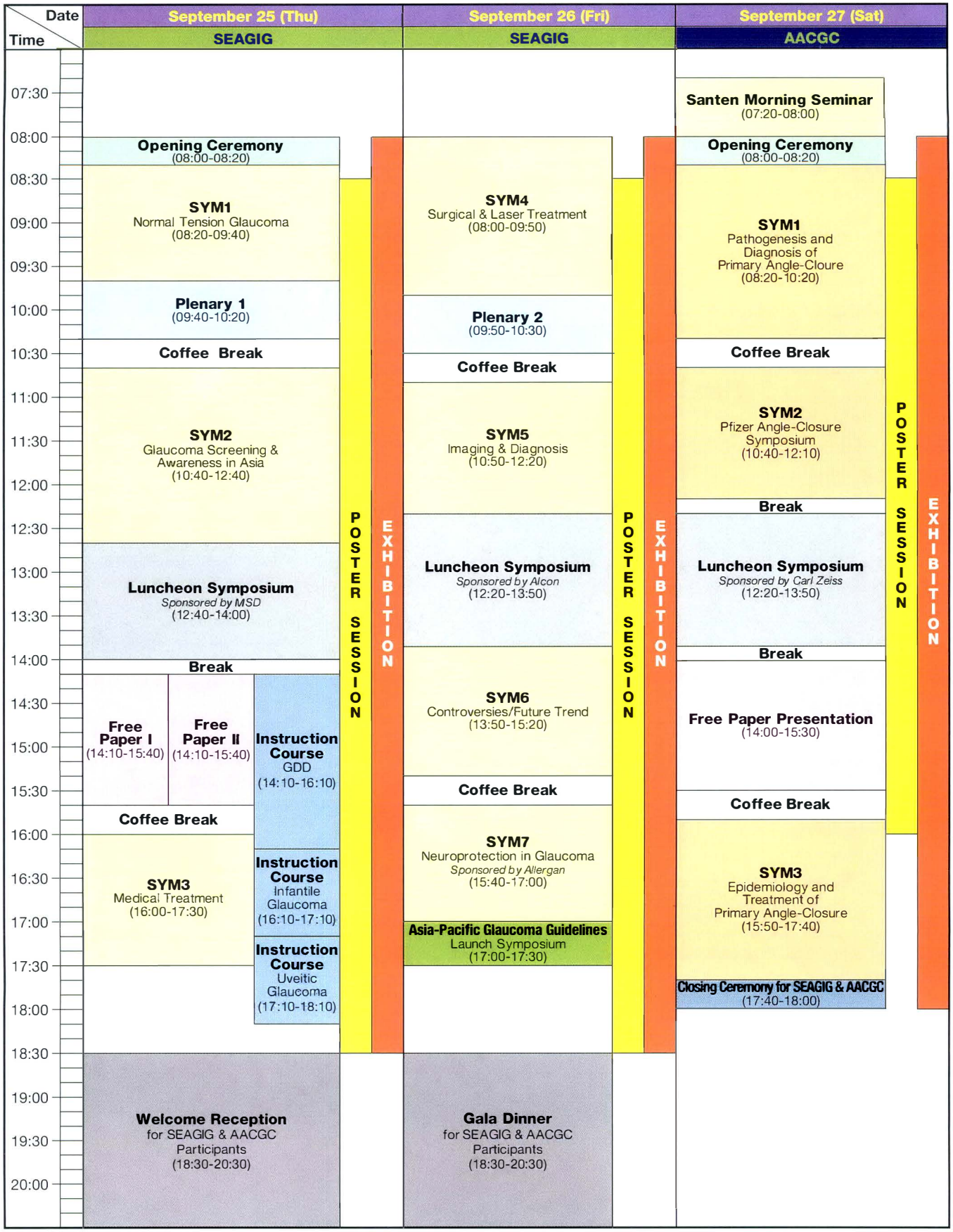
The scientific program of the Joint Congress comprises 2 plenary lectures, 10 symposia, 3 luncheon symposia, 1 morning seminar, 3 instruction courses, 3 free paper sessions with 27 presentations, and a poster session with 91 posters.

We would like to take this opportunity to thank the members of the 2008 SEAGIG/AACGC Joint Congress Organising Committee, who have committed themselves to making this Join Congress a success. Also, we should not forget to mention our appreciation for the encouragement and kind support of Dr Manuel B Agulto, President of SEAGIG, and Dr Chul Hong, President of AACGC, in the preparation of this Congress.

Dong Myung Kim, MD
Organising Chair of SEAGIG 2008

Yong Yeon Kim, MD
Ki Ho Park, MD
Organising Co-Chairs of Seoul AACGC 2008

SEAGIG 2008 AACGC Seoul 2008



5th Congress of the South East Asia Glaucoma Interest Group &
6th Meeting of the Asian Angle-Closure Glaucoma Club

Seoul, Korea, 25-27 September 2008

SEAGIG 2008

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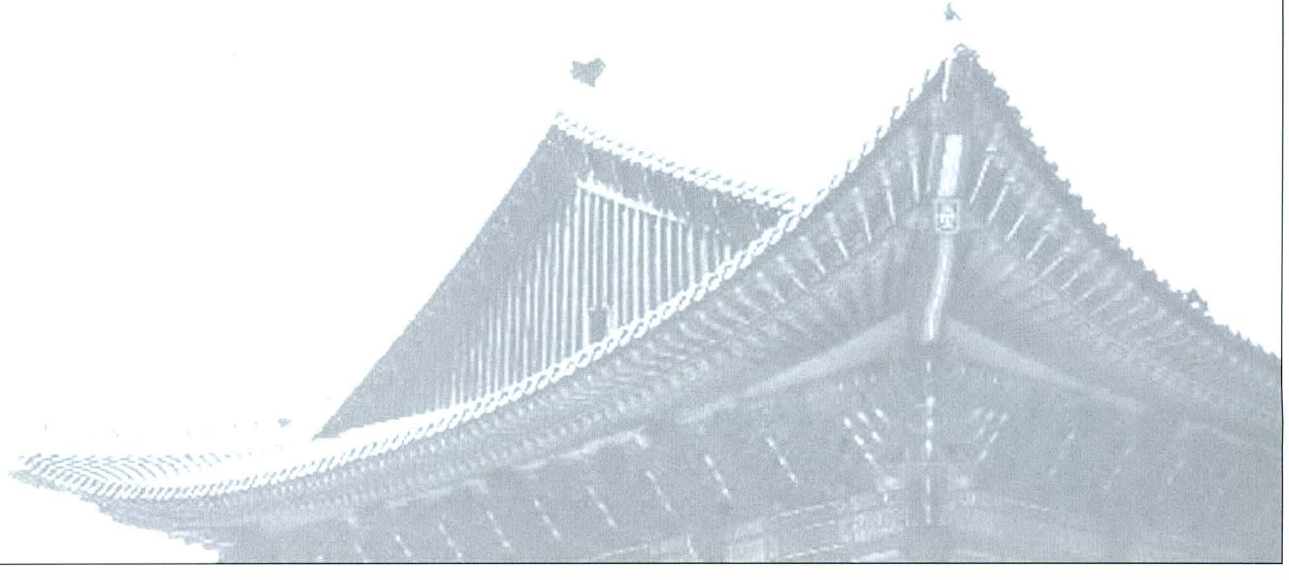
Plenary Lectures



Plenary Lecture 1

PL1

GLAUCOMA IN THE MOLECULAR LEVEL

Changwon Kee, MD, PhD
Department of Ophthalmology, Samsung Medical Center, Sungkyunkwan University, Korea

The pathogenesis of glaucoma is not clearly understood. In addition, there still exist controversies and difficulties in the diagnosis and the treatment of glaucoma.

These may be caused by the attempt to comprehend the glaucoma through the clue obtained from the visible circumstances, and it places the limitation of our understanding on the glaucoma.

Hence, it may be a better way to try to interpret the glaucoma in the molecular level with the knowledge learned by the clinical efforts.

In this point of view and on the basis my work, I intend to reinterpret and shed new lights on the glaucoma in the molecular level.

Plenary Lecture 2

PL2

IMAGINING THE FUTURE OF GLAUCOMA "WHAT GOT US HERE IN GLAUCOMA WILL NOT GET US THERE"

Robert N Weinreb, MD
Department of Ophthalmology, Hamilton Glaucoma Center, University of California, San Diego, USA

1. **What is glaucoma?**
   a. Clinical: progressive optic neuropathy with characteristic structural damage and a specific type of visual field loss.
   b. Biological: specific pathopysiological changes in retinal ganglion cell axons.
   c. Epidemiological: established, visually significant, organ damage.
   d. Genetics
   - Weinreb RN, Anton A. Glaucoma definition and classification. In: Easty DL, Sparrow JM (eds). Oxford Textbook of Ophthalmology. 1999;642-646.
   - Foster PJ, et al. The definition and classification of glaucoma in prevalence surveys. Br J Ophthalmol. 2002;86: 238-42.

2. **What damages the optic nerve?**
   - Weinreb RN, Khaw PT. Lancet. 2004;363:1711-1720.

3. **Easy to use models that mimic human glaucoma.**
   - Weinreb RN, Bowd C, Zangwill LM. Scanning laser polarimetry in monkey eyes using variable corneal polarization compensation. J Glaucoma. 2002;11:378-84.
   - Aihara M, Lindsey JD, Weinreb RN. Aqueous humor dynamics in mice. Invest Ophthalmol Vis Sci. 2003;44: 1581-73.

4. **Better understand role of IOP in causing and preventing glaucoma damage.**
   a. 24-hour IOP clinical monitor.
   b. IOP is higher at night.
   - Liu JK, Zhang X, Kripke DF, Weinreb RN. Twenty-four hour intraocular pressure pattern associated with early glaucomatous changes. Invest Ophthalmol Vis Sci. 2003;44: 1586-1590.

5. **Clinical methods for assessing the entire visual pathway.**
   a. Shrinkage of LGN neurons in glaucoma.

b. Yucel YH, Zhang Q, Gupta N, Kaufman PL, Weinreb RN. Loss of neurons in magnocellular and parvocellular layers of the lateral geniculate nucleus in glaucoma. Arch Ophthalmol. 2007; 118:378-384.

c. Yucel YH, Zhang Q, Weinreb RN, Kaufman PL, Gupta N. Prog Retin Eye Res. 2003;22:465-81.

d. Lindsey JD, Scadeng M, Dubowitz DJ, Crowston JG, Weinreb RN. Magnetic resonance imaging of the visual system in vivo: Transsynaptic illumination of V1 and V2 visual cortex. J Neuroimaging. 2007;34:1619-26.

6. Clinical imaging of the retinal ganglion cells for glaucoma screening, diagnosis and monitoring of progression.

- Leung CKS, Weinreb RN. In vivo imaging of murine retinal ganglion cells. J Neurosci Methods. 2007;168:475-8.

7. Refine predictive models to better determine who benefits most from treatment and who does not.

- Medeiros FA, Weinreb RN, Sample PA, Gomi CF, Bowd C, Crowston JG, Zangwill LM. Validation of a predictive model to estimate the risk of conversion from ocular hypertension to glaucoma. Arch Ophthalmol. 2005;123:1251-60.

8. Understanding the cellular and molecular mechanisms that regulate aqueous humor outflow through the trabecular meshwork and the uveoscleral outflow pathway.

a. Future issues for uveoscleral outflow.

i. What precisely is the outflow pathway?

ii. To where does it lead?

iii. Can it be readily assessed in clinical practice?

iv. How is it regulated?

v. Can it be exploited for drug delivery to the posterior segment?

- Alm A, Weinreb RN (eds). Uveoscleral Outflow. London: Mosby-Wolfe, 1998.

9. Understand and improve lifestyles that are deleterious to glaucoma.

a. Other modifiable factors: smoking, diet, obesity, exercise.

10. Neuroprotection as a direct means of preventing RGC death independent of IOP lowering.

a. Protect healthy RGC's.

b. Rescue damaged RGC's.

c. Replacing RGC's that have died with functional ones (e.g. stem cells or endogenous regeneration).

- Weinreb RN (ed). Glaucoma Neuroprotection. Philadelphia: Wolters Kluwer Health Inc. 2006.
- Levin LA, Weinreb RN, Di Polo A (eds). A Pocket Guide of Neuroprotection in Glaucoma. New York: Ethis Communications. 2007

5th Congress of the South East Asia Glaucoma Interest Group &
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Seoul, Korea, 25-27 September 2008

SEAGIG 2008

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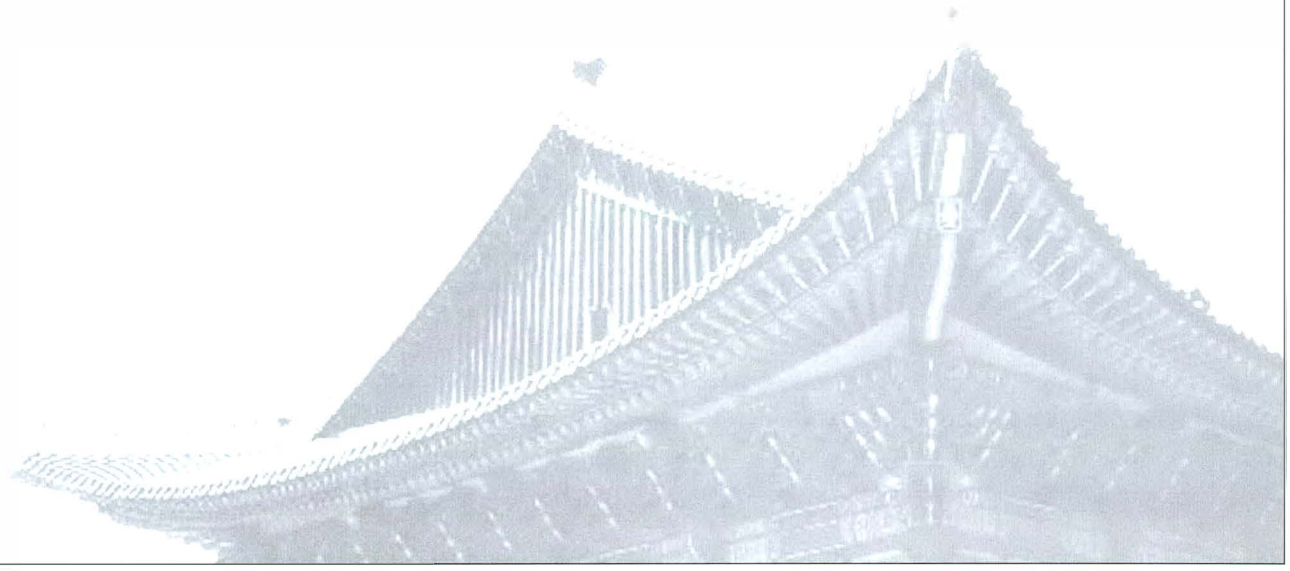
SEAGIG Symposia



Symposium 1: Normal Tension Glaucoma

SS1.1

GENOMIC STUDY OF NTG IN JAPAN

Makoto Nakamura, MD, PhD, Akira Negi, MD, PhD
Division of Ophthalmology, Department of Surgery, Kobe University Graduate School of Medicine, Japan

The purpose of this presentation is to demonstrate a scheme and methodology of an on-going multi-center genomic study to identify disease susceptibility gene for NTG in a Japanese population. Thirteen institutes participate in this study under direction of the Japanese Glaucoma Society. Subject inclusion criteria are intraocular pressure consistently under 21 mmHg, normal angle appearance, and glaucomatous disc change with corresponding visual field change at least in one eye of individuals between 20 and 60 years of age. In order to avoid the aging influence, strict criteria of visual field damage are applied. Additional exclusion criteria are myopic spherical equivalent over -8 diopters and local or systemic disorders that affect optic disc morphology or visual field. So far, 260 individuals compatible with the above criteria have been enrolled. Genome-wide microsatellite (MS) analyses using thousands of variable number of tandem repeat markers as well as genome-wide single nucleotide polymorphism (SNP) analyses using 500k gene chips are under way. In parallel, candidate gene approaches are also conducted for many genes. In MS analyses, a second screening process has been done, showing that more than 500 markers have a significant association. The genome-wide SNP analyses found 17 genes with p value less than 0.000001. Completion of this study, hopefully, will identify the disease susceptibility gene(s) for NTG in Japan.

SS1.2

ROLE OF SYSTEMIC BLOOD PRESSURE AND INTRAOCULAR PRESSURE IN GLAUCOMA

Michael Scott Kook, MD
Department of Ophthalmology, Asan Medical Center, Korea

Hypotheses associated with the development of glaucoma include those involving vascular factors, and those involving intraocular pressure (IOP).Many studies have suggested that unstable blood flow and/or loss of autoregulation in ocular blood flow (OBF) may be present in open-angle glaucoma (OAG). If autoregulatory mechanisms were defective in eyes with glaucoma, the ocular perfusion pressure would be directly affected by systemic blood pressure and IOP. In this context, nocturnal blood pressure drop will also adversely affect the ocular perfusion pressure. Furthermore, the calculated mean ocular perfusion pressure (MOPP) may reflect, at least in part, the true OBF. In this presentation, the role of systemic blood pressure, especially nocturnal blood pressure drop, will be discussed along with IOP in the context of glaucoma. In addition, the effect of variation in ocular perfusion pressure on glaucomatous damage will also be entertained.

SS1.3

ENLARGEMENT OF RETINAL NERVE FIBER LAYER DEFECTS AND DISC HEMORRHAGE IN NORMAL-TENSION GLAUCOMA

Kazuhisa Sugiyama, MD
Department of Ophthalmology & Visual Science, Kanazawa University Graduate School of Medical Science, Japan

Purpose: We investigated the difference in clinical characteristics {disc hemorrhage (DH), progression of visual field loss} between the cases with enlarged retinal nerve fiber layer defect (RNFLD) and stable RNFLD in normal-tension glaucoma (NTG).

Methods: We retrospectively reviewed NTG patients followed up for at least 3 years at 1- to 2-month intervals by a same examiner and selected eyes with clear fundus photography and distinct border of RNFLD.

We selected 80 eyes of 80 patients with NTG (mean follow-up, 6.3 years). We examined the RNFLD using red-free fundus photographs, measured the angle of RNFLD and divided into two groups; one is the enlarged RNFLD cases which RNFLD enlarged more than 2 degrees and the other is the non-enlarged RNFLD cases, and compared the incidence of DH, visual field loss progression (endpoint: MD deterioration more than 3 decibels demonstrated twice), and other clinical factors.

Results: We detected the enlargement of RNFLD in 36 of 80 eyes in NTG patients. DH was found in 25 (69.4%) of 36 eyes in the enlarged RNFLD group and in 2 (4.5%) of 44 eyes in the stable RNFLD group. The difference was statistically significant ($P<0.0001$, χ^2 test). All of 8 eyes exhibited recurrent DH enlarged RNFLD. In 32 eyes (88.9%) of 36 eyes of the enlarged RNFLD group, RNFLD enlarged toward the fovea. Of 37 disc hemorrhages, 30 (81.1%) were coincident in location with RNFLD. DHs located apart from RNFLD were excluded, RNFLD enlarged in the direction of DH in 23 DH (79.3%) of 29 DH. The cumulative probability of progression of visual field loss was significantly greater in patients with the

enlarged RNFLD group than in patients with the stable RNFLD group.

Conclusions: The enlargement of RNFLD seems to be closely associated with DH occurrence and the progression of visual field loss.

SS1.4

ROLE OF DISC HEMORRHAGE: CAUSE OR RESULT? VASCULAR OR MECHANICAL?

Ki Ho Park, MD, PhD

Department of Ophthalmology, Seoul National University Hospital, Korea

Disc hemorrhage (DH) is one of the important risk factors for glaucoma progression. Even though we still do not know the exact cause of DH, it is obvious that the presence of DH means the optic nerve may have trouble in that region. It is detected most frequently in the inferotemporal sector of the disc followed by superotemporal where the initial optic nerve head change usually appears. They are mostly found in the prelaminar nerve fiber layer but also detected in the laminar region. Recurrence of disc hemorrhage significantly increases the risk of glaucoma progression. A study reporting decreased incidence of DH after IOP lowering by trabeculectomy supports the mechanical theory, however, other studies related with vascular dysregulation and higher incidence of DH in NTG support vascular theory. Recent studies on the evaluation of retinal nerve fiber layer thickness showed that DH can be developed in the early stage of glaucoma. Population based studies have shown that DH may also develop in normal healthy subjects, however their follow-up results are not available yet.

SS1.5

TREATMENT OF NTG — SURGICAL OR MEDICAL?

Hidenobu Tanihara, MD

Department of Ophthalmology & Visual Science, Kumamoto University Graduate School of Medical Sciences, Japan

For the management of normal tension glaucoma (NTG), intraocular pressure (IOP)-lowering is the most important therapeutic concept. Many clinical investigations showed that IOP-lowering could inhibit progression of glaucomatous optic neuropathy (GON) in patients with NTG. Also, it has been shown that surgical treatments can result in lower IOP levels than medical treatments. These findings suggest that surgical treatments should be regarded as important therapeutic modality for the treatment of NTG. On the other hand, filtration surgeries may often induce visual-threatening risks such as postoperative endophthalmitis, cataract progression and central visual field loss. Also, in patients with NTG, progression rates in visual field defects may differ from patient to patient. Taken together into consideration, for safe and long-term management of NTG, we should pay much attention to risk/benefit balance of our therapeutic modalities. Furthermore, recent development of novel anti-glaucoma medications would enable us to bring a novel drug with more potent IOP-lowering and neuroprotective effects into realization.

SS1.6

PATHOPHYSIOLOGY OF GLAUCOMATOUS DAMAGE

Josef Flammer, MD

Department of Ophthalmology, University of Basel, Switzerland

Glaucoma is phenomenologically defined as a disease with characteristic loss of retinal ganglian cells and their axons combined with a tissue remodelling of the optic nerve head.

A number of major risk factors are well known. Some can be influenced such as IOP increase, blood pressure drops or a vascular dysregulation.

The exact mechanisms by which these risk factors lead to the damage is not yet known. We know that some ganglian cells die by apoptosis, but we do not know exactly the individual steps that initiate the apoptosis. We know that the glial cells are involved in the tissue remodelling and probably also in the neural cell damage. Astrocytes are activated both by mechanical as well as by ischemisc stress.

Based on the known facts, we can assume today that ischemia/reperfusion plays a major role in these pathomechanisms. Glaucoma patients have on the average a reduced ocular perfusion. Whereas the baseline blood flow in some glaucoma patients is still normal, an insufficient response to challenges such as an increase of IOP or a decrease of blood pressure can already be observed. Most of the patients with progressive glaucomatous damage despite an only moderately elevated or even normal IOP have altered autoregulation of ocular perfusion. Interestingly, signs of reperfusion damage could even be found in the circulating lymphocytes. Gene expression analysis of lymphocytes gives further insight into the pathomechanisms of individual patients and indicates whether a damage is present or not.

Symposium 2: Glaucoma Screening and Awareness in Asia

SS2.1

GLAUCOMA SCREENING IN AUSTRALIA

Paul R Healey, PhD, MBBS(Hons), B(Med)Sc, MMed, FRANZCO, Paul Mitchell, MD, PhD, FRANZCO

Department of Ophthalmology, University of Sydney, Centre for Vision Research, Western Sydney Eye Hospital, Australia

Purpose: To evaluate the accuracy of community-based screening for open-angle glaucoma in Australia and to compare it with a new screening algorithm derived from population-based data.

Methods: The prevalence and characteristics of community-based glaucoma screening was evaluated in the Blue Mountains Eye Study population. New screening models were developed using multiple logistic regression to calculate diagnostic odds ratios and receiver operating characteristic curves. Covariate selection utilized previously identified risk factors and signs ascertained from participants from the Blue Mountains Eye Study. Analysis of rank scoring was used to create simple decision rules, which were then compared to the regression models. Age-specific rates of positive screening from the final diagnostic model were used to calculate national rates for Australia.

Results: Community-based detection in the BMES population had a sensitivity 49% and a specificity of 98%. Diagnosis rates were similar across age groups. But almost all glaucoma cases with intraocular pressures <21mmHg were missed. Intraocular pressure performed poorly as screening test. Vertical cup-disc ratio performed better. A simplified screening model (glaucoma likelihood score) was developed using age IOP, disc haemorrhage, myopia vertical cup-disc ratio and a disc rim notch as covariates. A cut-off of 50 (GL50) would screen positive 4.5% of the Australian population over 50 years of age, with a sensitivity of 90% and a sensitivity of 98%. Across Australia, the GL50 screening algorithm would detect almost all of the currently undiagnosed open-angle glaucoma, particularly in younger age groups.

Conclusions: The GL50 screening test for OAG is simple, inexpensive and accurate. If verified, it has the potential to become a useful tool in glaucoma diagnosis.

SS2.2

APPROACHES TO GLAUCOMA IN CHINA

Liang Xu, MD

Department of Ophthalmology, Beijing Tongren Hospital, Capital University of Medical Science, China

It was estimated that 9.4 million people aged 40 years and older in China have glaucomatous optic neuropathy. According to the Beijing Eye Study which was held in 2001, the standardized prevalences of open-angle glaucoma and angle-closure glaucoma were 2.05% and 0.92%, respectively, in population aged 40+ years old. The unilateral blindness caused by primary open angle glaucoma and primary angle closure glaucoma were 7.3% and 20.5%. In the diagnosed glaucoma patients, 81% were not conscious. Building a low-cost and high-efficiency screening modality is essential, especially in countries with relatively undeveloped health care system.

In our practice of glaucoma screening these years, it showed that defining of high risk population and combination screening of multi eye diseases were important guarantee of a cost-effective screening. Non-mydriatic digital retinal imaging assisted with tele-ophthalmology was adopted. It cost only 3 dollars per capita for glaucoma, diabetic retinopathy, and cataract screening and about 15% were called back to hospital for detailed diagnosis and treatment.

SS2.3

TO BE OR NOT TO BE: ASIAN PERSPECTIVE ON GLAUCOMA SCREENING

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Population based studies from Asia have shown that prevalence of PACG is more than that in western population. It is estimated that half the glaucoma in the world is caused by angle closure. PACG is reported to cause three times more blindness than POAG. Approximately 75% of subjects with PACG in Asia have optic nerve damage. Whether PACG is a public health problem is partly addressed by the population attributable risk percentage (PAR%). A PAR% of 20% is considered significant. Primary angle closure (PAC) and primary angle closure glaucoma (PACG) have a PAR% of over 50%, demonstrating that glaucoma is indeed a public health

problem. The strategies for detection of disease include screening, defined as the detection of pre symptomatic disease. Screening can be either population based, or clinic based case finding. Population based screening will yield high false positives due to lower prevalence of disease. A population based study using newer instruments (AS-OCT, SPAC) reported low specificity when used for screening for narrow angles (PACS, PAC and PACG combined) and this may limit the usefulness of these devices in screening for angle closure. If the van Herick test is positive AND the IOP is raised (> 21 mm Hg), the specificity improves to 99%. Therefore, as far as a screening strategy is concerned, if the IOP is raised and the van Herick test is positive, the specificity is high enough to diagnose angle closure. This strategy is not appropriate for diagnosis of PAC in an ophthalmology clinic environment. The current best strategy for detection is case finding: looking for the disease in all patients who consult us, irrespective of their complaints.

SS2.4

GLAUCOMA SCREENING METHODS: PRESENT AND FUTURE (THE POSSIBILITY OF RECENT OBJECTIVE QUANTITATIVE DEVICES)

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Purpose: A mass screening method for glaucoma is urgently needed and it would be useful to introduce objective quantitative measurements. So, we assessed the efficacy and practical usefulness of the Heidelberg Retina Tomograph II (HRT II) compared with nonmydriatic stereoscopic photography in a public glaucoma screening.

Methods: We examined 1,173 local residents, aged 40 years or older, who visited a community health screening in Komatsu City. Initial glaucoma screening consisted of non-contact pneumotonometry, nonmydriatic stereoscopic fundus photography and HRT II. When glaucoma was suspected, the subjects were referred for a definitive examination, in which slit-lamp biomicroscopic examination, Goldmann applanation tonometry, Humphrey 30-2 test, gonioscopy, and optic nerve head evaluation were performed.

Results: A total of 97.2% (2279/2345) of the nonmydriatic stereoscopic optic disc photographs could be interpreted and 93.4% (2189/2345) were good images. HRT II measurements were successful in 99.0% (2322/2345) of eyes, and acceptable images were obtained in 91.9% (2154/2345) of eyes. Based on clinical diagnoses, 94 eyes of 60 participants were diagnosed with glaucoma. The sensitivity of nonmydriatic stereoscopic photographs for personal-level analysis and eye-level analysis were 95.8% and 95.5%, respectively. Using Moorfields regression analysis, HRT sensitivity and specificity were 91.5% and 84.0%, respectively, when "borderline" outcomes were treated as test positives and 72.3% and 93.1%, respectively, when "borderline" outcomes were treated as test negatives for personal analysis. HRT sensitivity and specificity were 72.6% and 89.7%, respectively, when "borderline" outcomes were treated as test positives and 60.3% and 95.6%, respectively, when "borderline" outcomes were treated as test negatives for eye-level analysis.

Conclusions: Although HRT II diagnosis is not definitive until confirmed by a glaucoma specialist's clinical fundus examination or evaluation of stereophotographs, HRT II have a possibility to be a useful tool for glaucoma mass screening.

SS2.5

PREVALENCE AND AWARENESS OF GLAUCOMA IN KOREA

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Purpose: To assess the prevalence and awareness of glaucoma in Korea, so as to determine which glaucoma patients require management.

Methods: Meta-analyses of a population based epidemiology study, glaucoma prevalence and awareness information from a government organisation and the medical system were performed.

Results: The Namil Study, a glaucoma epidemiology study was recently completed by the Korean Glaucoma Association in Namil, Kumsan, Korea. The study revealed total prevalence of glaucoma at 4.7% most of which was normotension glaucoma (64%). The National Health and Nutrition Survey performed by the government saw a life-time awareness of glaucoma at 5.9 per 1000 persons. This is only one tenth of what actual glaucoma epidemiology studies show. In the Namil study only 5.5% of glaucoma patients were aware they were suffering from the condition.

Conclusions: Korea has a relatively easily accessible medical system due to the National Medical Insurance policy. However, the present study revealed that many patients still do not recognize they are suffering from the condition. An effective screening tool seems to be needed in the detection of these patients.

SS2.6

GLAUCOMA SCREENING AWARENESS IN MALAYSIA — FROM A PUBLIC HEALTH PERSPECTIVE

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Glaucoma screening is justifiable as it fulfils the screening criteria, i.e. is an important public health problem, has recognisable early stage, has appropriate, acceptable and reasonably accurate screening test, has acceptable and effective treatment and cost of case finding is economically balanced to possible medical treatment.

However, implementation of glaucoma screening program is not as straight forward. This is because diagnosis of glaucoma requires personnel with expertise and skills, as well as specialized and often expensive equipment. Thus its implementation is very much depending on individual countries' healthcare policy and budget.

In Malaysia, clinical practice guideline published by the Ministry of Health in 2008 recommended opportunistic screening for people over 40 and those with positive family history at primary care setting including optometry outlet. The clinical test at primary care level includes vision testing, fundoscopy, and intraocular pressure (IOP) measurement if tonopen is available. At eye clinics, any patients above 40 will have vision test, IOP with Goldman tonometry, gonioscopic examination, and biomicroscopic optic disc assessment with dilated pupil. Patients with features suspicious of glaucomatous optic disc will undergo automated visual field testing.

Awareness among health care providers including optometrists on CPG recommendation is on the way. Eye care providers in the country should be made aware that screening program have to be supported by post screening care process for people detected to be confirmed glaucoma or even glaucoma suspect, or ocular hypertension. Extra health care personnel and health budget are needed to cater for these increased needs.

SS2.7

OUTPATIENT BASED EVALUATION OF GLAUCOMA SCREENING

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To determine the outpatient based prevalence of glaucoma and to assess the impact of screening program for early detection of glaucoma.

Screening was carried out at the outpatient department of the Central Republican Hospital. 26543 individuals were screened within six years. 910 subjects who were aged 35-70 and ocular pathology with increased IOP were referred to glaucoma clinic for further detailed examinations. The multifactoral Linear discriminant function (LDF) analysis for optimal set of 17 informative data were used to differentiate glaucoma and ocular hypertension for 227 subjects.

Glaucoma was confirmed in 538 (59.1%) subjects while a 50 (5.5%) were found to have ocular hypertension.

Primary angle–closure glaucoma was diagnosed in 329 (61.1%) subjects. Primary open-angle glaucoma was diagnosed in 209 (38.9%) subjects. Latent glaucoma was in 40 (4.4%) subjects.

With use of LDF analysis, glaucoma was diagnosed in 183 (80.6%) individuals out of 227, when glaucoma diagnosed in 31 (14.5%) subjects out of 214 based on generally accepted methods.

Primary angle-closure glaucoma is more prevalent than primary open-angle glaucoma, supporting clinic-based data from other studies in the country. The Linear discriminant function analysis made considerable impact on detection of glaucoma at an early stage and thus would save sight.

SS2.8

GLAUCOMA AWARENESS AND EDUCATION: THE PHILIPPINE INITIATIVE

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Department of Ophthalmology, University of the Philippines, The Philippines

In the light of existing geographic, socio-economic and logistic challenges that currently exist in the Philippines, this talk will center on the planned strategies and current efforts of the Philippine Glaucoma Society in elevating the level of glaucoma awareness and education amongst the nation's population.

SS2.9

GLAUCOMA SCREENING FOR THE MASSES

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Glaucoma awareness as a blinding disease is slowly but gradually becoming more prevalent. There is a great urgency to study the diseases and how it affects the various populations and the different type of glaucoma in these populations.

The level of sophistication of clinical examinations can vary, from studies where a trained technician picks up glaucoma suspects with basic examinations include the Van-Herrick Test, to ophthalmologist-based screenings that include intra-ocular pressure and gonioscopy.

In addition to this, some newer large scale studies have also included investigations as part of their glaucoma screening. These tests include Frequency Doubling Threshold (FDT), Automated Perimetry, Optic Disc Imaging and Anterior Segment Imaging.

Optic Disc Imaging, including Retinal Nerve Fibre Layer (RNFL) Thickness imaging has been done with different technologies, including the Heidelberg Retina Tomograph (HRT), the GDx VCC Nerve Fiber Analyzer, and the Optical Coherence Tomography (OCT). These methods compliment the traditional optic disc photography.

We aim to discuss the problems of glaucoma screening in large scale studies and the current screening tools for glaucoma on a large scale in our Asian populations. We will consider the use of the new disc imaging technologies to the results from clinical examination alone.

The Singapore Malay Eye Study was a population based study to study visual impairment in the Malay population in Singapore. Clinical examination and investigations were performed on the study cases. We will also share the results of our work in comparing the use of HRT as a screening tool for glaucoma as compared to clinical criteria based on Cup to Disc ratios, IOP and visual field defects.

SS2.10

GLAUCOMA SURVEY FOR THE ELDERLY IN TAIPEI

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The Shihpai Eye Study is a community-based, cross sectional survey of vision and eye diseases among non-institutionalized subjects 65 years of age or older in Shihpai, Taipei, Taiwan. Subjects were identified by using the household registration system. After excluding vacant households, residents who died before contact, and disabled, paralyzed or hospitalized residents, a total of 3746 subjects were eligible. Among them, 2045 subjects were randomly selected to participate in this study and 1361 (66.6%) completed the questionnaire and eye examinations. The baseline examination was conducted from July 1999 to December 2000. All participants were again invited to participate in follow-up examinations from March 2006 to December 2007. Glaucoma survey was conducted in the follow-up examination, including Goldman applanation tonometry, gonioscopy and fundoscopy at slitlamp with a 78 D lens. Four hundred and ninety-one subjects (40.4% of the surviving subjects) participated in the follow-up eye examinations.

We found the intraocular pressure (IOP) distribution skewed to the right in both eyes. The mean IOP was 13.3±3.1 mmHg (4.5 – 36.5 mmHg, 97.5 percentile, 18.8 mmHg). The median of the cup-to-disc ratio was 0.4 in both eyes, with the 97.5 percentile being 0.85 in the right eye and 0.9 in the left eye. Thirty seven subjects (7.54%) was identified as glaucoma cases, including 29 patients of category 1, five patients of category 2, and three patients of category 3, as defined by the classification scheme proposed by Foster in 2002. Among these cases, 19 was primary open angle glaucoma (2 cases with IOP >19 mmHg), 17 was primary angle-closure glaucoma and one was secondary glaucoma. Twenty-eight of them (75.7%) know they have glaucoma only after participating in the follow-up examination of Shihpai Eye Study.

Glaucoma remains largely undiagnosed in Taiwan, even in areas with sufficient medical resources and easy accessibility to the medical system.

SS2.11

GLAUCOMA SCREENING AWARENESS IN THAILAND

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Glaucoma in Thailand is a big problem as in many parts of the world. Though many campaigns have been done to promote the awareness of the disease importance in the community, lots of people in the country still do not have enough idea what glaucoma is and how much it harms. Not only public education is required, the alertness of the physicians to glaucoma screening is also important. However, proportion of the ophthalmologists to general population in Thailand is rather small, that is why active screening in the community sometimes hard to do. As a result, general ophthalmologists are our crucial tools to help. Optic nerve head screening for abnormality is encouraged as well as gonioscopy because subjects who are at risk for angle closure glaucoma is as commonly found in Thailand as in other Asian countries. Special instruments other than clinical evaluation for structural and functional change in glaucoma are also employed to confirm findings and often as baseline for further follow-ups. Glaucoma screening awareness in Thailand as to early disease identification and prompt management has increased its importance. Having been far from knowing whether glaucoma blindness has been reduced, it is strongly believed, though, this mission will be accomplished not beyond our reach.

Symposium 3: Medical Treatment

SS3.1

24 HOUR CONTROL OF IOP

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The only proven method to decrease the risk of progressive loss of vision due to glaucoma is lowering intraocular pressure (IOP). Several recent studies have demonstrated this treatment benefit with a mean IOP reduction of 18% resulting in a 40% reduction in the rate of glaucoma progression. These studies have also suggested the importance of consistency of IOP lowering. Currently, there is much interest in better measuring and understanding IOPs in glaucoma patients over longer time frames than the historical "diurnal curve" involving normal office hours on a single day. Studies have shown that a single IOP measurement likely does not reflect IOP peak, trough, or variability. There are several factors that should be considered when looking at studies involving IOP measurement over a full 24 hours. These include the setting, the method of tonometry, the impact of central corneal thickness, and patient position. There is no data on reproducibility of these 24-hour IOP measurements. Study outcomes have varied from a study showing that progression of visual field loss was not related to 24 hour IOP fluctuation to another study reporting immediate treatment changes in 59% of patients when 24 hour IOP measurement was performed. Supine IOP in the office has been suggested to be a surrogate for nocturnal supine IOP. Concerning treatment, studies suggest that prostaglandin analogs are the most effective class of medications in reducing IOP over the full 24 hour period. There is some data to suggest that their treatment effect can last up to 60 hours. In conclusion, in practice, a single IOP measurement is often used to determine adequacy of treatment. It now appears prudent to consider the impact of IOP over the entire 24 hour period when assessing glaucoma and its treatment.

SS3.2

MONOCULAR DRUG TRIAL IN GLAUCOMA PATIENTS

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Determining the effectiveness of anti-glaucomatous medications is critical when treating glaucoma patients. Monocular drug trial

has been a traditional way to evaluate the effectiveness of a drug. In monocular drug trial, a patient receives a medication in one eye only. The reduction of IOP from baseline in the treated eye is evaluated, whereas the untreated fellow eye serves as a control to assess the efficacy of the drug. Recent studies showed that monocular drug trial might not predict the IOP response well.

