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INTRODUCTION

The **5th Asia-Pacific Glaucoma Congress** will be held virtually for the first time from **4–8 June 2021**, hosted by the Asia-Pacific Glaucoma Society.

The Asia-Pacific Glaucoma Congress brings together clinicians, scientists, students, and other health practitioners from the Ophthalmology field with a focus on Glaucoma. The program provides a platform for delegates to collaborate, share experiences, knowledge and research results whilst also learning about world's best practice and the recent innovations helping us overcome challenges in clinical medicine and surgery.

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PROGRAM OVERVIEW

The Asia-Pacific Glaucoma Congress invited submissions for the official program over a broad range of themes including but not limited to basic research and pathogenesis, epidemiology and economic evaluation, glaucoma imaging and diagnosis, glaucoma surgery, laser treatment and medical treatment. Over 220 abstract submissions were received and peer reviewed to ensure a fair and equitable process.

Accepted into the official program are 98 poster presentations and 41 on-demand oral presentations, including 8 highlighted oral presentations which will participate in the "best free papers" session in the live scheduled program.
We hope that you find value and ongoing educational benefit from this publication of accepted oral and poster submissions from the 5th Asia-Pacific Glaucoma Society official program in 2021.

BEST PAPER ORAL PRESENTATIONS

Basic Research and Pathogenesis

Ten-Year-and-Beyond Longitudinal Change of ß-Zone Parapapillary Atrophy: Comparison of Primary Open-Angle Glaucoma with Normal Eyes

Eunoo Bak[1,2], Jin Wook Jeoung[1,2], Ki Ho Park[1,2]

[1]Department of Ophthalmology, Seoul National University College of Medicine, Korea, [2]Department of Ophthalmology, Seoul National University Hospital, Korea

Introduction:

To investigate the difference in longitudinal change of beta-zone parapapillary atrophy (ß-zone PPA) between primary open-angle glaucoma (POAG) and normal eyes.

Methods

A total of 153 eyes with POAG and 105 normal eyes were followed for 10 years or longer, with disc photography performed every year. The topographic parameters of ß-zone PPA (area, maximal radial extent, angular extent around disc) were measured. The factors associated with the enlargement of ß-zone PPA parameters were assessed by odds ratio (OR) using multivariable logistic regression.

Results

Over the course of the average 11.6 ± 1.3-year follow-up period, enlargement of ß-zone PPA was detected in 66.7% of POAG eyes and in 26.7% of normal eyes. Increment of all PPA parameters was significantly more common in cases of POAG than in normal eyes (all $P < 0.001$). The spatial distribution of maximal radial extent at baseline and final was significantly different between the two groups: POAG eyes; inferotemporal vs. normal eyes; temporal (Chi-square = 26.549, $P < 0.001$, Chi-square = 19.320, $P = 0.004$, respectively). The widening of radial extent was

significantly associated with older age (OR: 1.036, P = 0.010) and the presence of glaucoma (OR: 2.599, P = 0.002). The increment of angular extent was associated with the presence of glaucoma (OR:12.167, P = 0.017) and optic disc hemorrhage (OR: 3.266, P = 0.019).

Conclusion

The pattern of ß-zone PPA change differed between POAG and normal eyes during a follow-up period of 10 years or more. The enlargement of PPA occurred more frequently in POAG than in normal eyes. The widening of radial extent was associated with older age and glaucoma, while the increment of angular extent was associated with glaucomatous damage.

References

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2. Park KH, Tomita G, Liou SY, Kitazawa Y. Correlation between peripapillary atrophy and optic nerve damage in normal-tension glaucoma. Ophthalmology. 1996;103(11):1899-1906.

Descemet's membrane in primary congenital glaucoma

Shikha Gupta[1], Seema Sen[2], Sohini Mandal[1], Mansi Bhardwaj[2], Awadh Chaurasia[3], Jeewan Singh Titiyal[1], Viney Gupta[1]

[1]Dr. R.P. Centre for Ophthalmic Sciences, AIIMS, New Delhi, [2]Ocular Pathology, Dr. R.P. Centre for Ophthalmic Sciences, AIIMS, New Delhi, [3]Menzies Institute for Medical Research, Australia

Introduction

The study aimed to evaluate Descemet's membrane (DM) morphology in eyes with primary congenital glaucoma (PCG) in vivo using high-definition anterior segment OCT (ASOCT) and on histopathology.

Methods

In this comparative observational case control series, corneal scans of PCG patients (22 eyes of 15 patients) were evaluated for DM morphology and anterior chamber angle using ASOCT among. The DM thickness in PCG eyes was compared with fellow eyes (8 eyes) of unilateral PCG patients and healthy controls (12 eyes) on ASOCT. The DM morphology was also compared on histopathology of corneal tissues (9) obtained from PCG eyes following keratoplasty and enucleated eyes of retinoblastoma (6 controls) on light microscopy with immunostaining for collagen I and IV.

Results

On ASOCT, all affected eyes showed presence of either a thickened DM complex or a hyper-reflective double layer representing the thickened DM and pre Descemet's layer (PDL), unlike a single membrane in controls and fellow eyes. On ASOCT, among PCG patients the DM showed significant thickening (32.0 ± 11.2 µm) vs fellow eyes (14.4 ± 3.3µm) and controls (11.5 ± 1 µm); ($p < 0.001$; ANOVA). On histopathology, thickening of DM was also slightly more among PCG eyes (median: 67.9 µm) vs controls (median: 28.9 ± 5.1 µm); $p = 0.005$ as also the PDL (mean: 13.5 ± 5.1 µm PCG vs 3.7 ± 2.7µm in controls; $p = 0.014$).

Conclusion

Abnormal thickening of DM and PDL occurs in PCG eyes, the clinical significance of which should be the scope for future research.

Glaucoma Imaging and Diagnosis

Retinal nerve fiber layer thickness and neuroretinal rim area profiles in Asians: meta-analysis from the Asian Eye Epidemiology Consortium (AEEC)

Shivani Majithia[1], Yih Chung Tham[1], Marco Yu[1], Jost Jonas[2], Ian Wong[3], Ching-Yu Cheng[1]

[1]Singapore Eye Research Institute, Singapore, [2]University of Heidelberg, Germany, [3]University of Hong Kong, Hong Kong, China

Introduction

Reference databases for healthy retinal nerve fiber layer thickness (RNFL) and rim area (RA) are bias towards Caucasian populations. Therefore, the purpose of this study was to comprehensively examine determinants of RNFL thickness and RA in a large consortium of Asian population-based studies.

Methods

The Asian Eye Epidemiology Consortium (AEEC) is a network of population-based studies across Asia. Average RNFL and RA was measured by SD-OCT from 5 population-based studies (Singapore, Hong Kong, China). Non-glaucoma individuals aged ≥ 40 years were included, among which, eyes with poor quality scans were excluded. Associations of ocular and systemic factors were evaluated using multivariable linear regression. Effect estimates from each study were pooled and summarized using random effects meta-analysis.

Results

6,696 eyes for RNFL thickness and 5,527 eyes for RA were included. Mean age was 59.7 ± 8.8 and 53.4% were females. Older age (per year; β = -0.31; 95% CI -0.35 to -0.27; P < 0.001), male gender (β = -1.20; 95% CI -2.12 to -0.27; P = 0.01), higher IOP (per mmHg; β = -0.18; 95% CI -0.27 to -0.10; P < 0.001), and greater myopia (per dioptre; β = -1.18; 95% CI -1.44 to -0.92; P < 0.001) were associated with thinner RNFL. These factors were also associated with thinner RA (all P ≤ 0.003). Additionally, lower BMI was observed to be associated with thinner RA (β = -0.45; 95% CI -0.68 to -0.21; P < 0.001)

Conclusion

Among Asians, age, IOP, gender, and myopia are main determinants for RNFL thickness and RA. Our results are consistent with those previously reported in European descents.

Relationship of Vessel Density by Optical Coherence Tomography Angiography (OCT-A) in Healthy, Glaucoma Suspect, and Glaucoma Eyes

Bipul Kumer De Sarker[1], Zafrul Hassan[1]

[1]Glaucoma, Ispahani Islamia Eye Institute & Hospital, Bangladesh

Introduction

The purpose of the study was to evaluate optic nerve vascular density using optical coherence tomography angiography (OCTA) in patients with primary open angle glaucoma (POAG), glaucoma suspect and normal eyes.

Methods

This was a prospective, observational study including 250 eyes in total and divided into 3 groups: 100 eyes with POAG, 100 glaucoma suspect eyes, and 50 age-matched healthy eyes as controls. Vessel density was assessed as the ratio of the area occupied by the vessels in 3 distinct regions: 1) within the optic nerve head; 2) in the peripapillary region around the optic disc; and 3) in the whole image. The potential associations between vessel density and structural, functional measures were also analyzed.

Results

There was a statistically significant difference in vessel density among all the groups ($p < 0.001$) and also showed a stepwise decrease from normal eyes to glaucoma suspect eyes to glaucoma eyes. Glaucomatous eyes showed a significant difference for all measured vessel densities compared to control eyes ($p < 0.001$). The superior and inferior peripapillary area vessel densities were highly correlated with RNFL thickness in OCT and functional changes (visual field) in Humphrey visual field assessment in POAG eyes.

Conclusion

Eyes with glaucoma could be differentiated from glaucoma suspect eyes, which also could be differentiated from normal eyes using OCTA-derived retinal vessel density measurements. This may provide new structural parameters that could potentially be used to diagnose glaucoma at earlier stages.

Glaucoma Surgery

Sustained 5-year safety and IOP outcomes in open-angle glaucoma subjects treated with trabecular micro-bypass stents (iStent *inject*) as a standalone procedure

Daniel Lee[1]

[1]Wills Eye Hospital, USA

Introduction

This study prospectively evaluates long-term performance of 2nd generation trabecular micro-bypass stents (iStent *inject*®) implanted as a standalone procedure in patients with open-angle glaucoma (OAG) not controlled by 1 ocular hypotensive medication.

Methods

This 5-year controlled, prospective, single-arm study enrolled subjects with OAG and preoperative intraocular pressure (IOP) of 18-30 mmHg on 1 medication (med) and 22-28 mmHg after washout. All subjects underwent implantation of iStent inject stents as a standalone procedure. Assessments through Month 60 (M60) included IOP, med burden, adverse events (AEs), best-corrected visual acuity (BCVA), visual fields (VF), cup-to-disc ratio (C:D), and findings from slit-lamp, gonioscopy, and fundus/optic nerve examinations.

Results

All 57 subjects underwent successful standalone iStent inject implantation and completed M60 follow-up. Preoperatively, mean IOP on a single med was 19.5 ± 1.5 mmHg and unmedicated (post-washout) IOP was 24.4 ± 1.3 mmHg. At all visits through M60, mean IOP was ≤ 14.6 mmHg. At M60, mean IOP was 12.9 mmHg (34% and 47% reduction vs preoperative medicated and unmedicated IOPs, respectively; $p < 0.0001$ for both). At M60, of med-free eyes, 91% achieved unmedicated IOP ≤ 18 mmHg and 91% had IOP reduction ≥20% vs preoperative washout IOP. All but 4 eyes were med-free at M60. Favorable safety included no intraoperative or device-related AEs, BCVA 20/40 or better in 93% of eyes, and stable C:D and VF.

Conclusion

In OAG eyes with IOP not controlled on 1 med, standalone iStent inject implantation resulted in significant, sustained, and safe IOP and med reductions through 5 years postop with most eyes med-free. This favorable benefit-to-risk profile of standalone iStent inject implantation adds to existing evidence of the device's safety and efficacy.

Medical Treatment

Comparison of omidenepag isopropyl 0.002% with latanoprost 0.005% in subjects with open-angle glaucoma/ocular hypertension: the Phase 3 PEONY trial

Tin Aung[1], Ki Ho Park[2], Ronnie George[3], Fenghe Lu[4], Akihiro Iwata[5], Noriko Odani-Kawabata[4,5], Tsing-Hong Wang[6]

[1]Singapore National Eye Centre and National University of Singapore, Singapore, [2]Seoul National University, Korea, [3]Sankara Nethralaya, India, [4]Santen, Inc., USA, [5]Santen Pharmaceutical Co., Ltd, Japan, [6]National Taiwan University Hospital, Taiwan

Introduction

Omidenepag, the active metabolite of omidenepag isopropyl (OMDI), is a selective non-prostaglandin, prostanoid EP2 receptor agonist. This randomized, observer-masked, active-controlled, parallel-group phase 3 trial (NCT02981446) compared the efficacy and safety of OMDI 0.002% with latanoprost (LAT) 0.005% in subjects with open-angle glaucoma or ocular hypertension.

Methods

Subjects from India, Korea, Singapore, and Taiwan received once-daily OMDI 0.002% or LAT 0.005% (n = 185 each) bilaterally for 3 months. Intraocular pressure (IOP) was measured at 9:00AM, 1:00PM, and 5:00PM at baseline, at Weeks 1 and 6, and at Month 3. The primary efficacy endpoint was the mean diurnal IOP at Month 3. Adverse events (AEs) were recorded.

Results

Baseline mean ± SD diurnal IOP was similar in the OMDI (24.6 ± 2.3 mmHg) and LAT (24.5 ± 2.1 mmHg) groups. The least-squares mean (95% CI) IOP difference (OMDI minus LAT) at Month 3 was 0.64 (0.04, 1.24) mmHg, demonstrating that OMDI was non-inferior to LAT (95% CI upper limit ≤ 1.5 mmHg). Rates of AEs, ocular AEs, and suspected adverse reactions were 40.0%, 36.8%, and 23.2%, respectively, in the OMDI group and 29.7%, 21.1%, and 11.9%, respectively, in the LAT group, with

most AEs being mild and no serious ocular AEs reported. Rates of conjunctival hyperemia, corneal thickening, and ocular hyperemia were 11.9%; 3.8%, and 2.2%, respectively, in the OMDI group and 5.4%, 1.1%, and 2.2%, respectively, in the LAT group. Cosmetic AEs were observed only in the LAT group.

Conclusion

IOP lowering with OMDI was non-inferior to that with LAT after 3 months. The incidence of AEs was higher in the OMDI group, but no serious AEs were observed in either group and no cosmetic AEs were observed in the OMDI group.

Miscellaneous

Comparing the performance of iPad-based noise field perimeter versus Humphrey Field Analyzer in detecting glaucomatous visual field loss

Leonard Yip[1,2], Jianbin Ding[1], Ivan Tecson[2], Bryan Ang[2], Wenqi Chiew[3]

[1]Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore, [2]Department of Ophthalmology, Tan Tock Seng Hospital, Singapore, [3]Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Introduction

Glaucoma is a leading cause of global blindness. Majority of cases are undiagnosed, with more than half suffering visual field (VF) loss. There is a need for accessible, efficient, and reliable tools to detect glaucoma. We developed iPad-based VF testing software called Visual Field Fast (VFF). Subjects observe a screen-wide flickering stimulus and scotomas can be perceived immediately. We validate VFF in detecting glaucoma scotoma by comparing it against Humphrey Visual Field (HVF)

Methods

Prospective study of 66 glaucoma subjects and 30 healthy controls. VFF was compared against HVF whole field and quadrants. Correspondence in scotoma detection was analysed. Agreement and correlation between scotoma area on VFF and HVF and VFF scotoma area with severity of VF loss (Mean Deviation, MD; Visual Field Index, VFI) were studied. Test durations were compared. Repeatability was tested in glaucoma subjects.