The author performed a prospective study including measurement of diurnal variations. In this study, a monocular drug trial was performed in primary open-angle glaucoma and normal-tension glaucoma patients after measuring baseline IOP at 10:00, 12:00, 14:00, and 16:00. To minimize the contralateral crossover effect of drugs, only 0.005% latanoprost was utilized. During the first week, the medication was instilled in one randomly selected eye. Thereafter, the same medication was used in both eyes. After 4 weeks of treatment, the correlations of IOP reduction observed in a monocular drug trial with that seen in the fellow eyes when the same medication was then administered to the second eye were calculated. The study results showed a significant correlation between first-eye and second-eye responses to the same medication in both primary open-angle glaucoma and normal-tension glaucoma patients. Based on the current evidences, further studies are needed to clarify the value of the monocular drug trial and the fellow eye responses.

SS3.3

COMPLIANCE ISSUES IN THE MEDICAL MANAGEMENT OF GLAUCOMA PATIENTS

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Medical management of chronic glaucoma remains the commonest primary strategy to reduce intraocular pressure. In order to be effective, the agent(s) prescribed need to be obtained by the patient, the bottle(s) opened and used regularly and appropriately.

For a chronic, often minimally symptomatic disease like glaucoma, patients generally do not follow their regimen as prescribed, and doctors are not good at estimating which patients are failing in this way.

Added to this, there may be physical barriers to drop instillation: arthritis affecting shoulders and/or hands and tremor, for example, which may make it difficult or impossible for a patient to instill drops effectively.

Strategies to improve compliance include patient education about the importance of regular medication and instillation techniques, appropriate use of dosing devices, recognition of difficulties, including financial concerns, and the establishment of a strong, open, supportive patient-doctor therapeutic alliance.

SS3.4

FIXED COMBINATION THERAPY OVERVIEW

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Topical medical therapy remains the first line of treatment in the management of glaucoma. Despite significant advances during the past, a large proportion of glaucoma patients require more than one drug to achieve adequate control of intraocular pressure.The most recent additions to antiglaucoma drugs are fixed combination products for the glaucoma patient who is insufficiently responsive to monotherapy. Fixed-combination products have the combined efficacy of two ocular hypotensive drugs, and the convenience of a two-drug treatment regimen in a single container, which may aid patient adherence to treatment. Available fixed-combination products consist of timolol 0.5% as an invariant with brimonidine 0.2%, dorzolamide 2%, travoprost 0.004%, latanoprost 0.005% or bimatoprost 0.03%. Research on more advanced antiglaucoma medications continues. Fixed combinations offer benefits of convenience, cost, and safety, but limit individualization of dosing. Understanding the advantages and disadvantages of prescribing fixed combinations facilitates success in using these products in clinical practice.

SS3.5

EFFECTS OF BRIMONIDINE AND LATANOPROST ON THE ANTERIOR CHAMBER AS IMAGED BY ULTRASOUND BIOMICROSCOPY

Maria Cecilia Aquino, MD

Department of Ophthalmology, National University Hospital, Singapore

Several studies have shown efficacy of brimonidine and latanoprost as adjunctive treatment in chronic angle closure glaucoma management. The mechanism by which these drugs act is still vaguely understood. This presentation provides an overview of the existing evidence regarding the effects of these 2 anti-glaucoma medicines on the anterior chamber.

SS3.6

RATIONALES IN CHOOSING GLAUCOMA MEDICATION

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Glaucoma is a complicated disease with many underlying mechanisms and a complex relationship with intraocular pressure (IOP). The goal of glaucoma therapy is to lower the IOP to the target level by aggressive consistent pressure –lowering. The cost of medical therapy and follow-up for glaucoma is a main factor for treatment. Glaucoma treatment should be based on risk, the risk that the disease will influence the patient during their lifetime weighed against the risk that the management will cause side effects. Patient education and a positive doctor-patient relationship are the most crucial but easily overlooked components of glaucoma treatment. Patients therefore must be compliant with medications and management should be individualized for each patient to obtain the best result and life quality.

SS3.7

CHANGING PARADIGMS IN THE MEDICAL TREATMENT OF GLAUCOMA

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Population-based studies indicate that incidence, severity and progression of glaucoma consistently correlate with elevated intraocular pressure (IOP), which is currently the only modifiable risk factor to prevent disease progression. In the context of individualized glaucoma treatment, target IOP depends on clinical information such as baseline untreated IOP, severity of damage, life expectancy issues and rate of progression. However, the latter varies widely among patients and even within the same individual overtime, while we are unable to make any estimation for progression rates at initial diagnosis. Rate of progression can only be measured retrospectively and be projected in the future assuming linearity. This concept is directly associated with the goal of glaucoma treatment, which is to maintain the patient's quality of life at a sustainable cost. On the other hand, a threshold in visual field damage beyond which quality of life is affected has not been identified yet. In an effort to obtain target IOP with medical treatment, availability of new molecules has widened treatment choices. In many cases more than one active principle is needed to reach target IOP. However, issues facing glaucoma management such as compliance to treatment should be taken into account. Considering the burden of treatment from the patient's perspective, fixed combinations may offer benefits over concomitant therapy. However, their role and place in glaucoma management should be defined, while in the face of several choices available, our challenge is to keep medical therapy reasonable.

Symposium 4: Surgical and Laser Treatment

SS4.1

THE PLACE FOR SLT IN THE MANAGEMENT OF GLAUCOMA

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Laser trabeculoplasty (LTP) has many advantages over medical treatment and filtering surgery. Not only safer and easier than filtering surgery, LTP also is able to help glaucoma patients free from side effects and noncompliance caused by medical treatment. Even though these advantages, the rate of LTP treatment had been declined until year 2002. Argon laser was the major LTP tool as part of the treatment of open angle glaucoma since its introduction in 1979. Many glaucoma surgeons were not satisfied with argon laser trabeculoplasty (ALT) because of its short duration of effective intraocular pressure (IOP) lowering period, scar and peripheral anterior synechia (PAS) formation of trabecular meshwork (TM) by photocoagulation, limitation of repeated treatment, and the unclear IOP lowering mechanism. In 1998, Latina et al introduced a new treatment modality, selective laser trabeculoplasty (SLT). SLT uses the principle of selective targeting of pigmented TM. SLT is distinct from ALT in the point of absent or minimal coagulative damage to the TM. To achieve these, SLT uses Q-switched frequency doubled 532 nm Nd:YAG laser with short pulse duration (3.0 nsec) and thus emitting very low energy per pulse (0.6-1.0mJ/pulse). According to many clinical reports, SLT is known to be as effective as ALT and more safe. SLT can be indicated in the treatment of nearly the same cases where ALT can be applied. The indication of SLT are being widened to initial treatment choice of glaucoma, retreatment after prior ALT, repeated treatment after prior SLT, and elevated IOP after intravitreal triamcinolone injection. Known side effects of SLT are early postoperative IOP spike, anterior chamber reaction, redness, pain and discomfort, vision blurring, hyphema, and PAS formation. Most of these side effects were reported to be disappeared without sequela. Recently, LTP are gaining an important position again due to the introduction of SLT.

SS4.2

CURRENT SURGICAL PRACTICE PATTERNS IN GLAUCOMA IN THE USA, 1992-2008

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Purpose: To evaluate the current preferred surgical practice patterns of members of the American Glaucoma Society (AGS) in various clinical settings, as well as their preferred dose and duration of antifibrotic agent, and their preferred primary incisional glaucoma procedure.

Materials and Methods: Members of the AGS were asked to voluntarily participate in an anonymous web-based survey to indicate there surgical preferences and preferred mode for performing a primary trabeculectomy.

Results: There is a preference toward the use of glaucoma drainage devices (GDDs) in the setting of prior ocular surgery or inflammation (penetrating keratoplasty, scleral buckling procedure, pars plana vitrectomy, neovascular glaucoma, or uveitis). Trabeculectomy remains the preferred surgical management as a primary incisional procedure in eyes without a history of prior surgery and in eyes after uncomplicated phacoemulsification. Mitomycin C remains the preferred antifibrotic agent. The preferred dose (mg/mL) and duration (min) remains similar for most scenarios.

Conclusions: There is an increasing trend toward use of GDDs and away from trabeculectomy compared to prior survey years in 1996 and 2002. The duration and dose of MMC use has been similar in the last 12 years.

SS4.3

ASSESSMENT OF FILTRATION BLEB: FUNCTION AND PROGNOSIS

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A well-functioning filtering bleb is a successful symbol of trabeculectomy. Many studies focused on the size, height, vascularisation, vessels, encapsulation of filtering bleb. Moorfields Bleb Grading System (MBGS) and Indiana Bleb Apprearance Grading Scale (IBAGS) are used to evaluate the filtering bleb. Ultrasound

biomicroscope (UBM) is an important tool to observe internal structure of filtering bleb. Some studies showed that the features of the untrasound biomicroscopic image were significantly associated with filtering bleb function.

In our study twenty-four patients (27 eyes) who underwent phacoemulsification after successful trabeculectomy were evaluated the effects of phacoemulsification on intraocular pressure (IOP) and UBM images of filtering bleb in eyes with cataract and a previous functioning filtering bleb. The mean IOP before phacoemulsification was 12.46 ± 4.75 mmHg, and it increased 5.50, 3.85, 3.11, 3.05, 2.79 and 2.58 mmHg on the first postoperative day, after 1 week, 1 month, 3 months, 6 months and 12 months, respectively. There was no statistically significant difference in visibility of the route under the scleral flap and reflectivity inside the bleb between before and after phacoemulsification (P = 0.398, 0.096). An IOP greater than 10 mmHg and a filtering bleb with an invisible route under scleral flap and stronger reflectivity inside bleb before phacoemulsification were associated with postoperative antiglaucomatous failure (P = 0.025, 0.000, and 0.000, respectively). In our study we think that phacoemulsification significantly increased IOP, but had no obvious effects on the features of filtering bleb in UBM image. Eyes with higher IOP, invisible route under scleral flap and stronger reflectivity inside bleb in UBM image before phacoemulsification had greater postoperative antiglaucomatous failure.

SS4.4

NOVEL USES OF BLEB NEEDLING TO MANAGE COMPLICATIONS AFTER TRABECULECTOMY SURGERY

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Trabeculectomy has been the mainstay of glaucoma surgeries for over 40 years. Recent advances have focused on minimizing common complications such as wound leaks, bleb scarring and blebitis. In the early postoperative period, if all the sutures have been cut or removed and the bleb is still failing, bleb needling can effectively restore filtration. The scleral flap is easier to visualize for bleb needling if a tenonectomy was performed during surgery. Mitomycin C is more effective than 5-FU as a subconjunctival adjunct with bleb needling. To minimize the risk of blebitis in blebs with a cystic, avascular appearance, prophylactic bleb needling can restore communication of the cysts overlying the scleral flap to the subconjunctival space. These cysts are usually surrounded by a ring of fibrosis, limiting the egress of fluid from the areas directly overlying the scleral flap. The cysts become avascular because the hydrostatic pressure from the anterior chamber exceeds collapses the low-pressure conjunctival blood vessels. Depressurizing the cysts can restore vascularization of the conjunctiva, minimizing the risk of infection. Bleb leaks can occur early due to poor wound healing or late due to conjunctival breakdown in cystic, avascular, thin-walled blebs. Aqueous fluid tends to follow the path of least resistance out of the eye, and if a new tract is created via needling, the flowrate through the leak will decrease, allowing it to seal. In summary, bleb needling is a highly effective procedure for maintaining bleb survival as well as preventing or treating common postoperative complications.

SS4.5

FAILING BLEBS AFTER TRABECULECTOMY — UBM AND REVISION ASSESSMENT

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A retrospective review of a series of ultrasound biomicroscopy (UBM) performed before and after revision of failing blebs has illustrated the sites of drainage failure and the structural changes of the bleb following restoration of aqueous drainage through revision.

The failing blebs after trabeculectomy could be classified into two types: 1) flap-failure blebs due to episcleral fibrosis and/or subscleral adhesion and 2) Tenon-failure blebs caused by bleb encapsulation or Tenon's cyst. In flap-failure blebs, UBM showed a loose or tight adhesion of the scleral flap with the adjacent scleral bed or incision, whereas Tenon-failure blebs showed a free communication under the scleral flap between the anterior chamber and the subconjunctival space on UBM. The reformed filtering bleb following revision procedure appeared to be a new bleb formed in the area of less compromised Tenon tissue out of the previous fibrosed and condensed Tenon's layer and did not represent the same functioning bleb as before its failure.

Bleb failures had occurred during the early or late postoperative period. Early bleb failures, usually within 1-2 months of trabeculectomy, most commonly occurred in the eyes with an increased postoperative inflammation and/or a past history of intraocular neovascularization in both types of failing blebs. Late bleb failures usually occurred 1-2 years after trabeculectomy and were highly associated with an isolated or combined cataract surgery. This association between late bleb failure and

cataract surgery was more obvious in the Tenon-failure blebs. An intraoperative use of lower dose of mitomycin-C (MMC application of less than 2 minutes) and a skipped or delayed laser suture lysis were more frequently associated with flap-failure blebs than Tenon-failure blebs.

In most cases of Tenon-failure blebs, a closed revision at the outpatient setting was possible, but for the flap-failure blebs an open revision, i.e. a near reoperation was frequently indicated because of the difficulty to locate the firosed scleral flap through the opaque scarred conjunctiva.

SS4.6

IS THE ROLE OF SURGICAL TREATMENT CHANGING?

Tetsuya Yamamoto, MD

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Trabeculectomy has been served as the gold standard of glaucoma surgery in the world for 40 years since Cairns reported the new surgical procedure (AJO 66: 673, 1968). Introduction of adjunct use of antimetabolites such as mitomycin C and 5-fluorouracil has much strengthened the position. We, however, do not believe that trabeculectomy is an ideal treatment modality for glaucoma: The success rate is not high enough; Careful follow-up is mandatory, and; Several sight-threatening complications exist. Moreover, the recent advance of medical treatment may alter the firm position of trabeculectomy in the treatment of glaucoma in general.

In this presentation, I'd like to focus the following issues and seek for the current position of trabeculectomy in glaucoma treatment.

1. Surgical outcome of trabeculectomy
   a. IOP
   b. Visual field changes
   c. Complications
2. Surgical vs. Medical
3. Current position of trabeculectomy

SS4.7

CLINICAL COURSE FOLLOWING AHMED IMPLANT SURGERY

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We reviewed the medical records of the patients who underwent Ahmed glaucoma implant surgery for the treatment of refractory glaucoma. Ninety seven eyes from 97 patients (35 females and 64 males) were enrolled; the age was 55.3±15.0 and follow-up length after surgery was 33.3±20.0 months. Neovascular glaucoma was the most common type of glaucoma (43%), and followed by secondary glaucoma after uveitis, trauma or intraocular surgery (26%), failed previous filtration surgery (24%) and others (8%). The intraocular pressure (IOP) before surgery was 36.1±16.0 mmHg and was significantly decreased to 20.4±8.5 at 6 months, 18.7±7.4 at 1 year, 18.8±8.8 at 2 years, 19.1±7.4 at 3 years, and 20.1±7.7 mmHg at 5 years after surgery. Number of anti-glaucoma medication was 3.2±1.0 before surgery and decreased to 1.4±0.9 at 6 months, 1.5±0.9 at 1 year, 1.4±0.8 at 2 years, 1.4±0.8 at 3 years, and 1.4±0.8 mmHg at 5 years after surgery. Kaplan-Meier analysis for IOP less than 25 mmHg revealed 77.0% at 1 year, 72.4% at 2 years, and 58.8% at 3 years after surgery. Early postoperative complications were tube touching the cornea or iris (5 eyes), IOP elevation requiring second surgery (3 eyes), tube exposure or retraction (2 eyes), hypotony lasting more than 1 month (1 eye), and cataract formation (1 eye). Hypertensive period more than 25 mmHg within 6 months after surgery was noticed in 42.9% of the subjects. Late complications were cataract formation (4 eyes), tube exposure (3 eyes), chronic hypotony (2 eyes), intraocular lens dislocation (1 eye), and and corneal endothelial decompensation (1 eye). 8 eyes received additional glaucoma surgery for IOP control, and the implant was removed from one patient due to severe exposure. 5 eyes lost light perception after surgery despite of controlled IOP, and a case received enucleation due to phthisis after chronic hypotony.

SS4.8

ENSURING SUCCESS IN PEDIATRIC GLAUCOMA SURGERY

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The incidence of pediatric glaucomas is considerable, especially in developing countries, where they form the bulk of secondary glaucomas. Additionally, social mores such as consanguineous marriages also leads to a high incidence of congenital glaucoma.

Therapy for congenital and infantile primary glaucomas is almost exclusively surgical, and if trabecular or iridotrabecular dysgenesis is thought to be the cause, trabeculectomy alone may not suffice, but needs to be supplemented with an ab externo trabeculotomy with MMC as well. This combination has been evaluated for over 20 years with good success in such eyes.

The presence of any additional risk factors such as aphakia, Sturge Weber syndrome etc, would require an increased dose of MMC.

Juvenile glaucomas do extremely well after a trabeculectomy with antifibrotic agents for a few years.

Due to the increased fibroblastic response in children, and ongoing changes in the trabecular meshwork, a long term follow up for the additional use of medication or a repeat surgery is imperative.

SS4.9

OBTAINING A BETTER BLEB

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Success of trabeculectomy depends on a good filtering bleb. Obtaining a good bleb is not always reproducible since wound healing and scar formation is unpredictable and variable at different stage of wound healing. Loose suturing of the scleral flap and employing anti-scarring agents can produce a large and diffused bleb but predisposes to flat anterior chamber and other complications. Wound healing modulation in trabeculectomy has been oversimplified and thus leading to a less than favorable result.

Mitomycin-C (MMC) has been widely used to inhibit fibroblast proliferation and obtaining good bleb formation but increase the risk for late complications, including wound leakage, bleb infection and discomfort. Anti-VEGF (vascular endothelial growth factor) is currently being tested on its benefits in reducing bleb fibrosis and vascularization, which might be useful in enhancing a better bleb formation.

Modification of surgical technique has been constantly evolved with the changing in anti-fibrotic agents use. These include conjunctival flap design, scleral flap shape, MMC application technique, as well and suturing of both scleral and conjunctival flap. Postoperative mechanical manipulation using laser suture lysis, adjustable suture and ocular massage becomes a very important component to ensure bleb success.

Favorable bleb appearance and function is always desirable. Discussion shall be made on the ever changing aspects of surgical technique, wound healing modulation and postoperative procedure.

Symposium 5: Imaging and Diagnosis

SS5.1

DIAGNOSTIC ABILITY OF OPTICAL COHERENCE TOMOGRAPHY TO DETECT EARLY STAGE GLAUCOMA

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Optical coherence tomography (OCT) is a high-resolution, cross-sectional imaging technique that allows in vivo measurement of tissue thickness. Recently, a normative database has been added to the latest version of OCT (Stratus OCT), allowing comparisons of measurements of RNFL thickness with measurements from 328 healthy eyes. Stratus OCT with normative database showed high sensitivity and specificity for diagnosing glaucoma with manifest visual field defect. However, it is probably of most interest to know how accurately OCT may diagnose early stage glaucoma including "preperimetric" glaucoma. In our studies involving Korean glaucoma patients, the current Stratus OCT RNFL thickness parameters showed poor sensitivity to detect localized RNFL defect less than 20 degree in width or the defect in preperimetric glaucoma. While this finding may reflect a substantial overlap between the RNFL thickness in healthy and glaucomatous eyes, another study performed on Korean population suggests that ethnic difference in the RNFL thickness between Korean and subjects used to generate the normative database may also influence the ability of OCT to detect RNFL damage in early stage glaucoma. Nonetheless, OCT appeared to have the potential to recognize RNFL damage in our preperimetric subjects. This suggests that it might be feasible to increase the sensitivity of OCT to detect early stage glaucoma with the development of new analytical methods.

SS5.2

SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY FOR EVALUATION OF GLAUCOMA

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Spectral-domain optical coherence tomography (SD-OCT) has been newly introduced to various fields of ophthalmology. SD-OCT has two apparent advantages compared with previous time-domain OCT: 1) the data acquisition in SD-OCT is approximately 50 times faster than that in TD-OCT, 2) the spatial resolution in the z-axis by SD-OCT is 6 μm, which is finer than that by TD-OCT (10 μm). Based on the fastness and higher resolution, SD-OCT can three-dimensionally reconstruct the retinal structures including the retinal nerve fiber layer (RNFL) and optic disc with high quality images.

Regarding the evaluation of glaucoma, first, qualitative evaluation of three-dimensional mapping of RNFL thickness deter-mined by SD-OCT is useful. RNFL defects can be easily found, if it exists, in a color-coded three dimensional map. Because SD-OCT is correctly applicable even to high myopic eyes except extreme high myopia, diagnosis of glaucoma in high myopic eyes can be improved with using SD-OCT. Quantitative evaluation of RNFL thickness with SD-OCT is also important for the development of automatic classifier of glaucoma or for evaluation of glaucoma progression. Recently, normative database of SD-OCT in more than 250 normal Japanese subjects has been developed. In this presentation, I will present clinical application of this new technology, SD-OCT, with focusing on the qualitative and quantitative evaluation of glaucomatous changes in the RNFL and optic disc.

SS5.3

GDX IN THE DIAGNOSIS OF GLAUCOMA

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Nerve fiber analyzer (NFA/GDx, Laser diagnostic Technology, San Diego, CA) measures the change in polarization (retardation) that occurs when light illuminates birefringent retinal nerve fiber. Then polarization state of reflected light is measured by polarimeter and displayed as 256 by 128 pixel retardation map.

This technologies have been applied clinically to quantify optic disc and RNFL structure in numerous reported studies and cases. The most widespread use has been in patients with glaucoma, glaucoma suspect, or ocular hypertension. The GDx is designed to quickly and accurately estimate RNFL thickness and to monitor changes over time.

Good quality RNFL measures should be utilized in conjunction with careful clinical examination and visual function testing for glaucoma management decisions. It is essential that the clinician understand the specific strengths and weakness of each instrument so that the best quality RNFL information will be used. On the basis of good reproducibility, these techniques show promise for detecting small changes in the RNFL. Automated methods for detecting significant, repeatable thinning of the RNFL, on the basis

of changes outside of measurement variability are needed so that the clinician can more easily identify and utilize this information for glaucoma patient management decisions.

SS5.4

OPTIMIZING THE USE OF HRT3 IN GLAUCOMA MANAGEMENT

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This talk will serve to update clinicians on ways to optimize their use of HRT3 in the diagnosis of and particularly in the progression analysis of glaucoma. Topographical change analysis will be discussed, including the use of toggle and progression video files.

SS5.5

DETECTING AND QUANTIFYING GLAUCOMA PROGRESSION WITH PERIMETRY

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The goal of glaucoma treatment is to prevent loss of visual function and quality of life. Once diagnosed glaucoma should be prevented from progression. Disease progression rates vary very much among patients, is very common also at entirely normal pressure levels and cannot be predicted even taking risk factors into account. Progression must therefore be monitored. Standard automated perimetry is the preferred method of choice. Event analyses are preferred for earliest detection of deterioration, and can detect progression with certainty even when only little worsening has occurred. Even more important is assessment of the rate – velocity – of progression. This can be done using regression analysis of MD values over time or with the recently developed VFI index . Frequency of field testing and interpretation criteria are of critical importance both for detection of and quantification of progression. Recent recommendations published in Europe recommend frequent perimetry the first two years after diagnosis in order to be able to detect patients with rapid disease progression as early as possible.

SS5.6

CHANGING THE PARADIGM FOR DIAGNOSING GLAUCOMA "GETTING FROM HERE TO THERE"

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Detecting Structural Damage in Glaucoma

OVERVIEW

Clinical assessment of the optic nerve is a cornerstone of managing patients with glaucoma, as well as those at risk for glaucoma. Glaucomatous optic disc damage can predict visual functional loss. As retinal nerve fiber layer (RNFL) changes often precede optic disc changes, it is clear that careful clinical examination of the optic nerve structure is essential for accurate diagnosis

CLINICAL PEARLS

- For detecting and monitoring glaucomatous optic nerve damage, note vertical cup-to-disc ratio, in particular, as well as other important descriptive features including the width of the neuroretinal rim, parapapillary atrophy, optic disc hemorrhage, and RNFL defects.
- Stereo optic disc photography at the initial visit for glaucoma patients and suspects provides an invaluable baseline reference for identifying glaucomatous optic neuropathy and changes in the disc contour (cupping) over time.
- Due to the overlap between normal and abnormal variability, imaging technologies can detect moderate and advanced glaucoma, but lack the sensitivity and specificity to be used as glaucoma screening tools.

CLINICAL ASSESSMENT OF THE OPTIC DISC

The ISNT rule is a useful mnemonic device for assessing glaucomatous neuroretinal rim damage and is independent of optic disc size. The thickest portion of the neuroretinal rim is located in the Inferior quadrant, followed in descending order by the Superior, Nasal, and Temporal quadrants. Deviations from this rule regarding the width of the neuroretinal rim should alert the clinician to the possibility of early glaucomatous optic nerve damage, but they are not pathognomonic.

In addition to the cup-to-disc ratio, the size of the optic disc should be measured. Smaller diameter optic discs may not develop obvious glaucomatous cupping until late in the course of disease progression, and even a small cup in a small disc suggests glaucoma may be present. Conversely, large optic discs often have

large optic cups, thus nullifying the simple cup-to-disc ratio as a screening measure for glaucomatous nerve damage. In order to assess optic disc size, carefully identify the peripheral border of the optic disc. A prominent scleral ring can mask the peripheral edge of the optic disc.

Noting whether the neuroretinal rim is pink or pale can help differentiate glaucomatous optic nerve atrophy from other causes of damage. Pallor exceeding cupping is often associated with non-glaucomatous optic atrophy and is not characteristic of glaucoma.

A commonly overlooked feature when examining the optic disc is the presence or absence of an optic disc hemorrhage. Optic disc hemorrhage typically borders the area of a RNFL defect. Well-designed studies have established the strong relationship between an optic nerve hemorrhage and future progression.

MEASUREMENT OF OPTIC DISC SIZE

- The 5-degree aperture of a direct ophthalmoscope is ~1.5mm, the same size of a physiologic optic disc area. This approach is independent of refractive error and axial length.
- Confocal scanning laser ophthalmoscopy can provide a quantitative assessment of the optic disc area.
- Handheld stereoscopic lens and slit lamp reticule: Use either a 60, 78, or 90 diopter lens to determine the diameters of the disc. Both the 78 (1.1x) and 90 (1.3x) diopter lens require correction factors since they are dependent upon refractive error and axial length.

CLINICAL ASSESSMENT OF THE RETINAL NERVE FIBER LAYER

Retinal nerve fiber layer (RNFL) loss may be the earliest sign of glaucomatous damage in many patients. Examination of the RNFL can be performed using the red-free filter and a 78 diopter lens at the slit lamp (a 90 diopter lens for small pupils) to look for absence of features that are normally present, such as striations.

Scanning laser polarimetry utilizes polarization to capture data related to optical properties of the NFL. Since the cornea and lens are also polarizing structures, in the older polarimeters an average compensation for the cornea was applied. The newest iteration of the device individually assesses and compensates for all non-retina-related polarization, thereby enhancing the specificity and sensitivity of the technology. Spectral OCT offers considerable promise for RNFL examination.

Optic disc and RNFL assessment are complementary to the standard visual field examination. The ideal monitoring device would have high sensitivity and specificity, resistance to normal variation over time, require few confirmatory tests, remain accurate at all stages of progression, and be easy to interpret. Standard achromatic perimetry (SAP) currently offers clinicians many advantages, including various strategies of threshold testing, a normative database, and statistical analyses. However, SAP has limitations including poor sensitivity for early diagnosis. Selective functional testing (e.g., frequency doubling technology or short wavelength automated perimetry) and structural testing (e.g., scanning laser polarimetry with variable corneal compensation, optical coherence tomography [OCT], or Heidelberg retinal tomography [HRT]) complement SAP for glaucoma diagnosis and monitoring.

Detecting Functional Damage in Glaucoma

OVERVIEW

Two primary goals of visual field testing are the detection of glaucomatous damage and progression. The detection of functional damage requires the ability to distinguish normal from abnormal visual fields, and is therefore dependent upon a robust normative database. Detecting progression of glaucoma damage over time is a complex task, and there is no established consensus at this juncture regarding the most ideal strategy.

CLINICAL PEARLS

- When establishing progressive changes using standard achromatic perimetry (SAP), one must recognize the importance of differentiating biological change from test-retest variability. The degree of test variability is linked to disease severity (i.e., the most advanced the disease, the greater the variability). In addition, peripherally located test points vary more than centrally located points. Given these challenges, clinicians must use confirmatory tests to prove progression.
- During visual field tests, look for clustered, deep, reproducible defects. Progression must be in excess of fluctuation. Rely on a series of visual field exams, rather than a single test. Correlate field results with the clinical examination of the optic nerve.
- New software programs such as Swedish Interactive Thresholding Algorithm (SITA) and Glaucoma Progression Analysis (GPA) can improve achromatic (white-on-white) perimetry and allow better detection of progression.

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Symposium 6: Controversies/Future Trends

SS6.1

POSSIBILITY OF SIMULTANEOUS STEM CELL AND GENE THERAPY IN GLAUCOMA MANAGEMENT

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Purpose: To investigate the effects of stem cell-based delivery of brain derived neurotrophic factor (BDNF) gene to rat retina and to find out the changes of BDNF level in axotomized rat model.

Methods: We transduced rat bone marrow mesenchymal stem cells (rMSCs) with human BDNF cDNA by retroviral vector and detected BDNF expression in vitro. Intravitreal and subretinal injection of rMSCs were performed and its incorporation and BDNF expression in the rat retina was measured after two weeks. Also changes of BDNF level after axotomy were detected in the rat model.

Results: After transduction with retroviral vector with BDNF cDNA, rMSCs showed significantly higher levels of BDNF mRNA and protein compared to pure rMSCs. After subretinal injection, rMSCs were incorporated into the ganglion cell, inner plexiform and inner nuclear layer and an increase in BDNF mRNA level was detected by RT-PCR. However, after intravitreal injection, rMSCs were clustered in the vitreous cavity and were not incorporated into the retina and BDNF mRNA level was not changed. And in two weeks after axotomy, BDNF was maintained at the normal control level by western blot analysis.

Conclusions: Bone marrow MSCs can be transduced with high efficiency and it can express BDNF mRNA and protein. When transplanted by subretinal injection, significant levels of transduced stem cells were migrated into the retina and higher levels of BDNF expression was detected. And even after 2 weeks of axotomy, BDNF was maintained near normal control level. These observations may indicate that BDNF protein expression can be achieved in the retina using MSCs as a gene transfer vehicle.

SS6.2

24-HOUR IOP CONTROL IN NORMAL TENSION GLAUCOMA

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In a Japanese epidemiological study (Tajimi Study), normal tension glaucoma (NTG) accounts for more than 70% of glaucomatous patients. Therefore, how to treat NTG is a very significant issue in Japan. In cases whose visual field disorders has progressed, there are some cases in which intraocular pressure (IOP) during clinic hours is low level, but IOP becomes remarkably elevated during the nighttime hours. Also, it has been reported that the risk of progression of visual field disorders increases in cases with a large fluctuation in circadian IOP change. For this reason, not only diurnal IOP control but also 24-hour IOP control including the nighttime is significant in NTG treatment. Currently, β-blockers and PG analogues are frequently used as the first-line drugs for NTG treatment. At the Tokyo Metropolitan Police Hospital, the 24-hour IOP-lowering effects of Timolol, Carteolol, Latanoprost, and Travoprost were investigated, and herein report the effect of each drug on the 24-hour IOP variation and adverse events.

SS6.3

EXFOLIATION SYNDROME — NEW APPROACHES TO A POTENTIALLY CURABLE DISEASE

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Exfoliation syndrome (XFS) is an age-related, generalized disorder of the extracellular matrix (ECM) characterized by the production and progressive accumulation of a fibrillar extracellular material in many ocular tissues and is the most common identifiable cause of open-angle glaucoma worldwide. XFS plays an etiologic role in open angle glaucoma, angle-closure glaucoma, cataract, and retinal vein occlusion. It is accompanied by an increase in serious complications at the time of cataract extraction, such as zonular dialysis, capsular rupture, and vitreous loss.

An increasing spectrum of associations with cardiovascular and cerebrovascular diseases makes XFS a condition of general medical importance. Exfoliation material is present in the walls of posterior ciliary arteries, vortex veins and central retinal vessels, and in autopsy specimens of heart, lung, liver, kidney, gall bladder, and cerebral meninges. Systemic associations include TIAs, stroke, hypertension, angina, myocardial infarction, Alzheimer's disease, and hearing loss and hyperhomocysteinemia. Molecular biologic data support the concept of XFS as a stress-induced elastosis, an elastic microfibrillopathy, with TGF-β1, increased oxidative stress, ocular ischemia, a proteolytic dysbalance, an impaired proteasome system, and low grade inflammatory processes being key factors in pathogenesis.

Reduced aqueous humor ascorbate levels, elevated 8-iso-prostaglandin F2a, and increased malondialdehyde concentrations suggest a faulty antioxidant defense system and free radical damage. Ocular, retrobulbar, cerebral, and carotid blood flow are reduced, as are serum B6, B12 and folate. Hyperhomocysteinemia is associated with disruption of the elastic fiber component of the ECM, with resulting vascular complications. TGF-β1 interacts with lysyl oxidase to influence elastic tissue formation, and elevated aqueous TGF-β1 is thought responsible for ECM overproduction and causative in XFM production.

A recent milestone study showed that two common single nucleotide polymorphisms in the coding region of the lysyl oxidase-like 1 (LOXL1) gene on chromosome 15 are specifically associated with XFS and exfoliative glaucoma. LOXL1 is a member of the lysyl oxidase family of enzymes, which are essential for the formation, stabilization, maintenance, and remodelling of elastic fibers and prevent age-related loss of elasticity of tissues. LOXL1 protein is a major component of exfoliation deposits and appears to play a role in its accumulation and in concomitant elastotic processes in intra- and extraocular tissues of XFS patients. This discovery should open the way to new approaches and directions of therapy for this important and potentially curable disease.

SS6.4

WHAT CAUSES GLAUCOMA'S OPTIC NERVE DAMAGE: HOW OAG, ACG, AND AION ARE SIMILAR OR DIFFERENT

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It is sometimes said that OAG and ACG affect the optic disc differently, in terms of excavation or color change, while it is also said that AION can look similar to OAG. We studied 110 cases of OAG, 36 with ACG and 37 with AION by HRT image analysis for their topography, standardizing the comparisons by equating the degree of optic nerve damage judged by either fast RNFL total thickness on Stratus OCT, or mean deviation in visual field testing for each eye. When compared in this way, OAG and ACG were not significantly different in how they affected the degree of excavation, judged by any HRT parameter. In contrast, OAG was significantly different from either arteritic or non-arteritic AION discs, with greater rim loss and cup depth in OAG for the same degree of estimated ganglion cell loss. Changes at the optic disc from these disorders are a combination of prelaminar loss of axons and laminar deformation. All 3 disorders have prelaminar loss, but only the glaucomas have laminar deformation, explaining why they are different from AION.

SS6.5

GENE THERAPY FOR GLAUCOMA

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Current glaucoma therapy relies on topical eye drops and/or surgical interventions to lower intraocular pressure (IOP). Topical drops are easy to use but can have systemic and local side effects and patient adherence in a life long, asymptomatic disease is problematic. Surgical treatment options carry risk and many patients will eventually return to topical drop therapies. Gene therapy could potentially accomplish the same IOP lowering results, with a longer duration of effect, by the overexpression of proteins or enzymes to up or down regulate a biochemical or physiological process. A beneficial aspect of ocular gene therapy is that transgene expression can be monitored non-invasively, over time in vivo if the vector construct contains a fluorescent marker protein.

Sustained transgene expression is possible with both viral and non-viral methods of gene transfer. Viral vectors encoding ciliary neurotrophic factor (CNTF) and brain-derived neurotrophic factor (BDNF) have demonstrated a neuroprotective effect on retinal ganglion cells in optic nerve injury animal models. Neurotrophic factors may also help preserve the morphologic integrity of cells that survive the initial injury. Cellular contraction/relaxation, and resultant tissue contraction/relaxation in the actin cytoskeleton of the trabecular meshwork (TM) plays a role in the regulation of aqueous humor outflow making this system/pathway an attractive target. Viral vectors expressing genes that alter the actin cytoskeleton increase outflow facility in monkey and human organ culture models. RNA interference (RNAi) has potential as an approach for therapeutic gene silencing. A challenge to RNAi therapy is maintaining therapeutic levels in the eye. Vector-mediated expression of short hairpin RNAs may provide longer-term therapeutic effects.

The potential applications for gene transfer make it a promising approach for long-term glaucoma therapy.

Symposium 7: Neuroprotection in Glaucoma

SS7.1

A RATIONALE FOR NEUROPROTECTION IN GLAUCOMA

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Although dramatic strides have been made in treating diseases of the visual media, diseases characterized by the irreversible loss of neurons have been more resistant to treatment. These neuronal diseases are the most common causes of blindness in the developed world, and include macular degeneration, glaucoma, stroke of the visual pathways, and optic nerve disease from tumours and multiple sclerosis. Except for intraocular pressure lowering in glaucoma and anti-angiogenesis for neovascularization in macular degeneration, the treatment options for neuronal diseases of the visual system are severely limited. This therapeutic dearth results in a failure to prevent visual disability in a substantial proportion of patients, particularly as they age.

One of the fundamental reasons for the failure to transfer laboratory findings to clinical care is the "Lost in Translation" problem. Although cell culture and animal models can be used to show that therapeutic agents are effective in the laboratory, efficacy is difficult to prove when attempting to extrapolate results to randomized clinical trials. This problem has been particularly true for neuroprotection, a treatment strategy in which drugs are used to block neuronal cell death and thereby preserve function.

This lecture will focus on the rationale for neuroprotection, and how laboratory studies are best able to be translated to clinical practice.

SS7.2

THERAPEUTIC VACCINATION FOR GLAUCOMA: BOOSTING THE BODY'S NEUROPROTECTION POTENTIAL

Michal Schwartz, MD, PhD, Anat London, MD, PhD
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Glaucoma, a slow progressive neurodegenerative disorder associated with death of retinal ganglion cells and degeneration of their connected optic nerve fibers has often been linked to high intraocular pressure. Regardless of the primary risk factor, degeneration may continue resulting in further loss of neurons and subsequent glaucomatous damage. During the past decade, scientists and clinicians began to accept that, rather than or in addition to fighting off the risk factor(s), there is a need to protect the tissue from the ongoing spread of damage - an approach collectively termed 'neuroprotection'. We found that the immune system, the body's own defense mechanism, plays a key role in the ability of the optic nerve and the retina to withstand glaucomatous conditions. This defense involves recruitment of both innate (resident and blood-borne macrophages) and adaptive (self-antigens specific T cells) cells that together create a protective niche and thereby halt disease progression.

The spontaneous immune response might not be sufficient, and therefore we offer to boost it by immunization (with the appropriate antigen, in specific timing and dosing) which may be a suitable therapeutic vaccination to treat glaucoma. This view of immune system involvement in glaucoma will raise new challenges in glaucoma research, changing the way in which clinicians perceive the disease, and the approach to therapy.