Results

VFF tests were performed using black-white, 2x2 pixel and 30 Hz stimulus. VFF test time was faster than HVF in glaucoma (3.60 ± 1.85 min versus 6.92 ± 1.12 min, $p < 0.01$) and control (1.12 ± 0.486 min versus 5.16 ± 0.727 min, $p < 0.01$). VFF detected 91.2% of glaucoma subjects with 1 false-positive (kappa = 0.86). 79.9% of abnormal quadrants were localized (kappa = 0.61). VFF underestimated scotoma area as compared to HVF (18.6% versus 69.6%, $p < 0.01$) but correlated positively ($r = 0.290$,

p = 0.0275) with HVF and negatively with VFI (r = -0.343, p <0.01) and MD (r = -0.401, p < 0.01). VFF's quantitative repeatability was excellent for whole field (intraclass correlation coefficient, ICC: 0.96; p < 0.0001) and quadrants (ICC: 0.82-0.96; all p < 0.001). Qualitatively, scotomas had similar retest morphologies.

Conclusion

VFF localized scotomas with high accuracy and repeatability. Considering its portability and cost-effectiveness, VFF may be useful for glaucoma screening.

ON-DEMAND ORAL PRESENTATION ABSTRACTS

Basic Research and Pathogenesis

Detection of iris nerve and M3 receptor in patients with primary chronic angle-closure glaucoma

Siyuan Chen[1], Jibing Wang[1]
[1]Weifang Eye Hospital, China

Objective
The iris nerve and M3 receptors in patients with primary chronic angle closure glaucoma were detected and compared with normal eyes, to explore the pathological mechanism of primary chronic angle-closure glaucoma (CACG).

Methods
18 cases of CACG patients treated in Weifang Eye Hospital were collected from January to September 2019. The iris tissues were obtained from peripheral iridectomy during trabeculectomy, and normal iris tissues of the same region were obtained from 10 eyes of cornea donors. The iris tissues sections were stained with silver nitrate to detect nerve distribution and M3 receptors were detected with immunohistochemistry. The quantities of M3 receptors were evaluated by integrated optical density (IOD), and the nerve distributions were evaluated by Mean Density (MD) and compared separately.

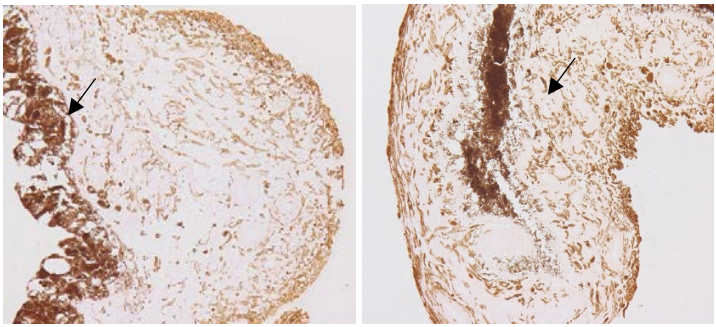
Results
The nerve quantities of peripheral iris in patients with CACG were higher than that of normal eyes, the difference was statistically significance (MD: 0.119101 ± 0.05431, 0.038314 ± 0.06015, $p < 0.05$). The quantities of M3 receptors of peripheral iris in CACG patients were less than of normal donors (IOD was 9355.60 ± 7209.80; 17418.27 ± 16635.73, $p < 0.05$), the difference was also statistically significance.

Conclusion

The human nerve quantities of peripheral iris in CACG patients is higher than that in normal eyes, and the quantities M3 receptors is less than that in normal eyes, which may be involved in the pathogenesis of CACG.

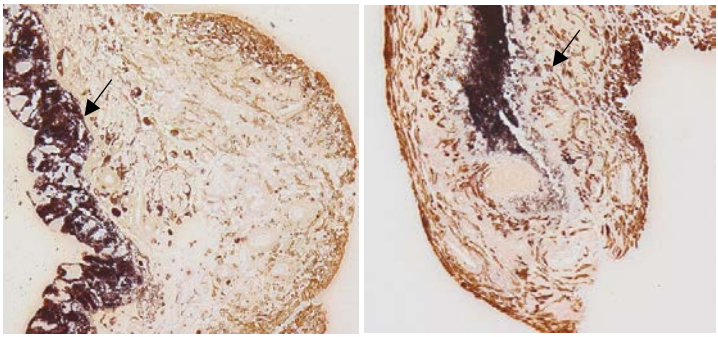
Tables, figures, and illustrations

Silver nitrate stain (200x). Black areas are nerve fibers.



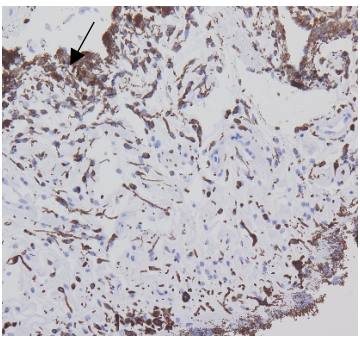
(Negative control)

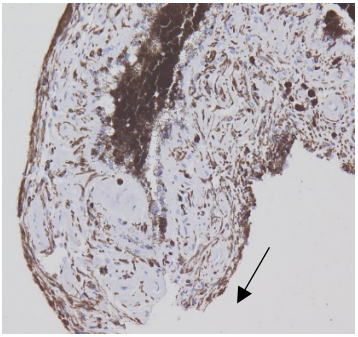
Normal



CACG

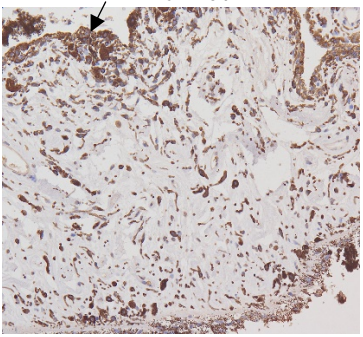
Immunohistochemistry (200x). Black arrow points to the area of increased M3 receptors.



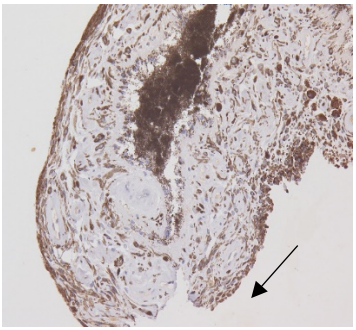


(Negative control)

Normal



CACG



Effects of a novel selective EP2 receptor agonist, omidenepag isopropyl, on conventional outflow pathway

Megumi Honjo[1], Natsuko Nakamura[1], Reiko Yamagishi[1], Makoto Aihara[1]
[1]Department of Ophthalmology, University of Tokyo, Japan

Introduction

A selective prostanoid EP2 receptor agonist, omidenepag isopropyl has been introduced recently in Japan with novel mechanisms of action, which increases the aqueous outflow both by uveoscleral and conventional (trabecular) outflow pathways in laser-induced ocular hypertensive monkey eye. We investigated the effects of omidenepag (OMD) on fibrosis of human trabecular meshwork (hTM) cells and barrier function of monkey Schlemm's canal endothelial (SCE) cells.

Methods

The effects of OMD on the expression of α-smooth muscle actin (αSMA), collagen, fibronectin and contractile property in TGFβ2-treated hTM cells was examined by real-time quantitative PCR, immunofluorescence and gel contraction assay. Biological changes in hTM cells and SCE cells were immunohistochemically analysed. The barrier function of SCE cells was determined by measurement of transendothelial flux of FITC-dextran and transendothelial electrical resistance (TEER).

Results

TGF-β2-treated hTM cells exhibited a significant increase in expression of αSMA, a marker of fibroblast-to-myofibroblast differentiation, and this increase was significantly suppressed, by treatment with OMD. OMD also significantly attenuated TGF-β2-induced fibronectin and collagen production, however, had no obvious effects on TGF-β2-induced collagen gel contraction. The increased TEER of SCE cells by treatment with TGF-β2 was significantly suppressed after 1h treatment with OMD, which was completely recovered after 3-6 hours. TGF-β2 increased the expressions of β-catenin and ZO-1in SCE cells, and these effects were attenuated by treatment with OMD.