SS7.3

NEUROPROTECTION — A PHARMACOLOGICAL APPROACH

Jonathan Crowston, MD, PhD
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Visual field defects in glaucoma point to the optic nerve head as the primary site for nerve damage in this optic neuropathy. This presentation will provide a brief overview of likely mechanisms that contribute to optic nerve degeneration in glaucoma. Each of these mechanisms raise potential therapeutic targets that have potential for protecting the optic nerve in glaucoma.

SS7.4

THE POTENTIAL ROLE OF GLUTAMATE TRANSPORTERS IN THE PATHOGENESIS OF NORMAL TENSION GLAUCOMA

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Glutamate-induced excitotoxicity may be one of the pathogenesis of glaucomatous optic neuropathy. Although there was no evidence of the increase of glutamate in the human retina or optic nerve of glaucoma patients, involvement of glutamate in the experimental glaucoma model eyes has been reported. Glutamate concentration in the retina may increase following to tissue damage or cell death. We showed that mice deficient in the glutamate transporters GLAST or EAAC1 demonstrate spontaneous RGC and optic nerve degeneration without elevation of IOP. In GLAST-deficient mice, the glutathione level in Müller glia was decreased and administration of glutamate receptor blocker prevented RGC loss. In EAAC1-deficient mice, RGCs were more vulnerable to oxidative stress. These findings suggest that glutamate transporters are necessary both to prevent excitotoxic retinal damage and to synthesize glutathione, a major cellular antioxidant and tripeptide of glutamate, cysteine, and glycine. Thus, given that genetic abnormalities of glutamate transporters were found in normal tension glaucoma (NTG) patients, glutamate and its transporters are possible to be the strong candidates of the causative factors in NTG. Also, we clarified that purified rat RGCs were more vulnerable to the glutamate-induced excitotoxicity, in case RGCs were cultured under the higher pressure. These studies suggest that glutamate and its transporters have a therapeutic potential to prevent glaucomatous optic neuropathy.

SS7.5

NEUROPROTECTIVE EFFECTS OF ALPHA-2 AGONISTS

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Glaucoma is a neurodegenerative disease characterized by a selective and progressive loss of retinal ganglion cells (RGCs). Although elevated intraocular pressure (IOP) is considered to be the major risk factor associated with glaucomatous visual field deterioration, some patients demonstrate progression of visual field defects even after effectively lowering IOP. Because RGC death was shown to follow an apoptotic pathway, many glaucoma researchers are investigating its neuroprotective mechanisms.

Alpha-2 adrenergic receptor agonists are presumed to have some neuroprotective functions. RGCs have innate alpha-2 adrenergic receptors, and their activation promotes RGC survival in various experimental glaucoma models. Brimonidine is the most commonly studied alpha-2 agonist and several ongoing clinical trials are evaluating its real protective effect in humans. However, it is too difficult to determine exactly how it protects RGCs in a pressure-independent manner.

Agmatine, 2-(4-aminobutyl) guanidine, is an endogenous polyamine and putative neurotransmitter. It has various biological activities and also functions as an alpha-2 agonist. Through in vitro and in vivo experiments, we revealed that agmatine could attenuate apoptotic death of RGCs under oxidative stress conditions. It maintained its effect even after washing out. In other words, agmatine pretreatment was as effective as cotreatment. Even though its precise working mechanisms are unknown, agmatine may be a successful neuroprotective anti-glaucoma drug.

Neuroprotection should be considered as a new anti-glaucoma treatment strategy, especially as some alpha-2 agonists look very promising. The time will come when we can protect and even rescue RGCs from glaucomatous death.

SS7.6

SELECTING APPROPRIATE PATIENTS FOR A NEUROPROTECTION STRATEGY

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Neuroprotection in glaucoma is a strategy to prevent, retard, or reverse retinal ganglion cells once a damaging stimulus (such as raised intraocular pressure) has set up a cascade of metabolic events that otherwise would lead to cell death. As an optic neuropathy that is chronic and axonal, glaucoma, like Alzheimer's and Parkinson's disease dementias, should be amenable to neuroprotective mechanisms.

To succeed, a wide therapeutic index is necessary, probably with a timed sequential cocktail, and innovative drug delivery systems.

Should a drug be shown to be effective in prospective randomized clinical trials in patients, how would it be used clinically? Access to such a strategy would represent the first new treatment paradigm for glaucoma since reduction of intraocular pressure began in 1860.

All patients at risk of visual disability could be expected to receive conventional therapy as well as neuroprotection. Those at lower risk of disability, would only receive the neuroprotectant if conventional therapy failed to arrest the disease process.

As this field progresses, clinicians should remain alert to advances, be skeptical of claims made, maintain common sense, plan to apply neuroprotectants rationally.

5th Congress of the South East Asia Glaucoma Interest Group &
6th Meeting of the Asian Angle-Closure Glaucoma Club

Seoul, Korea, 25-27 September 2008

SEAGIG 2008

AACGC Seoul 2008

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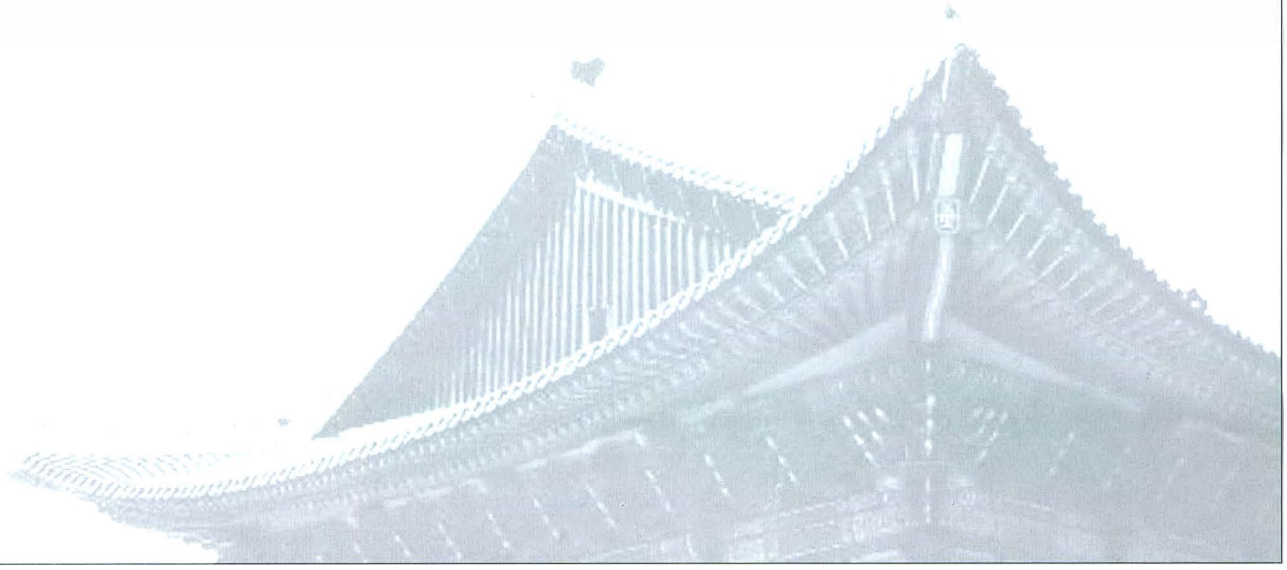

Symposium 1: Pathogenesis and Diagnosis of Primary Angle-Closure

AS1.1

NANOTECHNOLOGY — A NEW WORLD FOR OPHTHALMOLOGY

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Nanotechnology involves the creation and use of materials and devices at the level of molecules and atoms. By definition, it centers upon the development of nanodevices, nanomotors, nanosensors, nanocages, nanowires, nanoscaffolds, and other nanoconstructs of up to 100 nanometers in size, the scale at which intracellular structures and molecules operate. At this scale, materials take on unique behavior and properties. Nanotechnology has the potential to affect every aspect of our lives and will revolutionize society in ways previously unimagined. Its impact will equal that of the harnessing of electricity, the invention of the internal combustion engine, and the advent of the computer.

Much of nanotechnology is concerned with producing new or enhanced materials. One way of doing this is molecular self-assembly, in which the atoms or molecules arrange themselves into a structure due to their natural properties. Nanomedicine refers to highly specific medical intervention at the molecular scale for diagnosing, monitoring, and curing disease or repairing damaged tissues, such as bone, muscle, nerve, or the cells and tissues of the eye.

Tissue bioengineering involves the combination of a biodegradable polymer scaffold with a population of proliferating (stem) cells, with the aim of forming structures equivalent to normal tissues and organs. Examples of tissue bioengineered structures today include cartilage and bone, with blood vessels, heart muscle, and liver currently in development, and eventually, we will be able to engineer virtually all tissues and organs, which should not only be replaceable, but improved upon. This is the beginning of the age of regenerative medicine.

Regenerative medicine promises to become the major focus of medicine in the coming generation. New fields, using techniques unimagined until recent years, such as genomics, proteomics, gene therapy, and stem cell biology, hold forth the potential to eliminate many of the common diseases that afflict us today. Beyond that, modification of stem cells, alteration of behavior and personality, augmentation of brain function, and even aging itself, may be brought under human control. All of these areas and possibilities are tied together by a single conceptual thread, the rapidly proliferating applications of nanotechnology.

Ophthalmology is particularly amenable to tissue bioengineering. Potential applications in the near future deal with biomechanics, new drug delivery systems, "smart bomb" drugs, neural prosthetics, microsensors to measure intraocular pressure and small vessel blood flow, and cell and tissue regeneration, such as using stem cells to replace photoreceptors lost to degenerative diseases.

AS1.2

PATHOGENESIS & DIAGNOSIS OF PRIMARY ANGLE-CLOSURE

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Primary angle closure is due to an anatomical predisposition in smaller eyes having a narrow angle recess, thicker iris, thicker lens, plateau iris etc, precipitated by physiological circumstances such as accommodation in mesopic lighting, stress etc.

There is a spectrum of anatomic variations seen in the subgroups of PACG. Acute PACG eyes express an extreme shift of anatomical features away from normal, especially, shorter corneal diameters leading to a more mobile lens in an already crowded anterior segment. Thus predisposing them to both a severe relative papillary block as well as a form of ciliary block glaucoma. Chronic PACG eyes are less divergent from normal and therefore could suffer a milder form of the same kind of angle closure but over a more prolonged period. Subacute eyes deviate least from controls and for that reason exhibited mild signs and a spontaneous resolution.

Diagnosis of PACG is by a careful gonioscopy in all glaucoma suspects, using low illumination to look for an occludable angle, and evidence of closure i.e. pigment clumps or peripheral anterior synechiae. Further, the grading of PACG is done by taking into account the patients history, extent of PAS, IOP, and presence of a glaucomatous optic neuropathy.

The current proposed ISGEO classification falls far short of clinical requirements and a modification or combination of the old and ISGEO classifications needs to be developed.

AS1.3

OPTIC DISC TOPOGRAPHY IN EYES WITH PRIMARY ANGLE-CLOSURE

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Purpose: There is a lack of enough knowledge on physiological cupping of the optic disc of eyes with primary angle closure (PAC) before developing glaucomatous damage or their fellow eyes. In this study, we compared optic disc topography in eyes with PAC with that of normative eyes.

Method: Twenty-eight eyes from 28 subjects with PAC and eyes from control subjects matched for age, refractive errors and the optic disc area were prospectively enrolled. The PAC eyes had gonioscopic angles of equal to or less than grade 2 of Shaffer's scheme with peripheral anterior synechia, visual acuity better than 20/25, and showed no glaucomatous defects by the program SITA 30-2 of Humphrey visual field. The control eyes were recruited from those with wide-open angles, no glaucomatous defects by Humphrey visual field and no significant eye diseases excepting for mild cataract with visual acuity>20/25. The optic disc area and other optic disc parameters were measured using Heidelberg Retina Tomograph-II (HRT).

Results: The intraocular pressure at HRT imaging was 15.8 ± 3.0 mmHg for PAC eyes and 14.0 ± 2.4 mmHg for control eyes. Of HRT parameters, the rim area (1.5 ± 0.3 mm^2) and the rim volume (0.4 ± 0.1 mm^3) in the PAC eyes were larger than those in the control eyes (1.2 ± 0.3 mm^2 and 0.3 ± 0.1 mm^3) ($p<0.02$, unpaired t-test).

Conclusion: In PAC eyes, dimensions seem to be different from those of control eyes in optic disc topography.

AS1.4

PAS DETECTION BY INDENTATION GONIOSCOPY

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Formation of peripheral anterior synechiae (PAS) in eyes with a narrow angle can be clearly observed via indentation gonioscopy even before laser iridotomy or other surgical procedures. In this presentation we will demonstrate the PAS morphology and distribution in eyes with a narrow angle in current Japanese observed before surgical/laser intervention, and compare them with those examined over 10 years ago. The subjects are a total of 34 cases of primary angle-closure (PAC) or primary angle-closure glaucoma (PACG) examined in a 4-year period between June 2004 and May 2008 and they are compared with historical 156 cases examined in a 10-year period beginning 1985. All the indentation gonioscopy was performed with a Kitazawa modified Koeppe lens by two experienced gonioscopists. The prevalence, extent and distribution of PAS are to be presented. It is clearly shown that PAS formation has decreased in PAC/PACG in recent years in Japan.

AS1.5

PROPORTION OF PUPILLARY BLOCK TO NON-PUPILLARY BLOCK COMPONENT IN ASIAN PRIMARY ANGLE CLOSURE

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Pupillary block is one of the major mechanism of primary angle closure. However we do not know exactly how much pupillary block component contribute to primary angle closure. Even though the pupillary block is considered as the main mechanism of primary angle closure, the nonpupillary block component may not be neglected especially in Asian eyes. The incidence of IOP elevation due to angle closure in the eyes with patent laser peripheral iridotomy(LPI) is higher in Asian eyes compared to in western eyes. A prospective study was done to measure the proportion of pupillary block and none-pupillary block component in primary angle closure. Dark room prone position test (DRPT) was performed before and one month after argon LPI without any glaucoma medication. The non-pupillary block component measured by the amount of IOP rise after DRPT in the eyes with LPI was 32% compared to the amount of pupillary block component (68%). The nonpupillary block component may be explained by plateau iris or lens factor. The morphometric character of pupillary block measured by AS-OCT in acute angle closure is going to be discussed.

AS1.6

SCREENING FOR ANGLE-CLOSURE IN SINGAPORE USING VISANTE, SPAC AND IOLMASTER

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Purpose: To assess the screening effectiveness of three new non-contact devices, the scanning peripheral anterior chamber depth analyzer (SPAC), which measures peripheral anterior chamber depth (ACD); the IOLMaster, which measures central ACD and the Visante anterior segment OCT (AS-OCT), which images the angles, and to compare these instruments with gonioscopy in identifying people with narrow angles (NA).

Design: Cross-sectional, observational, community-based study.

Participants: Phakic subjects aged 50 years and older without ophthalmic complaints recruited from a community polyclinic in Singapore.

Methods: All subjects underwent examination with SPAC. IOLMaster and AS-OCT in the dark by a single operator. Gonioscopy was performed by an ophthalmologist masked to the instruments' findings. The area under the receiver operating characteristic curve (AUC) was generated to assess the performance of these tests in detecting people with NA in either eye.

Main Outcome Measures: Eyes were classified as having NA by gonioscopy if the posterior pigmented trabecular meshwork could be seen for 2 quadrants or less of the angle circumference, with or without peripheral anterior synechie(PAS).

Results: 2,052 subjects were examined and underwent all 3 tests. The prevalence of NA in at least one eye diagnosed by gonioscopy was 20.4% (422 subjects). The AUC for SPAC using numerical grade <5 as a cutoff was 0.83(95% Confidence Interval(CI): 0.82 to 0.85), with a sensitivity of 90.0 %(95%CI:86.8 to 92.7) and a specificity of 76.6%(95%CI: 74.4 to 78.6); AUC for IOLMaster at a cut-off ACD<2.87 mm was 0.83(95%CI:0.81 to 0.85), sensitivity 87.7%(95%CI: 84.2 to 90.7) and specificity 77.7% (95%CI:75.6 to 79.7); and AUC of the AS-OCT was 0.76(95%CI:0.74 to0.78), with a sensitivity of 88.4(95%CI:84.9 to91.3) and specificity of 62.9%(95% CI:60.5 to65.2).

Conclusion: The low specificity found with SPAC, IOLMaster and AS-OCT may limit the usefulness of these devices in screening for NA.

AS1.7

THE EFFECT OF ND-YAG LASER IRIDOTOMY ON THE CORNEAL ENDOTHELIAL DENSITY IN PRIMARY ANGLE CLOSURE PATIENTS

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Purpose: To investigate the effect of Nd-YAG laser iridotomy (LI) on the corneal endothelial density in primary angle closure (PAC) patients.

Patients and Methods: PAC patients with one eye suffered from an acute attack had their central corneal endothelial cell density measured by specular microscopy. The measurements were performed one and 24 months after LI.

Results: From July. 2005 to June. 2006, a total of 102 PAC eyes of 51 patients were enrolled. One month after LI, the mean central corneal endothelial cell density was 2371.7±422.3 (1556 to 3061) cells/mm2 in those eyes with an acute attack, and 2470.0±439.9 (1689 to 3123) in the fellow eyes. Two years after LI, the mean central corneal endothelial cell density was 2164.7±429.9 (1401 to 2971) cells/mm2 in the eyes with an acute attack, and 2410.0±409.1 (1590 to 3161) cells/mm2 in the fellow eyes ($P<0.05$, Student *t* test). An acute angle closure crisis accounted for about a 8.7% loss in corneal endothelial cell density after 2 years follow up, The procedure of LI itself had no significant effect in the reduction of corneal endothelial cell density in the fellow eye. Besides, age, gender, intraocular pressure, biometry, initial vertical cup to disc ratio, and mean defect in the Humphrey visual field were all not significant risk factors in predicting the loss of corneal endothelial cell density after LI .

Conclusion: The acute attack in PAC patients may decrease central corneal endothelial cell density.

AS1.8

DIAGNOSIS AND IMAGING LENS COMPONENT

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Background: Defining lens mechanism is important in the diagnosis and treatment of angle closure but such definition is lacking at present. Gonioscopy and anterior segment OCT findings are correlated and may allow quantitative guide on precise definition

of lens component. A new set of parameters obtained by anterior segment OCT is used to define lens component in angle closure eyes. Quantitative definition may aid in refining angle closure mechanism and making decision whether lens removal is indicated. This may provide a better guide and facilitate ophthalmologist to a more precise diagnostic and treatment approach in angle closure glaucoma.

Purpose: To define lens component in angle closure using gonioscopy and anterior segment OCT.

Methods: Prospective case series of 50 eyes with angle closure (all had iridotomy) and 11 normal eyes. Anterior chamber depth (ACD), anterior lens height (ALH), and other biometric parameters were measured. Eyes were classified into 4 groups based on visibility of ciliary processes through gonioscopy.

Results: Only ACD and ALH were statistically significant different between the 4 groups. Using a cut-off of ACD < 2.00 mm and ALH > 1.00 mm, the sensitivity was 84.8%.

Conclusion: Assuming that the visibility of ciliary processes indicates the lens mechanism after excluding the pupillary block component, a new quantitative definition of lens component is obtained.

AS1.9

WILL CLINICAL GONIOSCOPY BE OBSOLETE?

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Gonioscopy has been an ultimate and indispensable tool for glaucoma diagnosis. Its important could not be emphasized more in cases with angle closure glaucoma. Performing gonioscopy is critical in determining the type of glaucoma and its subsequent management. Nevertheless, its subjectivity and high learning curve has led to the advent of several newer instruments to visualize and image the anterior chamber angle, including ultrasound biomicroscopy (UBM), Scheimflug photography and anterior segment optical coherence tomography (AS-OCT). Ease of operation, objectivity and reproducibilty are the claimed advantages of some of these instruments. However, each of these instruments has its own drawbacks e.g. the identification of scleral spur in AS-OCT.

There was an evidence that gonioscopy was done less often than it should be by ophthalmologists in the U.S. (1) With the newer instruments for visualizing anterior chamber angle, there will be a trend toward less gonioscopic examination. Some glaucoma experts had predicted that clinical gonioscopy wth gonioscopic lenses may be replaces by these instruments in the future.

The arguments why clinical gonioscopy will still be the gold standard in glaucoma diagnosis and that other newer imaging instruments should be viewed as only supporting tools will be presented. Furthermore, to make gonioscopy more useful, gonioscopic documentation with goniogram rather than grading systems will be discussed.

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AS1.10

IRIS VOLUME CHANGES AS A RISK FACTOR FOR ANGLE-CLOSURE GLAUCOMA

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Using Visante anterior segment OCT, we have measured the iris cross-sectional area in 65 adult eyes comparing those with OAG and ACG when the iris is imaged in bright light (small pupil) and in the dark (larger pupil). We find a dramatic loss of iris volume when the pupil dilates, estimated as a 12% loss per each millimeter pupil diameter increase. The most likely explanation is that extracellular water leaves the iris as it dilates. This loss of iris area is significantly less in those with ACG than non-ACG, suggesting that one reason that persons with ACG develop closure is a failure of their iris to shrink as much with dilation. This phenomenon could be used as predictive test for ACG if confirmed by further, longitudinal study.

AS1.11

PREVALENCE OF INTERMITTENT ANGLE-CLOSURE PRECEDING ACUTE ANGLE-CLOSURE ATTACK IN KOREA

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Knowledge of the prevalence of preceding IAC prior to AAC may be meaningful in developing health care strategies to decrease the incidence of AAC. To estimate the prevalence of preceding IAC in patients with AAC in Korea, we prospectively performed standard face-to-face interviews to collect the history of preceding symptoms that may be potentially associated with IAC. The association of those symptoms with IAC was confirmed by the disappearance of the symptoms after laser peripheral iridotomy. A total of 26 of the 88 AAC patients (29.5%) reported symptoms presumably associated with IAC, including ocular pain, blurred vision and halo. All of the 26 patients reported complete or partial resolution of their symptoms following treatment. Our data suggest that substantial portion of AAC patients suffer from preceding IAC. AAC may be prevented in these subgroup patients if they present to ophthalmologists in the stage of IAC. Thus, we conclude that efforts to increase awareness of IAC among the general population may help to decrease the incidence of AAC in Korea.

Symposium 2: Pfizer Angle-Closure Symposium

AS2.1

EPIDEMIOLOGY OF PRIMARY ANGLE-CLOSURE GLAUCOMA IN KOREA

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The Namil Study Group, Korean Glaucoma Society performed a population-based study in 2007-2008. Of 1,909 persons over 40 years of age residing in Namil district, Chungnam province, Korea, 1,539 persons underwent full screening tests for the detection of glaucoma including an interview, Goldmann applanation tonometry, slit-lamp biomicroscopy, refraction, a van Herick test, fundus photography, corneal thickness measurement with ultrasound pachymetry, a visual field test using frequency-doubling technology, gonioscopy and ocular biometry (anterior chamber depth, corneal diameter and axial length) using IOL master. If the findings were suspicious or equivocal, visual field tests with Humphrey visual field analyzer as well as optical coherence tomography and scanning laser polarimetry, were additionally performed for confirmation of the diagnosis.

A diagnosis of primary angle-closure suspect (PACS: posterior trabecular meshwork not visible by gonioscopy in >3 quarters of the angle circumference), primary angle closure (PAC: PACS plus elevated IOP, peripheral anterior synechiae, iris distortion, and/or glaukomflecken), or primary angle-closure glaucoma (PACG: PAC plus optic nerve/visual field damage) was made based on the gonioscopy, optic disc appearance, and perimetric results.

Estimated prevalence of PACS, PAC, and PACG were 2.1%, 0.5% and 0.5% respectively. Prevalence of all glaucoma was 4.7%. In this presentation, various ocular biometric parameters collected in the Namil Study, and also comparisons with other domestic and international epidemiologic studies will be presented.

AS2.2

MEDICAL TREATMENT OF PRIMARY ANGLE CLOSURE GLAUCOMA

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Most current medications that we employ in the treatment of angle closure glaucoma (ACG) are adopted from our experience in treating open angle glaucoma (OAG). However, it may not correct to assume that the same agent will achieve equal efficacy and safety in ACG as what it does in OAG. Existing literature is inadequate to assess drug efficacy and safety in ACG.

Most of ACG cases seen in the clinic are chronic angle closure glaucoma (CACG). Although there might be clinical experience in case series study or observational study on many anti-glaucoma medication in CACG, it was not until recently that RCTs were conducted to evaluate therapeutic effects of many different new agents. Comparative studies between topical latanoprost and timolol were among the first that appeared in the peer-reviewed literature, ranging from a pilot study, a cross-over study to a full scaled multi-center study. Since then many more studies have been conducted including comparison between bimatoprost and timolol as well as travoprost and latanoprost in CACG. Alpha-agonist has also been studied in comparison to timolol in CACG. In essence, all prostaglandin derivatives are superior to timolol on ocular hypotensive efficacy while alpha2-agonist is comparable. Safety profiles will be presented and discussed.

AS2.3

NEW MECHANISM IN PACG

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Symposium 3: Epidemiology and Treatment of Primary Angle-Closure

AS3.1

EVIDENCE-BASED ROLES FOR PHACOEMULSIFICATION, PHACO-TRABECULECTOMY, AND TRABECULECTOMY IN CHRONIC ANGLE-CLOSURE GLAUCOMA

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Chronic angle closure glaucoma (CACG) is associated with cataract. Previous studies established that lens extraction alone significantly reversed the anterior chamber anatomical relationships that predispose to angle closure glaucoma.

When CACG co-exists with cataract, the main surgical treatment options include lens extraction alone by phacoemulsification and combined phaco-trabeculectomy. Data from recent randomized controlled trials suggested that phacoemulsification alone resulted in significant improvement in intraocular pressure (IOP) control. Combined phaco-trabeculectomy is associated with lower requirement for IOP-lowering drugs than phacoemulsification alone, but combined surgery resulted in more supplementary surgical interventions and post-operative complications. Phacoemulsification alone may therefore be a viable first-line surgical treatment option for CACG with co-existing cataract.

When there is only CACG but no cataract, the main surgical treatment options to consider may include lens extraction by phacoemulsification alone or trabeculectomy alone. An ongoing randomized controlled trial suggested that phacoemulsification alone may effectively deal with the CACG, while also avoiding the need for future cataract surgery. The long-term benefits of this approach have yet to be proven by longer follow up of the study patients.

Results from these and other recent surgical trials are gradually defining an important and increasing role for lens extraction in the surgical management of CACG, whether alone or in combination with other glaucoma procedures.

AS3.2

ACCURACY OF INTRAOCULAR LENS POWER PREDICTION FOR CATARACT SURGERY IN ANGLE-CLOSURE GLAUCOMA

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Purpose: To assess the accuracy of intraocular lens (IOL) power predictions for cataract surgery in eyes with angle-closure glaucoma (ACG) and to compare the predictability across different biometry formulae.

Methods: This retrospective comparative case series comprised 42 eyes from 42 patients with ACG and 45 eyes from 45 normal subjects undergoing uneventful cataract surgery. Anterior chamber depth (ACD), lens thickness, axial length (AXL), and differences between the predicted and actual postoperative spherical equivalent (SE) refractive errors were analyzed.

Results: In ACG patients, ACD and AXL were shorter and lens thickness was thicker than normal controls (all $p<0.001$). The SRK II formula showed a mean difference between predicted and actual postoperative SE refractive error of 0.64±0.50 diopters in AGC patients and 0.39±0.36 diopters in control subjects ($p=0.012$). The number of eyes not in the predicted refractive error range (± 0.5 diopters from predicted refractive error) were 21 (50.0%) eyes in the ACG group, but 13 (28.9%) ones in the normal group. In addition, the SRK II formula showed best predictability when compared with the SRK/T, Holladay 2 and Hoffer Q formulas.

Conclusion: IOL power predictions for cataract surgery in ACG patients can be inaccurate, and it may be associated with their unique anterior segment anatomy.

AS3.3

EVALUATION OF PERIPHERAL ANTERIOR CHAMBER ANGLE: HONG'S METHOD AND OCT

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[3]*Department of Ophthalmolgy, Dr Hong's Eye Clinic, Korea*

Purpose: To find out the correlation between the methods of peripheral anterior chamber evaluation and the Visante OCT.

Methods: 35 patients (70 eyes) were included in the study. Peripheral anterior chamber angle evaluation was done with van Herick, Hong's methold, Spaeth's method and the Visante OCT. The OCT was applicated for the peripheral anterior chamber angle and the evaluation parameters are the AC angle, the gonio angle, and other parameters (AOD500, AOD750, ARA500, ARA750, TISA500, TISA75).

Results: The average age and refractive error were 60 ± 10 years and -0.5 ± 4.0D and the ratio of male to female was 14:21. The Hong's methold was correlated significantly with following parameters: van Herick ($r=-0.78$, $p<0.0001$), Spaeth's method ($r=-0.86$, $p<0.0001$), AC angle ($r=-0.75$, $p<0.0001$, Gonio angle ($r=0.80$, $p<0.0001$), and also others (AOD500, AOD750, ARA500, ARA750, TISA500, TISA75).

Conclusion: Hong's method in the evaluation of peripheral angle was correlated well with van Herick, Spaeth's method and the parameters of OCT.

AS3.4

CLINICAL COURSE OF PRIMARY ANGLE-CLOSURE GLAUCOMA FOR INDONESIAN, MALAY, AND CHINESE EYES

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Purpose: to observe the clinical course of PACG for Indonesian's Malays and Chinese eyes.

Methods: This was a retrospective descriptive study of Indonesian subjects with PACG. The study was conducted at the Glaucoma unit, Department of Ophthalmology, Dr Cipto Mangunkusumo General Hospital (CMH), University of Indonesia, starting from January 2005 until December 2006 for Indonesian's Malays PACG patients (group 1) and Jakarta Eye Center (JEC) for Indonesian's Chinese PACG patients (group 2). All patients underwent full glaucoma eye examination upon admission. There were 40 eyes for Indonesian's Malays PACG patients and 40 eyes for Indonesian's Chinese PACG patients. We observed result of laser peripheral iridectomy, surgery (trabeculectomy and/or facoemulsification + IOL) and glaucoma medical treatment.

Results: The stages of PACG patients who came to CMH more advance compare to PACG patients who come to JEC (86% and 20%). Also the result of surgery in the group 1 , in term of intraocular pressure, was poor (60% compare to 15%). However two groups were still having glaucoma medication despite of glaucoma surgery to prevent progression.

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AS3.5

PREVALENCE OF NARROW CHAMBER ANGLE IN KUMEJIMA ISLAND — SCANNING PERIPHERAL ANTERIOR CHAMBER DEPTH ANALYSER

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To investigate the prevalence of narrow chamber angle and distribution of anterior chamber depth(ACD) in subjects of Kumejima island. The ACD was measured by scanning peripheral anterior chamber depth analyzer(SPAC) for the subjects participated in Kumejima study.Based on the data provided by SPAC, the prevalence of narrow chamber angle and distribution of ACD is disclosed. Total subjects could be analyzed were 3158 and average age was 59.5 years old (1588 men and 1570 women). The results of SPAC measurement was inverse proportion to age, refraction error and proportion to axial length. The SPAC measurement were correlated with central ACD and van Herick method. Numbers of moderate risk (P-rank) was estimated to be 295 (9.3%), 113 (7.1%) in men, and 182 (11.6%) in women. High risk (S-rank) was considered 379 (12%),114 (7.2%) in men and 246 (15.7%) in women,respectively. Age related increase of risk for angle closure was significant for women. The results of SPAC measurement correlate with age, refraction error, axial length, central ACD and van Herick method. Risk of angle closure increased with age predominantly for women.Primary angle closure and angle closure glaucoma and its relation to SPAC measurement will be presented.

AS3.6

MANAGEMENT OF ACUTE ANGLE-CLOSURE CRISIS

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1. Recognition and differentiation from other causes
   a. Diagnostic terminology
   b. Differential diagnosis (lens induced, uveitis, exfoliation, neovascular, drug-induced)
   c. History
   d. Needed examination techniques

2. Immediate management
   a. IOP-lowering eyedrops, oral acetazolamide, oral glycerol, intravenous Mannitol
   b. Steroid eyedrops
   c. Other methods, including interventions
      - Iridoplasty
      - Paracentesis

3. Laser iridotomy of affected and fellow eye
   a. Methods: YAG, argon/diode, both in combination

4. Subsequent management after resolution of the acute episode
   a. Steroid eyedrops, +/- antiglaucoma drugs
   b. Examination schedule
   c. Mydriatic provocative test to rule out plateau iris
   d. Long-term exam schedule for PAC/ PACG

5. Methods when laser iridotomy fails
   a. Surgical iridectomy
   b. Lens extraction
   c. Trabeculectomy
   d. Malignant glaucoma — vitrectomy

AS3.7

INFLUENCE OF LASER IRIDOTOMY IN PATIENTS WITH PLATEAU IRIS CONFIGURATION

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Purpose: To assess incidence and clinical aspects of patients with plateau iris configuration and prophylactic laser peripheral iridotomy for primary angle closure.

Methods: A total of 4725 individuals aged 50 years and above were recruited to the study and randomised to intervention or control groups in 1999. Six years later, 2088 (44.19%) were re-examined in 2005. Data sheet review of 185(8.86%) individuals (aged >55years) with plateau iris configuration had determined in a Mongolian population from a nested cohort study. The diagnoses of the plateau iris was defined in a quadrant by the presence of an anteriorly directed ciliary body, an absent ciliary sulcus, closed angle for at least 180 degrees. A full slit-lamp examination including Goldman intraocular pressure, limbal chamber depth, gonioscopy, optic disk assessment, anterior chamber depth by A-scan ultrasound were measured. Those with occludable angles were offered laser iridotomy.

Results: Among 2088 individuals in the study, data from 2041 (97.74%) right eyes were available for analysis. Overall, 64.3% of eyes had a regular iris profile, 26.5% were steep, 0.14% were concave, and 9.06% were graded plateau. 41 participants (20.2%, 95% CI: 14.6-25.8) were diagnosed with occludable angles without evidence of raised IOP or peripheral anterior synechiae. 185 participants were diagnosed with plateau iris configuration (75 men, 110 women). The mean age was 67.16+/-7.23 for men, 65.00+/-7.59 for women. The mean ACD in participants with plateau iris was significantly smaller than the hypothesized normal ACD 2.37+/-0.24 mm vs 3.00 mm (95%CI: 2.34-2.41, P=0.000). The mean IOP was 13.01+/-4.08 mm Hg (95% CI: 12.4-13.6 mm Hg). Plateau iris was most commonly observed in the superior and inferior quadrants. 39/185 (21.08%) with occludable angles were offered laser iridotomy. 6/39(15.38%) patients had not opened in 3 quadrants after patent laser iridotomy.

Conclusions: This study suggest that laser iridotomy is useful. Therefore, argon laser peripherial iridoplasty is effective in these cases to further open the iridocorneal angle. Longitudinal studies are necessary to determine strategies for preventing PACS.

AS3.8

COMBINED CATARACT AND GLAUCOMA SURGERY IN ANGLE-CLOSURE GLAUCOMA

Manuel B Agulto
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AS3.9

LASER PERIPHERAL IRIDOTOMY VERSUS PHACOEMULSIFICATION FOR TREATMENT OF ACUTE ANGLE-CLOSURE

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The goal of therapy in acute angle closure is to eliminate pupil block, re-open the angle and prevent further damage to the optic nerve by lowering the IOP. Laser peripheral iridotomy relieves relative pupil block. It can be performed quickly without the attendant risks of incisional surgery. There is however, potential corneal endothelium injury risk. Inflammation and pigment release may also worsen trabecular damage and increase formation of peripheral anterior synaechiae. Lens removal with implantation of a posterior chamber IOL has been demonstrated to lower IOP in angle-closure glaucoma. Deepening of the anterior chamber may result in relief of relative pupil block and reduction of angle crowding. The likelihood of creeping angle-closure and chronic rise in IOP may be reduced. The talk compares the long term IOP control of these two modalities in the treatment of acute angle closure in patients with follow-up period of up to 24 months.

AS3.10

LOCATION OF LASER IRIDOTOMY AND PATIENTS' SUBJECTIVE SYMPTOMS

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Laser iridotomy (LI) is the procedure of choice for relief of pupillary-block-induced angle-closure. The location of LI is always recommended as peripheral as possible, at the point where the distance between the iris and lens is greatest. At the same time, the location of LI is also recommended that it can be covered by eyelid, if possible, to avoid monocular diplopia. However, the

upper eyelid is usually in a dynamic condition and with individual difference, it is hard to achieve the aim of covered by eyelid constantly. For evaluating the patients' subjective symptoms in different location of laser iridotomy, a programmed, randomized, consecutive study was carried on from January 2006 to June 2008. 68 eyes of 45 chronic angle-closure glaucoma patients, 75 eyes of 52 primary angle-closure patients were enrolled. Laser iridotomy was performed randomized to peripheral temporal upper iris or to peripheral nasal lower iris according to existing thin area or a crypt. The pre- and post-LI subjective symptoms including monocular diplopia, glare, or other complaints were evaluated by a questionnaire. The results revealed no any complaint in those eyes with complete exposure of LI hole (72 eyes) or complete covered by eyelid (66 eyes). Only 5 eyes with partial covered by eyelid revealed a light shadow at the corresponding site of peripheral temporal upper LI. However, there is no significant difference in subjective symptoms between peripheral temporal upper LI and peripheral nasal lower LI. Our conclusion is that laser iridotomy can be performed at any site of peripheral iris; however it should be avoid creating a LI with partial covered by eyelid.

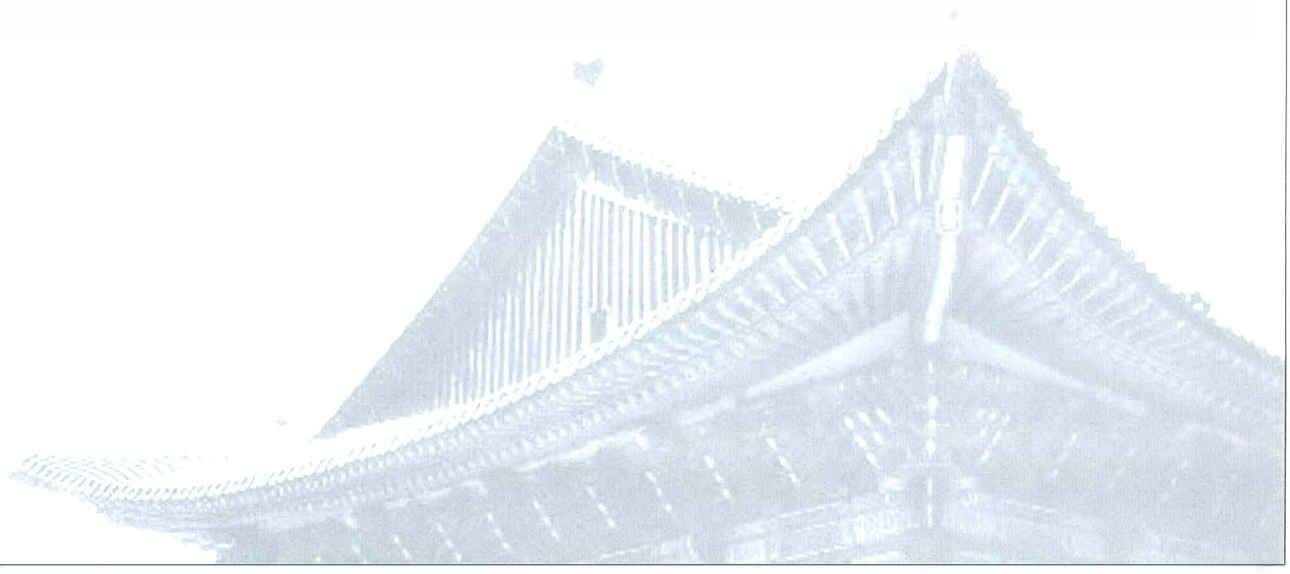
5th Congress of the South East Asia Glaucoma Interest Group &
6th Meeting of the Asian Angle-Closure Glaucoma Club

Seoul, Korea, 25-27 September 2008

SEAGIG 2008

AACGC Seoul 2008

Instruction Courses



Instruction Course 1: Glaucoma Drainage Devices — All You Wanted to Know about Glaucoma Drainage Devices but Were Too Afraid to Ask

IC1

INTRODUCTION

Ivan Goldberg, MBBS, FRANZCO, FRACS
Department of Ophthalmology, Glaucoma Services, University of Sydney, Sydney Eye Hospital, Australia

INDICATIONS

Clement CY Tham, BM, BCh (Oxford), FRCS (Glasgow), FCS (HK), FCOphth (HK)
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Implantation of glaucoma drainage devices (GDDs) is conventionally indicated when:

1. A safe IOP is not achieved with medications and further optic nerve fiber loss is anticipated, and
2. When trabeculectomy is likely to fail, even with anti-fibrotics, and
3. Reasonable visual prognosis.

Trabeculectomy is considered 'likely to fail' if:

1. Previously failed trabeculectomy despite anti-fibrotics
2. Secondary glaucomas, such as uveitic and neovascular glaucomas
3. Scarred anterior conjunctiva

In this lecture, GDD will be compared to alternative surgical procedures such as diode laser transscleral cyclophotocoagulation. Results and implications of the TVT (tube versus trabeculectomy) study will also be discussed.

DEVICE DIFFERENCES

Paul R Healey, PhD, MBBS(Hons), B(Med)Sc, MMed, FRANZCO, Paul Mitchell, MD, PhD, FRANZCO
Department of Ophthalmology, University of Sydney, Centre for Vision Research, Western Sydney Eye Hospital, Australia

METHODS (AHMED AND BAERVELDT)

Seng Kheong Fang
International Specialist Eye Center, Kuala Lumpur, Malaysia

This course will cover all aspects of glaucoma drainage devices (GDDs), including indications, methods for implanting each device, device differences, complications and their management, alternatives and outcomes of implanting such devices. It is designed to have maximum audience participation and interaction and lively panel discussions from all panelists. The details of the course are outlined below.

Objective: At the end of the course the participants will be able to have full knowledge of the various tubes available, which ones are more widely used, the implantation techniques, what are the possible complications and how to manage them, various alternatives to tubes and what are the short-term and long-term outcomes for each device.

TECHNIQUE FOR DOUBLE PLATE MOLTENO GLAUCOMA DRAINAGE DEVICE

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Molteno implant is a non-valved drainage device that provides free communication between the anterior chamber and posterior sub-tenon space. The tube has no resistance and thus leading to hypotony and other consequences.

Several techniques has been developed to prevent such complications such as a) two-stage procedure in which the insertion of the tube follow the plate placement b) the rip-cord tube occlusion c) external ligation with venting slits and d) combining trabeculectomy with external tube ligation. A new and comprehensive technique of 'Sequential Drainage System (SDS)' is developed to provide better IOP control at short to long-term period and avoid complications.

The technique of SDS can be performed with posterior sub-tenon injection of 2% lidocaine with adrenaline. The double-plate Molteno implant is prepared by tying the inter-connecting tube with Vicryl 5-0. The anterior chamber tube is inserted with Vicryl 5-0 as occluding stent and tightly tied externally with black Nylon 8-0 to limit drainage to the first plate in early post-operative period. The 2 reservoir plates were fixed onto the sclera with black-silk 6-0 at 8-10 mm. posterior to the limbus between the recti. The anterior

chamber tube is trimmed before insertion. The external tube is fixed with Vicryl 8-0 and overlaid with glycerine preserved corneal graft.

SDS provides sequential drainage of aqueous and avoid early post-operative flat anterior chamber and hypotony. The flow can be enhanced by making laser suture lysis of the external nylon ligation over the anterior chamber tube through clear corneal graft. The second plate will only function at 6-8 weeks providing sequential drain while avoiding early postoperative complications.

SURGICAL TIPS TO PREVENT EARLY HYPOTONY

Ki Ho Park, MD, PhD
Department of Ophthalmology, Seoul National University Hospital, Korea

COMPLICATIONS

Ching Lin Ho, MD
Singapore National Eye Center, Singapore

ALTERNATIVE GDDS

Manuel B Agulto, MD
Department of Ophthalmology and Visual Sciences, Philippine General Hospital, The Philippines

OUTCOMES

Paul TK Chew, MD
Department of Ophthalmology, National University Hospital Singapore, Singapore

OCULAR CARE POST-OPERATIVELY

Ningli Wang, PhD
Beijing Tongren Hospital, Beijing, China

MANAGEMENT OF ENCAPSULATION AFTER GDD

Da-Wen Lu, MD, PhD
Department of Ophthalmology, Tri-Service General Hospital, Taiwan

Following the surgery of a glaucoma drainage device (GDD), the filtering bleb goes through two-stage modification prior to becoming stable. The initial stage is the hypotensive phase that lasts one to four weeks and is associated with edematous conjunctiva and low IOP. The second stage is the hypertensive phase that begins three to six weeks after the operation and may last up to six months. Excessive fibrous reaction around the bleb appears to be the major cause of the hypertensive phase. The intensity of the fibrous reaction may depend on several factors, such as the biomaterial, size, design of the end-plate of the GDD and the individual patient's immune response to the operation. Several studies have demonstrated the critical importance of the permeability of the bleb lining in determining the long-term control of the intraocular pressure: a thin permeable bleb lining giving good control of the IOP while a thicker less permeable lining (encapsulation) gives poorer results.

Since surgical failure appears to be more common in the first postoperative year than subsequent years, careful management of the bleb fibrosis and encapsulation may play important roles for the long-term success of GDD. So, during the hypertensive phase, antiglaucoma medications with digital message are indicated when the IOP is considered to be too high by the treating physician. In those cases that do not respond to the conventional treatments, bleb revision with needing of the bleb or surgical excision of the encapsulated bleb are other options for GDD with encapsulated bleb. In this presentation, we will emphasize more on the surgical management of encapsulation after GDD.

ALTERNATIVES TO GDDS

Ramanjit Sihota, MD, FRCS, FRCOphth, Viney Gupta, MD, Tanuj Dada, MD
Department of Ophthalmology, Glaucoma Research Facility and Services, Dr Rajendra Prasad Center for Ophthalmic Sciences, All India Institute of Medical Sciences, India

The 'Tube vs trab' study has misled ophthalmologists into the feeling that GDDs are as safe as a trabeculectomy. However the recent review of the long term effects of GDDs in Ophthalmology 2008, reinforces the long held belief of Glaucoma specialists, that GDDs still need more modification and evaluation.

In a study of post PK glaucoma eyes, we found that 23 eyes that underwent a modified trabeculectomy had a good control of IOP and maintained or improved vision at 2 years of follow up. Only 1 eye showed a late graft rejection which resolved on treatment. In the same time period, 11 AGVs were used, 7 in the AC and 3 through the parsplana. Two AGVs extruded and had to be removed, 2 showed extrusion of the tube, which were replaced, 1 had vitreous blocking the tube, and 1 had uncontrolled IOP, which later went into phthisis.

Studying Neovascular glaucoma, we have had a follow up of over 10 years of eyes in which a preparatory ARC or PRP was done, and followed by trabeculectomy with MMC. Patients having a better baseline acuity and duration of < 3 months had good success with a controlled IOP and restoration of vision.

Ophthalmologists should therefore look at a surgery they have more experience with, and not fall prey to the misconception that GDDs are the only options in such refractory glaucomas.

Instruction Course 2: Infantile Glaucoma

IC2

INTRODUCTION

Ching Lin Ho, MD
Singapore National Eye Center, Singapore

PEARLS IN DIAGNOSIS AND EXAMINATION IN PEDIATRIC GLAUCOMA

Paul Lee, MD
Department of Ophthalmology, Duke Eye Center, USA

GONIOTOMY

Ching Lin Ho, MD
Singapore National Eye Center, Singapore

TRABECULOTOMY

David S Walton, MD
Department of Ophthalmology, Harvard Medical School, USA

TRABECULECTOMY

David S Walton, MD
Department of Ophthalmology, Harvard Medical School, USA

AQUEOUS DRAINAGE IMPLANTS

Ching Lin Ho, MD
Singapore National Eye Center, Singapore

CYCLOABLATION

Ching Lin Ho, MD[1] Paul Lee, MD[2]
[1]Singapore National Eye Center, Singapore, and [2]Department of Ophthalmology, Duke Eye Center, USA

Instruction Course 3: Uveitic Glaucoma

IC3

UVEITIC GLAUCOMA

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Glaucoma Service, Singapore National Eye Center, Singapore

Managing uveitic glaucoma can be challenging. Intraocular inflammation and steroids can both lead to elevated IOP. Successful management of uveitic glaucoma depends on recognition of the uveitis syndrome and clarification of the mechanism(s) contributing to the glaucoma. The course aims to provide participants with an overview of uveitic glaucoma as well as the specific uveitic entities associated with glaucoma. Surgical treatment with trabeculectomy and glaucoma drainage implant surgery will also be discussed.

INTRODUCTION TO UVEITIS AND UVEITIC GLAUCOMA

Lennard Thean, MD
Department of Ophthalmology, National University Hospital, Singapore

Uveitis is inflammation of the uveal tract. It can be divided into anterior, intermediate, posterior or pan uveitis. Causes of uveitis can be idiopathic, infective, associated with systemic conditions eg sarcoidosis, ankylosing spondylitis etc. Glaucoma associated with uveitis can be caused directly from the underlying disease or secondary from topical or systemic steroid treatment. History of uveitic glaucoma: 1813 Joseph Beer described arthritic iritis, 1891 Smith Classified secondary glaucomas, 1906 Fuch described specific uveitic glaucoma and 1948 Posner & Schlossman described specific uveitic glaucoma.

OVERVIEW OF UVEITIC GLAUCOMA

Lennard Thean, MD
Department of Ophthalmology, National University Hospital, Singapore

Raised intra-ocular pressure can occur in any intraocular inflammation. Uveitic related OHT is transient raised intra-ocular pressure without optic nerve head damage. In uveitic glaucoma, there is raised intra-ocular pressure with optic nerve head damage. Classification can be by course (acute/chronic), angle structure (open angle/closed angle), pathology (non-granulomatous/granulomatous) or causes (infectious/autoimmune/systemic/idiopathic). Uveitic conditions with secondary glaucoma include anterior uveitis (Fuch's heterochromic iridocyclitis, Posner Schlossman syndrome), intermediate uveitis, posterior uveitis (Ocular toxoplasmosis) and panuveitis (sarcoidosis, Behcets disease). Pathogenesis include inflammatory cells causing mechanical obstruction of outflow pathway or cytotoxic damage of trabecular endothelial cells, proteins causing aqueous sludging hence decreasing outflow as well oxygen free radical production increasing damage. Glaucoma is either open angle, closed angle or mixed.

THE ETIOLOGY OF GLAUCOMATOCYCLITIC CRISIS

Joon Mo Kim, MD
Department of Ophthalmology, Kangbuk Samsung Medical Center, Korea

The etiology of glaucomatocyclitic crisis, Posner-Schlossman syndrome, has remained elusive. Several factors have been postulated as contributors to the development of glaucomatocyclitic crisis, to include the following: Abnormal vascular process, Autonomic defect, Allergic condition, Variation of developmental glaucoma, Cytomegalovirus (CMV), Herpes simplex virus. Description of a final common pathway usually includes a reference to changes in the trabecular meshwork leading to a reduction of outflow facility. However, some authors describe an increase in aqueous production. Elevations in IOP are postulated to be secondary to inflammation of the trabecular meshwork, which may be mediated by prostaglandins. Prostaglandins, especially prostaglandin E, have been found in higher concentration in the aqueous humor of patients during acute attacks. These levels return to normal between episodes. The vascular effects of prostaglandins may contribute to the tortuosity seen in iris vessels and the leakage demonstrated with fluorescein angiography of the iris. The exact mechanism by which prostaglandins regulate IOP has not been described, but a direct correlation between elevated levels of prostaglandins in the aqueous humor and the level of IOP has been found during acute attacks of glaucomatocyclitic crisis. Evidence exists that glaucomatocyclitic crisis may be associated with POAG. Patients with a 10-year or longer history of glaucomatocyclitic crisis are 3 times more likely to develop visual field changes and optic disc changes. These patients may have a higher than normal incidence of corticosteroid responsiveness, leading to an elevated IOP. This must be kept in mind during the treatment of this disorder with corticosteroids. Associations with immunogenetic factors also exist; in one study, the presence of human leukocyte antigen Bw54

(HLA-Bw54) was found in 41% of patients. Associations with certain allergic conditions, helicobactor pylori and gastrointestinal diseases have been described.

TRABECULECTOMY FOR THE INFLAMED EYE

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Department of Ophthalmology, Singapore National Eye Centre, Singapore

Inflammation is the major cause of trabeculectomy failure. There are several reasons for an eye to have an existing inflammatory state. Precautionary therapeutic measures can be taken in the preoperative, and postoperative period to limit the inflammatory response and therefore improve surgical outcomes. The role of current anti-inflammatory and antifibrotic agents in the pre-operative, intraoperative and post-operative periods will be discussed.

TUBE SURGERY FOR THE INFLAMMED EYE

Sek Tien Hoh, MD, MBBS, FRCSEd, FAMS
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5th Congress of the South East Asia Glaucoma Interest Group &
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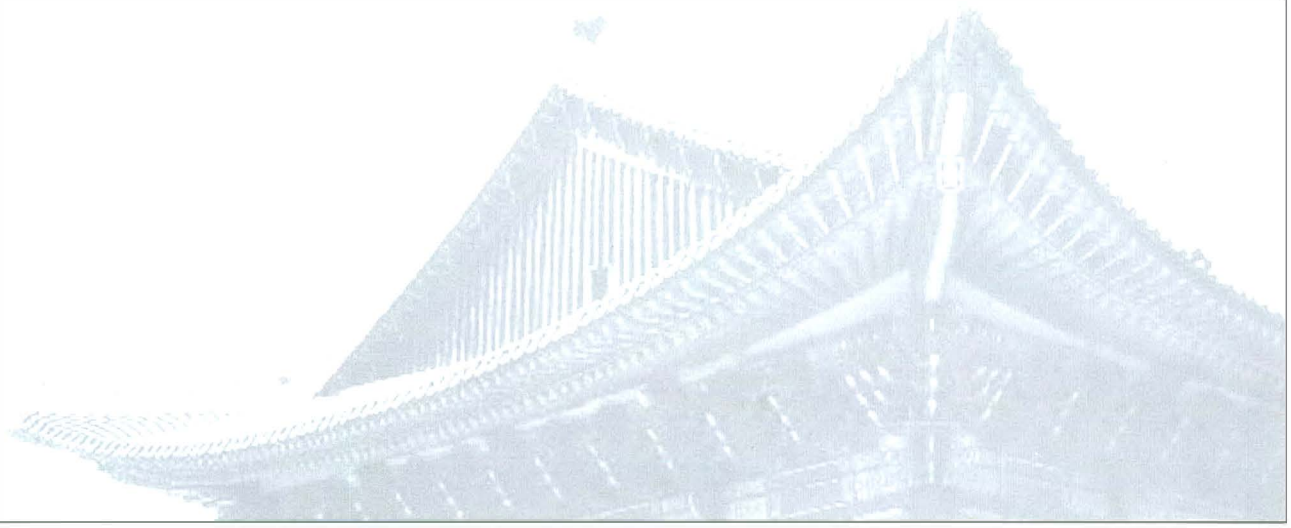

Session 1

SF001

A LONG TERM EVALUATIVE COMPARISON OF DIFFERENT SEVERITIES OF PRIMARY OPEN AND CHRONIC ANGLE-CLOSURE GLAUCOMA

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Glaucoma services, Dr RP Center for Ophthalmic Sciences, India

Purpose: To evaluate and compare changes in scanning laser ophthalmoscopy, HRT II, and perimetry in adult primary open angle and chronic angle closure glaucoma, over at least 5 years.

Methods: 245 eyes of 245 patients, 166 POAG eyes and 129 CPACG eyes, of different severities of glaucoma, earliest to severe were studied. Standard achromatic perimetry and optic nerve head topography by HRT II were studied serially, at baseline and thereafter every 6 months. Changes in the visual field and HRT parameters in response to IOP reduction in both groups and in eyes with differing severity of glaucomatous neuropathy were compared over time.

Results: 14 POAG eyes (11.2 %) and 20 CPACG eyes (15.5 %), showed progression on achromatic perimetry over time. CPACG eyes also progressed faster and to larger extent (1.8 dB/year) on SAP than POAG eyes (1.36 dB/year), p=0.1, with a survival rate of 79 % at 245 months and 47% at 228 months in POAG and CPACG eyes, respectively. Eyes that progressed in both groups in all severities of glaucoma, had intermittent fluctuations of ≥ 4mm Hg on follow up visits.

Conclusions: Intermittent IOP fluctuations of ≥ 4mm Hg over the mean IOP, was associated with progression on SAP and HRT in POAG and CPACG eyes. CPACG eyes appeared to progress faster and to a greater extent, and were more resistant to changes in ONH tomography following standard therapy, requiring a larger percentage drop in IOP to manifest improvement in optic nerve head parameters, as compared to POAG eyes.

SF002

THE POSSIBLE ROLE OF ADRB2 GENE POLYMORPHISM IN PREDICTING THE SUSCEPTIBILITY OF GLAUCOMA IN MALAYSIAN POPULATION

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Purpose: To determine the frequency of ADRB2 gene polymorphisms among primary open angle glaucoma patients in Malaysia.

Methods: A prospective study was conducted involving 92 newly diagnosed glaucoma (60 POAG, 30 NTG and 2 OHT) patients and 92 age, sex and ethnic matched non-glaucoma control subject. A complete ophthalmic examination including visual field assessment and fundus photography was conducted. 3 cc of venous blood was obtained. DNA extraction was performed using Qiagen minikit. Multiplex PCR was carried out to analyze the ADRB2 polymorphisms at allele 16, 27, 164, -20 and -47.

Results: Majority were Malays (73.4%), followed by Chinese (14.7%) and Indian (11.9%). The allele frequency among the glaucoma patients were (61%) Arg16, (39%) Gly16, (85%) Gln27, (14%) Glu27, (100%) Thr164, (55%) -20C, (33%)-20T, (11%) -47C and (88%) -47T. The allele frequency among control group were (61%)Arg16, (35%)Gly16, (84%) Gln27, (16%)Glu27, (100%)Thr164,(16%)-20C, (84%)-20T, (10%)-47C and (90%)-47T. There was a significant overrepresentation of allele -20C (p=0.03) and Gln27 (p=0.05) in glaucoma patients compared to control subject.

Conclusions: Allele -20C and Gln 27 of ADRB2 gene may increase the susceptibility of an individual to develop glaucoma in Malaysian population and perhaps is a useful tool in predicting susceptibility of glaucoma. However, further study is needed to determine the possible role of the ADRB2 gene in the pathogenesis of glaucoma.

SF003

DIFFERENT RISK FACTORS IN SUBGROUPS OF NORMAL-TENSION GLAUCOMA

Sung Chul Park, MD, DH Lee, MD, C Kee, MD, PhD
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Purpose: To identify risk factors in subgroups of normal-tension glaucoma (NTG).

Methods: Medical records of 95 unilateral NTG patients were reviewed. Inter-eye comparisons of baseline spherical equivalent, central corneal thickness (CCT), untreated IOP, disc area, and zone β parameters measured with HRT were performed in each subgroup divided by age and visual field pattern standard deviation (PSD) in glaucoma eye; group I (age≤50 years, PSD≤8 dB), II (≤50 years, >8 dB), III (>50 years, ≤8 dB), and IV (>50 years, >8 dB).

Results: Fifteen, 27, 30, and 23 subjects were included in group I, II, III and IV, respectively. Both IOP and zone β parameters were significantly greater in glaucoma eyes than in fellow eyes in subjects older than 50 years (P=0.010 for IOP and P≤0.008 for zone β parameters in group III; P=0.016 for IOP and P≤0.012 for zone β parameters in group IV). In group II, zone β parameters were significantly greater in glaucoma eyes than in fellow eyes (P≤0.002), while IOP was not (P=0.256). In group I, IOP was significantly greater in glaucoma eyes than in fellow eyes (P=0.009), while zone β parameters were not (P≥0.270). Spherical equivalent, CCT, and disc area showed no difference between both eyes in each subgroup.

Conclusions: IOP, not zone β, was a risk factor in young NTG patients with mild visual field loss, whereas zone β, not IOP, was a risk factor in young NTG patients with moderate to severe visual field loss.

SF004

FLUOROPHOTOMETRIC MEASUREMENTS OF AQUEOUS HUMOR FLOW IN FILIPINO EYES

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Purpose: To determine the rate of aqueous humor flow after instillation of fluorescein in Filipino eyes using Ocumetrics Fluorotron Master fluorophotometer (Ocumetrics Inc. Mountain View, California)

Methods: Patients underwent a complete evaluation including collection of demographic data, ocular, medical, surgical and medication history, ultrasonic pachymetry, applanation tonometry, slit-lamp biomicroscopy, gonioscopy, corneal staining with fluorescein, and dilated fundus examination. Fluorescein dye was instilled in the cul-de-sac three times, three drops every five minutes. Three scans were made on each eye every thirty minutes for two hours using the fluorophotometer. Variation of aqueous humor flow across pre-specified age groups was determined using non-parametric Kruskal Wallis analysis of variance. Statistical correlation between continuous variables was performed using Pearson moment product correlation.

Results: A total of 74 eyes were included. The mean age of the patients was 46.6 years SD11.1. The average aqueous humor flow rate was 2.78 microliters/min SD0.27. Aqueous humor flow rate did not statistically vary with the eye assessed (p=0.77), nor with gender (p=0.19). Similarly no significant variation was noted with the flow rate across the decades of life represented (p=0.084). Among all variables analyzed, a positive but fair relationship was seen with anterior chamber volume and depth with aqueous flow rate (r-0.35, p=0.002 and r=0.36,p=0.002) respectively. Aqueous outflow facility was inversely and fairly correlated with pachymetry (r=-32,p=0.006).

Conclusions: Aqueous humor flow rates in this study are similar to those found in studies of Bloom et al and van Best et al. Direct correlation was noted with anterior chamber depth and volume.

SF005

PGF SYNTHASE TRANSGENE EXPRESSION IN HUMAN CILIARY MUSCLE CELLS AND ITS EFFECT ON INTRAOCULAR PRESSURE IN MONKEY EYES IN VIVO

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Purpose: To elevate PGF2a levels in cultured human ciliary muscle (HCM) cells by lentivirus-delivered bovine lung prostaglandin F synthase (BOVPGF) gene expression and determine its effect on intraocular pressure (IOP) in monkey eyes.

Methods: A feline lentiviral (FIV) vector expressing both BOVPGF and green fluorescent protein (GFP) was used to transduce cultured human ciliary muscle (HCM) cells (1.7 and 0.6 MOI). Lentivirus induced BOVPGF expression in FIV-BOVPGF–GFP-transduced cells was verified by western blot analysis and changes in PGF2a levels

in HCM cell culture media were determined by ELISA. To test its in vivo effects, viral particles (2.0 E7 TU/eye) were injected into monkey eyes.

Results: Dose-dependent BOVPGF expression in FIV-BOVPGF-GFP transcduced cells was shown by western blot. There was no noticeable morphologic change in transduced cells. There was approximately a 150% increase in PGF2a levels in FIV-BOVPGF-GFP transduced cells by ELISA. In monkey eyes, GFP expression was detected mainly in the trabecular meshwork 2 weeks after viral injection. One eye injected with FIV-BOVPGF-GFP had IOP 4mmHg lower than the contralateral eye injected with FIV-GFP. GFP expression and IOP difference have been maintained for at least 3 months.

Conclusion: BOVPGF transduction is effective in elevating PGF2a in HCM cells and in decreasing IOP in live monkey eyes, suggesting that BOVPGF transgene expression may be an effective approach for glaucoma therapy.

SF006

THE DETRIMENTAL INFLUENCE OF SERUM WITHDRAWAL FROM RETINAL NEURONS IN CULTURE ARE ATTENUATED BY THE EP2 AGONIST, BUTAPROST

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Purpose: To deduce whether the EP2 receptor agonist butaprost can blunt an insult of serum deprivation to primary retinal cultures and/or cultures of a transformed rat retinal ganglion cell line (RGC-5).

Methods: RGC-5 cells or cultures of primary retinal cells were placed in serum free medium or in medium containing only 1% serum, respectively. Different concentrations of butaprost were added before serum withdrawal/reduction. Various techniques were used to assess cell viability (MTT-assay, WST-1 assay, LDH assay), apoptosis (APOPercentage method, TUNEL staining), the generation of reactive oxygen species (DHE staining) and numbers of GABA-positive neurons. Moreover, the level of cAMP in cultures was determined by an ELISA procedure. Electrophoresis/western blotting was used to determine the level of apoptotic markers (caspase-3 and poly(ADP-ribose) polymerase or PARP) in cultures.

Results: Butaprost caused an elevation of cAMP in RGC-5 cells and primary retinal cultures suggesting the presence of EP2 receptors. Serum deprivation to RGC-5 cells caused an expression of cleaved caspase-3 and PARP suggestive of apoptosis. Butaprost (100nM - 1μM) dose-dependently attenuated the negative effect of serum withdrawal/reduction in both cultures. Moreover, the clear reduction of GABA-immunoreactive neurons in primary retinal cultures caused by serum reduction was attenuated by 100nM butaprost.

Conclusions: Altered serum supply to cultures of primary retinal cells and RGC-5 cells results in altered cell viability and apoptosis. Evidence is provided to show that butaprost significantly blunted the negative effect of altered serum levels to both culture types by probably stimulating EP2 receptors to cause an elevation of intracellular cAMP.

SF007

REDOX PROTEINS THIOREDOXIN 1 AND THIOREDOXIN 2 SUPPORT RETINAL GANGLION CELL SURVIVAL IN EXPERIMENTAL GLAUCOMA

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Purpose: We investigated the neuroprotective effect of thioredoxin 1 (Trx1), thioredoxin 2 (Trx2) and thioredoxin-interacting protein (Txnip), which play critical roles in the regulation of oxidative stress, on RGCs in a rat glaucoma model.

Methods: Rat glaucoma model was carried out with dye laser photocoagulation. Quantitative and spatial expression of Trx1, Trx2, and TXNIP was examined with immuno blot and immuno-histochemistry. Electroporation was used to deliver Trx1 and Trx2 expression constructs to RGCs in vivo. Cell protective effect of Trx1 and Trx2 overexpression on RGCs after IOP elevation was determined by RGC density analysis.

Results: Txnip-, Trx1- and Trx2-expressing cells in the GCL were primarily co-localized with RGCs. The increased Txnip level was observed in the retina after glaucoma induction. Trx1 level decreased after glaucoma induction. No change in Trx2 levels was detected. In non-transfected and EGFP-transfected retinas, RGC loss was approximately 27% at 5 weeks after IOP elevation, compared to control. The loss of RGCs in Trx1 or Trx2 transfected retinas was approximately 15% and 17%, respectively. Thus, Trx1 and Trx2 preserved 45% and 37% of cells, respectively that were destined to die in glaucomatous retinas.

Conclusion: The results of this study provide evidence for involvement of oxidative stress in RGC degeneration in experimental glaucoma and point to potential strategies to reduce its impact.

SF008

ACTIVATION OF AUTOPHAGY IN RETINAL GANGLION CELLS

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Purpose: Autophagy has been shown to be activated in neuronal cells in response to injury and suggested to have a cell-protective role in neurodegenerative diseases. In this study, we investigated the activation of autophagy in retinal ganglion cells (RGCs) following optic nerve transection (ONT) and evaluated its effect on RGC survival.

Methods: Expression of several autophagy-related genes, including *Atg5*, *Atg7* and *Atg12*, and autophagy markers LC3-II and beclin-1 were analyzed at the transcriptional or protein level 1, 3 and 7 days after ONT. Cell viability of RGC-5 cells was determined in serum deprivation with or without pharmacologic inhibition of autophagy.

Results: Transcription of the *Atg5*, *Atg7* and *Atg12* genes was upregulated 1.5- to 1.8 fold in the retina 3 days after ONT compared with that in the controls. Seven days after ONT, expression of *Atg5*, *Atg7* and *Atg12* mRNA was comparable to that in the untreated retinas. Western blot analysis of proteins isolated from RGCs showed 1.6-, 2.7-, and 1.7-fold increases in LC3-II level 1, 3, and 7 days after ONT, respectively, compared with those in the controls. Expression of beclin-1 was 1.7-fold higher 1 day after RGCs were axotomized, but 3 and 7 days after ONT it was comparable to that of the control. Inhibition of autophagy with bafilomycin A1, 3-methyladenine, and Wortmannin in RGC-5 cells under serum-deprived conditions decreased cell viability by approximately 40%.

Conclusions: These results suggest possible activation of autophagy in RGCs after optic nerve transaction and demonstrate its protective role in RGC-5 cells maintained under condition of serum deprivation.

SF009

EXPRESSION OF MMPS AND TIMPS IN RAT SCLERAL LAMINA CRIBROSA IN CHRONIC OCULAR HYPERTENSION MODEL

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Purpose: To investigate the expression of Matrix metalloproteinases and tissue inhibitors of Metalloproteinases in rat sclera lamina cribrosa in chronic ocular hypertension model,and approach the relationship of MMPs and TIMPs and pathogenesy of glaucoma.

Methods: Methods To examine expression of MMP-2, MMP-9, TIMP-1, TIMP-2 in sclera lamina cribrosa of the rat model by immunohistology, Western blotting and RT-PCR technique respectively .

Results: We confirmed that of the expressions of MMP-2, MMP-9, TIMP-1, TIMP-2 in sclera lamina cribrosa in control eyes were not or little. But expressions of MMP-2, MMP-9, TIMP-1, TIMP-2 in rat scleral lamina cribrosa in model of chronic ocular hypertension were significantly increased.

Conclusion: Our experiment confirmed that the expressions of MMP-2, MMP-9, TIMP-1, TIMP-2 in rat lamina cribrosa in model of chronic ocular hypertension were significantly increased.

Session 2

SF010

ANTERIOR CHAMBER (AC) ANGLE ASSESSMENT WITH ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY (AS-OCT) IN HEALTHY SUBJECTS: REPRODUCIBILITY AND CHARACTERISTIC FINDINGS

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Purpose: To evaluate the reproducibility and characteristic findings of AC angle measurement obtained by AS-OCT.

Methods: Thirty-nine healthy subjects were imaged for AC angle with AS-OCT. All subjects underwent imaging of the nasal, temporal, and inferior AC angle under standardized light and dark conditions. All subjects were scanned in two different visits by single well-trained operator. Angle opening distance at 500μm (AOD500), trabecular-iris space area at 500μm (TISA500) and angle recess area at 500μm (ARA500) were obtained two times with each single image by two different examiners assigning scleral spur location. Difference between light and dark conditions, symmetry between right and left eye, difference between each quadrant, inter-visit and inter-examiner reproducibility were evaluated.

Results: There was no significant difference between right and left eye in all parameters. All parameters were significantly different between light and dark condition (p=0.00, 0.01, 0.01) in nasal angle. Temporal angle was wider than nasal and inferior angle in both dark and bright conditions with all parameters (p=0.01-0.03). All parameters in nasal and temporal angle demonstrated excellent inter-visit and inter-examiner reproducibility in both light and dark conditions (ICC 0.838-0.992), which was slightly lower in inferior angle (ICC 0.662-0.843).

Conclusions: AS-OCT demonstrated quantitative and reproducible assessment of AC angle. There were mild disagreements in some parameters between two examiners in inferior angle, which may be induced by variable scleral spur location assignment.

SF011

COMPARISON OF ANTERIOR CHAMBER ANGLE ASSESSMENT BETWEEN AN ULTRASOUND BIOMICROSCOPY AND A SLIT-LAMP GONIOSCOPY SYSTEM BASED ON INFRARED LIGHT

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Purpose: We have previously published the development of a slit-lamp system that uses only infrared light (J Glaucoma, 2005). This system allows an observation of anterior chamber angle in complete darkness, which cannot be achieved by gonioscopy using a conventional light source. In this study, we conducted a light/dark test using this new slit-lamp system and compared with the results obtained from the measurements made by ultrasound biomicroscopy (UBM).

Methods: Eighteen eyes of 18 consenting outpatients who visited our hospital were examined. The slit-lamp gonioscopy system was used with a conventional light and in the dark using infrared light. Also using UBM, angle opening distance; trabecular iris angle; and angle recess area were measured in the same condition.

Results: Mostly the angle narrowing was observed with the slit-lamp system using infrared light, and it was confirmed as the changes in quantitative parameters measured by UBM. But the changes of Scheie grade of angle narrowing did not always match the amount of changes in quantitative parameters measured by UBM.

Conclusions: The individual variation of iris motion had an influence on the differences between the results coming from two methods. When performing a light/dark test for the diagnosis of angle-closure glaucoma, not only quantitative assessment by UBM but ascertainment of the structure of the angle over a wide area by gonioscopy is important. The present system is useful for this purpose.

SF012

THE MEASUREMENT OF RETINAL NERVE FIBER LAYER THICKNESS ACCORDING TO THE OPTIC DISC SIZE USING TWO DIFFERENT MODES OF OPTICAL COHERENCE TOMOGRAPHY

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Purpose: To evaluate the relationship between retinal nerve fiber layer (RNFL) thickness and optic disc size by using two different modes of optical coherence tomography (OCT).

Methods: The measurement of RNFL thickness was performed by employing two different modes of OCT, i.e. fast RNFL thickness mode(fixed 3.4mm diameter) and customized circle mode(fixed distance- disc diameter adding 0.85mm from each optic disc edge), on patients in large optic disc group (diameter>1.91mm) on the one hand and in small optic disc group (diameter≤1.91mm) on the other.

Results: In both group, RNFL thickness increased in proportion to the increase of the disc diameter. Higher correlation between optic disc diameter and RNFL thickness is evident especially in large optic disc group. Differences between two different methods were larger at superior & inferior sectors, especially 12 and 6 o'clock area. 30 eyes which were interpreted as normal on the fast RNFL thickness mode fell outside the normal limit of less than 5% of the normal distribution in the customized circle mode. The false positive ratio was 28% in large optic disc group and 21% in small optic disc group, but there is no significant difference between the two groups (p=0.464).

Conclusions: Since the customized circle mode for RNFL thickness evaluation is little affected by the variation in the disc diameter as compared to the fast RNFL thickness mode, it is more useful for early detection of glaucoma.

SF013

COMPARISON OF THE DIAGNOSTIC ACCURACY OF HRT2 AND HRT3 IN GLAUCOMA

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Purpose: To compare the diagnostic accuracy of HRT2 and HRT3 in glaucoma.

Methods: Two groups of patients (glaucoma and normal), who satisfied the inclusion and exclusion criteria were included. Glaucoma was diagnosed in the presence of open angles, characteristic glaucomatous optic disc changes correlating with the visual fields on automated perimetry. Normal subjects had visual acuity ≥ 20/30, intraocular pressure < 22 mm Hg with normal optic disc and fields and no ocular abnormality. All patients underwent complete ophthalmic evaluation including visual field examination (24-2 / 30-2 SITA standard program) and imaging with HRT2. HRT2 examinations were exported to the HRT3 software. The sensitivity and specificity of MRA in HRT2, HRT3 with ethnicity correction and GPS were calculated.

Results: One hundred and seventy seven subjects (98 glaucoma, 79 normal) were included. There was no significant difference in the age (p= 0.26) and sex distribution (p=0.41) between the two groups. The mean MD on visual field was 7.3±6.7 dB and 0.4±1.1 dB for glaucomatous and normal eyes respectively (P<0.001). The sensitivity and specificity of HRT2 MRA global was 56.1% and 96.2% respectively. HRT3 (ethnicity adjusted) yielded a sensitivity of 37.7% and a specificity of 97.4%, while GPS gave a sensitivity of 86.7% and a specificity of 68.3%. On comparison (McNemar's test), MRA of HRT2 was better (p= <0.0001) than HRT3 MRA and GPS.

Conclusion: In this cohort, HRT2 performed better than HRT3 MRA and GPS.

SF014

A COMPARATIVE STUDY BETWEEN TWO VISUAL FIELD GRADING SCALES: HODDAP-PARRISH-ANDERSON (H-P-A) AND FIELD DAMAGE LIKELIHOOD SCALE (FDLS)

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Purpose: Glaucoma is a disease characterized by irreversible loss of neural tissue over time. Standard automated perimetry is the accepted technique for quantifying functional damage in glaucoma. Different classification methods have been proposed for quantifying functional damage in glaucomatous patients. Hoddap-Parrish-Anderson (H-P-A) use MD and defective points in pattern deviation probability map to classify visual field defect in 4 stages. The Field Damage Likelihood Scale (FDLS) counts the number of depressed points on the plot and divides field abnormality into seven stages. The present study compares the two visual field scoring systems for classifying glaucomatous field defects and also highlights the definite advantage of FDLS over H-P-A.

Methods: In a Retrospective Chart review, 24 cases with the diagnosis of either ocular hypertension or chronic glaucoma were reviewed. 42 reliable visual field charts (SITA Standard 24-2) were analyzed, performed with Humphrey Field Analyzer.

Results: There was total agreement between these two classification methods in 22 charts. There was 1 stage difference in 18 charts. There were two stage differences in 2 charts. Eight charts, classified as stage 0 with H-P-A staging were classified as stage 1 in FDLS.

Conclusions: FDLS method offers a fine categorization of visual field defects. The addition of "Most minimal loss detectable" is a stage intermediate between "No loss" and "Mild loss" in FDLS method. This intermediate stage is helpful to include borderline cases, as 8 charts in this study demonstrate. FDLS also defines the severity of glaucoma by introducing stage like "Marked loss" and "Advanced Loss".

SF015

THERAPEUTIC PATTERNS ON PRIMARY ANGLE-CLOSURE GLAUCOMA IN CHINA: A SURVEY AMONG OPHTHALMOLOGISTS

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Purpose: To describe the current practice patterns of treatment on primary angle closure glaucoma (PACG) in China.

Methods: All attendees to the glaucoma section of the 10th Congress of the Chinese Ophthalmological Society in Tianjin (September 11th, 2005.), were invited to answer a questionnaire regarding practice patterns for PACG.

Results: 262 (79.4% of attendees) ophthalmologists responded from 29 provinces (this represents all of China except Taiwan and Hainan province). 53.1% (139/262) believed that argon laser iridoplasty was a good treatment for acute angle closure (AAC). 31.3% had treated patients with iridoplasty. Incisional peripheral iridotomy (PI) was more frequently used (60%) for early PAC than laser PI (40%). 39.3% (103/262) used medications as the first choice for early stage of PAC, while 58.8% performed PI first. Trabeculectomy was estimated to be required in 66.5% of AAC cases and 73.3% of chronic PACG patients. 27.1% claimed to use releasable sutures in all PACG, while 18.3% never used them. Ophthalmologists reported a wide range of adherence to follow up at one year (10 to 90%) and stated that poor glaucoma awareness was a major barrier.