Conclusion

These results suggest that OMD may regulate the conventional outflow by modulation of fibrosis of hTM cells and permeability of SCE cells.

References

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2. Aihara M, Lu F, Kawata H et al., J Ocul Pharmacol Ther. 2019;35:542-550.

GLP-1 Receptor Agonist Exendin-4 Regulates Retinal Capillary Tone and Restores Microvascular Patency Under Ischemia-reperfusion Injury

Ruyi Zhai[1], Xiangmei Kong[1]

[1]Department of Ophthalmology and Visual Science, Eye, Ear, Nose and Throat Hospital, Fudan University, China

Introduction

To investigate the vasorelaxant effect of glucagon-like peptide-1 receptor (GLP-1R) agonist exendin-4 on retinal capillaries under normal and ischemia-reperfusion (I/R) conditions.

Methods

The regulation of capillary diameters by exendin-4 on whole-mounted retina were directly observed using the infrared differential interference contrast microscopy. A rat model of retinal I/R was established using high perfusion pressure in an anterior chamber. To observe the possible protective role of exendin-4, the peptide drug was administered through subcutaneous injection, intravitreal injection, or eye drops. The underlying mechanism was explored by immunofluorescence, qPCR, and Simple Western.

Results

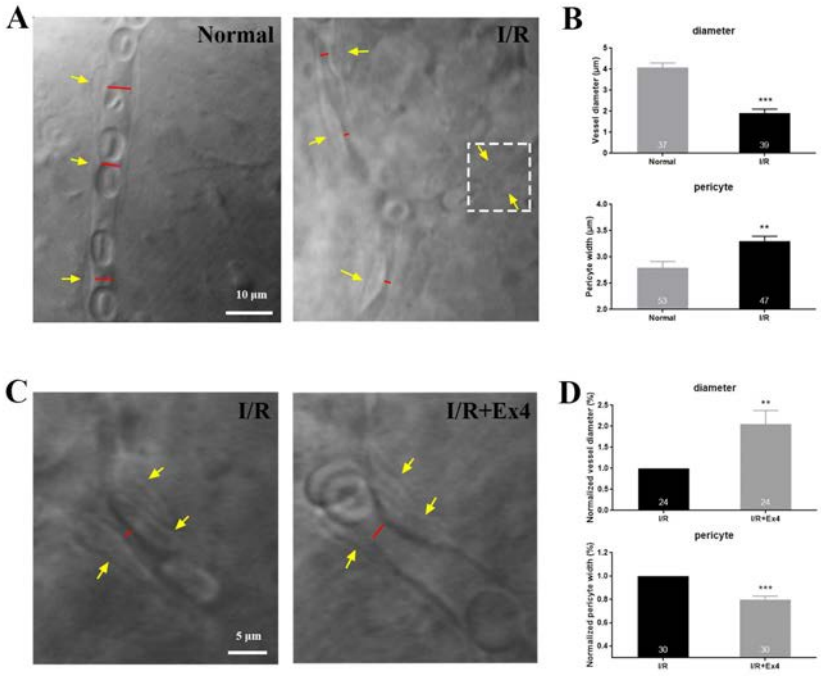
Immunofluorescence staining showed that GLP-1R was expressed in the endothelial cells of retinal capillaries. Exendin-4 significantly relaxed the capillaries pre-contracted by noradrenaline ($p < 0.05$), which was abolished by denuding endothelium with CHAPS and inhibited by GLP-1R antagonist exendin-9-39, endothelium nitric oxide synthase (eNOS) inhibitor L-NAME, and the guanylate cyclase blocker ODQ, but not by cyclooxygenase inhibitor indomethacin. Retina capillary was constricted in I/R injury and perfusion of exendin-4 could restored it effectively ($p < 0.01$). The expression level of PI3K and AKT, phosphorylation level of eNOS, and NO production in I/R group was lower than that in the normal control group, and the administration of exendin-4 improved the changes ($p<0.05$).

Conclusion

Exendin-4 can restore injured microvascular patency in I/R. Exendin-4 may regulate retinal capillaries through the GLP-1R-PI3K/AKT-eNOS/NO-cGMP pathway. Therefore, exendin-4 may be an effective treatment for improving tissue perfusion

in I/R-related diseases.

Tables, figures, and illustrations



Exendin-4 restores microvascular patency of capillary negatively affected by I/R injury. The red lines indicate the lumen diameter. The yellow arrow indicates the pericyte soma.

Epidemiology and Economic Evaluation

Cost-utility analysis of iStent *inject*® in mild to moderate primary open-angle glaucoma in Japan

Igarashi A[1], Ishida K[2], Shoji N[3], Chu A[4], Falvey H[5], Han R[6]
[1]The University of Tokyo, Japan, [2]Toho University, Japan, [3]Kitasato University, Japan, [4]Glaukos Singapore, Singapore, [5]Glaukos Corporation, USA, [6]Creativ-Ceutical, Paris, France

Introduction

This study aimed to evaluate the cost-effectiveness of iStent *inject*® plus cataract surgery versus cataract surgery alone in Japanese patients with mild to moderate primary open-angle glaucoma (POAG) from a public payer's perspective.

Methods

A Markov model was developed over a lifetime horizon using monthly cycle. Patients entered the model with mild to moderate POAG and could transition to the next severity. Reimbursement fee for iStent *inject*® in Japan was used in the analysis. The outcomes included number of blind eyes avoided, life years (LYs), quality-adjusted life-years (QALYs), direct medical costs and incremental costs per QALY gained (ICUR). Probabilistic analysis for base case, one-way sensitivity analyses including all parameters, and scenario analysis from a societal perspective were performed.

Results

Compared to cataract surgery alone, iStent *inject*® plus cataract surgery strategy was found to increase costs by ¥89,229 mainly driven by iStent *inject*® procedure fee and increase the number of QALY gained (0.07), LY gained (0.02), and blind eyes avoided (0.01), with an ICUR of ¥1,387,682/QALY gained. At Japanese willingness-to-pay threshold of ¥5,000,000 per QALY gained, iStent *inject*® plus cataract surgery strategy was found to have a 90% probability of being cost-effective. In scenario analysis, iStent *inject*® plus cataract surgery strategy was found to dominate cataract surgery alone strategy over lifetime from a societal perspective.

Conclusion

iStent *inject*® plus cataract surgery is a cost-effective strategy over cataract surgery alone from a public payer's perspective in Japanese patients with mild to moderate POAG.

Ten-year progression of primary open-angle glaucoma: the Beijing Eye Study

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Introduction
To investigate the 10-year progression rate of glaucoma in the population-based longitudinal Beijing Eye Study.

Methods
The study participants underwent detailed ophthalmic and general examinations. Using fundus photographs obtained in 2001 and 2011, we assessed the glaucoma progression using a flicker method to compare the optic disc and retinal nerve fiber layer (RNFL) morphology between 2001 and 2011. Eyes diagnosed with glaucoma at baseline (either open-angle glaucoma (OAG) or angle closure glaucoma (ACG)) were categorized into “no progression”, “minor rim change” (local rim thinning within one diameter of the temporal-inferior retinal artery at the disc border) and “marked progression” (obvious rim change with RNFL loss).

Results
The Beijing Eye Study included 4439 participants in 2001 and the follow-up rate was 69.2% in 2011. By following 246 eyes from 147 glaucoma patients (92 OAG and 55 ACG) diagnosed with glaucoma at baseline, the 10 year-progression rate was 54.1% per subject (59.1% per eye) and 88.4% per subject (86.3% per eye), if a minor rim change was not included or whether it was considered, respectively. The progression rate did not differ between OAG and ACG (P = 0.44). Higher glaucoma marked progression rate was associated with a higher intraocular pressure at baseline (P = 0.010; odds ratio (OR): 1.14; 95% confidence interval (CI): 1.03, 1.26), presence of disc hemorrhages (P = 0.036; OR: 9.19; 95% CI: 1.15, 73.22), and a thinner choroidal thickness (P = 0.023; OR: 0.99; 95% CI: 0.99, 1.00). In comparing eyes with without any change in 10 years, eyes with minor rim change had a larger horizontal Bruch’s membrane opening diameter (P = 0.032) and a smaller vertical

tilt angle of disc (P = 0.024).