Conclusions: Ophthalmologists report that they more often use surgical iridectomy than laser iridotomy, likely due to limited access to equipment. Surgeons preferred trabeculectomy initially in a large percentage of angle closure patients with an angle of >180 degree of synechial closure.Prospective studies to determine current practices are needed to improve the care of PACG patients.

SF016

UTILITY OF BLEB IMAGING WITH ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IN CLINICAL DECISION-MAKING AFTER TRABECULECTOMY

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Purpose: To determine if imaging of blebs with ASOCT affects clinical decision-making with regards to laser suture lysis (LSL) after trabeculectomy.

Methods: In this prospective case series we included patients with poorly controlled IOP after standardized trabeculectomy from May – November 2006. One observer assessed intraocular pressure (IOP), anterior chamber (AC) depth and bleb formation, and decided whether or not to undertake LSL based on clinical grounds. Another observer independently recorded a decision with regards to LSL based on ASOCT assessment of scleral flap position, presence of a sub-flap space, patency of the internal ostium, and bleb wall thickening. We compared the two observers' decisions to determine how ASOCT influenced decision-making.

Results: 7 eyes of 7 patients were included. Based on clinical examination, LSL was recommended in all 7 (100.0%) cases due to presence of elevated IOP, deep ACs and poorly formed blebs. Using ASOCT, LSL was recommended in 5/7 (71.4%) cases with apposed scleral flaps, absent sub-flap spaces and absent bleb wall thickening. In 2/7 (28.7%) cases, LSL was not recommended based on ASOCT findings of an elevated scleral flap, a patent sub-flap space and bleb wall thickening. All 7 patients had good IOP control and formed blebs at a mean of 8.4 ± 2.6 months after trabeculectomy.

Conclusion: ASOCT imaging affects decision-making with regards to LSL by providing information not apparent on clinical examination.

SF017

BLEB CHARACTERISTICS OF SUBCONJUNCTIVAL COLLAGEN IMPLANT IN TRABECULECTOMY COMPARED WITH MITOMYCIN BLEBS

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Purpose: To evaluate the bleb parameters after trabeculectomy with a subconjunctival collagen implant.
Methods: 25 eyes of glaucoma patients scheduled for trabeculectomy with antifibrotics were randomized into two groups. In 12 eyes a biodegradable collagen implant was placed beneath the conjunctiva after suturing the scleral flap (Group A) while in 13 eyes sub-conjunctival 0.02% Mitomycin C was used as an antifibrotic(Group B). Trabeculectomy was performed with two releasable sutures in all 25 eyes. The patients were followed over a 16-24 month period. In three patients of Group A , the fellow eye underwent MMC trabeculectomy after 4 weeks. Intraocular pressure, bleb characteristics including UBM evaluation were done at 1 month, 3 months and thereafter at 3 monthly intervals.
Results: The blebs were diffuse, elevated but not avascular in Group B but in the MMC group almost 31% developed avascular blebs after 4 months and the IOP control was in single digits compared with low teens of implant eyes. Two patients in Group A and one in Group B developed a Tenon cyst between 3- 5 months and underwent bleb needling. The implant started disintegrating after 3 months and had completely absorbed after 6-9 months. No episode of inflammation, bleb leak, dellen formation, or induced cataract was noted during this follow up.
Conclusion: Collagen implants are viable, and safer alternatives to chemical antifibrotic modalities in trabeculectomy.

SF018

EXPRESS SHUNT VERSUS TRABECULECTOMY PERFORMED BY RESIDENTS – INTERMEDIATE-TERM RESULTS

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Purpose: The purpose of this study was to compare the success and complication rates between resident-performed ExPress shunts and resident-performed trabeculectomies in consecutive open angle glaucoma patients on the same service.
Methods: All eyes receiving trabeculectomy or ExPress shunt placement from the resident service of the Division of Ophthalmology at the San Francisco Veterans Administration Medical Center between 1997 and 2007 were evaluated retrospectively. Eyes were excluded from analysis if they had less than six months follow-up. In patients where both eyes had been operated on, only data from the right eye was used. Pre-operative intraocular pressure (IOP) and number of ocular hypotensive medications, as well as IOP and number of ocular hypotensive medications at several time intervals after surgery were recorded. Complications such as hypotony, development of choroidals, and re-operation were also recorded, as were additional procedures including laser suture lysis, anti-fibrotic agent injection, and bleb needling. Case-control statistical analysis will be used to compare these variables between the two surgical groups while adjusting for confounders such as age, race, pre-operative IOP, etc. Comparisons using the aggregate data between groups will also be completed.
Results: In all, sixty eyes with trabeculectomy and thirty five eyes with ExPress shunt placement were included. Detailed data on the results of our analysis will be presented at the SEAGIG meeting.
Conclusions: Preliminary results suggest that in surgery done by 2nd and 3rd year residents, the ExPress shunts are less likely to produce profound hypotony and choroidal detachments in the early post-operative period with equivalent pressure lowering.

5th Congress of the South East Asia Glaucoma Interest Group &
6th Meeting of the Asian Angle-Closure Glaucoma Club

Seoul, Korea, 25-27 September 2008

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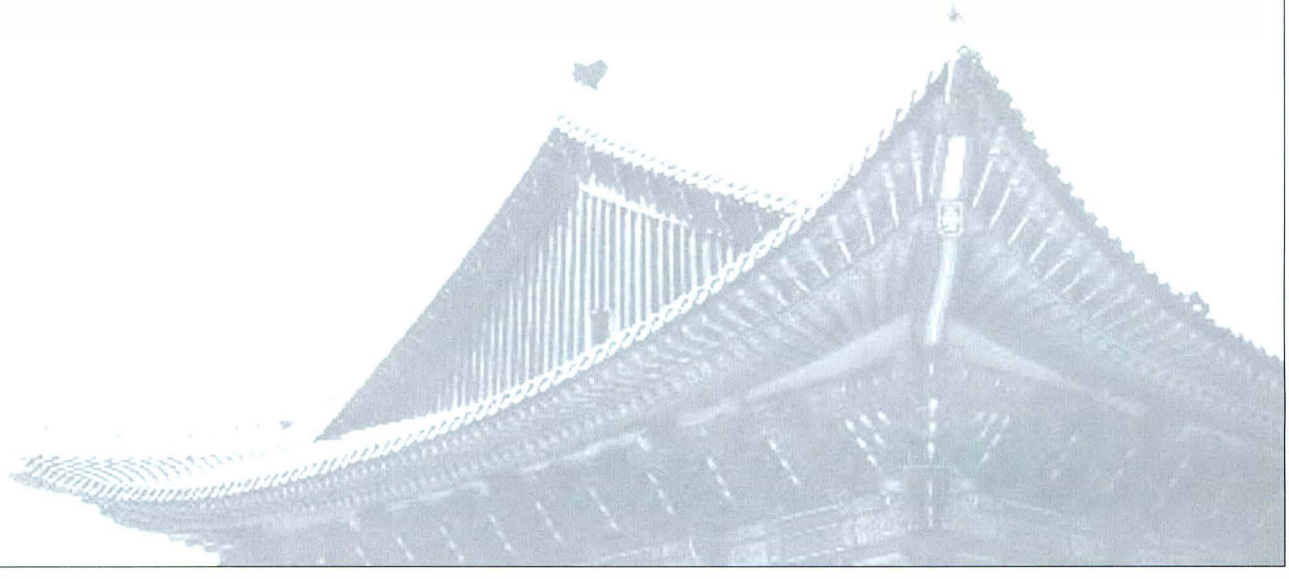

Session 1

AF001

PROSPECTIVE LONG TERM EVALUATION OF SUB-ACUTE ANGLE-CLOSURE

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Purpose: To study the long term course of eyes with sub-acute angle closure

Methods: 61 eyes of 61 patients diagnosed with sub-acute angle closure glaucoma were studied. Gonioscopy and peripheral laser iridotomy was performed in all eyes at baseline. Standard achromatic perimetry (SAP) and IOP were performed at baseline and serially every 6 months. Changes in the visual filed and the IOP response over time were analyzed

Results: 8 eyes showed visual field progression on SAP, over a mean period of 9.09+/-3.7 years. Eyes that progressed had a significantly narrower angle recess, ≤ 10 degrees, p=0.02, with goniosynechie in ≥ 1 quadrant at initial presentation. Eyes with a narrow recess <15 degrees had significantly thinner central corneal thickness, 536 microns, cf those with a wider recess, 560 microns, p=0.04, and a larger difference of baseline maximum-minimum diurnal variation of IOP, 7.1mm Hg, p=0.05.

Conclusion: Sub-acute angle closure eyes having a narrow recess, thinner cornea and a larger diurnal IOP fluctuation at presentation, correlated significantly with progression, p<0.05.

AF002

ULTRASOUND BIOMICROSCOPIC FEATURES ASSOCIATED WITH ANGLE-CLOSURE IN FELLOW EYES OF ACUTE PRIMARY ANGLE-CLOSURE AFTER LASER IRIDOTOMY

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Purpose: To investigate the frequency of appositional angle closure and related anatomical characteristics in the fellow eyes of Chinese subjects with acute primary angle closure (APAC) after laser peripheral iridotomy (LPI).

Methods: The fellow eyes with APAC after LPI were enrolled. Ultrasound biomicroscopy (UBM) and qualitative analysis of appositional closure was performed in darkness on the fellow eyes after LPI .The UBM parameters were compared between the eyes with and without appositional closure.

Results: Thirty-four total subjects were enrolled in the study. Thirteen subjects (38.2%) were found to have appositional closure in at least one quadrant. The values of AOD500 (angle opening distance500), ARA750(angle recess area750) and T-I angle(trabecular-iris angle) in four quadrants, and TCPD (trabecular-ciliary process distance) inferiorly and temporally were lower; the values of IT1 (peripheral iris thickness) superiorly and nasally were higher in the appositional closure positive group than in the negative group (p≤0.001, p=0.006, 0.003 respectively, and p=0.003, 0.048 respectively). Thirty-one subjects accepted darkroom provocative test. Only three (11.1%) of 27 eyes with appositional closure of 0~2 quadrants were positive. Three (75.0%) of four eyes in 3~4 quadrants were positive (p=0.0164).

Conclusions: More than 1/3 of fellow eyes with APAC are shown to have appositional angle closure in darkness after LPI. The narrower angle, the more anterior position of the ciliary body, and the thicker peripheral iris, are the anatomical characteristics associated with appositional angle closure after LPI. These findings may indicate an increased risk in patients who remain closed after LPI, further research is recommended.

AF003

DISTRIBUTION OF UVEAL EFFUSION IN PRIMARY ANGLE-CLOSURE EYES DIAGNOSED BY AS-OCT

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Purpose: Previously we have reported the uveal effusion in primary angle closure (PAC) eyes. In this presentation, we report the distribution of uveal effusion in PAC eyes diagnosed by anterior segment OCT (Visante, Zeiss).

Methods: 11 PAC patients with uveal effuision diagnosed by Visante AS-OCT has been recruited. AS-OCT images were taken using high resolutional scanning mode in 4 quadrants for each eye. Diagnosis of uveal effusion was defined as the separation of ciliary body from sclera at least one quadrant of the eye.

Results: 20 eyes out of 21 eyes which can be available for imaging showed uveal effusion. Uveal effusion has been observed 9 eyes at superior quadrant, 16 eyes at inferior, 17 eyes at temporal, and 5 eyes at nasal (p=0.00011, chi-square Wiliam's correction).

Conclusions: Most of the patients showed uveal effsusion in

both eyes. Uveal effusion in PAC eyes is observed at temporal and inferior segment, dominantly.

AF004

EVALUATION OF BLOTCHY PIGMENTS IN THE ANGLE AS A SIGN OF PRIMARY ANGLE-CLOSURE (PAC)

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Purpose: To assess the diagnostic capability of blotchy pigments in the angle as a sign of primary angle closure

Methods: Prospective study of 382 open angle and 80 angle closure subjects. Subjects over 35 years of age who cooperated for gonioscopy were included. Subjects with a history of intraocular surgery, trauma or psuedoexfoliation were excluded. All subjects underwent a complete ophthalmic examination. Gonioscopy was done by three consultants and one glaucoma fellow using a Sussman's four-mirror gonioscope under standard conditions. Primary angle closure was defined as occludable angles (³ 1800) with either blotchy pigments in the angle, goniosynechiae, increased IOP or a combination of these. The site of blotchy pigments in the angle was documented. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and the positive likelihood ratio of blotchy pigments as a sign of angle closure were evaluated.

Results: Prevalence of blotchy pigments in open angles was 5.75% (95% CI, 3.4-8.1) and prevalence of blotchy pigments in PAC was 38.75% (95% CI, 28.82-49.71%). The presence of blotchy pigment in superior angle had sensitivity and specificity of 12.5 % (95% CI, 6.93–21.5) and 99.48% (95% CI, 98.11–99.86) respectively. Positive LR for blotchy pigmentation in the angle was 6.73 (95% CI, 4.12-11) and for blotchy pigmentation in the superior angle was 23.87 (95% CI, 5.33-106.88).

Conclusion: Blotchy pigments can be seen in open angles too and their presence in the superior angle is highly specific for primary angle closure.

AF005

THE ROLE OF PROSTANOID RECEPTOR GENE (PTGFR) POLYMORPHISMS AND ANTERIOR SEGMENT BIOMETRY IN PRIMARY ANGLE-CLOSURE AND ACUTE ANGLE-CLOSURE PATIENTS

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Purpose: To determine the presence of polymorphism in prostanoid receptor (PTGFR) gene and its role in primary angle closure (PAC) and acute angle closure (AAC) patients.

Methods: A comparative cross sectional study was conducted involving 27 PAC/AAC patients and 30 controls. Ocular biometric assessment; anterior chamber depth (ACD), lens thickness, axial length and anterior chamber grading were performed using Redmond-Smith method, handheld ultrasound A scan, van Herick and gonioscopy using Shaffer grading. 3 ml of venous blood were obtained. DNA was then extracted using GeneAll extraction kit. 12 pairs of primers for all the 4 exons and its flanking region of PTGFR gene were designed. PCR was then performed, followed by denaturing High Performance Chromatography (dHPLC). Gene sequencing was then performed to confirm the presence of polymorphisms.

Results: Two polymorphisms were found; IVS3-97A>T and EX4 1209A>G in both PAC/AAC patients and control without any significant different. There was significant difference in genotype frequency of IVS3-97A>T between PAC and AAC patients (p=0.036). However, there were no significant association between the ACD (p=1.00, p=0.97), lens thickness (p=0.11, p=0.45) and axial length (p=1.00, p=0.14) with the genotype frequency of IVS3-97A>T and EX4 1209A>G respectively.

Conclusions: PTGFR gene polymorphism at IVS2-97A>T may play important role in the development of AAC in susceptible eyes. The development of an acute attack may be associated with polymorphisms in PTGFR, which plays a pivotal role in the inflammatory process.

AF006

A RANDOMIZED CROSS-OVER STUDY COMPARING BIMATOPROST AND LATANOPROST IN SUBJECTS WITH PRIMARY ANGLE-CLOSURE GLAUCOMA

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Purpose: To compare the intraocular pressure (IOP) lowering efficacy and side effects of latanoprost 0.005% and bimatoprost 0.03% in subjects with chronic primary angle closure glaucoma (PACG).

Methods: This was an observer-masked randomized cross-over study of 60 PACG subjects who received either latanoprost or bimatoprost for 6 weeks, after which they were crossed over to the other medication for another 6 weeks. The IOP-reducing effect of the medications was assessed by the reduction in IOP after 6 weeks of treatment compared to baseline.

Results: Fifty-four subjects (80 eyes) completed the study. Latanoprost reduced IOP (mean ± SD) by 8.4 ± 3.8 mmHg and bimatoprost by 8.9 ± 3.9 mmHg from a baseline of 25.2 + 3.6 mmHg and 25.2 + 3.6 mmHg respectively (p=0.23). Adverse events were mild and infrequent in both groups. Ocular irritation was the most frequently reported adverse events in both groups; 22 subjects (37.9%) treated with bimatoprost experienced ocular hyperemia as compared to 13 subjects (22.4%) treated with latanoprost (p=0.11).

Conclusions: Bimatoprost once daily was similarly effective in reducing IOP compared to latanoprost once daily in subjects with chronic PACG. Both drugs were well tolerated with few ocular adverse events.

AF007

EFFICACY OF BIMATOPROST 0.03% IN PRIMARY CHRONIC ANGLE-CLOSURE GLAUCOMA WITH 360 DEGREE SYNECHIAL CLOSURE: REPORT FROM A PRELIMINARY STUDY

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Purpose: To evaluate the efficacy and safety of Bimatoprost 0.03% in lowering intraocular pressure (IOP) in patients with 360° synechial angle closure glaucoma

Methods: Prospective, non randomized, non comparative, selective analysis, pilot study. Twenty Indian CACG patients having 360° PAS, IOP greater than 21 mmHg ,with no visual potential in the study eye were recruited. Detailed eye examination included assessment of vision, slit-lamp biomicroscopy, applanation tonometry, gonioscopy. Following YAG iridotomy reconfirmation of complete angle closure by indentation gonioscopy.Baseline IOP was measured and once-daily evening dose of Bimatoprost 0.03% administered for 8 weeks. Visits were scheduled at day 1, week 1,4&8 .At each visit, IOP was recorded at 8:00, 10:00 AM and 4:00 PM. The primary efficacy outcome measure was percentage change in IOP from baseline to 8 weeks of therapy

Results: The mean age was 56.15 + 8.23 years. Mean baseline IOP was 43.22 ± 5.18 mmHg. Post-treatment mean IOP at day 1, weeks 1, 4 and 8 were 27.43 ± 9.72, 29.72 ± 10.55, 28.96 ± 9.25 and 28.03 ± 9.88 respectively. The mean percentage reduction in IOP from baseline to 8 weeks of Bimatoprost therapy was 33.42% (43.22 ± 5.18 to 28.53 ± 9.95 mmHg, P = 0.0000). The most commonly reported adverse event was conjunctival hyperaemia (35%).

Conclusion: In this study, Bimatoprost 0.03% treatment resulted in a statistically significant reduction in IOP in primary CACG patients with 360° PAS

AF008

CONVENTIONAL VS MODIFIED LASER IRIDOTOMY IN EYES WITH PRIMARY ANGLE-CLOSURE SUSPECT: ANTERIOR CHAMBER MEASUREMENTS WITH PENTACAM®

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Purpose: To compare the conventional laser peripheral iridotomy (LPI) and the modified LPI in the aspect of the anterior chamber dimension changes measured by Pentacam® in eyes with primary angle closure suspect (PACS).

Methods: Forty-eight eyes of 24 subjects with bilateral PACS were consecutively recruited. Each eye was randomly allocated to the conventional or modified LPI. Modified LPI was comprised of simultaneous argon LPI and pheripheral iridoplasty, whereas conventional LPI only consists of traditional argon LPI. Each patient had anterior chamber measurements by Pentacam® before and 2 weeks after LPI. Mean anterior chamber depth (ACD), anterior chamber volume (ACV), anterior chamber angle (ACA) were

measured, and topographic ACD analysis was performed. The results were compared between the conventional and modified LPI groups.

Results: In both conventional and modified LPI groups, Mean ACD and ACV were increased significantly after LPI. Topographic ACD analysis revealed that mid-peripheral ACD increase was significantly larger in the modified LPI group than in the conventional LPI group. Intraocular pressure (IOP) changes and post-LPI complications were not different among groups.

Conclusions: Both the conventional and modified LPI increased mean ACD and ACV measured by Pentacam®. Modified LPI may have a role for the treatment of PACS by simultaneously relieving pupillary block component with laser iridotomy and angle crowding component with laser iridoplasty.

AF009

LASER PERIPHERAL IRIDOTOMY VERSUS LASER PERIPHERAL IRIDOTOMY PLUS IRIDOPLASTY IN TREATMENT OF CHRONIC PRIMARY ANGLE-CLOSURE/GLAUCOMA: 1-YEAR RESULTS OF A RANDOMIZED, CONTROLLED TRIAL

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Purpose: To compare the clinical outcome and the safety of laser peripheral iridotomy (LPIt) versus LPIt plus laser peripheral iridoplasty (LPIp) in treatment of chronic primary angle-closure/glaucoma (CPAC/G).

Methods: Consecutive patients who were 40 years or older and diagnosed with CPAC/G were screened. The eligible patients were recruited and randomized to receive one of two treatment options: LPIt or LPIt plus LPIp. Follow-up was attempted for at least 1 year after laser therapy completed. Main outcome measures were intraocular pressure (IOP), range of peripheral anterior synechiae (PAS), visual acuity, visual field, requirement for supplemental medical therapy, reoperations for glaucoma, corneal endothelial cell count (CECC), and complication rates. In patients with two eligible eyes, one eye was selected randomly for inclusion in the final analysis.

Results: A total of 77eyes (77 patients) were randomized into the LPIt group, and 81 eyes (81 patients) into the LPIt plus LPIp group, and 61 patients (79%) and 65 patients (80%) completed 1 year follow-up, respectively. There were no significant differences between the two groups in the baseline data (gender, age, presenting IOP, best-corrected visual acuity, PAS, visual field mean deviation, cup/disk ratio and CECC. No significant differences were found between the two groups in IOP level, PAS range, requirement for glaucoma medications and surgical therapy, and visual function measures at the 1-year visit.

Conclusions: The results indicate that the combination of LPIp plus LPIt is not superior to pure LPIt in controlling IOP and maintaining visual function. LPIp may be a risk factor in PAS progression. Further follow-up is needed.

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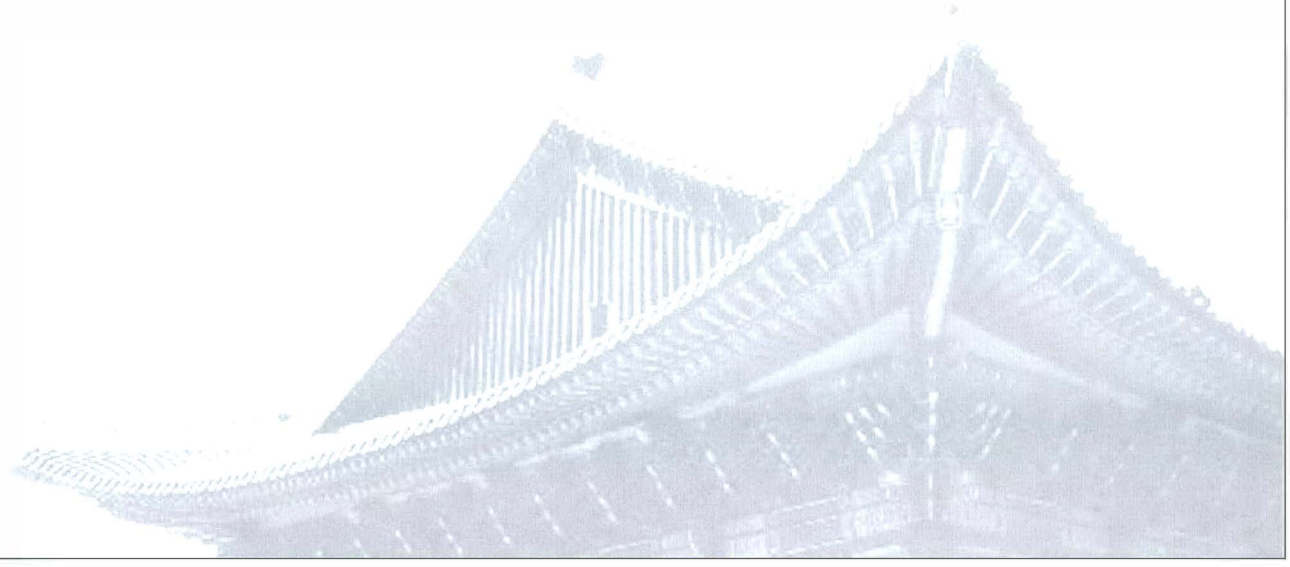

Epidemiology

SP001

THE PREVALENCE OF OCULAR HYPERTENSION AND GLAUCOMA IN GRAVES DISEASE IN KOREAN

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Purpose: To investigate the prevalence of ocular hypertension, and open-angle glaucoma in association with Graves disease.
Methods: In a prospective study, a complete ophthalmic examination including applanation tonometry, exophthalmometry, automated static threshold perimetry, and computed tomography of the orbit was performed in 178 consecutive Korean patients with Graves disease. Ocular hypertension was defined as an intraocular pressure greater than 21 mm Hg on at least two occasions during the period of follow-up.
Results: Of the 178 patients, 8 (4.4%) exhibited typical glaucomatous visual field defects in automatic static threshold perimetry in the absence of compressive optic neuropathy. The intraocular pressure in six of the 8 patients was consistently less than 21 mm Hg during the follow-up period. Thus, these patients were diagnosed as having normal-tension glaucoma. Of the 178 patients, 46 (25.8%) were diagnosed as having ocular hypertension.
Conclusions: Normal-tension glaucoma as well as open-angle glaucoma has same prevalence in the general Korean population. Ocular hypertension was significantly higher among patients with Graves disease than in the general population.

SP002

THE RELATIONSHIP BETWEEN INTRAOCULAR PRESSURE AND HEALTH PARAMETERS IN OCULAR HYPERTENSION

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Purpose: This study was to evaluate the relationship between intraocular pressure (IOP) and health parameters including age, obesity index, and blood pressure in ocular hypertensive patients.
Methods: A total of 2697 ocular hypertension underwent automated multi-phasic test, including tonometry, automated perimetry, fundus photography, blood pressure, and body mass index (weight of subject/standard weight X 100%). The subjects were divided into six age groups: 20's, 30's, 40's, 50's, 60's, and 70's or older. The relationships between IOP and healthy parameters were examined by means of cross-sectional analysis.
Results: The mean age of participants was 48.0 years, and 1777(66.3%) of participants were men and 909 (33.7%) of participants were women. The mean IOP was 22.04±2.2mmHg. IOP was associated with blood pressure, gender, and obesity index by multiple regression analysis. IOP had a significant relationship with mean blood pressure, gender, and the obesity index. The relationship between IOP and age adjusted for mean blood pressure, gender, and obesity index showed a significantly negative tendency. The relationship between IOP and obesity index after adjusted for age, gender, and mean blood pressure showed a significantly positive tendency. The relationship between IOP and blood pressure after adjusted for age and obesity index showed a significantly positive tendency regardless of gender.
Conclusions: IOP of ocular hypertension had a direct relationship with health parameters. The higher the mean blood pressure or obesity index is, the IOP increased in both men and women. Therefore, it is necessary to periodically measure blood pressure and obesity index for hypertension patients.

SP003

PREVALENCE AND RISK FACTORS FOR PRIMARY OPEN ANGLE GLAUCOMA AND PRIMARY ANGLE-CLOSURE DISEASE IN URBAN AND RURAL POPULATIONS IN ANDHRA PRADESH EYE DISEASE STUDY

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Purpose: To compare the prevalence and risk factors for Primary Open Angle Glaucoma and Primary angle closure disease in urban and rural populations in Andhra Pradesh Eye Disease Study
Methods: A total of 10,293 subjects selected by using stratified, cluster, systematic random sampling to have 25% from one urban and 75% from three rural areas underwent a detailed interview and a comprehensive ocular evaluation. Glaucoma was diagnosed and categorized using International Society of Geographical and Epidemiological Ophthalmology classification.
Results: Of the 3724 above 40 years of age, the urban cohort had 934 subjects and the rural cohort had 2790 subjects. POAG was present in 37/934 in urban area (4%) as compared to 45/2790 (1.6%)

in rural area. Age (P <0.001) and IOP (P<0.001) were risk factors for POAG. Prevalence of PACG in urban cohort 15/934 (1.8%) was more (P=0.002) than in rural cohort 20/2790 (0.6%). Prevalence of PAC (P= 0.02) and PACS (P<0.001) were more in urban cohort than in rural cohort. Age (p= 0.03), IOP (p=0.0001) female gender (p=0.02) and diabetes (p=0.001) were risk factors for PAC And PACG. Bilateral blindness defined as a vision less than 3/60 or visual filed less than 10 degrees was more in PACG (20%) as compared to POAG (7%), but the confidence intervals are overlapping.

Conclusion: The prevalence of both POAG and primary angle closure disease was greater in urban as compared to rural area.

SP004

EFFECT OF HAEMODIALYSIS ON INTRAOCULAR PRESSURE

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Purpose: To study the effect of haemodialysis on intraocular pressure (IOP) in patients at University Malaya Medical Centre, Kuala Lumpur and to analyse the effect of diabetes and occludable anterior chamber angles on the change in IOP.

Methods: Prospective, single centre study. Sample size 50 patients. Ocular examination was performed prior to haemodialysis and pre and post-haemodialysis IOP measurements taken. Plasma osmolarity changes and volume of fluid removed were noted. Among those excluded were patients on anti-glaucoma treatment or who have had previous laser or surgical procedures for it. Student' *t*-test and Pearson coefficient test were used to determine statistical significance.

Results: In this study, in which 92% of patients had non-occludable anterior chamber angles, IOP decreased slightly but the results were not significant (p>0.05 in all). Plasma osmolarity decreased significantly (p<0.001). The correlations between changes in IOP and that of plasma osmolarity or volume of fluid removed were not significant (p>0.05 in all). IOP changes were not significant in relation to diabetes (p>0.05). There was a significant decrease in IOP in patients with occludable angles, but this is questionable as the sample size was small. Some patients had large changes in IOP after haemodialysis but this could not be solely attributed to haemodialysis.

Conclusions: Haemodialysis does not cause significant changes in IOP in normal eyes. However, large elevations may still occur in eyes with abnormal aqueous outflow pathways. Further studies in these patients are needed.

SP005

PSEUDOEXFOLIATIVE GLAUCOMA AND SYNDROME: CLINICAL PRESENTATION AND LENS RELATED COMPLICATION AMONG MALAYSIA POPULATION

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Purpose: To determine the clinical presentation and lens related complication in patients with pseudoexfoliative glaucoma and syndrome seen in eye clinics in Kelantan, Malaysia.

Methods: A retrospective review was done among patients who attending eye clinics in two tertiary hospital in Kelantan, Malaysia from January 2002 to December 2007. Those patients with pseudoexfoliative materials on ocular surface with or without evidence of glaucoma were included in the study. Exclusion criteria include those eyes with close angle according to Shaffer Grading as well as suspecting other type of glaucoma. Demographic data, clinical presentations and management were recorded and analyzed.

Results: A total of 76 eyes (42 patients) were reviewed. Majority of patients (57.9%) presented at the age more than 70 years old and 84% are males. Eighty three percent eyes diagnosed as pseudoexfoliative glaucoma and another 17% as pseudoexfoliative syndrome. At diagnosis, 49.1% is graded as severe stage of glaucoma, 8.5% as moderate and 42.4% as mild based on vertical cup disc ratio and Humphrey visual field findings. Eighty one percent of eyes are associated with cataract and 13.2% noted phacodonenesis. Twenty two percents of eyes that underwent cataract operation were complicated with poor pupillary dilatation, zonulardialysis and posterior capsule rupture.

Conclusions: Pseudoexfoliative glaucoma is not uncommon among Malaysian population. Advanced stage of glaucoma at presentation contributes to high mobility and challenge in cataract operation as well as preserving the vision.

Imaging and Diagnosis

SP006

INTRAOCULAR PRESSURE MEASUREMENT: COMPARISON OF PASCAL DYNAMIC CONTOUR TONOMETRY, GOLDMANN APPLANATION TONOMETRY AND NONCONTACT TONOMETRY

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Purpose: A digital dynamic contour tonometer (DCT) has been introduced as a new method and a competitor of IOP measurement, and supposedly independent of cornea thickness. In this study, We compare the measurement of IOP obtained between DCT, GAT and non-contact tonometry (NCT).

Methods: In this prospective study included 262 eyes of 262 subjects (65 eyes with glaucoma suspect, 82 eyes with open angle glaucoma, 73 eyes with angle closure glaucoma and 42 normal eyes). IOP was measured using DCT, GAT and NCT in random order. The DCT can also measure additionally the ocular pulse amplitude (OPA).

Results: The mean DCT measurements (18.91 ± 4.90mmHg) were significantly ($p< 0.001$) different both from mean GAT (17.48 ± 4.88mmHg) and from NCT values (16.25 ± 5.69mmHg). The OPA in angle closure glaucoma patients (3.72 ± 1.68mmHg)was significantly higher compared to glaucoma suspect (2.68 ± 1.01mmHg, $p<0.001$) and to open angle glaucoma patients (2.58 ± 1.58mmHg, $p<0.001$).

Conclusion: The DCT is a new and promising device for measurement of IOP and its dynamic pulsatile fluctuations (OPA) in clinical practice.

SP007

COMPARISON OF ULTRASOUND BIOMICROSCOPIC CHANGES AFTER GLAUCOMA TRIPLE PROCEDURE AND TRABECULECTOMY IN EYES WITH PRIMARY ANGLE-CLOSURE GLAUCOMA

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Purpose: To evaluate ultrasound biomicroscopy (UBM) changes in the anterior chamber angle (ACA) configuration after glaucoma triple procedure (GTP), compared with those seen after trabeculectomy, in eyes with primary angle closure glaucoma (PACG).

Methods: Twenty-seven PACG eyes that underwent GTP were compared with twenty-nine eyes that underwent trabeculectomy only, using UBM. Anterior segment parameters such as anterior chamber depth (ACD), angle opening distance (AOD500), trabecular ciliary process distance (TCPD), trabecular iris angle (TIA), iris ciliary process distance (ICPD), iris thickness along the TCPD line (ID1), scleral ciliary process angle (SCPA), scleral iris angle (SIA), and angle recess area (ARA) were measured preoperatively and at three months postoperatively; these parameters were then compared between the procedures.

Results: Among the anterior segment parameters, postoperative increases in the ACD, AOD500, and ARA were statistically significant in the eyes that underwent trabeculectomy. For the eyes that underwent GTP, all parameters except the ICPD and ID1 were significantly increased after the operation.

Conclusions: For the eyes that underwent GTP, the ciliary body process was posteriorly positioned and the ACA was significantly increased after the operation, as compared to the eyes that underwent trabeculectomy. The posterior shift of the ciliary process only after GTP was indirect evidence that the lens plays an important role in ACA configuration in eyes with PACG.

SP008

EVALUATION OF SCHLEMM'S CANAL AFTER CANALOPLASTY USING FOURIER-DOMAIN OPTICAL COHERENCE TOMOGRAPHY

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Purpose: To assess anterior segment anatomy following canaloplasty, a new glaucoma surgical procedure designed to avoid external filtration, using Fourier-domain optical coherence tomography (FDOCT).

Methods: Six eyes of 5 consecutive patients with uncontrolled glaucoma underwent uncomplicated canaloplasty. All eyes were imaged with the cornea anterior module option of FDOCT (RTVue-100, Optovue, INC. Fremont, CA) postoperatively at the 3:00 and 9:00 positions. This device has 5 μm and 15 μm axial

and transverse resolution respectively, a scanning speed of 26,000 A-scans/second and the scan beam wavelength of 840 nm. Unoperated fellow eyes were also imaged and served as controls. FDOCT images were reviewed and analyzed by a masked observer.

Results: The mean age of patients was 76.2 ± 6.2 years (range, 68 to 82 years). The mean intraocular pressure reduction was 36.2% from baseline (21.2 ± 9.5 vs 13.5 ± 4.8 mmHg) after a mean follow-up of 5 months. FD-OCT images showed various degrees of oval hyporeflective areas as the enlarge Schlemm's canal in 5/6 (83.33%) eyes and trabecular distension in 4/6 (66.67%) eyes compared to the fellow eyes.

Conclusion: FDOCT following canaloplasty demonstrates trabecular distension and widening of Schlemm's canal.

SP009

COMPARISON OF THE GDX VCC SCANNING LASER POLARIMETER AND STRATUS OCT OPTICAL COHERENCE TOMOGRAPHY FOR THE DETECTION OF GLAUCOMA

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Purpose: To compare the diagnostic ability of scanning laser polarimetry with variable corneal compensation (GDx VCC) and Stratus optical coherence tomography (OCT) in discriminating between healthy and glaucomatous eyes in a Taiwan Chinese population.

Methods: This prospective cross-sectional study included 50 glaucomatous patients (mean deviation, -9.65±5.58 dB) and 50 normal subjects (-2.44±1.83 dB). Each subject received GDx VCC, Stratus OCT and Humphrey Field Analyzer visual field testing. One eye per subject was considered for further analysis. Sensitivity at 90% specificity and area under the receiver operating characteristic curve (AROC) were calculated for each GDx VCC and Stratus OCT parameter.

Results: The largest AROCs with Stratus OCT were associated with Cup/Disk Vertical Ratio (0.845) for ONH scan, and with average thickness (0.752) for RNFL scan. The nerve fiber indicator provided the greatest AROC for the GDx VCC indices (0.767).

Conclusion: Both the GDx VCC and Stratus OCT instruments showed similar diagnostic capability in glaucoma detection.

SP010

DETECTION OF RETINAL NERVE FIBER LAYER DEFECTS IN GLAUCOMA EYES WITH HIGH MYOPIA

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Purpose: Evaluation of glaucomatous optic neuropathy is often difficult in high myopic eyes with the tiled discs and/or tigroid fundus. Using a newly developed spectral-domain optical coherence tomography (SD-OCT), high speed and three dimensional evaluation of the retinal nerve fiber layer (RNFL) can be achieved. In this study, we compared the ability of SD-OCT to detect RNFL defects in open-angel glaucoma (OAG) eyes with high myopia with that by red-free fundus photos.

Methods: In 35 eyes of 35 OAG patients with high myopia (spherical equivalent < -6 diopters) and 30 eyes of 30 OAG patients without high myopia, measurements of SD-OCT (3D-OCT1000, Topcon, Japan) and color fundus photography were performed. Presence or absence of RNFL defects was determined in the RNFL thickness map determined by SD-OCT and in red-free fundus photos digitally converted from color photos by two independent and masked examiners.

Results: Sensitivity of RNFL defects with SD-OCT was not different from that with red-free photos in non-high myopic eyes (66.3% vs. 48.8%, P>0.1, Fisher exact test), while that with SD-OCT was significantly higher than that with red-free photos in high myopic eyes (71.7% vs. 40.4%, P<0.001).

Conclusion: SD-OCT detected RNFL defects in high myopic OAG eyes more sensitively than red-free photos.

SP011

ANGLE EVALUATION WITH VISANTE AS-OCT VERSUS CIRRUS SD-OCT

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Purpose: Qualitative comparison of anterior segment scans obtained with high-definition spectral domain optical coherence tomography (Cirrus SD-OCT) and anterior segment optical coherence tomography(Visante AS-OCT).

Methods: Prospective observational study of 41 consecutive subjects recruited at the National University Hospital, Singapore.

The Cirrus SD-OCT was fitted with a special lens to allow imaging of the anterior segment.All subjects underwent imaging with the modified Cirrus SD-OCT and Visante AS-OCT (Carl Zeiss Meditec, Dublin/USA) under standardised dark room conditions. Nasal angle quadrants of right eye images taken with Cirrus SD-OCT were compared with corresponding quadrants on Visante AS-OCT scans of the same subjects by 2 independent masked operators, graded as open or closed. Kappa was calculated for agreement.