Conclusion

The 10-year progression rate of glaucoma in the elderly Chinese population was 50.7%. Besides baseline intraocular pressure and disc hemorrhage, the choroidal thickness as measured at the end of the follow-up was found to be a risk factor. By using the flicker method, minor rim changes could be detected on disc photographs.

Glaucoma Imaging and Diagnosis

Evaluation of Macular Ganglion Cell Layer Thickness Versus Peripapillary Retinal Nerve Fiber Layer Thickness for Glaucoma Detection Using Optical Coherence Tomography in a Philippine Hospital.

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Introduction

The macular ganglion cell layer complex (mGCL) has been receiving attention as a potential indicator for early glaucoma detection. Significant anatomic change is detected in the mGCL early on, preceding pRNFL and functional changes. This study appraised the validity of measuring mGCL thickness as an indicator of early glaucoma in Filipino eyes, as compared to measurement of pRNFL thickness.

Methods

This was a single-center, cross-sectional, retrospective study of Filipino adult patients. Patients underwent automated visual field testing with either Humphrey Visual Field Analyzer (24-2 SITA program) or Octopus 311 (G1 program), and Spectral-Domain Optical Coherence Tomography (Cirrus HD-OCT 5000). Modified Hodapp-Anderson-Parish criteria was used to classify subjects as either healthy, suspect, or early glaucomatous eyes. Thickness changes were directly observed. Area under receiver operating curve (AUC) analysis was used to determine mGCL and pRNFL ability to discriminate healthy and early glaucomatous states.

Results

Ninety-six eyes were included in total. Progressive thinning for all parameters was noted for both pRNFL and mGCL from healthy to suspect to early glaucomatous eyes. Highest AUC for pRNFL and mGCL was seen when comparing healthy vs early glaucomatous eyes, with AUC values of 0.744 and 0.668 respectively (Figure 1). However, all AUC values for both pRNFL and mGCL were above 0.500.

Conclusion

This study, the first to be done on Filipino patients, validates mGCL thickness as a good parameter in discriminating healthy from early glaucomatous eyes. It exhibits comparable performance to pRNFL measurements in detecting anatomic glaucomatous change. It is a tool that can be utilized for early detection in addition to current standard tests for glaucoma.

Tables, figures, and illustrations

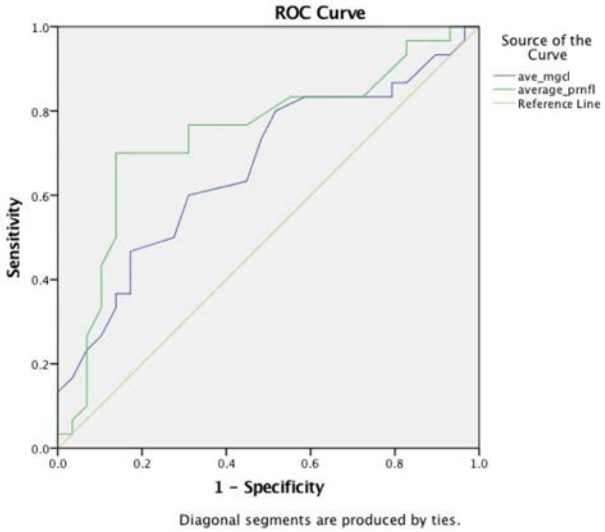

Figure 1. Comparison of AUC curves for Healthy versus Early glaucomatous average pRNFL and mGCL.

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Wavefront aberrometry for ocular aberrations in primary congenital glaucoma

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Introduction

A large proportion of primary congenital glaucoma (PCG) patients have visual deprivation, despite well controlled IOP. We aim to highlight the magnitude of ocular higher order aberrations (HOA) and lower order aberrations (LOA), including component contributions by corneal and internal aberrations in PCG patients and compare them to control subjects.

Methods

34 consecutive treated PCG patients (12-unilateral, 22-bilateral) who were old enough to cooperate for ocular examination, were enrolled. Best corrected visual acuity, cycloplegic refraction and applanation intraocular pressure were recorded. Wavefront aberrometry and topography findings using iTrace (Tracey technologies, USA) were compared with age and gender matched controls, correlation between corneal and internal planes calculated, p values calculated for determining differences between any two groups. In absence of lenticular opacities in subjects, aberrations from internal wavefront were considered to be from posterior cornea.

Results

Mean age of PCG patients was 11.8 ± 5.9 years (range: 3-30 years); and controls was 12.2 ± 6.1 years (range, 3-30 years); (p: 0.79). Total ocular (RMS 1.727 vs 0.257 um), corneal (RMS 1.091 vs 0.122 um) and internal (RMS 1.121 vs 0.255 um) aberrations, as well as HOAs and LOAs at each plane were significantly higher in PCG patients versus controls (p: < 0.001). Component HOAs from anterior cornea and internal optics were positively correlated with each other. Astigmatism was predominant aberration in 63% PCG patients and 82.6% controls. Amongst HOAs, coma and trefoil contributed maximally. PCG eyes with corneal opacity/Haab's striae had significantly higher HOAs than those with clear cornea. Total aberrations were maximum in affected eyes and least in control eyes.

Conclusion

Increased total, HOAs and LOAs, at corneal and internal plane were seen among affected eyes of PCG patients. Total ocular WF were more than either corneal or internal aberrations suggesting decoupling of internal compensatory feedback loop evident in younger population.

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Structure-function correlation of juxtapapillary choroidal thickness with visual field analysis of patients suspected with glaucoma

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Introduction

Reduced ocular perfusion is a risk factor for glaucoma prevalence, incidence, and progression.[1] The primary blood supply of the prelaminar and laminar optic nerve is derived from the choroid. This study will evaluate juxtapapillary choroidal thickness of glaucoma suspects obtained thru SD-OCT and correlate it with perimetry results.

Methods

175 eyes diagnosed as “glaucoma suspect” had standard automated perimetry to document the presence of functional glaucomatous damage using the Humphrey Visual Field Analyzer II (Carl Zeiss Meditec, Inc., CA). SD-OCT imaging (Cirrus HD-OCT, Carl Zeiss Meditec, Inc., CA) of the RNFL was done to look for structural glaucomatous damage and in using Enhanced Depth Imaging at the nerve, choroidal thickness was measured at five points. The population was classified in two: Group 1 are those with structural or functional glaucomatous damage (n = 68) and Group 2 were those without (n = 107).

Results

One-Way Multivariate Analysis of Covariance was utilized. After controlling the covariates of the mean temporal choroidal thickness, there is no statistical difference between patients with and without glaucomatous damage ($p = 0.856$). This is similar in terms of mean nasal choroidal thickness ($p = 0.734$). The mean temporal and nasal choroidal thickness scores of the two groups at different juxtapapillary locations: 0 µm, 250 µm, 500 µm, 750 µm and 1000 µm away from the disc were not statistically different.

Conclusion

Juxtapapillary choroidal thickness is not correlated with glaucomatous damage and cannot be considered a variable in glaucoma management.

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The Impact of Signal Strength on Optical Coherence Tomography (OCT) Parameters

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Introduction

To evaluate the impact of signal strength (SS) on Optical Coherence Tomography (OCT) parameters and to devise a correction algorithm for parameter optimization.