Results: Mean age of the 41 subjects was 60.9 years, 80.48% were Chinese and 70.73% female. Angle closure was observed in 18 eyes with Cirrus SD-OCT compared to 22 eyes with Visante AS-OCT. ACI Kappa estimate for agreement between the 2 devices was 0.65. 7 eyes were excluded from analysis due to poor visibility of the angle

Conclusions: Both devices demonstrate good agreement(82.35%) for angle measurements, especially where angles were clearly open or closed. Agreement was poorer for very narrow angles.Posterior trabecular meshwork and peripheral iris were not clearly visualized in 17.07 % of Cirrus scans due to limited scleral penetration by lower wavelength used in the device. Cirrus SD-OCT offers higher resolution, better visualization of the trabecular meshwork compared to Visante AS-OCT and shows potential for anterior segment imaging. However, further refinement is required.

SP012

ANTERIOR SEGMENT EVALUATION IN ANTERIOR MEGALOPHTHALMOS

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Purpose: To report the anterior segment evaluation in anterior megalophthalmos.

Methods: Complete ophthalmological evaluation was performed in 2 patients having megalophthalmos.

Results: First patient was a 48 years old male with bilateral megalocornea presented with painless progressive diminution of vision of both eyes. Detailed evaluation revealed presence of enlarged corneas of diameter of 16 mm associated with very deep anterior chambers(AC), posterior bowing of the irides and iridodonesis. Additional findings were central areolar corneal dystrophy with posterior subcapsular cataract. The second case was a 10 year old male presented with diminution of vision. The corneal diameter was 14.5mm × 15 mm. AC and iris had similar findings but cornea and lens showed no abnormality. Gonioscopy revealed wide open angles with broad ciliary body band. Iris insertion was posterior with concave configuration. Both the cases had normal intraocular pressures (IOPs) in both eyes. Fundus showed normal findings. A scan biometry measured normal axial length in both cases indicating small posterior segment in theses eyes. Anterior chamber depth(ACD), lens thickness, and central corneal thickness were also measured. Ultrasound biomicroscopy on P40 machine revealed superior trabecular iris angle(TIA) of 73.6 degrees and 71.1 degrees and inferior TIA of 83.4 and 82.9 degrees in both patients respectively. AOD 250, AOD 500, TCPD, ILCD, ILA, CB thickness, IT and ACD was also measured.

Conclusions: The case reports describe the evaluation and difficulties found in clinical examination and investigations in a case of Megaloophthalmos. UBM helps in quantifying angle parameters and in finding angle abnormalities.

SP013

OPTICAL COHERENCE TOMOGRAPHY TO MEASURE RETINAL NERVE FIBER THICKNESS IN NORMAL CHILDREN OF NORTH INDIAN POPULATION

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Purpose: To measure retinal nerve fiber layer thickness in normal children of north Indian population with Optical Coherence Tomography

Methods: 100 eligible subjects amongst those reporting to the hospital for refraction were randomly selected. Subjects with BCVA 20/40 or better, with normal optic discs and no other ocular pathology were included. OCT Stratus 4.0.7 (0132) was used and an average of 3 fast RNFL scans was recorded .One eye per child was randomly selected for statistical analysis.

Results: Age group was 8-17 years. OCT was possible in 97%. The mean average Retinal nerve fiber layer (RNFL) thickness was 103.11±9.72 µm. RNFL was thickest superiorly (133.82±17.9 µm) and inferiorly (128.3±15.43 µm), thinner nasally (83.5±16.82 µm), and thinnest temporally (67.98 ± 9.74 µm). The average time taken was 2.5 ± 0.9min.

Conclusions: Optical coherence tomography can be used to measure RNFL thickness in children. OCT holds promise in being able to evaluate glaucoma as effectively as VFA and is less time

consuming and less difficult, as it requires less patient cooperation The normative data provided by this study may assist in identifying changes in RNFL thickness in children in various ocular conditions.

SP014

CORNEAL BIOMECHANICAL PROPERTIES AND RETINAL VASCULAR CALIBER IN CHILDREN: POTENTIAL PATHWAYS IN GLAUCOMA

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Purpose: To examine the relationship between corneal biomechanical properties and retinal vascular caliber in Singaporean children.
Methods: This was a cross sectional study of 257 subjects from the Singapore Cohort Study of Risk Factors for Myopia (SCORM). Corneal hysteresis (CH), corneal resistance factor (CRF), central corneal thickness (CCT) and intraocular pressure (IOPcc) were measured with the ORA. Digital retinal photography was performed and retinal vascular calibre was measured using custom software. The central retinal arteriolar and venular equivalents (CRAE and CRVE) were calculated, representing the average arteriolar and venular calibers. Spherical equivalent refraction, axial length, height, weight, and blood pressure were measured.
Results: The mean age of the study subjects was 13.97 ± 0.90 years. The mean CH was 11.80 ± 1.55mmHg, the mean CRF was 11.83 ± 1.72mmHg, mean CCT was 578.76 ± 34.47µm and mean IOPcc was 15.12 ± 2.84mmHg. The mean CRAE was 151.70 ± 15.54µm and the mean CRVE was 227.51 ± 22.82µm. After controlling for age, sex and ethnicity, and then further for paternal educational level, MABP and SE, there was a significant increase in CRAE by 1.40 (95% CI: 0.17, 2.61; p = 0.03)µm for every 1.55mmHg increase in CH. There were no significant associations between CRVE and CH, CRF, CCT or IOP.
Conclusions: Lower CH is associated with narrower retinal arterioles in Singaporean children. Corneal structure may be linked to the structure of vascular tissues in or around the optic nerve head, and this may be relevant to vascular theories of glaucoma.

SP015

OCULAR RESPONSE ANALYZER (ORA) PARAMETERS IN CHINESE SUBJECTS WITH GLAUCOMA

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Purpose: To evaluate ocular response analyzer (ORA; Reichert) parameters in Chinese subjects with glaucoma and compare the intraocular pressure (IOP) measured by the ORA and Goldmann applanation tonometer (GAT).
Methods: 71 Chinese subjects diagnosed to have glaucoma [primary open angle glaucoma n=26; primary angle closure glaucoma n=22; normal tension glaucoma: n=23] were recruited in this crossectional observational study. One eye of each subject had three measurements of corneal compensated IOP (IOPcc), Goldmann – correlated IOP (IOPg) and corneal hysteresis (CH) with the ORA followed by IOP measurements using GAT.
Results: Mean age of subjects was 68.7 ± 9.4 years and there were 30 females (42 %). Mean IOPcc and IOPg was17.5 ± 4.2 mmHg and 15.6 ± 4.1 mmHg respectively. Mean GAT value was 15.5 ± 3.3 mmHg. Mean IOPcc showed a moderately strong correlation with GAT measurements (r = 0.571, p<0.001). Bland-Altman plots indicated that the 95% limits of agreement between IOPcc and GAT were -9.0 to 4.9 mmHg. IOPcc values measured 2.0 ± 3.5 mmHg higher than GAT readings (p<0.001).Mean IOPg correlated well with GAT values (r = 0.632, p<0.001). Mean corneal hysteresis (CH) was 9.1 ± 1.6 mmHg (range, 5.6 – 12.9 mm Hg).
Conclusions: IOPcc measured by the ORA was consistently higher when compared with GAT values. IOPg showed good agreement with GAT values in Chinese subjects with glaucoma.

SP016

MACULAR THICKNESS VARIABILITY IN PRIMARY OPEN ANGLE GLAUCOMA PATIENTS USING OPTICAL COHERENCE TOMOGRAPHY

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Purpose: To evaluate the structural asymmetry of macula using OCT in Primary open angle glaucoma patients and normal subjects.
Methods: Prospective observational case controlled study. Of 36 subjects recruited 19 were POAG and17 controls. Subjects

underwent fast macular thickness scan ocular imaging with dilated pupil using the commercially available STRATUS OCT MODEL 3000 OCT.

Results: The mean age was 50.1 +/- 5.4 years. 66.7% of patients were male. The study groups were balanced in terms of age and gender. The macular thickness was statistically significantly reduced in the POAG group ($p<0.0001$). The average inner macular thickness was 236.7 +/- 16.1 µm among the POAG eyes corresponding to 256.2 +/- 9.6 mm among the Control eyes. The mean outer macular thickness was temporally 199.74, superiorly 217.03, nasally231.68 and inferiorly 203.58 in the POAG group and 223.84 temporally, 235.52 superiorly, 253.45 nasally and 230.68 inferiorly in the Control group and there was a statistical difference between the groups. Reduction of macular thickness at the inferior and outer macular region was statistically significant($p<0.0001$) between POAG eyes (203.6 +/- 22.8 µm) and Control eyes (230.7+/- 14.5 µm).

Conclusion: The macular thickness was statistically significantly reduced in the POAG eyes ($p<0.0001$) in the all regions and mean macular thickness were found to be significantly reduced.

SP017

COMPARISON OF INTRAOCULAR PRESSURE MEASURED BY PASCAL DYNAMIC CONTOUR TONOMETRY AND GOLDMANN APPLANATION TONOMETRY

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Purpose: To compare the intraocular pressure (IOP) measurements obtained using the Pascal dynamic contour tonometer (PDCT) with the standard Goldmann applanation tonometer (GAT) and to correlate these with central corneal thickness (CCT).

Methods: This is a prospective observational clinical study of 170 eyes from patients attending glaucoma clinic. All eyes underwent IOP measurement by GAT and PDCT followed by measurement of central corneal thickness.

Results: A clear correlation was found between PDCT and GAT ($r=0.66$; $p<0.001$). The mean IOPs recorded by GAT and PDCT were 20.8+/- 8.3mmHg and 19.7+/- 5.0 mmHg respectively. There was no statistically significant difference between the mean IOPs recorded by the two instruments. There was a good agreement between the PDCT and GAT when the IOPs were less than 21 mm HG; this means that the average difference between measurements of the two devices varied as the IOP increased. Dividing the eyes into three groups on the basis of CCT, the mean IOP recorded in the thicker corneal range by GAT showed a poor agreement with IOP recorded by PDCT. However PDCT measurements showed no significant differences with different CCT groups ($p=0.96$).

Conclusions: The two tonometers (PDCT and GAT) showed good agreement with each other. Demonstration of the relative independence of PDCT IOP measurements from CCT supports a potential clinical role for this instrument over conventional Goldmann applanation tonometer for screening and management of patients with glaucoma.

SP018

OCULAR BLOOD FLOW CHANGES POST TRABECULECTOMY: A COLOUR DOPPLER IMAGING STUDY

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Purpose: To assess effect of trabeculectomy on ocular blood flow in patients of open angle glaucoma.

Methods: Color Doppler imaging was performed in 20 patients undergoing trabeculectomy. Prospective evaluation at 2, 6, and 12 weeks post trabeculectomy was undertaken to evaluate blood flow changes in central retinal artery (CRA) and short posterior ciliary artery (SPCA).

Results: The IOP reductions of 33%.(2weeks), 31% (6weeks) and 34%(12 weeks) did not translate into a significant improvement in ocular blood flow. In the CRA, a decrease in resistive index could be documented in 10 cases and increase in mean PSV and EDV in 9 and 10 eyes respectively. In SPCA, both the PSV and EDV improved by 17% and 9% at 12 weeks. A decrease in Resistive index could be documented in only 10 cases. None of these changes were of statistical significance.

Conclusions: Our study demonstrated that the ocular hemodynamics are only partly influenced by IOP changes. A short follow up of 3 months probably influenced the results.

SP019

AGREEMENT BETWEEN SLIT LAMP EXAMINATION AND OPTICAL COHERENCE TOMOGRAPHY IN ESTIMATING CUP DISC RATIOS IN GLAUCOMA PATIENTS

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Purpose: To compare cup disc ratio measurements by optical coherence tomography[OCT] with those estimated by 2 experienced glaucoma specialists using slit lamp for evaluation of optic nerve head in glaucoma patients.

Methods: Optic nerve head of 102 eyes of 54 glaucoma patients were examined using slit lamp with a +90 D lens by 2 experienced examiners. Horizontal cup disc ratio [HCDR] and vertical cup disc ratio [VCDR] were recorded. These measurements were compared with those obtained by OCT readings.

Results: The mean HCDR [0.761±0.15] obtained by OCT was significantly higher than HCDR estimated by both the examiners by slit lamp [0.590±0.15 and 0.595±0.15, p value <0.001].The mean VCDR [0.698±0.14] obtained by OCT was also significantly higher than VCDR estimated by 2 examiners by slit lamp [0.532±0.13,0.526 ±0.14,pvalue<0.001]. The CDR difference between two examiners was not statistically significant.

Conclusions: The measurements obtained from OCT differ significantly from those obtained by subjective evaluation of optic nerve head by both the examiners using slit lamp .This difference needs to be considered

SP020

COMPARISON OF VISUAL FIELD DEFECTS AND RETINAL NERVE FIBRE LAYER (RNFL) ANALYSIS BY OPTICAL COHERENCE TOMOGRAPHY (OCT) IN ESTABLISHED CASES OF GLAUCOMA

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Purpose: To correlate the average retinal sensitivity of the superior and inferior hemifield on 24-2 programme of Humphrey's Field analyzer(HFA) with the average retinal nerve fibre layer thickness of the inferior and superior quadrants respectively in optical coherence Tomography(3.4 fast RNFL scan).

Methods: In a prospective study 18 diagnosed patients of POAG having BCVA of equal to or better than 6/18 were subjected to 24-2 HFA test with undilated pupils followed by fast RNFL thickness (3.4) scan in OCT under dilation. Average retinal sensitivity was calculated for superior and inferior hemifields in all cases and compared to the average RNFL thickness of inferior and superior quadrants in 3.4 Fast RNFL scan on OCT.

Results: In total, 34 eyes of 18 patients were analysed. A statistically significant correlation was found between superior visual field and inferior RNFL thickness (Linear regression analysis r2 .183, $p < .05$). There was no significant correlation between inferior visual field and superior RNFL thickness.

Conclusion: A statistically significant correlation was found between superior visual field sensitivity and inferior RNFL thickness

SP021

EVALUATION OF BLOTCHY PIGMENTS IN THE ANGLE AS A SIGN OF PRIMARY ANGLE-CLOSURE (PAC)

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Purpose: To assess the diagnostic capability of blotchy pigments in the angle as a sign of primary angle closure

Methods: Prospective study of 382 open angle and 80 angle closure subjects. Subjects over 35 years of age who cooperated for gonioscopy were included. Subjects with a history of intraocular surgery, trauma or psuedoexfoliation were excluded. All subjects underwent a complete ophthalmic examination. Gonioscopy was done by three consultants and one glaucoma fellow using a Sussman's four-mirror gonioscope under standard conditions. Primary angle closure was defined as occludable angles (^{3} 1800) with either blotchy pigments in the angle, goniosynechiae, increased IOP or a combination of these. The site of blotchy pigments in the angle was documented. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and the positive likelihood ratio of blotchy pigments as a sign of angle closure were evaluated.

Results: Prevalence of blotchy pigments in open angles was 5.75% (95% CI, 3.4-8.1) and prevalence of blotchy pigments in PAC was 38.75% (95% CI, 28.82-49.71%). The presence of blotchy pigment in superior angle had sensitivity and specificity of 12.5 % (95% CI, 6.93–21.5) and 99.48% (95% CI, 98.11–99.86) respectively. Positive LR for blotchy pigmentation in the angle was 6.73 (95%

CI, 4.12-11) and for blotchy pigmentation in the superior angle was 23.87 (95% CI, 5.33-106.88).
Conclusion: Blotchy pigments can be seen in open angles too and their presence in the superior angle is highly specific for primary angle closure

SP022

STUDY OF ULTRASOUND BIOMICROSCOPIC PARAMETERS IN FAMILY MEMBERS OF PRIMARY ANGLE-CLOSURE GLAUCOMA PATIENTS

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Purpose: To identify treatable cases among family members of primary angle closure glaucoma (PACG) patients.
Methods: 46 PACG patients and their 184 family members underwent angle measurement on Ultrasound biomicroscopy.
Results: Affected family members (26.5%) had trabecular iris angle (TIA) of 6.45±4.9°, angle opening distance of 0.037±0.6mm and 0.104±0.9mm at 250μ and 500μ respectively as compared to 22.3±7.8°, 22.7±9.2°, 0.131±0.10mm, 0.303±0.19mm in unaffected (p=0.0001). Angle recess area was 0.069±0.05mm^2 in affected and 0.174±0.12 in unaffected family members.
Conclusion: UBM is an important tool for screening of family members of PACG patients.

SP023

CROSS-SECTIONAL ANATOMIC CONFIGURATIONS OF PERIPAPILLARY ATROPHY EVALUATED WITH SPECTRAL-DOMAIN THREE-DIMENSIONAL OPTICAL COHERENCE TOMOGRAPHY

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Purpose: Peripapillary atrophy (PPA) is known to be associated with glaucomatous optic neuropathy, especially normal-tension glaucoma. We aim to evaluate the vertical cross-sectional configurations of PPA in normal subjects using spectral domain optical coherence tomography (SD-OCT).
Methods: Normal subjects recruited had complete ophthalmic examination including optic disc imaging with SD-OCT. PPA-alpha and PPA-beta were identified from colour disc photographs. B-mode images obtained with SD-OCT were subjectively analyzed.
Results: 120 ophthalmologically normal eyes (61 males and 59 females) were recruited. Age averaged 53+/-16 years, spherical equivalent refractive error -0.46+/-1.8 diopters, axial length 23.73+/-1.04mm and IOP 13.9+/-2.2mmHg. All eyes (100%) had PPA-alpha and 90 eyes (75%) had PPA-beta. Based on SD-OCT images, the cross-sectional configurations of the retinal pigment epithelium/Bruch's membrane complex and sclera corresponding to PPA were classified as flat, slope, step and others with frequency of 65%(78/120), 70.8%(85/120), 5%(6/120) and 13.3%(16/120) respectively. There was significantly more flat in eyes with PPA-beta than eyes without PPA-beta (p=0.0001). Age was significantly correlated to frequency of flat (p=0.005) while gender and refraction were not. The step configuration was associated with myopia and longer axial length (p=0.0014 and 0.0105 respectively).
Conclusion: Using SD-OCT, we were able to describe and classify the cross-sectional anatomic configurations of PPA.

SP024

NEURORETINAL RIM AND OPTIC DISC-CUP STRUCTURES: CORRELATIONS REVEALED BY STRATUS OPTICAL COHERENCE TOMOGRAPHY

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Purpose: To investigate the optic nerve head (ONH) using Stratus optical coherence tomography (OCT) and to analyze correlations between neuroretinal rim and optic disc-cup structures in a healthy Taiwan population.
Methods: One hundred and two healthy individuals (sixty females and forty-two males) were enrolled in this cross-sectional study. In each subject, one eye was randomly selected for analysis, and all measurements were performed by a single skilled technician. The ONH parameters of the neuroretinal rim and the optic disc-cup structures (disc or cup sizes and cup-to-disc ratios) were measured. The associations between neuroretinal rim parameters and optic disc-cup structure parameters were determined.
Results: Individual age and cup-to-disc ratios correlated negatively with neuroretinal rim parameters ($p < 0.05$). Correlation analysis

indicated that the rim thickness parameter (average nerve width, ANW) was independently associated with disc diameter ($p = 0.659$) and area ($p = 0.415$); the rim area parameters, horizontal integrated rim width (HIRW) and rim area (RIA), were independently associated with cup diameter as well as cup area, including HIRW (diameter, $p = 0.262$; area, $p = 0.995$) and RIA (diameter, $p = 0.387$; area, $p = 0.276$). Stepwise regression analysis revealed that, of the neuroretinal rim parameters, only ANW was not significantly associated ($p > 0.05$) with optic disc-cup structure parameters.

Conclusions: Neuroretinal rim parameters correlate positively with disc size but negatively with cup size and cup-to-disc ratios. Of the neuroretinal rim parameters, only ANW is unassociated with optic disc-cup structures.

SP027

PERFORMANCE OF HUMPHREY MATRIX 24-2 AND STANDARD AUTOMATED PERIMETRY (SAP) INDICES ON GLAUCOMA DISCRIMINATION

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Purpose: To evaluate and compare performance of Matrix and SAP indices on glaucoma discrimination

Methods: 189 eyes of 189 subject who had SAP, Matrix, optical coherence tomography (OCT) and GDx VCC were retrospectively analyzed. Mean deviation (MD) and pattern standard deviation (PSD) were compared between Matrix and SAP. Agreement of two diagnostic criteria, PSD<5% and abnormal glaucoma hemifield test (GHT) was assessed using kappa statistics. All eyes were classified into 4 groups, G1 (PSD<5% or abnormal GHT in SAP), G2 (PSD<5% and abnormal GHT in SAP), G3 (PSD<5% or abnormal GHT in Matrix), G4 (PSD<5% and abnormal GHT in Matrix). Normative classification of OCT average RNFL thickness and Nerve fiber indicator (NFI) of GDx VCC were used for defining glaucoma. Glaucoma discrimination capability was analyzed by area under the receiver operating characteristics (AROC) in 4 groups.

Results: There was a significant correlation of MD and PSD between Matrix and SAP (R=0.78, 0.77). The agreement of PSD<5% and abnormal GHT was excellent in SAP but poor in Matrix (kappa=0.85, 0.14). AROC of G1, G2, G3 and G4 were 0.71, 0.75, 0.54, 0.65 using GDx NFI>40 as glaucoma definition, 0.72, 0.77, 0.55, 0.70 using OCT average RNFL thickness as glaucoma definition.

Conclusions: Agreement between abnormal GHT and PSD<5% was poor in Matrix. When either of these two criteria was used, glaucoma discrimination capability was poor in Matrix. Combining two criteria improved discrimination capability in both SAP and Matrix.

SP028

COMPARISON OF STRUCTURAL AND FUNCTIONAL RELATIONSHIP IN GLAUCOMA BETWEEN STANDARD AUTOMATED PERIMETRY (SAP) AND HUMPHREY MATRIX

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Purpose: To evaluate and compare the correlation of structural and functional loss assessed by optical coherence tomography (OCT), GDx VCC, SAP and Matrix

Methods: 93 glaucomatous eyes based on SAP and 119 on Matrix were independently classified into 3 groups, G1 (MD>-6dB), G2 (-12<MD<-6dB) and G3 (MD<-12dB) by mean deviation (MD) of each test. Average and sectoral RNFL thickness and percentage of abnormal classification by internal normative database assessed by OCT and GDx VCC were compared among each 3 groups.

Results: Average RNFL thickness assessed by OCT were 96.3, 79.6, 59.3microns in G1, G2, G3 classified by SAP, 97.1, 88.5, 65.1microns by Matrix. Nerve fiber indicator (NFI) values of GDx VCC were 36.9, 53.8, 76.6 in G1, G2, G3 by SAP, 34.7, 44.7, 68.0 by Matrix. In SAP groups, RNFL thickness in nasal and temporal quadrants of OCT, inferior average of GDx VCC were not different between G1 and G2 (p=0.12, 0.66, 0.18). In Matrix groups, all measurement parameters were not different between G1 and G2 except for average and inferior RNFL thickness of OCT and NFI of GDx VCC (p=0.01, 0.00, 0.03). In comparison of abnormal classification, all measurement parameters were significantly different in both SAP and Matrix groups except for nasal RNFL thickness of OCT (p=0.26, 0.11).

Conclusions: SAP groups showed good correlation of structural and functional defect assessed by OCT and GDx VCC. This correlation was weaker in Matrix groups than SAP groups, especially in early stage of glaucoma.

SP029

ABILITY OF STRATUS OCT TO DETECT PROGRESSIVE RETINAL NERVE FIBER LAYER ATROPHY IN GLAUCOMA

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Purpose: To evaluate the ability of Stratus optical coherence tomography (OCT) to detect progressive glaucomatous retinal nerve fiber layer (RNFL) atrophy observed using red-free RNFL photography.

Methods: Intersession test-retest variability of each clock hour, quadrant and average RNFL thickness was determined using 53 control subjects. The sensitivity and specificity of OCT for identifying progressive RNFL atrophy were tested on subjects with progressive RNFL atrophy clearly observed in red-free RNFL photographs (n=27) and another control subjects (n=62) using criteria derived from the test-retest variability. In addition, the topographic relationship between the OCT-measured RNFL thickness change and the progressive RNFL atrophy according to RNFL photography was examined.

Results: When tested with criteria set at upper 95% confidence limit, the sensitivity of Stratus OCT RNFL measurement ranged from 14.8 % (for average RNFL thickness) to 85.2 % (for clock hour thickness). While the specificity was around 95% for average RNFL thickness, the specificity decreased considerably for the clock hour (59.7%) or quadrant thickness (77.4%), which is presumably due to the multiple testing for multiple clock hours or quadrants. The specificities for the clock hour and quadrant thickness increased to 86.6 % and 92.5 %, respectively when calculated based on 2 consecutive follow-up examinations. The OCT-measured RNFL thickness change showed excellent topographic agreement with the progressive RNFL atrophy observed using RNFL photography.

Conclusions: Stratus OCT can detect progressive RNFL atrophy with high sensitivity and moderate specificity. The specificity may be improved by repeated testing. Stratus OCT may be potentially useful for detecting glaucoma progression.

Normal Tension Glaucoma

SP031

PRESENCE OF SILENT CEREBRAL INFARCT (SCI) IS ASSOCIATED WITH DISEASE PROGRESSION IN NORMAL TENSION GLAUCOMA (NTG)

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Purpose: Silent Cerebral Infarct (SCI) is a neuroimaging feature implying small-vessel occlusion without clinical stroke. Studies have suggested SCI is associated with NTG, migraine, and obstructive sleep apnea; SCI in basal ganglia may predict generalized atherosclerosis in carotid and coronary arteries. We investigated the association between SCI and visual-field progression in NTG.

Methods: Presence of SCI was determined by computed tomographic (CT) brain scans for 286 untreated Chinese NTG patients. 64 were positive for SCI. Subjects were prospectively followed for 36 months. Field progression was defined with established criteria. Kaplan-Meier survival and Cox proportional hazards analysis were performed.

Results: Baseline median, maximum, and fluctuation of office intraocular pressures (IOP), central corneal thickness (CCT), and presenting visual field indices were not significantly different between those with or without SCI. An older mean age was noted in those with SCI (72.4 vs. 63.2 years-old; $p<0.0001$). Cox regression showed that the presence of disc hemorrhage (hazard ratio [HR] = 2.28; 95%CI = 1.54–3.37), SCI (HR = 1.61, 95%CI = 1.09–2.36), systemic hypertension (HR = 1.48, 95%CI = 1.04–2.10) and thinner CCT (for every 30μm decrease conferred HR = 1.35, 95%CI = 1.16 –1.75) were associated with field progression. Age was not significant in the regression model. The commonest site for SCI in NTG was basal ganglia, and significantly more of them showed disease progression.

Conclusions: SCI is a potential independent risk factor associated with disease progression in NTG. The role of atherosclerosis and small-vessel disease in pathogenesis of NTG warrants further studies.

SP032

NORMAL TENSION GLAUCOMA AND METABOLIC SYNDROME IN KOREA

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Purpose: Recently, metabolic syndrome has been emphasized because it was served as the independent risk factor of cardiovascular events. And patients with normal tension glaucoma (NTG) have been thought to have some vascular dysregulations, which are one of the features of metabolic syndrome.

Methods: We retrospectively reviewed all medical records of patients who were or over 40 and received annual health check-up, including ocular examinations (nonmydriatic color fundus photography and intraocular pressure measurement) at Seoul National University Hospital Health Care System in 2007.

Results: The number of eligible patients was 18373. The metabolic syndrome was present in 3121 subjects (17.0%) and NTG was present in 287 subjects (1.6%) according to our diagnosing criteria. In NTG group, prevalence of metabolic syndrome was 20.9% whereas 16.9% in control group. But this result could not statistically contribute metabolic syndrome to NTG. (OR 1.20 [CI 0.90, 1.61]). In multivariable models adjusted for age and sex, the components of metabolic syndrome had no statistically significant associations with NTG. Only elevated fasting glucose level (>110mg/dl) has marginally significant association with normal tension glaucoma (OR 1.35 [CI 0.99, 1.83], p=0.0710)

Conclusions: There's no statistically important relation between metabolic syndrome and NTG. Only elevated fasting glucose level had marginally significant association with normal tension glaucoma.

Primary Open-Angle Glaucoma

SP033

PHAKOMATOSIS PIGMENTOVASCULARIS ASSOCIATED WITH STURGE-WEBER SYNDROME

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Purpose: To report an unusual case of Phakomatosis pigmentovascularis associated with Sturge-Weber Syndrome

Methods: An 8-year-old girl with Sturge-Weber syndrome-associated seizure was referred to the ophthalmology department for ocular examination. She did have nevus flammeus on both portions of the face, neck, chest, and both arms that was present from birth. Characteristic bluish pigmentation was observed in both episclera. Intraocular pressures in both eyes were high.

Results: After instillation of topical prostaglandin analogue, intraocular pressure decreased to the normal limits.

Conclusion: It is necessary to perform a careful ophthalmic evaluation in those patients because of the likelihood of having a congenital or juvenile glaucoma, especially for an infant with phakomatosis pigmentovascularis associated with Sturge-Weber syndrome.

SP034

INCIDENCE AND RISK FACTORS OF VISUAL FIELD PROGRESSION IN PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: To estimate the incidence of visual field progression and to determine risk factors for visual field progression in Primary Open Angle Glaucoma (POAG) patients under follow up at University Malaya Medical Centre (UMMC)

Methods: Retrospective study. The Advanced Glaucoma Intervention Study (AGIS) visual field score was applied to Humphrey visual field printouts of 100 patients with POAG who had at least 5 years of follow up. Eyes with other ocular diseases apart from cataracts were excluded. Pertinent demographic and clinical factors such as baseline and current intraocular pressure (IOP), Cup:Disc Ratio (CDR),

Mean Deviation (MD), Pattern Standard Deviation (PSD), number of antiglaucoma medications, cataract surgery and trabeculectomy were evaluated for statistical association with visual field progression.
Results: In 7.4 ± 1.8 years of follow-up, the incidence of VF progression was 17%. Baseline variables were: IOP -22.15 ± 4.51mmHg, CDR 0.59 ± 0.17, MD -6.00 ± 4.67dB, PSD 4.07 ± 2.93dB, AGIS score 4.42 ± 4.67. The average IOP throughout follow up was 15.70 ± 2.09mmHg. VF progression was not associated with any of the variables investigated
Conclusion: Our study population demonstrated a lower rate of visual field progression compared to other studies. No significant risk factors could be associated with visual field progression

SP035

THE STUDY OF CORRELATION BETWEEN CENTRAL CORNEAL THICKNESS AND SEVERITY OF PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: To evaluate whether glaucomatous visual field damage in patients with Primary open angle glaucoma (POAG) is correlated with central corneal Thickness.
Methods: This cross sectional study included 119 patients (225 eyes) with POAG. Whole sample was divided into three groups each according to Mean deviation (MD) values(Humphrey visual field rating criteria from Hodapp, Parrish and Anderson) (16) & according to CCT - thinner corneas- ≤520μ (GAT is calibrated for this CCT),adequate corneas- >520μ & ≤555μ(Alteration of CCT within this range will not have measurement significant effect)(17, 18) & thicker corneas- >555μ.
Results: Our study showed a significant association of thinner corneas with severe glaucoma (p =0.024) as compared to mild and moderate groups. This was not true for mild and moderate groups (p = 0.663). All indicators of severe disease had significant difference in three damage groups as expected but age and measured GAT readings (measured IOP values) did not show any difference p=0.915, One way ANOVA & p=0.185, Kruskall-Wallis test respectively
Conclusions: All eyes with severe damage had an association with thinner corneas. But whether all thinner corneas will progress to severe damage could not be answered from this study; it needs a longitudinal study to answer this question.

Secondary Glaucoma

SP036

TREATING OF NOT COMPENSATED SECONDARY GLAUCOMA IN PATIENTS WITH DIABETES MELLITUS

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Purpose: Now in Russia is about 17,8 million pations with diabetes mellitus. Frequency and the severity of many complicating diseases of diabetes are related not only to duration of a disease, but also with degree of improvement of skill level of glucose.
Methods: In Sep. 2007 - Mar. 2008 it has been opereited 12 of a patients (5 men and 7 womens), the midlife of which was 56,2+5,6 years. All of a patients was operated with valve implantation of Achmed (the model "FP-7 was performed" it has been implanted 4 of a patients, "FP-8" - 8 of a patients).
Results: In all patients in postoperative period was obtained the resistant reducing the height of intraocular pressure, which reliably has been different from such as they enters. Is heeding the slight increase of level the intraocular pressure 30 days after dealing with subsequent the coming around to level on seventh the day following operations. Judging from appearance, it can be linked with shock of ciliary body immediately after interference and reduction its function of 30 days after interference.
Conclusion: The utilization of drainage system the Ahmed valve, may be effectively be used in patients by the diabetes mellitus in case of proliferative diabetic retinopathy with secondary pain secondary glaucoma.

SP037

BILATERAL ACUTE ONSET MYOPIA AND ANGLE-CLOSURE GLAUCOMA IN A YOUNG PATIENT RECEIVING ORAL TOPIRAMATE: A CASE REPORT

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Purpose: To describe bilateral acute onset myopia and angle-closure glaucoma as ocular adverse effects of topiramate.
Methods: Case report.
Results: Case presentation: A 23 year-old woman developed bilateral severe blurred vision seven days after initiating therapy with topiramate. Her visual acuity was counting fingers in both

eyes. Intraocular pressures were 33 mmHg and 32 mmHg in the right and left eyes, respectively, with conjunctival chemosis, corneal edema, shallow anterior chambers, and closed angles. Her refraction was -7.50 diopters in both eyes. The symptoms and clinical findings resolved completely upon discontinuation of topiramate and administration of antiglaucoma drugs.

Conclusions: Topiramate use can result in acute bilateral angle-closure glaucoma and myopia which are usually reversible upon cessation of the drug. Visual outcome is usually good and the episode resolves within a few weeks. Thus, it is important for clinicians to recognize these conditions and educate patients about these serious adverse effects when prescribing topiramate.

SP038

ZONA GLAUCOMA: DIAGNOSIS AND TREATMENT

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Purpose: Some considerations on treatment of Zona Glaucoma (ZG)

Methods: Compare trabeculectomy and medical treatment on ZG by monitoring visual acuity and intraocular pressure.

Results: The patients have restored vision and have normalized intraocular pressure, and some satisfying results were reported here after one year follow- up.

Conclusions: Zona glaucoma (ZG) commonly caused by uveitis with or without blockage pupil or obstructed trabecular meshwork. Accumulation of macrophages in severe inflammation over a short period of time may acutely obstruct the meshwork and result in transient elevation of intraocular pressure in association with exercise of dilation of pupil, then ZG can be treated by medicaments and may be not need surgery. A randomize clinical trial study with many patients should be done to confirm this result.

SP039

COMPARATIVE STUDY ON CONTACT DIODE LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION AND AHMED GLAUCOMA VALVE IN THE MANAGEMENT OF NEOVASCULAR GLAUCOMA

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Purpose: To compare the effectiveness of contact diode laser transscleral cyclophotocoagulation with Ahmed Glaucoma Valve implantation in the management of medically uncontrolled neovascular glaucoma.

Methods: Twenty-one consecutive patients diagnosed with neovascular glaucoma and having at least light perception at presentation, whose intraocular pressure remains greater than 21 mmHg despite maximally tolerated anti-glaucomatous medications were randomized to receive either contact diode laser transscleral cyclophotocoagulation or Ahmed Glaucoma Valve implantation.

Results: Mean intraocular pressure reduction of 64.3% and 64.7% at a mean followup duration of 29.8 months was achieved with cyclophotocoagulation and Ahmed Glaucoma Valve, respectively. At the last visit, 75% of the cyclophotocoagulation patients and 50% of the Ahmed Glaucoma Valve patients had intraocular pressure of 21 mmHg or less ($p=0.37$). Loss of light perception and phthisis bulbi was found in 14.3% and 0% in the cyclophotocoagulation group, and, 36.4% and 16.6% in Ahmed Glaucoma Valve group, respectively.

Conclusions: Both cyclophotocoagulation and the Ahmed Glaucoma Valve achieved similar mean intraocular pressure reduction. Although cyclophotocoagulation had higher success in lowering the intraocular pressure to 21 mmHg or less, this was not statistically significant. Cyclophotocoagulation was, however, associated with a lower incidence of total blindness or phthisical change.

SP040

DETECTION OF HERPES SIMPLEX VIRUS IN PSEUDOEXFOLIATION SYNDROME

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Purpose: Pseudoexfoliation syndrome (PEX) is one of the most common identifiable causes of open angle glaucoma with unknown etiology and pathogenesis. Infection, possibly viral is one of the proposed pathogenic mechanisms in this condition. In this study the presence of herpes simplex virus (HSV) in specimens of anterior lens capsule of PEX patients has been searched

Methods: The presence of HSV- DNA was searched by PCR method in specimens of anterior lens capsule(5mm diameter) of 50 patients with PEX (study group) and 50 patients without it(control group) whom underwent cataract or combined cataract and glaucoma surgery during one year(2006)in Khalili Hospital, Shiraz, Iran.

Results: HSV Type I DNA was detected in 18% of study group (SG) compared with 2% in age and sex matched control group (CG). This finding was statistically significant (P = 0.01). The difference between ranges of intraocular pressure (IOP) in two groups was not statistically significant

Conclusions: Result of this study suggests the possible relationship between HSV Type 1 and PEX syndrome. It may be a treatable etiology in this multi factorial disorder and may help to future management of these patients specially to prevent some of its complications.

SP041

PREVALENCE AND MANAGEMENT OF GLAUCOMA IN PATIENTS UNDERGOING OSTEOODONTO KERATOPROSTHESIS (OOKP)

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Purpose: To assess the prevalence and risk factors for glaucoma in patients undergoing OOKP for refractory corneal blindness and to report on their management.

Methods: Retrospective case series. (March 2003-March 2008).

Results: 54 patients underwent the procedure: it was complete in 49 and incomplete in 5.M:F 27:27, age 16-53 years. Indications included chemical burns 18, Steven Johnson syndrome 22, others 14. Glaucoma was diagnosed in 19 eyes (35.1%).Of these, 15 (27.7%) were diagnosed pre-OOKP (defined as IOP>25 mmHg, moderate or high IOP measured digitally.) Ultrasound biomicroscopy was possible in 14 eyes prior to surgery. Pre-existing angle closure on UBM was seen in 11(57%) eyes with glaucoma; 3 with normal anterior segments had normal intraocular pressure. 9 (50%) eyes with chemical burns developed glaucoma compared to 10 of the remainder(O.R 2.1: 95% C.I 1.04-4.3) Successful control of IOP was possible in 5 of 6 eyes (83.3%) with Ahmed valve implants medical treatment and Diode cyclophotocoagulation+ medical treatment was used in 7 eyes(36%),the rest were managed with medications alone. Successful IOP control (IOP<21, normal or low digital IOP at the final visit) was possible in 16; 3 were failures. Visual acuity of >6/12 was achieved in 7 eyes (36.8%), 6/18-6/60 in 4 eyes (21%) ;< 6/60 in 6 eyes (31.5%) of those with glaucoma.2 lost light perception. Mean follow up was 14.6(S.D 8.1) months.

Conclusions: Pre-existing glaucoma is common in those undergoing OOKP. Chemical burns are a significant risk factor for glaucoma in this group.

SP042

EPIDEMIC DROPSY GLAUCOMA — A 7 YEAR FOLLOW UP

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Purpose: To assess the effect of an episode of Epidemic dropsy ocular hypertension after 7 years.

Methods: Fourteen patients who had been afflicted with high intraocular pressures (IOP), retinal bleeds and systemic features of epidemic dropsy were reviewed over a period of 7 years. IOP, gonioscopy, fundus exam, Humphrey 24-2 visual fields were performed yearly.

Results: Healthy adults (age 6- 35 years), who had suffered from epidemic dropsy glaucoma during 1998-99 Delhi outbreak were studied. The IOP in all 14 cases was > 40 mm Hg and persisted for 3- 6 weeks during the acute glaucoma episode. Glaucoma control was established with systemic Acetazolamide, Mannitol and Beta blockers. Systemic corticosteroids were required in 36%. One patient underwent mitomycin augmented trabeculectomy OU. All cases had documented significant visual field defects during the acute phase but at 6 months after clearing of pedal edema (a classical sign of active dropsy), the visual fields of all were clear and IOP normal. The situation remained similar at yearly follow

up's. The trabeculectomy case (35 year lady) developed cataracts necessitated phacoemulsification after 6 years. Post operative corrected vision was 20.20 OU with no residual optic nerve head or visual field damage.

Conclusion: Epidemic dropsy causes severe ocular hypertension which if controlled during the acute phase, does not lead to a long term sequel.

SP043

EVALUATING THE MANAGEMENT OF NEOVASCULAR GLAUCOMA: OLD FASHIONED TO THE ROLE OF ANTI-VEGF

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Purpose: The aim of the study is to evaluate the characteristics and management of neovascular glaucoma in RSCM as there is a new invention in managing neovascular glaucoma.

Methods: This is a retrospective study analyzing data of neovascular glaucoma patients who came to RSCM from Jan 2006 – until May 2008.

Results: There were 33 persons included in the study, 2 persons had bilateral neovascular glaucoma. Most of them (66.7%) were men and 51.5% were between 40 – 60 years old. The presenting IOP were usually high, 57.6% above 50 mmHg and the visual acuity in most cases (75.8%) were hand movement or light perception. The underlying ocular causes were predominantly by Diabetic retinopathy (33.3%) and CRVO (12.1%). Twelve percent of the patients underwent only panretinal photocoagulation and the same number of patients did trabeculectomy. Anti VEGF injection was done in 14.3% patients. Of all patients managed in RSCM, 50% reached IOP less than 20 mmHg and only 8% more than 30 mmHg.

Conclusions: Diabetic retinopathy is the main causes of neovascular glaucoma and most of the patients came in late stage. The appropriate management of neovascular glaucoma will decrease the IOP and lessen the pain.

Basic Research

SP044

ACTIVATION OF FOCAL ADHESION KINASE AND UPREGULATION OF CONNECTIVE TISSUE GROWTH FACTOR IN TGF-β-STIMULATED HUMAN TENON'S FIBROBLASTS

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Purpose: To investigate the role of focal adhesion kinase (FAK) and connective tissue growth factor (CTGF) for TGF-β-induced fibrosis in primary cultured human Tenon's fibroblasts.

Methods: The extent of cell proliferation was measured by the latate dehydrogenase assay. Using the Western blots, transition from fibroblasts to myofibroblasts was detected by the presence of α-smooth muscle actin (α-SMA).Production of various extracellular matrix (ECM) was assessed by the expression of type I collagen and fibronectin. For intracellular signaling pathways, levels of FAK, phospho-FAK, and CTGF were determined.

Results: Compared to control, the expression of α-SMA, type I collagen, and fibronectin were highly up-regulated 12 hours after exposure to 5 ng/mL TGF-β1 in Tenon's fibroblasts. Phospho-FAK and CTGF were also increased markedly at similar time points. They were increased as time passed. In contrast, the level of total FAK showed only a slight increase.

Conclusion: It seems that activation of FAK pathway and up-regulation of CTGF are closely associated with the abnormal transition from normal fibroblasts to myofibroblasts and ECM synthesis in TGF-β1-stimulated Tenon's fibroblasts.

SP045

PAX6 GENE MUTATIONS AND CLINICAL FEATURES IN KOREAN ANIRIDIA PATIENTS

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Purpose: To report the PAX6 mutations and clinical features in Korean aniridia patients.

Methods: Genomic DNA was isolated from 12 aniridia patients and 5 normal controls. The coding regions of PAX6 gene were analyzed

by direct sequencing of polymerase chain reaction products. Relationship between mutational types and ophthalmic fiindings from medical records were identified.

Results: Mutation analysis demonstrated seven different types of mutations, five of which were not previously reported. Peculiarly, these mutations were confined to the paired domain and the linker domain in PAX6 gene. Although R44X and W156X were recurrent mutations, novel mutations were c.414G>A (in exon 5), IVS6+1insG (in intron 6), c.777G>C (in exon 7), c.779A>C (in exon 7), and c.785C>A (in exon 7). Glaucoma was diagnosed in five (42%, adult patients aged 30 years or older) of twelve patients and four of them were male patients.

Conclusions: This is the first report to identify the PAX6 gene mutations in Korean aniridia patients. R44X was the first revealed mutation in familial aniridia in Korean populations. Our limited data show that glaucoma was more prevalent in male and adult patients. Also, patient's age along with PAX6 genotype might be one of factors related with glaucoma in aniridia.

SP046

EFFECT OF TOPICAL CARBONIC ANHYDRASE INHIBITORS ON CULTURED HUMAN CONJUNCTIVAL CELLS

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Purpose: We studied the inhibitory effect of two commercial ophthalmic solutions of cabonic anhydrase inhibitors (CAIs) on human cultured conjunctival cells proliferation.

Methods: Human cultured conjunctival cells (clone 1-5c-4, Dainippon Sumitomo, Japan) were seeded at 4000 cells per well on the 96-well plates, and each drug was administered after 24 hours. Ophthalmic solutions used in this study were brinzoramide (Azopt® : Alcon, USA) and dorzoramide (Trusopt® : Banyu, Japan) and timolol (Timoptol® : Banyu, Japan) was served as a control. These drugs were diluted with the medium so that the final concentrations became 1/300, 1/100 and 1/30, and 10 μL of each solution was administered. Experiments were performed at 24 hours after drug administration: Experiment 1: Cell morphology: examined by phase-contrast microscopy; Experiment 2: Cell counts: scanned by fluorescence microscopy after Hoechst 33342 staining and then counted by Software "Image J"; and Experiment 3: Cell activity: measured via absorbance after reaction with WST-8.

Results: Experiment 1: Decreased cell count and deformed cell morphology were evident at a concentration of 1/30 in brinzoramide -treated groups, while they were well maintained in dorzoramide -treated groups. Experiment 2: At concentrations of 1/30, dorzoramide -treated group showed a significantly increased number of cells as compared with timolol and brinzoramide -treated groups (unpaired t-test: $p<0.005$, 0.0001 respectively). Experiment 3: At concentrations of 1/30, dorzoramide -treated group showed significantly higher values than timolol and brinzoramide -treated groups (unpaired t-test: $p<0.0005$, 0.0001 respectively).

Conclusion: Dorzoramide exerts less inhibitory effect on the cell parameters examined than brinzoramide and timolol do.

SP047

ANALYSIS OF MYOC GENE MUTATION IN KOREAN GLAUCOMA PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: Myocillin (MYOC) is first gene identified to be involved in primary open angle glaucoma (POAG). MYOC gene mutation have been shown to be associated with POAG, especially in its juvenile oneset POAG. The MYOC gene is mutated in 3-4 % POAG patients. To investigate the mutation prevalence in Korea, we performed a mutation analysis in 50 unrelated Korean patients.

Methods: All coding exons 1-3, promoter region, and flanking introns of MYOC gene were screened for sequencing alterations by polymerase chain reaction and direct DNA sequencing.

Results: Five sequence variants were observed in the MYOC gene in 50 Korean POAG patients. : promoter region -83 position (10%), Gly12Arg (4%), Arg46ter (4%), Arg76Lys (6%). And, one subject had a novel MYOC Pro370Pro variant (synonymous codon change). The single polymorphism (SNP) in intron 2 (IVS2+32) of MYOC gene were detected in 44% patients.

Conclusion: The highly probable for disease-causing mutations, namely Arg46ter, among MYOC sequence variants was found at the rate of 2/50 (4%) probands, similar to previous reports with other ethnic populations.

SP048

PROPTEOMICS-BASED IDENTIFICATION OF AUTOANTIBODY AGAINST VCP, ALPHA-ENOLASE, AND COLLAGEN VI IN PATIENTS WITH GLAUCOMA

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Purpose: To analyze the autoimmune response to optic nerve tissue and to identify antigens associated with autoantibodies to optic nerve proteins in glaucoma patients.

Methods: We have screened the sera of 38 patients suffering from primary open angle glaucoma and normal tension glaucoma and compare with the sera of healthy control and other eye diseases patients. (POAG n= 25, NTG n= 13, healthy control n= 22, cataract n= 11, diabetic retinopathy n= 9) Western blot analyses against bovine optic nerve antigens were used to detect the autoantibodies present in the patients' sera. The proteins reacted with patient's antibodies were analyzed by LC-MS/MS.

Results: All subjects showed different and complex antibody patterns. Glaucoma patients showed specific up-regulations of antibody reactivities compared to the control group and other eye diseases group. The identified antigens in this experiment were valosin-containing protein (VCP), alpha-enolase, and collagen VI.

Conclusions: Using bovine optic nerve antigen, we are able to demonstrate that complex IgG autoantibody patterns exist in sera of patients with glaucoma. These findings indicate that VCP, alpha-enolase, and collagen VI are potential candidate antigens targeted by the serum antibodies in patients with glaucoma. The autoantibody for VCP we detected was found at the rate of 8/25 (32%) and 1/13 (7.7%) in serum of POAG and NTG patients, respectively.

SP049

THE NEUROPROTECTION OF GROSS SAPONIN OF TRIBULUS TERRESTRIS (GSTT) ON THE RABBIT EYES WITH HYPER-INTRAOCULAR PRESSURE

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Purpose: To observe the effects of Gross Saponin of Tribulus Terrestris (GSTT) on the retina ganglion cell (RGC) of rabbit with Hyper-intraocular Pressure (HIOP).

Methods: 30 healthy New Zealand rabbits were randomly divided into 3 groups: normal control group, HIOP untreated group, HIOP treated with GSTT group. HIOP was induced by 20g•L-1 methylcellulose injection into the anterior chamber. 5 mg/kg GSTT was intravenous injected in the GSTT group every day. After 28 days, the rabbits were sacrificed and the eyeballs were removed for retina SOD and NO detecting and RGC apoptosis cells counting.

Results: Statistical significance was found in the SOD content, NO content and apoptosis percentage of three groups ($P<0.05$).

Conclusion: GSTT may protect RGC against HIOP and prevent it from apoptosis.

SP050

ANTERIOR SEGMENT VEGF EXPRESSION IN EXPERIMENTAL NEOVASCULAR GLAUCOMA MODEL

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Purpose: Neovascular glaucoma (NVG) is a major visual threatening complication of various ischemic ocular disease including diabetic retinopathy and central retinal vein occlusion (CRVO).VEGF is known to be increased in ocular neovascular disease. In this study, we tried to establish NVG model in rabbit eye by 3 different methods. We also evaluated change of anterior segment VEGF expression.

Methods: 1.2kg weighted male Newzealand white rabbits were used. To establish an NVG model, 3 different surgical methods were tried. For group 1, two long ciliary arteries were cauterized to make anterior segment ischemia model. For group 2, 3 vortex veins were cauterized to make anterior segment congestion model. For group 3, 4 major branch retinal veins were thromboembolized using intravenous rosebengal injection and Argon laser photocoagulation to make CRVO model. Intraocular pressure (IOP) was measured using Tono-pen preoperatively and at postoperative 1,2,4,8 weeks. At postoperative 1, 2, 4, 8 weeks, eyes were enucleated prepared for histologic exmanination(HE stain) and immunohistochemistry(anti-VEGF Ab). The presence of iridocorneal angle (ICA) occlusion and the VEGF immunoreactivity were compared.

Results: In group 2 and 3, we could not found ICA occlusion. In group 1 ICA occlusion was noted from postoperative 2 weeks. VEGF immunoreactivity was increased in group 1and 2 from postoperative 1 week, but showed no change in group 3. IOP was changed at each time point in group 1 and 2, but showed no change in group 3.

Conclusion: Group 1 was most effective to make an NVG model. VEGF immunoreactivity was increased by anterior segment blood flow interruption.

SP051

THE FLAVONOID BAICALIN IS A POWERFUL ANTIOXIDANT AND ATTENUATES NEURONAL DEATH INDUCED BY VARIOUS INSULTS

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Purpose: To show that Baicalin is a powerful antioxidant and can attenuate neuronal death induced by various insults.
Methods: Lipid peroxidation was induced by exposing brain homogenates to sodium nitroprusside (SNP) assay and the capacity of Baicalin to act as an antioxidant determined. Cultures of a transformed rat retinal ganglion cell line (RGC-5) were exposed to three different insults (light, hydrogen peroxide and serum deprivation) where oxidative stress is implicated in the presence or absence of Baicalin. An index for cell survival was deduced by use of two apoptosis methods (APOPercentage and TUNEL), the MTT and WST-1 assays for cell viability and quantification of ROS by use of 2', 7'-Dichlorofluorescin diacetate (DCFH-DA).
Results: Baicalin was more effective than vitamin E (trolox) or the flavonoid Epigallicatechin gallate at blunting SNP-induced lipid peroxidation having an IC50 value approximately 2μM. Bailcalin dose-dependently (between 500nM to 10μM) counteracted the detrimental effect of hydrogen peroxide, light or serum deprivation to RGC-5 cells in culture.
Conclusion: Evidence is provided to show that Baicalin is a powerful antioxidant and has the capacity to enhance cell survival caused by insults such as light, hydrogen peroxide and serum deprivation where apoptosis is implicated to occur.

SP052

COCH TRANSGENE EXPRESSION BY ADENOVIRUS IN CULTURED HUMAN TRABECULAR MESHWORK CELLS AND ITS EFFECT ON OUTFLOW FACILITY IN ORGAN CULTURED MONKEY ANTERIOR SEGMENTS

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Purpose: To determine the effects of adenovirus-delivered Coch transgene expression on cultured human trabecular meshwork (HTM) cells and on outflow facility in organ cultured monkey anterior segments.
Methods: An adenoviral (Ad) vector expressing both Cochlin and green fluorescent protein (GFP) was used to transduce cultured HTM cells (28 and 2.8 MOI). Ad-Coch-GFP induced Cochlin expression in transduced HTM cells and its culture media were verified by western blot analysis and immunofluorescence staining 5 days after transduction. Cultured cynomolgus and rhesus monkey eye anterior segments were used to test the effect of Ad-Coch-GFP on outflow (2.8E10 VP/segment).
Results: Dose-dependent Cochlin expression in Ad-Coch-GFP transcduced cells and its culture media were shown by western blot. There was no noticeable morphologic change in cells transduced with vectors. In organ culture studies, Cochlin expression was first detected in media 3 days post transduction. Outflow facility was decreased in some of the Ad-Coch-GFP-transduced eyes while it remained unchanged in others when compared to baseline and corrected for changes in the control eye.
Conclusions: Adenoviral vector delivery of the Coch transgene resulted in cochlin expression in HTM cells and organ-cultured anterior segments. Cochlin expression was effective in decreasing outflow facility and increasing IOP in some organ cultured monkey anterior segments but not in others. Factors contributing to the Cochlin-induced IOP elevation and its role in glaucoma have yet to be determined.

Medical Treatment

SP053

EFFECT OF DORZOLAMIDE COMPARED TO TIMOLOL MALEATE ON THE CENTRAL CORNEAL THICKNESS OF GLAUCOMATOUS FILIPINO EYES

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Purpose: To determine the effect of topical dorzolamide versus timolol on the central corneal thickness (CCT) of glaucomatous Filipino eyes

Methods: Patients of age > 17 years with a diagnosis of primary open angle glaucoma, ocular hypertension, normal tension glaucoma, pigmentary glaucoma, and pseudoexfoliation glaucoma, with a cup-disc ratio of <0.8 and a visual acuity of 6/60 or better were included. Collection of demographic data, endothelial cell count, central corneal thickness was done after baseline ophthalmologic examination. Patients were randomly assigned to receive either timolol or dorzolamide eyedrops twice a day. Patients and investigators were masked as to the treatment assignments. CCT and IOP measurements were repeated on day 1, week 1, week 2, week 4. Endothelial cell count was repeated at week 4 of treatment. Main outcome measures were CCT, IOP and endothelial cell count.

Results: A total of 34 eyes were included. The mean CCT baseline of the dorzolamide group was higher (533.9 micra SD35.6) compared to the timolol group (511.4 micra SD23.8, p=0.015). The mean change in CCT of the dorzolamide group is statistically higher compared to the CCT of the timolol group although the change per group is not statistically significant. Endothelial cell count did not show any statistically significant difference between the two groups. There is no correlation between the mean IOP and the mean CCT per day measured for both groups.

Conclusion: Dorzolamide did not produce a statistically significant change in the CCT and IOP of glaucomatous Filipino eyes in a span of one month.

SP054

DEEP LID SULCUS AND BLEPHAROPTOSIS AFTER TREATMENT WITH TOPICAL TRAVOPROST AND BIMATOPROST

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Purpose: To report a new adverse effect (deep lid sulcus and blepharoptosis) related to treatment with travoprost and bimatoprost and to find out the incidence and cause of this adverse effect.

Methods: We did a prospective cohort study including phenylephrine test in case of blepharoptosis by prescribing travoprost and bimatoprost to 44 and 60 glaucoma patients respectively. We tried to find out the incidence of this adverse effect in patients using these two drugs and evaluated levator functions test , which performed in 25 eyes of 14 patients who consented to the test, to figure out the cause of adverse effect.

Results: 3 of 44 patients (6.8%) and 16 of 60 patients (26.7%) treated with travoprost and bimatoprost respectively showed alteration of eyelid appearance. MRD1 increased after instillation of 2.5% phenylephrine in 33.3%(1/3 eyes) of travoprost group and 59.1%(13/22 eyes) of bimatoprost group. MRD1 increased in 56%(both group) by 1.07mm in average and Berke's test results increased in 60%(both group) by 1.40mm in average.

Conclusions: This adverse effect of deep lid sulcus and blepharoptosis may have been caused by relaxation of Müller muscle and contraction of levator apponeurosis muscle by complex cross-interaction of travoprost and bimatoprost with prostanoid FP,TP, EP, IP, DP receptor subtypes according to their receptor affinity. We also strongly suspect that these receptor subtypes play a significant role as vasodilator or vasoconstrictor in the vascular smooth muscle of ocular blood vessels.

Surgical and Laser Treatment

SP056

THE STUDY OF THE CORNEAL ENDOTHELIUM AFTER COMBINED ARGON AND ND:YAG LASER IRIDOTOMY IN PRIMARY ANGLE-CLOSURE GLAUCOMA

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Purpose: To study the effect of combined laser iridotomy on the corneal endothelium in PACG.

Methods: 1) 59eyes were performed L.I. with combined argon and pulsed Nd:YAG laser iridotomy. Corneal endothelial specular microscopy was performed before and after iridotomy at 1week. 2)30eyes treated with laser iridotomy because of pupillary block (group A), 30eyes performed prophylactic laser iridotomy (group B, the mean follow up period was 63.2months), 30eyes not performed laser iridotomy(group C) were retrospectively reviewed about corneal endothelium. All of 90 eyes had diagnosed primary angle closure glaucoma.

Results: 1) The decrease of endothelial cell density after iridotomy was not statistically significant at 1week ($p=0.248$). Partial correlation coefficients indicated no statistical correlation between the change in endothelial cell density and the total energy used during the treatment ($r=-0.0572$, $p=0.670$). 2) The mean endothelial cell density of group A was statistically significantly less than that of group B($p=0.038$) and that of group C ($p=0.021$). There was no statistical difference in the mean endothelial cell density between group B and C ($p=0.599$). There was negative partial correlation between the number of pupillary block and endothelial cell density in group A ($r=-0.509$, $p=0.009$). There was no correlation between the period after iridotomy and endothelial cell density in group B ($r=0.508$, $p=0.133$).

Conclusions: Combined argon and Nd:YAG laser iridotomy don't pose any short and long-term hazard to corneal endothelium in PACG. But the number of pupillary block associates with the decrease of endothelial cell density. Argon and Nd:YAG laser iridotomy in PACG is considered as an effective and a safe procedure that prevent the pupillary block and corneal endothelial damage.

SP057

TRABECULOTOMY COMBINED WITH PHACOEMULUSIFICATION AND INTRAOCULAR LENS IMPLANTATION (PHACOTRABECULOTOMY) FOR PSEUDOEXFOLIATION GLAUCOMA

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Purpose: To show an advantage of Phacotrabeculotomy (PLOT) for the eyes with pseudoexfoliation glaucoma (XFG) coexisting cataract.

Methods: Sixty-seven eyes from 65 Japanese XFG patients performed PLOT, phacotrabeculectomy (PLEC) or MMC trabeculectomy (LEC) were followed up in Niigata University Medical and Dental Hospital. The outcomes of postoperative intraocular pressure (IOP) and visual acuity, and complications were compared among tree surgical procedures.

Results: Preoperative IOP in PLOT, 22.4 ± 5.13 mmHg, decreased to 12.3 ± 2.33 mmHg at 12 months postoperatively and maintained up to 36 months. Preoperative IOPs, 21.9 ± 4.18 mmHg in PLEC and 26.6 ± 7.57 mmHg in LEC, reduced to 13.3 ± 2.79 mmHg in PLEC and 12.6 ± 6.00 mmHg in LEC at 12 month time point. No statistical difference was identified among three groups at any time points after 3 months. While postoperative corrected visual acuities were similar between PLOT and PLEC, averaged time length in PLOT to reach best postoperative visual acuity, 1.37 ± 1.74 months, was significantly shorter than that of PLEC, 4.92 ± 4.36 months.

Conclusions: PLOT can be recommended as an initial glaucoma surgery for XFG coexisting cataract. Because PLOT is a closed surgery to use a physiological aqueous route and it is safer and easier to manage than filtering surgeries. In addition, PLOT has no or little severe postoperative complications, such as blebitis, endophthalmitis, hypotony maculopathy, and various bleb-related complications.

SP058

RABECULECTOMY WITH OLOGENTM COLLAGEN MATRIX IMPLANT: THE TREATMENT OUTCOMES AFTER SIX MONTH OF FOLLOW-UP

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Purpose: To determine the effectiveness and safety of the ologenTM Collagen Matrix implants in trabeculectomy surgery.
Methods: In this prospective and non-randomized study, 26 patients (30 eyes) diagnosed with glaucoma were allocated for filtering trabeculectomy surgery with ologen™ Collagen Matrix Biodegradable Implant, which was implanted on the top of the sclera flap before closing the conjunctiva during traditional trabeculectomy surgeries. 27 patients (30 eyes) diagnosed with glaucoma as well as, the control group, were allocated to be treated with the traditional trabeculectomy procedure without the use of adjunctive therapy. All patients were receiving the maximally tolerated medical therapy before operation and evaluated for IOP, visual acuity, bleb morphology, bleb function and complications at 1st , 7th,14th,30th,60th,90th and 180th post-op days.
Results: The proportion of patients reaching different predefined target IOPs after surgery was slightly higher in the control group than in OlogenTM group. The mean preoperative IOP was 17.9 ± 8.13 mmHg and 20.1±5.24 ($p>0.05$) respectively. Postoperatively, the mean IOP at 180 days follow-up was 14.9 ± 4.29 mmHg in OlogenTM group and the mean IOP was 18.5 ± 4.22 mmHg in control group ($p<0.05$). Likewise, there was no statistically significant intra-operative complications between the groups. Post-operative complications included transient shallow anterior chamber and hypotony.
Conclusions: OlogenTM Collagen Matrix Implant were found to be equally safe adjuncts to trabeculectomy. It helps to control intra-ocular pressure and form functional filter-bleb.

SP059

THE CHANGE OF INTRAOCULAR PRESSURE AFTER CATARACT SURGERY WITH FILTERING BLEBS

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Purpose: To evaluate retrospectively the effect of cataract surgery on intraocular pressure (IOP) control in eyes that have undergone trabeculectomy.
Methods: We undertook a retrospective analysis of 80 eyes that have undergone trabeculectomy. Of the 51 eyes performed cataract surgery during the follow-up period of 2-5 years were included in this analysis. Their IOP, the glaucoma medicines were compared before cataract surgery with at the 1,3,6,12,24 months follow-up. We classified by the type of glaucoma, the period until cataract surgery and Preoperative IOP into three groups, and the result were compared.
Results: Cataract surgery were performed 6~59 months (median 26.9 months) after trabeculectomy. Before cataract surgery, the mean IOP was 12.5±4.9 mmHg and the mean number of glaucoma medicines was 0.43± 0.76. At the 24 months after cataract surgery, mean IOP was 13.2±4.1mmHg and the mean number of glaucoma medicines was 0.51±0.79. No statistical differences between before cataract surgery and after cataract surgery were identified with respect to IOP and glaucoma medications except for the group that have less than 10mmHg in preoperative IOP. The 8 eyes needed more than one medicine or performed further filtering surgery.
Conclusions: We indicate that cataract surgery following trabeculectomy have less influence on IOP and the number of glaucoma medicines in this prospective study. But we think that we should need more consideration about glaucoma types, period until cataract surgery and preoperative IOP, because some cases increased IOP and needed more glaucoma medicines after cataract surgery.

SP060

A CASE OF ENDOPHTALMITIS FOLLOWING TRABECULECTOMY AFTER RADIAL KERATOTOMY

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Purpose: To report a severe case of endopthalmitis following Mitomycin C (MMC) trabeculectomy after radial keratotomy
Methods: Case presentation
Results: A 36-year-old man was performed radial keratotomy in a clinic of plastic surgery and had continued medication of steroid eye drop. He visited an ophthalmological clinic complaining blurred visionin both eyes. His intraocular pressures (IOP) were 43 mmHg OD and 51mmHg OS. He was finally diagnosed as late developmental glaucoma with steroid-induced glaucoma. His both eyes underwent trabeculotomy and following MMC trabeculectomy because IOPs were hard to control even with maximum tolerated medical therapy. Two years later, bleb leakage occurred in his right eye without any symptoms of bleb-related infection. When he visited to our clinic 4 days later, his right eye had already complicated severe stromal keratitis, endophalmitis, and cellulitis. We performed pars plana vitrectomy, lensectomy, and vitreous irrigation with antibiotics immediately and continued administration of antibiotics. His endopthalmitis and cellulitis had progressed and finally his right eye was enucleated. Streptcoccus pneumoniae was detected from aqueous humor.
Conclusion: Radial keratotomy might make bleb-related infection more serious because of combined corneal infection.

SP061

COMPARATIVE EFFICACY OF SINGLE SITE VERSUS TWO SITES PHACOTRABECULECTOMY WITH FOLDABLE ACRYLIC (3 PIECE) IOL IMPLANTATION IN CONTROLLING IOP

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Purpose: To compare the intraocular pressure lowering efficacy of temporal phacoemulsification (2.8mm) with superior trabeculectomy and single site phacotrabeculectomy (triangular scleral flap) using foldable 3 piece acrylic intraocular lens.
Methods: Twenty six eyes of 26 patients undergoing single site phacotrabeculectomy(superior triangular sclera flap) with foldable acrylic(3 piece aspheric) intraocular lens were include in group 1. Group 2 included 20 eyes of 18 patients undergoing two site phacotrabeculectomy with 2.8 mm temporal incision and superior trabeculectomy using foldable acrylic (3 piece aspheric) intraocular lens.
Results: The mean IOP lowered from 23.6±4.8mm Hg to 14.8±1.9mm Hg in group 1after a mean follow up of 12 months. Only 1 patient required topical anti glaucoma medications. In group 2, mean IOP decreased from 22.8±5.1mm Hg to 14.9±2.5mm Hg after a mean follow up of 12 months. One of patient required topical anti glaucoma medication to control IOP. The visual acuity significantly improved in 89.2% in group1 and 91.5% in group 2. The IOP lowering was not statistically significantly different in both the groups.
Conclusion: Both single site and two site phacotrabeculectomy appears to be safe and effective surgery for IOP control and improving the vision in patients having cataract and glaucoma.

SP062

CONSENSUAL OPHTHALMOTONIC REACTION (COR) FOLLOWING TRABECULECTOMY/ PHACOTRABECULECTOMY

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Purpose: To analyze the intraocular pressure change of the contra-lateral eye of patients undergoing trabeculectomy/Phacotrabeculectomy
Methods: In this prospective comparative observational study fifty eyes of patients with POAG (84%) and PXFG (10%) and NTG (6%) undergoing trabeculectomy/phacotrabeculetomy were included
Results: Right eye was operated in 21 (42.0%) instances. The preoperative mean baseline IOP among the operated eye was 21.7±7.6 mmHg corresponding to 18.0±4.5 mmHg in the other eye In the operated eye a decrease in IOP was noted in 41 (82.0%) eyes, no change in 3 eyes, increase in 6 (12.0%) eyes The reduction in the intra ocular pressure was statistically significant ($p<0.0001$). The reduction in the IOP in the contra lateral eye however was not statistically significant (p-0.645) when analyzed separately. Of the contra-lateral eyes 22 (44.0%) eyes had a reduction in IOP, 24 (48.0%) eyes had increase in IOP while 4 (8.0%) eyes did not show

any change. When the magnitude of change of IOP was compared between the operated and their corresponding un-operated eyes, the difference was statistically significant ($p<0.0001$).

Conclusion: Although COR leads to a reduction in IOP in the other eye our study did not observe such an event in all patients therefore the un-operated eye should also be closely monitored.

SP063

LIMBUS-BASED VS FORNIX-BASED CONJUNCTIVAL FLAP IN TRABECULECTOMY WITH ADJUNCTIVE MITOMYCIN C

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Purpose: To determine the efficacy and safety of limbal-based vs fornix-based conjunctival flaps in patients with primary open-angle glaucoma (POAG) undergoing trabeculectomy with subconjunctival mitomycin C (MMC) treatment.

Methods: In a retrospective study, 94 eyes with 94 POAG patients undergoing trabeculectomy with MMC as the initial ocular surgery were enrolled into the study. 47 patients of fornix-based group were matched with 47 patients of limbal-based group in the clinical background. Postoperative intraocular pressure (IOP) and complications were compared between the two groups.

Results: The mean IOPs on 12 and 24 months postoperatively were significantly lower in the fornix-based group ($p=0.001$). Incidence of wound leak was significantly higher in the fornix-based group ($p=0.027$). Other postoperative complications were not significantly different between the two groups.

Conclusion: These results suggested that the fornix-based conjunctival flap is easer to perform and provides better surgical procedure compared with the limbal-based conjunctival flap.

SP064

INITIAL RESULTS OF DIODE LASER CYCLO PHOTOCOAGULATION IN REFRACTORY GLAUCOMAS

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Purpose: To evaluate efficacy of Diode Laser Cyclo Photocoagulation (DLCP) in refractory glaucomas.

Methods: DLCP was performed in 50 patients, under peribulbar anesthesia Secondary glaucoma was commonest at 63 % cases, followed by chronic angle closure glaucoma 30%. Glaucoma filtration surgeries had been performed in 75% of the cases. Non seeing eyes comprised 55%. Laser parameters used were- power 1200-1600m J; duration 2000 ms and usually 24 spots were given.

Results: Pre laser IOP on maximum medication, including systemic Acetazolamide, was >25 mm Hg in all. Mean IOP fall of 40% (range 14-80%) occurred within the first month in 33 eyes. Average of 2.5 sittings were required over a mean follow up of 12 months. In 23 eyes, initially the intraocular pressure dropped and was maintained for the first month, thereafter it steadily rose again after 4-6 weeks necessitating a repeat after 6-8 weeks. In three patients scheduled for trabeculectomy, wherein IOP remained in the range of 40-50mm Hg despite maximal medical therapy including systemic Mannitol DLCP succeeded in controlling the IOP temporarily and allowed a trabeculectomy to be performed later in a quiet eye. DLCP did not lead to any drop in visual acuity, hypotony, or significant inflammation at any time. Pain in spite of analgesics was noted in most patients.

Conclusion: DLCP causes a biphasic IOP drop with the initial drop reversing after 4-6 weeks in almost 50% cases in Indian eyes.

SP065

NEEDLING OF ENCYSTED BLEB AFTER AHMED GLAUCOMA VALVE IMPLANTATION

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Purpose: To evaluate the effect of needling with 5-FU in encysted blebs post Ahmed Glaucoma Valve (AGV) implantation.

Methods: Eleven cases of refractory glaucoma underwent AGV implantation by a single surgeon. Formation of encysted bleb associated with a rise in intraocular pressure (IOP) was encountered

in four patients between 3 to 11 weeks of the postoperative period. The mean IOP of 8 mmHg in the first week increased to a mean IOP of 28 mmHg (24-30mmHg) at 4-11 weeks. All the patients showed a very tense, large and raised bleb over the plate area. These patients were subjected to needling with 5- Fluorouracil.

Results: The mean IOP dropped to 6mmHg on the first post needling day along with diffuse blebs in all the cases. A gradual rise in the IOP was observed in three patients over the next two weeks. The fourth case demonstrated an adequate control of IOP following needling of the encysted bleb for the next two months. All cases had to be put on antiglaucoma medications.

Conclusion: Needling of the encysted bleb with 5-FU has a low success rate. Other modalities of treatment need to be explored.

SP066

COMPARISON OF THE SURGICAL OUTCOMES OF SINGLE SITE PHACOTRABECULECTOMY WITHOUT MITOMYCIN C IN PRIMARY ANGLE-CLOSURE GLAUCOMA AND PRIMARY OPEN ANGLE GLAUCOMA

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Purpose: To compare the surgical outcomes of single site phaco trabeculectomy without Mitomycin C in primary angle closure glaucoma (PACG) and primary open angle glaucoma (POAG).

Methods: Retrospective review of 47 eyes of 39 PACG patients and 45 eyes of 33 POAG patients who underwent single site phaco trabeculectomy without MMC with a minimum post-operative follow-up of 12 months. Preoperative and post operative data between the two groups were analysed

Results: The mean follow-up was 41.35±18.13 months. The average IOP reduction in PACG group was 31.25%±34.49%. The average IOP reduction in POAG group was 21.14%±25.69%. (p=0.021). The mean number of medications at final follow-up in PACG group was 0.26±0.57 and in POAG group was 0.60±0.863 (p=0.026).

Conclusion: The surgical outcomes of single site phaco trabeculectomy without MMC are better in PACG as compared to POAG

SP067

MANAGING A CASE OF NEOVASCULAR GLAUCOMA WITH CATARACT AND SUDDEN ANGLE-CLOSURE – CASE REPORT

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Purpose: To report the treatment of sudden angle closure in a case of neovascular glaucoma with a history of previous trabeculectomy for primary open angle glaucoma

Methods: A 54 year old male who presented with sudden onset pain and loss of vision in his right eye was examined. He had undergone trabeculectomy in that eye a month ago and had an uneventful post-operative recovery. Examination revealed angle closure with iris bombe in all quadrants and an extremely shallow anterior chamber with intraocular pressure of 34 mmHg. Multipe YAG iridotomies were done, but it was not helpful. Over a course of 1 week he developed neovascularisation of the iris. Subsequently, cataract surgery with intravitreal bevacizumab injection was done.

Results: Regression of neovascular vessels with control of intraocular pressure was acheived.

Conclusion: The potential role of intravitreal bevacizumab for neovascular glaucoma and its effect on wound healing needs to be studied further.

SP068

EFFECT OF PHACOEMULSIFICATION IN CASES OF ANGLE-CLOSURE GLAUCOMA

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Purpose: To evaluate changes in anterior chamber parameters and intraocular pressure in cases of angle closure glaucoma controlled with medication or glaucoma surgery.

Methods: Twenty eyes of primary angle closure glaucoma patients with intraocular pressure controlled either with medication or surgery underwent temporal clear corneal incisional phaco-emulsification procedure for cataract. Assessment of intraocular pressure (IOP) and anterior chamber depth (ACD) was conducted preoperatively and 3 months post operatively.

Results: The mean ACD was 2.12 +/- 0.12 mm which increased significantly to 3.5 +/- 0.26 mm at 3 months post-operative period.

The mean IOP was 14.58 +/- 3.4 mm of Hg preoperatively. At 3 months post-operative period the mean IOP was 13.6 +/- 2.7 mm of Hg. The decrease was not significant ($p>0.05$).

Conclusions: Lens extraction causes significant increase in anterior chamber depth in patients with chronic angle closure glaucoma but the change in intraocular pressure was not significant at 3 month post operative period in patients who are already well controlled either on medication or glaucoma surgery. The temporal clear corneal phacoemulsification procedure does not compromise bleb function.

SP069

LONG TERM OUTCOME OF COMBINED TRABECULECTOMY WITH VITRECTOMY AND LENSECTOMY IN PATIENTS WITH A SUBLUXATED OR DISLOCATED LENS WITH GLAUCOMA

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Purpose: To determine Intraocularpressure (IOP) control & Visual outcome in patients who had a Subluxated or Dislocated lens with uncontrolled glaucoma who underwent combined surgery over the last 10 years

Methods: We retrospectively analyzed 68 eyes of 59 patients (44 males & 15 females, with a mean age 38.1±19.6 years (11-17yrs)

Results: Trauma was the cause of lens dislocation in 44 eyes(64.7%). 44 eyes (64.7%) had a SFIOL while 24 eyes(35.3%) were left aphakic. The mean follow-up was 17.2±21.9(.26-124.7) months. There was a significant difference in mean IOP preoperatively (29.97±10.9 mm Hg)and postoperative both at six weeks (mean 13.7±7.3 mm Hg $p< 0.0001$)and at last followup(mean 13.3±5 mm of Hg $p<0.0001$). There was no significant difference in IOP at last follow up in eyes with or without a SFIOL $p=0.36$. 26(38.2%) eyes needed antiglaucoma medications postoperatively with only 1 eye requiring 3 drugs to maintain their IOP less than 20 mm of Hg. 4 eyes had IOP greater than 20 at last followup. 2 eyes required a retrabeculectomy and 2 underwent a diode cyclophotocoagulation. 1 eye was eviscerated 1 eye had a retinal detachment requiring a repeat vitrectomy. Visual acuity was < 6/12 preoperatively in 86.3% compared to 53% at last followup.

Conclusion: Combined surgery can be considered a safe and effective option in the management of subluxated or dislocated lens with Glaucoma with good long term results

SP070

RESULTS OF GONIOTOMY AND CATARACT SURGERY FOR EXFOLIATIVE GLAUCOMA

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Purpose: To evaluate the results of goniotomy in a case series of patients with exfoliative glaucoma.

Methods: A retrospective chart review was performed on 6 patients with exfoliative glaucoma who underwent goniotomy and phacoemulsification with intraocular implantation in one eye by a single surgeon. Kaplan-Meier life-table survival analysis was used to analyze cumulative progression in the reduction in number of hypotensive mediations and intraocular pressure (IOP) at monthly intervals. IOP control was defined as ≤ 21 mmHg, without further glaucoma surgery.