Methods

The study included 5085 subjects (9582 eyes), age ≥ 40 years from the Singapore Epidemiology of Eye Diseases Study. Each subject underwent standardized ocular examination. 200x200 ONH (optic nerve head) scan and the 512X128 macula scan (Cirrus HD-OCT) were used. The impact of SS was evaluated using multiple structural breaks linear mixed effect models. Final model was used to devise an algorithm for correction of OCT parameters. This was evaluated in a test set with repeated OCT measurements (different SS) using Bland-Altman plots and intraclass correlation coefficients (ICC's) before and after SS correction.

Results

We report the individual correction factors for ONH and macular OCT parameters. For increment from SS of 4 to 10, correction factors (µm) for RNFL (average, inferior, superior, nasal, temporal) and GCIPL (average, supero-temporal, superior, nasal, naso-inferior, inferior, temporo-inferior) were (9.64, 16.06, 14.72, 6.11, 2.82) and (6.41, 0.78, 1.19, 3.99, 10.17, 3.41, 2.58) respectively. When evaluated in the test set the algorithm produced less bias after correction and performed comparably to the actual measurements with comparable ICCs for OCT parameters (algorithm, actual) like RNFL thickness (0.932, 0.908) and average GCIPL (0.905, 0.916).

Conclusion

OCT scan parameters can be optimized for poor SS using an automated algorithm available on https://seri-seed.shinyapps.io/Cirrus-OCT-Signal-Correction/. These scans can then be reliably used for clinical application in diseases requiring OCT parameters for monitoring and diagnosis.

Peaks of circumpapillary retinal nerve fiber layer and associations in healthy eyes: The Beijing Eye Study 2011

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Introduction

To investigate the distribution and associations of the retinal nerve fiber layer (RNFL) thickness distribution profile, characterized as the position and height of four peaks, in healthy Chinese population.

Methods

Participants underwent detailed ophthalmic and systematic examinations including the RNFL measurement using spectral-domain OCT, with 768 points at the circumferential 3.4mm. A subgroup was randomly selected, composing of participants without showing any retinal or optic nerve diseases. The location and height of four peaks were determined, including the peak in the superotemporal (ST) quadrant, the superonasal (SN) quadrant, the inferonasal (IN) quadrant, and the inferotemporal (IT) quadrant. An RNFL scan with quality score less than 15 was excluded. Univariate and multivariate analysis was used to investigate the associations of ocular and systemic factors with the thickness and position of the RNFL peaks.

Results

The study included 698 eyes from 698 individuals (404 female), with the mean age of 59.5 ± 7.5 years (range: 50–90 years). The mean thickness and location of the four RNFL peaks was 181.7 ± 24.7 µm (73.0 ± 10.7°),124.6 ± 23.6 µm (134.6 ± 13.1°),125.1 ± 24.2 µm (241.5 ± 8.8°), and 193.5 ± 25.0 µm (288.2 ± 12.4°), for the $Peak^{ST}$, $Peak^{SN}$, $Peak^{IN}$, and $Peak^{IT}$, respectively. The associated systematic and ocular parameters with univariate analysis were shown in Table 1. After multivariate regression, the thickness of the four peaks decreased by 3.2~6.7 µm per millimeter of axial elongation ($P < 0.001$). One-year increase in age was associated with a 0.3~0.4 µm decrease of the thickness of $Peak^{ST}$, $Peak^{IN}$ and $Peak^{IT}$ ($P < 0.05$) (Table 2). $Peak^{ST}$, $Peak^{IT}$ located more closely to disc-fovea line, by about

2.3° and 3. 0° per millimeter of axial elongation and by 2.1° and 3.7° in women in comparing with men, respectively (Table 3, Figure 1).

Conclusion

The RNFL peak locations were associated with gender and axial length, while their thickness was associated with age, gender and axial length in healthy population. Considerations on the normal variance of RNFL distributions should be taken in establishing normative database and in disease discrimination.

Tables, figures, and illustrations

Table 1. Associations between circumpapillary retinal nerve fiber layer peaks as measured by spectral domain optical coherence tomography and ocular and systemic parameters in the Beijing Eye Study 2011 (univariate analysis)

VARIABLES	The location of the RNFL PEAK				The Thickness of the RNFL PEAK			
	PeakST	Peak^{SN}	Peak^{IN}	Peak^{IT}	PeakST	Peak^{SN}	Peak^{IN}	Peak^{IT}
Age,years	[1]-0.06 [2]-0.13,0.01 [3]0.11	-0.04 -0.12,0.03 0.27	-0.03 -0.11,0.04 0.36	0.05 -0.03,0.12 0.22	-0.12** -0.19,-0.05 <0.001	-0.11* -0.18,-0.03 0.01	-0.2** -0.27,-0.13 <0.001	-0.14** -0.21,-0.07 <0.001
Gender, male/female	-0.02 -0.09,0.06 0.62	0.03 -0.05,0.1 0.44	0.05 -0.02,0.12 0.18	0.02 -0.06,0.09 0.65	-0.02 -0.09,0.06 0.61	0.11** 0.03,0.18 <0.001	0.14** 0.06,0.21 <0.001	0.08* 0.01,0.16 0.03
Education	-0.05 -0.13,0.02 0.18	-0.02 -0.1,0.05 0.54	-0.05 -0.12,0.03 0.22	0.1 0.02,0.17 0.01	-0.03 -0.1,0.05 0.47	-0.11** -0.18,-0.04 <0.001	-0.14** -0.22,-0.07 <0.001	-0.08* -0.16,-0.01 0.03
Body Height, cm	-0.02 -0.09,0.05 0.61	-0.03 -0.11,0.04 0.37	-0.03 -0.1,0.04 0.43	0.03 -0.05,0.1 0.46	0.05 -0.02,0.12 0.18	-0.13** -0.2,-0.05 <0.001	-0.12** -0.19,-0.05 <0.001	-0.03 -0.1,0.05 0.46
Body Weight, kg	0.02 -0.05, 0.1 0.52	-0.04 -0.11,0.04 0.31	-0.02 -0.1,0.05 0.56	-0.02 -0.1,0.05 0.57	0.05 -0.02,0.13 0.15	0.04 -0.03,0.12 0.24	0.03 -0.04,0.11 0.36	0.06 -0.02,0.13 0.14
Hip Circumference, cm	0.02 -0.05,0.1 0.53	<0.001 -0.08,0.07 0.97	<0.001 -0.07,0.07 0.99	-0.04 -0.11,0.04 0.32	0.01 -0.07,0.08 0.84	0.09* 0.01,0.16 0.02	0.1* 0.03,0.18 0.01	0.08* 0.01,0.15 0.03
Waist Circumference, cm	0.04 -0.04,0.11 0.3	-0.01 -0.09,0.06 0.77	0.03 -0.05,0.1 0.49	-0.04 -0.12,0.03 0.27	0 -0.07,0.08 0.94	0.06 -0.01,0.14 0.1	0.05 -0.03,0.12 0.19	0.07 -0.01,0.14 0.08
Systolic Blood Pressure, mmHg	0.03 -0.04,0.11 0.41	-0.03 -0.1,0.05 0.47	-0.01 -0.08,0.07 0.86	-0.06 -0.14,0.01 0.09	-0.04 -0.11,0.04 0.35	0.03 -0.04,0.11 0.4	0.05 -0.02,0.13 0.17	0 -0.08,0.07 0.91
Diastolic Blood Pressure, mmHg	0.05 -0.03,0.12 0.2	0.03 -0.05,0.1 0.48	0.01 -0.07,0.08 0.83	-0.04 -0.12,0.03 0.24	0.01 -0.07,0.08 0.89	0.04 -0.03,0.11 0.28	0.12** 0.05,0.19 <0.001	0.05 -0.02,0.12 0.19

VARIABLES	The location of the RNFL PEAK			The Thickness of the RNFL PEAK			
	PeakST	Peak^{SN}	Peak^{IN}	Peak^{IT}	PeakST	Peak^{SN}	Peak^{IN}	Peak^{IT}
Best Corr. Visual Acuity , logMAR	0.10 0.02,0.17 0.01	-0.02 -0.09,0.06 0.66	0.06 -0.01,0.14 0.10	-0.07 -0.15,0.00 0.06	0.06 -0.02,0.13 0.12	0.09* 0.01,0.16 0.02	0.14** 0.07,0.21 <0.001	0.08* 0.01,0.15 0.04
Intraocular pressure,mmHg	0.01 -0.06,0.09 0.74	-0.00 -0.08,0.07 0.98	0.07 -0.01,0.14 0.08	0.01 -0.06,0.08 0.80	0.00 -0.07,0.08 0.94	0.04 -0.04,0.11 0.33	0.03 -0.05,0.10 0.44	0.01 -0.06,0.09 0.71
Central Cornea Thickness , µm	-0.03 -0.11,0.05 0.45	0.00 -0.08,0.08 0.98	0.02 -0.05,0.10 0.52	0.05 -0.02,0.13 0.18	-0.01 -0.09,0.07 0.79	 -0.07,0.08 0.96	-0.02 -0.09,0.06 0.64	-0.01 -0.08,0.07 0.89
Anterior Chamber Depth ,mm	-0.13** -0.21,-0.06 <0.001	0.03 -0.05,0.10 0.49	0.00 -0.08,0.07 0.95	0.15** 0.07,0.22 <0.001	-0.06 -0.13,0.02 0.13	-0.17** -0.24,-0.09 <0.001	-0.17** -0.25,-0.10 <0.001	-0.13** -0.21,-0.06 <0.001
Lens Thickness, mm	-0.02 -0.1,0.06 0.63	0.04 -0.04,0.12 0.31	0.01 -0.06,0.09 0.75	0.01 -0.06,0.09 0.76	0.01 -0.07,0.08 0.83	0.00 -0.08,0.08 0.98	0.01 -0.06,0.09 0.73	0.02 -0.06,0.09 0.64
Axial Length,mm	-0.26** -0.33,-0.19 <0.001	0.01 -0.07,0.08 0.90	-0.07 -0.14,0.01 0.09	0.26** 0.19,0.33 <0.001	-0.15** -0.23,-0.08 <0.001	-0.31** -0.38,-0.24 <0.001	-0.37** -0.43,-0.30 <0.001	-0.18** -0.25,-0.10 <0.001
Cornea Curvature Radius	-0.07 -0.14,0.01 0.09	0.00 -0.07,0.08 0.96	-0.10* -0.18,-0.03 0.01	0.07 -0.01,0.14 0.07	-0.05 -0.13,0.02 0.16	-0.03 -0.1,0.05 0.50	-0.09* -0.16,-0.01 0.02	-0.09* -0.17,-0.02 0.02
Fovea-Disc Distance, mm	-0.13** -0.2,-0.05 <0.001	0.00 -0.08,0.07 0.97	-0.03 -0.1,0.05 0.47	-0.01 -0.09,0.06 0.75	-0.04 -0.12,0.03 0.26	-0.11** -0.18,-0.04 <0.001	-0.07 -0.14,0.01 0.07	-0.02 -0.1,0.05 0.51
Mean Bruch's membrane opening	-0.14** -0.21,-0.07 <0.001	0.01 -0.07,0.08 0.83	-0.09* -0.16,-0.01 0.02	-0.04 -0.12,0.03 0.24	0.04 -0.03,0.12 0.26	-0.04 -0.11,0.04 0.32	-0.01 -0.08,0.06 0.78	0.05 -0.02,0.13 0.17
Sub-foveal choroidal thickness	0.16** 0.09,0.23 <0.001	-0.03 -0.1,0.05 0.46	-0.01 -0.08,0.07 0.87	-0.13** -0.2,-0.06 <0.001	0.09* 0.01,0.16 0.02	0.17** 0.1,0.24 <0.001	0.25** 0.17,0.31 <0.001	0.12** 0.05,0.20 <0.001

VARIABLES	The location of the RNFL PEAK				The Thickness of the RNFL PEAK			
	PeakST	PeakSN	PeakIN	PeakIT	PeakST	PeakSN	PeakIN	PeakIT
High-Density Lipoproteins (mmol/L)	0.00 -0.09,0.08 0.94	0.00 -0.09,0.08 0.92	0.00 -0.09,0.08 0.96	0.00 -0.08,0.09 0.93	0.01 -0.08,0.09 0.90	-0.05 -0.13,0.04 0.28	0.02 -0.07,0.10 0.72	0.00 -0.08,0.09 0.98
low-Density Lipoproteins (mmol/L)	0.02 -0.06,0.10 0.64	-0.02 -0.1,0.07 0.67	0.06 -0.02,0.15 0.15	-0.07 -0.15,0.02 0.13	0.04 -0.04,0.13 0.34	0.02 -0.06,0.11 0.59	0.02 -0.06,0.11 0.57	0.00 -0.08,0.09 0.97
Triglyceride(mmol/L)	-0.01 -0.09,0.08 0.89	0.01 -0.08,0.09 0.90	0.02 -0.06,0.11 0.61	0.09* 0.01,0.18 0.03	0.04 -0.04,0.13 0.32	0.08 -0.01,0.16 0.07	0.02 -0.07,0.10 0.66	0.06 -0.03,0.14 0.19
Cholesterol (mmol/L)	0.00 -0.09,0.08 0.95	-0.02 -0.11,0.06 0.63	0.04 -0.04,0.12 0.35	-0.03 -0.11,0.06 0.56	0.04 -0.05,0.12 0.40	0.02 -0.06,0.11 0.58	0.01 -0.08,0.09 0.89	0.00 -0.09,0.08 0.98
CRP (mmol/L)	-0.05 -0.13,0.03 0.24	0.01 -0.07,0.10 0.79	0.02 -0.06,0.11 0.58	0.05 -0.04,0.13 0.29	0.04 -0.04,0.12 0.36	0.02 -0.06,0.11 0.60	-0.02 -0.11,0.06 0.61	0.02 -0.07,0.10 0.71
Glucose (mmol/L)	-0.01 -0.09,0.08 0.84	-0.05 -0.13,0.04 0.28	0.01 -0.07,0.10 0.79	0.03 -0.05,0.11 0.48	0.05 -0.04,0.13 0.27	0.00 -0.09,0.08 0.92	-0.01 -0.09,0.08 0.88	0.00 -0.08,0.09 0.94

Table 2. Associations between the thickness of four retinal nerve fiber layer peaks as measured by spectral domain optical coherence tomography and ocular and systemic parameters in the Beijing Eye Study 2011 (Multivariate analysis)

		Unstandardized Coefficients	Standardized Coefficients		95.0% Confidence Interval for B		Collinearity Statistics
Dependent Variable	Model	B	Beta	P value	Lower Bound	Upper Bound	VIF
[1]The thickness of PeakST, μm	Age, years	-0.343	-0.103	0.009	-0.599	-0.087	1.048
	Gender	-4.488	-0.090	0.026	-8.439	-0.538	1.122
	Axial Length, mm	-3.276	-0.163	<0.001	-4.876	-1.676	1.135
[2]The thickness of Peak^{SN}, μm	Axial Length, mm	-5.927	-0.310	<0.001	-7.315	-4.540	1.000
[3]The thickness of Peak^{IN}, μm	Axial Length, mm	-6.676	-0.332	0.000	-8.127	-5.225	1.039
	Age, years	-0.440	-0.135	0.000	-0.676	-0.205	1.039
[4]The thickness of Peak^{IT}, μm	Axial Length, mm	-3.189	-0.154	0.000	-4.770	-1.607	1.039
	Age, years	-0.344	-0.102	0.009	-0.601	-0.087	1.039

[1]Adjusted for: Age, Gender, Education, Axial Length

[2]Adjusted for: Age, Gender, Hip Circumference, Fovea-disc Distance, Axial length