Results: Mean age was 75.7±4.6 years (range, 68-82). Mean pre-operative IOP was 20.1±3.7 mmHg. The mean postoperative IOP at 3 months was 16.7±2.8 mmHg. At one month, 5 patients (83.3%), experienced IOP reduction, and at 3 months all six patients did. Mean pre-operative number of medications was 2.33±1.0. After 3 months, the mean number of medications was 1.33±1.2. 5 patients (83.3%) achieved decreased number of medications 3 months postoperatively. Hyphema occurred in 1 patient and resolved spontaneously. Visual acuity was stable or improved in all patients.

Conclusions: In our case series, combined phacoemulsification with goniotomy was effective in reduction of IOP and number of hypotensive medications in nearly all patients. A larger prospective longitudinal study is necessary to establish this procedure as a viable treatment option in patients with exfoliative glaucoma before proceeding to filtering surgery.

SP071

GLAUCOMA DRAINAGE DEVICES FOR THE TREATMENT OF KERATOPLASTY PATIENTS WITH GLAUCOMA

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Purpose: To investigate the effectiveness and safety of glaucoma drainage devices in controlling the intraocular pressures in the treatment of glaucoma in keratoplasty patients
Methods: Twenty two patients with keratoplasty and glaucoma who underwent drainage devices for the treatment of glaucoma were evaluated. Four eyes had Ahmed valve implants while 18 eyes had Baerveldt implants. In 8 cases, the Baerveldt implant and the corneal graft were performed on the same day.
Results: The follow up time was between 1 month to 2 years. The success rate in intraocular pressure control was 68.1% at 6 months and 50.0% at 1 year. There were no cases of graft failure in any of the 8 cases which had the Baerveldt implant at the same time as the corneal graft.
Conclusion: Glaucoma drainage devices were successful in controlling the intraocular pressure for the treatment of glaucoma in patients with keratoplasty.

SP072

GLAUCOMA DRAINAGE DEVICES FOR TREATMENT OF GLAUCOMA

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Purpose: To investigate the effectiveness of glaucoma drainage devices in intraocular pressure control for the treatment of neovascular glaucoma, post penetrating keratoplasty glaucoma and other types of uncontrolled glaucoma.
Methods: Forty eight patients (56 eyes) with glaucoma (neovascular glaucoma, post penetrating keratoplasty glaucoma and various types of uncontrolled glaucomas) who underwent drainage devices were retrospectively evaluated. Ahmed valve was used in 6 eyes (10.7%) Baerveldt was used in 50 eyes (89.2%).
Results: The mean follow up time was 11.6 months. There were 21 eyes with neovascular glaucoma, 22 eyes with post keratoplasty glaucoma and 13 eyes with uncontrolled glaucoma (eg aniridia, Iridocorneal endothelial syndrome and juvenile glaucoma). The success rate in intraocular pressure control at 6 months was 66.7% in the neovascular glaucoma group, 54.5% I the post keratoplasty group and 69.2% in the uncontrolled glaucoma group respectively. The success rate of intraocular presure control at 1 year was 23.0% in the neovascular glaucoma group, 27.2% in the post keratoplasty group and 30.8% in the uncontrolled glaucoma group respectively.
Conclusion: Glaucoma drainage devices were successful in intraocular pressure control for the treatment of different types of glaucoma.

SP073

COMPARISON OF SLT (SELECTIVE LASER TRABECULOPLASTY) EFFICACY IN PATIENTS WITH OPEN ANGLE AND ANGLE-CLOSURE GLAUCOMA

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Purpose: To compare efficacy of 180 degree selective laser trabeculoplasty (SLT) in lowering intraocular pressure between open angle and angle closure glaucoma patients
Methods: Medical records of patients who underwent 180 degree selective laser trabeculoplasty (SLT) from June 2005 to Jan 2008 at King Chulalongkorn Memorial hospital, Bangkok, Thailand, were reviewed. Intraocular pressure (IOP) and number of glaucoma medications were assessed at baseline, 4-week and 12-week after SLT. Main outcome was difference of IOP reduction from baseline and each follow up visit between open angle glaucoma (OAG) and angle closure glaucoma (ACG) patients.
Results: There were 39 open angle glaucoma and 20 angle closure glaucoma patients enrolled into the study. Mean (SD) age of open angle glaucoma and angle closure glaucoma patients were 63.13(11.89) and 66.00(9.12) years. Mean (SD) IOP at baseline in OAG and ACG groups were 18.47(4.72) and 19.48(3.78) mmHg, respectively. At 4 weeks after SLT, mean (SD) IOP of OAG and ACG groups were 15.92(3.36) and 18.05(4.21) mmHg, respectively. At 12 weeks after SLT, mean (SD) IOP of OAG was 15.12(2.81) mmHg, whereas ACG was 16.93(3.56) mmHg. SLT can significantly decrease IOP in both open angle and angle closure groups at 12 weeks after laser ($p < 0.01$). The efficacy of SLT in IOP reduction

was not different between open angle and angle closure groups at both 4-week and 12-week after laser ($p > 0.05$). The number of glaucoma medications used between baseline and 12-week post laser in both groups were not different.

Conclusion: Selective Laser Trabeculoplasty can reduce intraocular pressure in either open angle glaucoma or angle closure glaucoma patients. The efficacy in IOP reduction of SLT was not shown statistically significant between open angle and angle closure groups.

SP074

THE EFFECT OF EXCISION OF AVASCULAR BLEB AND ADVANCEMENT OF ADJACENT CONJUNCTIVA FOR TREATMENT OF HYPOTONY

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Purpose: To evaluate the effect of excision of avascular bleb and advancement of adjacent conjunctiva (EBAC) for treatment of hypotony after trabeculectomy with mitomycin C (MMC).

Methods: Seventeen eyes (15 patients), received EBAC for treatment of hypotony between September 1996 and September 2007, were reviewed retrospectively. The main outcomes were intraocular pressure (IOP) and postoperative complications.

Results: (IOP< 6mmHg) of 8 eyes (47.1%) of 7 patients was caused by bleb perforation, and 2 eyes (2 patients) of them had trauma history. After trabeculectomy with MMC, hypotony was appeared at 33.9±30.8 months and EBAC was performed at 48.2±35.3 months. The mean follow-up period was 35.5 ± 30.8 months. Cumulative success rates of EBAC were 94.12% at 18 months and 84.71% at 51 months after EBAC by Kaplan-Meier analysis. The post-EBAC complications were blepharoptosis in 4 eyes (23.5%), and bleb perforation in one eye (5.9%). This ptosis was disappeared within one month after EBAC in 2 patients. But in the others, mild ptosis was remained at postoperative 12 months and 18 months respectively.

Conclusion: EBAC was an effective method for treatment of hypotony after trabeculectomy with MMC and postoperative blepharoptosis was chief complication.

Miscellaneous

SP075

COMPARISON OF INTRAOCULAR PRESSURE MEASURED BY THREE DIFFERENT TONOMETERS IN GLAUCOMA PATIENTS

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Purpose: To compare the intraocular pressures (IOPs) measured by a Goldmann applanation tonometer (GAT), a Pascal dynamic contour tonometer (DCT), and an Icare rebound tonometer (RBT) in eyes with open-angle glaucoma (OAG), and to determine if a significant correlation exists between the IOP and the corneal properties.

Methods: IOP was measured with the GAT, DCT and RBT in random order in 123 eyes with 123 OAG patients. Corneal radius of curvature was determined using a keratometer before IOP measurements. Subsequently, the central corneal thickness (CCT) was measured using an ultrasonic pachymeter.

Results: There was a strong correlation between the IOPs determined by GAT and DCT and between those by GAT and RBT (both $P < 0.001$; Spearman rank test). Furthermore, a Bland-Altman plots showed that the correlation between GAT and DCT or RBT measurements were statistically significant ($P = 0.0099$ or < 0.001, respectively). The IOP readings with GAT and RBT revealed statistically significant correlations with those with CCT ($P = 0.0187$ and $P = 0.002$, respectively). However, the IOP reading with DCT was no correlations with CCT ($P = 0.7139$). On the other hand, both corneal curvature and corneal astigmatism did not influence on IOP readings obtained from the three tonometers.

Conclusions: There are good correlations among the 3 methods of IOP measurements. The IOP readings with GAT and RBT could be affected by variations in the CCT.

SP076

COMPARISON OF THE TOTAL DEVIATION OF STANDARD AUTOMATED PERIMETRY AND HUMPHREY MATRIX IN PATIENTS WITH PREPERIMETRIC GLAUCOMA

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Purpose: To compare the results of total deviation (TD) measured by standard automated perimetry(SAP) and those of Humphrey Matrix in patients with preperimetric glaucoma.

Methods: 52 eyes of 52 patients with preperimetric glaucoma who have retinal nerve fiber layer(RNFL) defect in red-free photograph but normal SAP according to the Anderson's criteria for minimal abnormality were included. Subjects were examined with Humphery Matrix and Stratus optical coherence tomography (OCT) and the results of each examination were analyzed. The proportions of the abnormal results in SAP TD, Matrix TD, and Matrix pattern deviation (PD) were calculated. Statistical correlations between SAP TD and Matrix TD, SAP TD and PD, visual fields and OCT were evaluated. In addition, the difference of peripapillary RNFL thickness according to the result of SAP TD in preperimetric patients with abnormal Matrix PD were analyzed

Results: The abnormalities of SAP TD, Matrix TD and Matrix PD were found in 22(42.31%), 34(65.38%), 41(78.85%) eyes, respectively. There were marginal correlation between SAP TD and Matrix PD($r=0.25$, $P=0.07$) and significant correlation between Matrix PD and OCT (TSNIT graph $r=0.29$ $P=0.03$, clock-hour analysis $r=0.40$ $P<0.01$). There was no significant correlation between SAP TD and OCT but RNFL thickness was significantly lower in abnormal SAP TD group than normal SAP TD group at average, superior quadrant, 12 o'clock, and 5 o'clock($P<0.05$)

Conclusions: In patients with preperimetric glaucoma, 42.31% and 78.85% had glaucomatous VF defect in SAP TD and Matrix PD, respectively. Such results were beyond our expectation, especially SAP TD. Moreover, there was marginal correlation of SAP TD and Matrix PD.

SP077

COMBINED TRABECULOTOMY AND TRABECULECTOMY WITH MMC IN PRIMARY CONGENITAL GLAUCOMA

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Purpose: To investigate the long-term outcome of combined trabeculotomy and trabeculectomy with mitomycin C (MMC) in primary congenital glaucoma (PCG).

Methods: We retrospective reviewed 24 eyes in 12 children diagnosed as PCG and undergoing combined trabeculotomy and trabeculectomy with MMC from January 1999 to May 2005.

Results: Mitomycin (0.2-0.4 mg/mL) was used in all eyes. Average postoperative follow-up was 36.50 ±20.09 months. Mean postoperative IOP was 16.75±3.92 mmHg at last review and average decreasing 15.2 ±5.8 mmHg ($P < 0.01$). No severe complication was recorded.

Conclusions: Combined trabeculotomy and trabeculectomy with MMC was a safe and viable treatment in PCG. MMC may prompt the success rate of surgery.

SP078

QUANTITATIVE ANALYSIS OF RETINAL NERVE FIBER LAYER THICKNESS PROFILE IN HEALTHY EYES

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Purpose: To compare the retinal nerve fiber layer (RNFL) thickness profile between mild to moderate myopic eyes and high myopic eyes.

Methods: We divided forty six healthy myopic eyes into two groups, a mild to moderate myopic (spherical equivalent < -6D) group (A) and a high (spherical equivalent ≥ -6D) myopic group (B). If they were having tilted disc, they excepted from this study. And they were tested with fast RNFL thickness scan of Stratus optical coherence tomography. From the raw data of scanned images, angles of superior maximal thickness points from a reference line, which was drawn horizontally though the center of the scan circle, were calculated. With same method, angles of inferior maximal thickness points were calculated. The differences of superior and inferior angles were compared between two groups.

Results: Mean diopter of group A (32 eyes) was -3.2 ± 1.7 diopter and that of group B (14 eyes) was -9.0 ± 2.0 diopter. Both the mean angle of superior and inferior maximal thickness points were smaller in group B (54.1° and 52.3°, respectively) ($P < 0.01$, Mann-Whitney U tests) than in group A (67.1° and 62.6°, respectively) ($P < 0.01$, Mann-Whitney U tests).
Conclusion: Maximal superior and inferior RNFL thickness points were located closer to fovea in high myopic eyes than in mild to moderate myopic eyes.

SP079

SPONTANEOUS FILTERING BLEB IN LOCALIZED SCLERODERMA

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Purpose: To report an unusual case of spontaneous filtering bleb.
Methods: 27 years male presented with ocular discomfort and swelling in the white part of left eye. On examination, BCVA was 6/6 in both eyes. A diffuse, thin avascular bleb was present in left eye superiorly with deep anterior chamber. Rest of the anterior segment was within normal limits. Right eye was within normal limits on slit lamp examination. On gonioscopy, angles were open upto scleral spur in both eyes. No scleral ostium was seen on gonioscopy in left eye. Applanation tonometry was 16 and 8 mm of Hg in right and left eye respectively. UBM confirmed bleb formation in the left eye. Systemic history revealed progressive depression in skin of forehead with left-sided alopecia of eyebrow and head. Patient was referred to dermatologist and diagnosed as localized scleroderma or Morphea.
Results: On reviewing the literature only three such cases are reported so far.
Conclusion: Spontaneous filtering bleb although rare can be seen in patients with collagen vascular disorders.

SP080

EVALUATION OF QUALITY OF VISION IN GLAUCOMA PATIENTS

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Purpose: To evaluate the possible correlation between quality of vision (QOV) and visual function of glaucoma patients.
Methods: The relationship between QOV and visual scores (visual acuity and visual field) were investigated in 174 Japanese glaucoma patients at Niigata University Medical Hospital and its facilities. QOV was assessed using the Japanese version 25-item National Eye Institute Visual Function Questionnaire (VFQ-25).We obtained the visual acuity, mean deviation and foveal threshold of the central 30°and 10°visual field using Humphrey Field Analyzer (HFA) as data of visual functions. All the tests were conducted both in the better eyes and the worse eyes. Statistical analyses were made using linear regression analysis to determine the relationship between the scores of VFQ-25 and visual functions.
Results: There was a significant relationship between the score of VFQ-25 and visual functions both in the better eyes and the worse eyes. The average scores of General health, Driving and Peripheral vision were the lowest three.
Conclusions: VFQ-25 is a useful method to understand the QOV of glaucoma patients. Scores had good reflection of the characteristic of the disease. It should be considered as one of the important clinical data in deciding the appropriate timing of patient's treatment.

SP081

COMPARATIVE STUDY OF CENTRAL CORNEAL THICKNESS BY NON CONTACT SPECULAR MICROSCOPE AND ULTRASOUND PACHYMETRY IN NORMAL SUBJECTS

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Purpose: To compare central corneal thickness measurements by non contact specular microscope and ultrasound pachymeter of corneas of normal subjects.
Methods: Central corneal thickness was measured in 96 eyes of 49

patients using non contact specular microscope SP2000P (Topcon) and ultrasound pachymeter P2000 (Micro medical devices USA). The mean of five readings was taken with ultrasound pachymeter and mean of 2 readings by Topcon unit. The patients with corneal opacity, corneal edema, glaucoma and diabetes were excluded.

Results: The mean value by Topcon unit (490±24.4μm) were significantly less (38.87μm) than those of mean values of ultrasound pachymeter(528.5±23.8μm).this difference was statistically significant($p<0.001$)

Conclusions: non contact specular microscope gave smaller thickness readings than ultrasound pachymeter, but these two devices showed an excellent linear correlation. These differences must be considered in patients of refractive surgery and glaucoma.

SP082

STRUCTURAL AND FUNCTIONAL CHANGES FOLLOWING ACUTE PRIMARY ANGLE-CLOSURE

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Purpose: To measure peripapillary retinal nerve fiber layer (RNFL) thickness after acute primary angle closure (APAC) using optical coherence tomography (OCT), and to correlate this with optic nerve head morphology and visual field changes.

Methods: This was a prospective comparative observational study of patients who had an episode of unilateral APAC from 2000 to 2006. Peripapillary RNFL thickness was measured using OCT. Confocal laser scanning ophthalmoscopy or CLSO of the optic nerve head and automated static white-on-white perimetry were also performed. Results were compared with normal fellow eyes as matched controls.

Results: Fourteen patients were included in this study. 5 patients were male (35.7%) and the mean age of the patients was 60.5 +/- 6.6 years. Study assessments were performed at a mean of 32.9 +/- 20.8 months after APAC. OCT showed reduced average (86.9 +/- 22.2 vs 109.9 +/- 12.4 um, p=0.0009), supreior (111.3 +/- 32.3 vs 141.1 +/- 19.9 um, p=0.007) and inferior (106.8 +/- 35.8 vs 141.6 +/- 23.2 um, p=0.0007) peripapillary RNFL thickness in APAC eyes compared to controls. Perimetry showed reduced mean deviation in APAC eyes compared to controls (-4.57 +/- 3.44 vs -2.48 +/- 1.37 um, p=0.028). CSLO of optic nerve heads showed no difference in mean rim area, rim volume or linear cup-disc ratio between AAC eyes and controls. Optic atrophy was found in 3 of the 4 (75%) APAC eyes with significant visual field defects.

Conclusion: There was a reduction in RNFL thickness and visual field loss in APAC eyes with no loss or neuroretinal rim.

SP083

GLAUCOMA MANAGEMENT IN PATIENTS WITH OSTEO-ODONTO KERATOPROSTHESIS (OOKP): THE SINGAPORE OOKP STUDY

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Purpose: To report diagnostic modalities and treatment options for glaucoma in eyes with osteo-odonto-keratoprosthesis (OOKP).

Methods: Eyes that underwent OOKP were evaluated for glaucoma at the time of the first post-operative visit, then at 1 and 3 months after the procedure and thereafter every 6 months. All eyes underwent stereo-biomicroscopic optic nerve head (ONH) assessment, kinetic (Goldmann perimetry) and automated static visual field testing, ONH photography, Heidelberg Retina Tomograph (HRT), Scanning Laser Polarimetery (GDx) and Optical Coherence Tomography (OCT). Treatment of glaucoma was also reviewed.

Results: Average follow-up period was 19.1 (range 5-31) months. Of the 15 eyes that underwent OOKP, 5 eyes had pre-existing glaucoma. None of the other 10 eyes developed glaucoma following OOKP. ONH photography and visual field testing were the most reliable methods to assess status of the disease, while HRT and OCT could be performed with reasonable reproducibility and quality; GDx imaging was poor. All patients with glaucoma were treated with oral acetazolamide 500 mg twice a day. Transcleral cyclophotocoagulation was performed in 3 eyes at stage 2 of OOKP surgery. Progression of glaucoma was noted in 2 eyes based on optic disc photographs and automated perimetry.

Conclusions: Visual field testing and optic disc assessment with optic disc photos appear to be effective methods to monitor eyes with OOKP for glaucoma. Treatment strategies include oral medications to lower IOP and cyclophotocoagulation.

SP084

CASES OF RARE GLAUCOMA PRESENTING IN GLAUCOMA CLINIC AT KING GEORGE'S MEDICAL UNIVERSITY, LUCKNOW, INDIA

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Purpose: To report the rare glaucoma cases in glaucoma clinic at King George Medical University, Lucknow, India

Methods: A retrospective study of the records of patients attending the glaucoma clinic from 1998 to 2007 of Department of Ophthalmology, King George Medical University was carried out.

Results: It was found that 14 patients out of 1592 (0.94%) with rare glaucoma presented in the glaucoma clinic. Three patients of glaucoma due to epidemic dropsy were managed. Two patients were twins and presented as mirror image buphthalmos. Another young male patient presented with aniridia, coloboma lens with secondary glaucoma and a young lady with aniridia. One patients each of pigmentary glaucoma, ICE syndrome, bilateral cornea plana with acute angle closure glaucoma, Axenfeld Reiger syndrome, congenital hereditary microcoria, iris cyst and a post snake bite exacerbation of PNAG.

Conclusion: Though rare, the patients with rare type of glaucoma can present to glaucoma clinic and we should be aware of these conditions as regular routine management has to be customized as per case.

SP085

THE PREVALENCE OF PSEUDOEXFOLIATION IN A NATIONAL EYE HOSPITAL

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Purpose: To determine the prevalence of pseudoexfoliation in patients who attend The Tun Hussein Onn National Eye Hospital, Petaling Jaya, Selangor.

Methods: All patients (30 years and above) attending clinic at The Tun Hussein Onn National Eye hospital from 16th April 2007 to 16th July 2007, who met the inclusion and exclusion criteria, were screened for pseudoexfoliation. Slit lamp examination, gonioscopy and funduscopy were performed. The intraocular pressures were checked with Goldmann's tonometer. The eyes were checked for pseudoexfoliation before and after dilation.

Results: A total of 8597 patients who met the inclusion and exclusion criteria were recruited. There were 4634 (53.91%) females and 3963(46.09%) male patients. Of these, there were 4813 (55.98%) Chinese, 1974 (22.97%) Indians, 1335 (15.55%) Malays and 475 (5.51%) of other races. Twenty-seven patients (0.31%) were found to have pseudoexfoliation. Of these, 13 patients (0.15%) were Chinese, 8(0.10%) were Indians, 5 (0.05%) and 1 patient (0.01%) was of other races. Of the 27 (0.31%) patients who had pseudoexfoliation, 9 patients (0.1%) presented with raised intraocular pressures.

Conclusions: There were no previous data on the prevalence of Pseudoexfoliation in Malaysia. The present study is a pilot study on the prevalence of pseudoexfoliation in patients attending clinics at the Tun Hussein Onn National Eye Hospital, Petaling Jaya, Malaysia.

SP086

THE RELATIONSHIP BETWEEN INTRAOCULAR PRESSURE AND INFLUENCING FACTORS IN THE HEALTHY KOREAN POPULATION

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Purpose: To assess the influence of aging, gender, blood pressure and sugar, total cholesterol, triglyceride, high density lipoprotein (HDL), and body mass index (BMI) on IOP in Healthy Korean population.

Methods: A total of 30,893 healthy participants underwent automated multi-phasic test, including tonometry, systolic and diastolic blood pressure, FBS, total cholesterol, triglyceride, HDL and BMI. We used six age groups divided by decades ranging from 20 to 29 years to 70 to over 80 years old. The association between IOP and influencing factors was examined cross-sectional analysis and multiple linear regression analysis.

Results: The median age of participants was 48.1 years, and 50.9% of the population was males. The mean IOP was 15.5± 3.2mmHg. The prevalence of ocular hypertension was 4.2%. IOP decreased with aging, and increased with the higher level of systolic and diastolic blood pressure, total cholesterol, triglyceride, HDL, and blood glucose. By multiple linear regression analysis of right intraocular pressure in normal IOP, there's no relationship in gender, but a tendency of negative regression in aging and positive regressions in systolic and diastolic blood pressure, total cholesterol, triglyceride, HDL, and blood glucose.

Conclusions: This study showed a significant association between IOP and influencing factors, which increase IOP such as, systolic and diastolic blood pressure, FBS, total cholesterol, triglyceride, HDL and BMI. Further studies should be needed to clarify this issue.

5th Congress of the South East Asia Glaucoma Interest Group &
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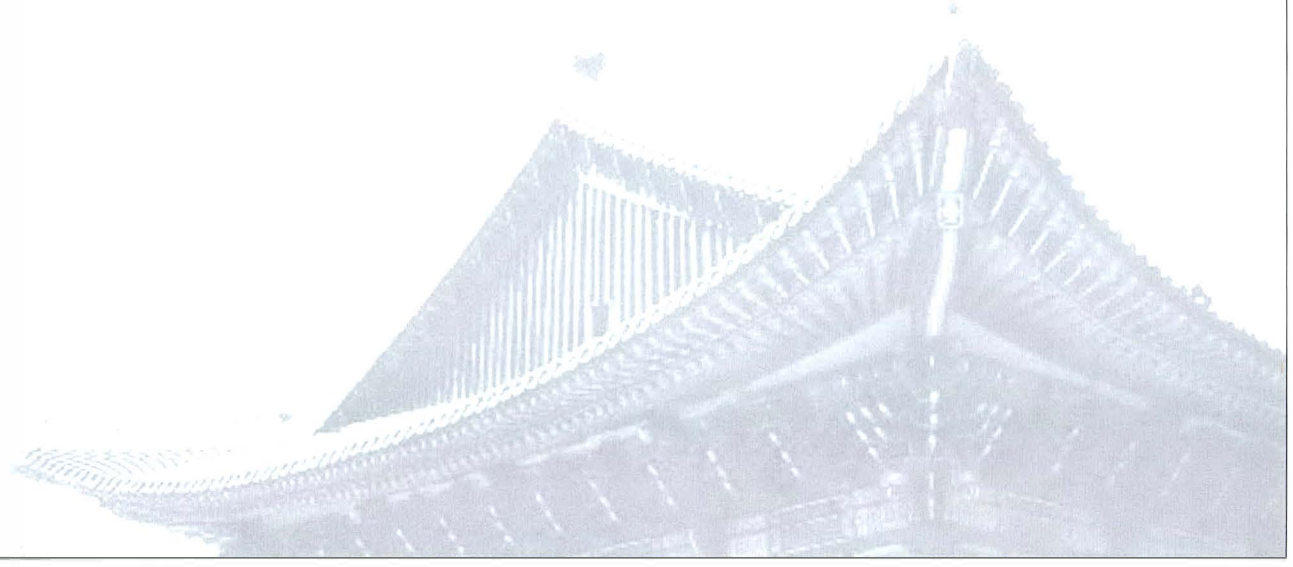

Angle-Closure Glaucoma

AP001

THE PREVALENCE OF PRIMARY ANGLE-CLOSURE GLAUCOMA AND CATARACT SURGICAL RATE IN ASIAN COUNTRIES

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Purpose: To compare the prevalence of primary angle closure glaucoma (PACG) with cataract surgical rate (CSR) in various Asian countries to provide an evidence for potential benefit of cataract surgery in preventing PACG.
Methods: A review of data from population based studies from 2000 to 2007 to investigate the prevalence of PACG in Asian countries was performed. The prevalence of PACG in each countries were compared with World Health Organization data; Cataract surgical rate (CSR; number of cataract operations per million population per year) in 2003.
Results: The PACG prevalence rate in Myanmar was highest (2.5%) and the CSR was less than 124. In China, three epidemiological surveys revealed that the PACG prevalence was 1.2-2.5 % and CSR was 250-499. The PACG prevalence and CSR in Korea were 1.14 % and 2000-2999 respectively. The prevalence of PACG in India was found to be 0.78-0.88% and the CSR in this country was 3000-3999. Finally, in Japan, the prevalence of PACG was 0.6%, which is lowest among the countries, and the CSR was over 4000.
Conclusions: In Asian countries, the PACG prevalence tend to increase as the CSR decreases. This is suggestive of a potential role of lens in the pathogenesis of PACG.

AP002

OUTCOMES FOLLOWING ACUTE PRIMARY ANGLE-CLOSURE IN AN ASIAN POPULATION

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Purpose: Data regarding development of PACG following acute primary angle closure (APAC) is conflicting. This study looks at visual and IOP outcomes after an APAC episode treated in the past three years with a secondary aim to identify any risk factors that could predict progression to PACG.
Methods: This is a retrospective review of the charts of consecutive patients who were diagnosed with APAC from December 2003 to June 2006. All were treated in a standard manner with initial intensive medical therapy or laser iridoplasty followed by early laser peripheral iridotomy within 24 hours of presentation.
Results: 42 eyes of 41 patients were analyzed. The mean follow-up period was 27.3 ± 16.2 months. Nine eyes (21.4%) developed an increase in IOP within a mean of 11.9 months (median 5 months) after resolution of APAC. Eight eyes went on to have trabeculectomy or seton implant. At final follow-up, the mean IOP of attack eye was 13.3 ± 2.92 mmHg. None of the eyes, including those that underwent surgery, required topical medication to control IOP. 38 eyes (90.5%) have BCVA of 6/6 to 6/12. On multivariate analysis, the duration of symptoms before presentation and number of medications used in the acute attack were found to be significantly associated with development of PACG.
Conclusions: The results of this study suggest that outcomes following successful treatment of APAC may not be as poor as described previously. Early aggressive management of the acute episode may have a role to play in preventing development of PACG after APAC.

AP003

CENTRAL CORNEAL THICKNESS IN PRIMARY ANGLE-CLOSURE GLAUCOMA

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Purpose: To characterize central corneal thickness (CCT) in subjects with primary angle closure glaucoma (PACG), in comparison with other types of glaucoma.
Methods: CCT was measured by ultrasonic pachymetry in 89 subjects with PACG and this was compared with CCT in 88 primary open angle glaucoma (POAG) and 80 normal tension glaucoma (NTG) subjects. Statistical analysis comprised Student's t-test with Bonferroni correction and analysis of variance using SPSS 11.5.
Results: Mean CCT was 539.96 +/- 31.90 um in PACG compared to 547.34 +/- 31.02 um in POAG (P=0.22) and 534.36 +/- 36.85 um in NTG subjects (P=0.60). CCT in NTG subjects was significantly lower (P<0.04) that those with POAG.
Conclusion: Eyes with PACG have similar CCT with both POAG and NTG while CCT in NTG subjects was significantly lower than POAG subjects.

AP004

ANTERIOR CHAMBER MEASUREMENT WITH THE PENTACAM FOR UNILATERAL PRIMARY ANGLE-CLOSURE

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Purpose: To quantitatively analyze the anterior chamber morphology in eyes with unilateral primary angle closure using the Pentacam rotating Scheimpflug camera.
Methods: We retrospectively studied eight eyes of four patients (male; mean age 65 years old; no history of ocular trauma) with unilateral primary angle closure. The central anterior chamber depth (ACD) and the anterior chamber volume (ACV) were measured with the Pentacam.
Results: Both ACD (1.64±0.18mm) and ACV (64±14.3mm3) for the eyes with unilateral primary angle closure were significantly smaller than for the contralateral eyes (ACD: 2.59±0.52mm; ACV: 131±23.0mm3). After laser iridotomy (LI), ACD and ACV were 1.78±0.31mm and 98±8.2mm3, respectively. Lens subluxation showed that the rate of increase in ACV after LI was more than twice as large (105%) as for other cases (40-46%). In all cases, diaphanoscopy showed a ripple-like curved line on the lens.
Conclusion: Measurements of ACD and ACV with the Pentacam are useful for analyzing the anterior chamber morphology for unilateral primary angle closure.

AP005

ULTRASOUND BIOMICROSCOPY STUDY IN 10 EYES WITH NANOPHTHALMOS

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Purpose: To characterize the anterior chamber angle of nanophthalmos and to elucidate the mechanisms how the angle closure glaucoma develop.
Methods: 10 phakic eyes of 6 patients with nanophthalmos were studied. Anterior chamber angle and ciliary body structures were observed with Ultrasound biomicroscpy. To assess the structural feature, Angle open distance 500 (AOD500),Trabecular sulcus angle (TSA), Anterior chamber depth 1500 (ACD1500) were measured. Furthermore, structural changes after Laser iridectomy or peripheral iridectomy were studied in 7 eyes.
Results: Relative pupillary block existed in the all eyes without iridectomy. In most of them, AOD500 was smaller than 100um. After the iridectomy was perfomed, both AOD500 and ACD1500 were increased clearly, whereas changes in TSA remained small.
Conclusion: Relative pupillary block may play an important role in angle closure glaucoma which arises in nanophthalmic eyes, but another mechanism probably exists simultaneously.

AP007

COURSE OF THE DISEASE FOLLOWING LASER IRIDOTOMY IN PATIENTS WITH PRIMARY ANGLE-CLOSURE GLAUCOMA

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Purpose: To study the course of the disease following laser PI in patients with PACG
Methods: Retrospective analysis of 20 patients diagnosed to have PACG. Period of study- Jan 2007 to April 2008. All these patients were treated with YAG laser iridotomy. Follow up period varied from 2- 12 months. During the follow up the need for additional antiglaucoma medications, additional laser procedures, trabeculectomy, combined lens extraction was noted.
Results: All the patients were treated with YAG laser PI. A successful iridotomy was achieved in a single sitting in 17 eyes. 3 patients underwent trabeculectomy. 13 patients required additional antiglaucoma medications to control the intraocular pressure. None of the patients underwent laser iridoplasty or lens extraction.
Conclusions: 39.3% of the eyes in our study required additional antiglaucoma medication following laser PI. In 51% of the eyes laser PI alone was sufficient to control the intraocular pressure.

AP008

SURGICAL IRIDECTOMY OR TRABECULECTOMY IN ANGLE-CLOSURE: CASE SERIES IN A YEAR PERIOD

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Purpose: To evaluate the initial management of angle closure without laser facilities

Methods: This was a descriptive – retrospective study of newly diagnosed angle closure patients who came in our clinic on 2005-2006. It depends on the clinical evaluation whether the patients would have surgical iridectomy or trabeculectomy and then visual acuity, intraocular pressure (IOP) and last medication was noted in a year.

Results: There were 34 eyes listed from medical records. Sixteen eyes underwent trabeculectomy (T) and the rest had surgical iridectomy (SI). The sum of female patients was 2.5 times more often than male. The mean intraocular pressure in SI group was 28.67 mmHg and the T group was 44.9 mmHg. In T group, 87.5% was chronic angle closure glaucoma with at least 3 quadrants had peripheral anterior synechiae (PAS). In SI group, 44.4% was diagnosed with chronic angle closure glaucoma (with or without the recurrence of acute attack). In a year of follow up, all patients in SI group had well controlled IOP without medication, but in T group there was 1 patient needed additional medication to control the IOP.

Conclusion: Trabeculectomy or surgical iridectomy will give a good result in initial management of angle closure/glaucoma based on clinical evaluation.

AP009

CHRONIC ANGLE-CLOSURE GLAUCOMA (CACG) COULD BE CURED BY PHACOEMULSIFICATION

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Purpose: To evaluate IOP and anterior chamber angle configuration changes following phacoemulsification with posterior chamber IOL in CACG patients who had 360° appositional closure of anterior chamber angle

Methods: Prospective analysis of CACG patients who had either 1) IOP ≥20 mmHg. with or without medication or 2)IOP <20 mmHg. with medication, glaucomatous optic disc appearance, and 360° appositional closure of anterior chamber angle with or without patent iridotomy. Phacoemulsification with posterior chamber IOL was performed on each patient. IOP was examined at 1week, 3 weeks, and 3 months postoperatively without pressure-reducing medication. Anterior chamber angle configuration was noted at 3 weeks.

Results: There were 11 eyes of 9 patients in the study. Preoperative IOP ranged from 20 to 35 mmHg. in eyes without medication and 10 to 23 mmHg. in eyes with medications. There were 5 eyes that needed anti-glaucoma medications of that 4 had patent iridotomies. Postoperatively, all eyes had angle configuration of widely opening. At 1week, 3 weeks, and 3 months following phacoemulsification, IOP ranged from 8 to 16, 8 to 16, and 10 to 15 mmHg. with mean of 12.64, 12.2, and 11.83 mmHg. respectively.

Conclusions: Phacoemulsification could reduce IOP to less than 17 mmHg. in all CACG eyes with 360° appositional closure. Angle opening had been changed dramatically in all eyes.

When glaucoma progresses...

Xala Control

...Progress to Once Daily Xalacom® latanoprost/timolol maleate for proven efficacy[1-6]

REFERENCES: 1. Larsson L-I, *et al*. The effect on diurnal intraocular pressure of the fixed-combination of latanoprost 0.005% and timolol 0.5% in patients with ocular hypertension. *Acta Ophthalmol Scand*. 2001;79:125–8. 2. Konstas AGP, *et al*. Twenty-four hour control with latanoprost-timolol-fixed combination therapy vs latanoprost therapy.*Arch Ophthalmol*. 2005;123:898–902. 3. Diestelhorst M and Larsson L-I, for the European-Canadian Latanoprost Fixed Combination Study Group. A 12-week, randomized, double-masked, multicenter, study of the fixed combination of latanoprost and timolol in the evening versus the individual components. Ophthalmology. 2006;113:70–6. 4. Shin DH, *et al*. Efficacy and safety of the fixed combinations latanoprost/timolol versus dorzolamide/ timolol in patients with elevated intraocular pressure. Ophthalmology. 2004 Feb;111:276–82. 5. Topouzis F, *et al*. A 1-year study to compare the efficacy and safety of once-daily travoprost 0.004%/ timolol 0.5% to once-daily latanoprost 0.005%/timolol 0.5% in patients with open-angle glaucoma or ocular hypertension. *Eur J Ophthalmol*. 2007;17:183–90. 6. Martinez A and Sanchez M. A comparison of the safety and intraocular pressure lowering of bimatoprost/timolol fixed combination versus latanoprost/timolol fixed combination in patients with open-angle glaucoma. *Curr Med Res Opin*. 2007;23:1025–32.

In the 6-month registration trials, the most frequent adverse events were eye irritation, including stinging, burning, and itching (12.0%); eye hyperemia (7.4%); corneal disorders (3.0%); conjunctivitis (3.0%); blepharitis (2.5%); eye pain (2.3%); headache (2.3%); and skin rash (1.3%)[1].

Summary of Prescribing Information

Composition: Bottles containing 2.5 ml ophthalmic solution, 1 ml contains 50 mcg of latanoprost and 6.8 mg of timolol maleate equivalent to 5 mg timolol. **Indications:** Reduction of elevated intraocular pressure (IOP) in patients with open-angle glaucoma and ocular hypertension insufficiently responsive to topical beta blockers and PG analogues **Contraindications:** Reactive airway disease including bronchial asthma, a history of bronchial asthma, or severe chronic obstructive pulmonary disease, sinus bradycardia, second or third-degree atrioventricular block, overt cardiac failure, or cardiogenic shock, known hypersensitivity to latanoprost, timolol maleate, or any other component of the product. **Adverse Reactions:** Adverse events observed in 1% of the patients treated with Xalacom during clinical development were: abnormal vision, blepharitis, cataract, conjunctival disorder, conjunctivitis, corneal disorder, errors of refraction, eye hyperemia, eye irritation, eye pain, increased iris pigmentation, keratitis, photophobia, and vision field defect. Other systemic reactions include infection, sinusitis, and upper respiratory tract infection,diabetes mellitus, hypercholesterolemia, depression, headache, hypertension, hypertrichosis, rash, and skin disorder and arthritis **Warnings and Precautions:** Latanoprost: increased brown pigmentation of iris, reversible eye lid skin darkening. May gradually change eyelashes and vellus hair in the treated eye, heterochromia, and macular edema, including cystoid macular edema. Limited experience in the treatment of inflammatory neovascular or congenital glaucoma. No adequate and well-controlled studies in pregnant women, use with caution in nursing women. Timolol: Monitor patients with severe heart disease for signs of cardiac failure. Aggravation of Prinzmetal's angina, aggravation of peripheral and central circulatory disorders, hypotension, fatal cardiac failure, severe respiratory reactions such as fatal bronchospasm in patients with asthma and bradycardia may occur. Consider gradual withdrawl prior to major surgery. Used with caution in patients with spontaneous hypoglycemia or diabetes, may mask certain signs and symptoms of hyperthyroidism. Patients with h/o atopy/ severe anaphylactic reaction to allergens may be more reactive to repeated challenge with such allergens. May increase muscle weakness in patients with myasthenia gravis/ myasthenic symptoms; choroidal detachment after filtration procedures. Patients should not drive or use machines while on Xalacom. **Dosage:** One drop in the affected eye(s) once daily. Dose should not exceed once daily. If more than one topical ophthalmic drug is being used, the drugs should be administered at least five minutes apart. Safety and effectiveness not established in children.

Please refer to the SmPC before prescribing Xalacom® (Latanoprost and Timolol maleate)

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