[3]Adjusted for: Age, Gender, Hip Circumference, Diastolic Blood Pressure, Axial length, Sub-foveal Choroidal Thickness

[4]Adjusted for: Age, Gender, Hip Circumference, Axial length, Sub-foveal Choroidal Thickness

Table 3. Associations between the location of four retinal nerve fiber layer peaks as measured by spectral domain optical coherence tomography and ocular and systemic parameters in the Beijing Eye Study 2011 (Multivariate analysis)

Dependent Variable	Model	Unstandardized Coefficients B	Standardized Coefficients Beta	P value	95.0% Confidence Interval for B		Collinearity Statistic
					Lower Bound	Upper Bound	VIF
[1]The location of PeakST, degree	Gender	-2.136	-0.100	0.011	-3.788	-0.483	1.121
	Axial Length, mm	-2.327	-0.272	0.000	-3.006	-1.648	1.172
[2]The location of Peak^{SN}, degree	___	___	___	___	___	___	___
[3]The location of Peak^{IN}, degree	___	___	___	___	___	___	___
[4]The location of Peak^{IT}, degree	Gender	3.720	0.148	0.001	1.524	5.916	1.112
	Axial Length, mm	2.986	0.274	0.000	2.026	3.946	1.129

[1]Adjusted for: Age, Gender, Axial Length, Fovea-disc Distance, Sub-foveal Choroidal thickness

[2]Adjusted for: Age, Gender, Axial Length

[3]Adjusted for: Age, Gender, Axial length

[4]Adjusted for: Age, Gender, Axial length, Triglyceride

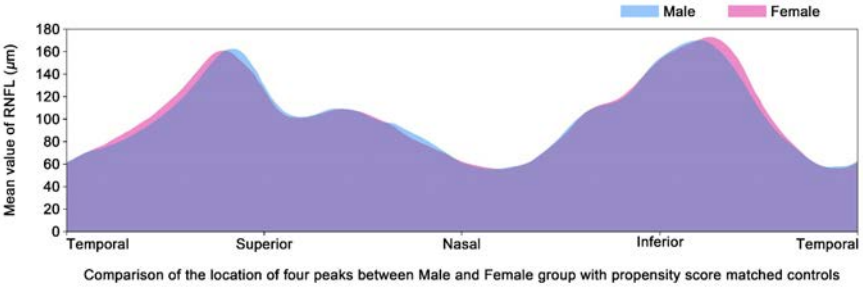

FIGURE 1.

As shown in Figure 1, compared to the 174 multivariate-matched controls (Age, Gender, Education, Axial length, Sub-foveal Choroidal Thickness, Triglyceride, Systolic blood pressure, Fovea-Disc Distance, supplementary-table 3), $Peak^{ST}$, $Peak^{IT}$ located more closely to disc-fovea line in women (73.17 ± 9.96μm and 289.51 ± 12.92μm,Red curve) in comparing with men (75.17 ± 10.67μmand (285.76 ± 12.37 μ m, Blue curve).

Glaucoma Surgery

Prospective Study of Combined iStent Inject Implantation and Phacoemulsification in Asian Eyes with Normal-Tension Glaucoma - 12-Month Outcomes

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Introduction

To evaluate 12-month efficacy and safety outcomes of the iStent inject (Glaukos Corporation, Laguna Hills, CA) combined with phacoemulsification in Asian eyes with coexistent cataract and normal-tension glaucoma (NTG).

Methods

Retrospective case series of NTG eyes which underwent combined iStent inject and phacoemulsification from April 2017 to August 2019. Outcome measures included intraocular pressure (IOP), number of glaucoma medications and adverse outcomes.

Results

Data from 91 eyes was analysed, with 33 eyes seen at post-operative month (POM) 12. Majority of subjects were male (53, 58.2%) and Chinese (79, 86.8%). Mean age was 73.2 ± 7.2 years. Preoperatively, mean IOP was 14.3 ± 3.0 mmHg and mean number of medications was 1.5 ± 0.8. Significant IOP reduction was observed at all following timepoints, except post-operative week (POW) 1 and POM12 – POW1: reduction of 0.6 ± 4.0 mmHg (n = 91, p = 0.15); POM1: 0.9 ± 3.9 mmHg (n = 91, p < 0.05); POM3: 2.1 ± 2.8 mmHg (n = 57, p < 0.001); POM6: 1.5 ± 2.8 mmHg (n = 47, p < 0.001); POM12: 0.7 ± 3.0 mmHg (n = 33, p = 0.17). Number of medications was reduced at all timepoints (p < 0.001), with a reduction of 1.2 ± 1.0 medications (p <

0.001) by POM12. 1 eye underwent laser iridoplasty for implant obstruction by iris. Gross hyphema occurred in 2 eyes but resolved by POM3. 23 eyes had complete data at all timepoints and demonstrated reduction in medications up to POM12 (by 1.3 ± 1.1 medications, $p < 0.001$) and at all timepoints except for POW1, which did not demonstrate significant reduction in either IOP ($p = 0.23$) or medications ($p = 0.11$).

Conclusion

Asian eyes with NTG which underwent combined phacoemulsification and iStent inject surgery demonstrated a significant and sustained reduction in number of glaucoma medications up to 12 months postoperatively.

Five-year outcomes of trabecular micro-bypass stents (iStent inject) combined with travoprost in glaucomatous eyes on 2 preoperative medications

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Rationale

Assess long-term outcomes following standalone implantation of 2nd-generation trabecular micro-bypass stents (iStent *inject*®) combined with travoprost in subjects with open-angle glaucoma (OAG) on 2 preoperative medications.

Methods

This 5-year prospective single-arm study enrolled subjects with OAG on 2 ocular hypotensive meds and with preoperative IOP of 18-30 mmHg (medicated) and 22-38 mmHg (post-washout). Subjects underwent standalone implantation of iStent inject and started topical travoprost on postoperative Day 1. Annual medication washouts were performed. Assessments included IOP, meds, adverse events, best-corrected vision (BCVA), visual fields (VF), cup-to-disc (C:D) ratio, and slit-lamp, gonioscopic, optic nerve, and funduscopic examinations.

Results

All 53 enrolled subjects underwent uncomplicated iStent inject implantation and completed 5 years of follow-up. At M60 postop, mean IOP on travoprost reduced to 12.1 mmHg, a 39% reduction vs preop IOP of 19.7 mmHg on 2 meds ($p < 0.0001$). At M61 (after washout), mean unmedicated IOP was 16.1 mmHg, a 35% reduction vs preop washout IOP of 24.9 mmHg ($p < 0.0001$). Mean medicated IOP remained ≤ 13.1 mmHg at all postop visits through M60. 92.5% of eyes achieved M60 IOP ≤ 18 mmHg on travoprost and 88.7% achieved IOP ≤ 15 mmHg on travoprost. 4 eyes required additional medication, but all remaining eyes were on travoprost alone throughout the study. BCVA, C:D, and VF were stable through 5 years.

Conclusion

In glaucomatous eyes with IOP not controlled on 2 meds, the combination of standalone iStent *inject* implantation with topical prostaglandin – thereby enhancing both trabecular and uveoscleral outflow - resulted in sustained and safe

5-year IOP and med reductions. This corroborates the growing evidence base for this device in treating glaucoma.

Reduction in secondary incisional glaucoma surgery after 4-years with a Schlemm's canal microstent combined with cataract surgery for treatment of primary open-angle glaucoma

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Purpose

To assess the 4-year outcomes in patients who underwent cataract surgery alone compared to those who underwent cataract surgery combined with implantation of a Hydrus® Microstent.

Methods

Subjects with POAG and cataract with washed-out diurnal IOP between 22 and 34 mmHg were randomized in a 2:1 to undergo cataract surgery with or without a Hydrus Microstent in the HORIZON study.[1]

Results

556 eyes were randomized after cataract surgery to phacoemulsification with Hydrus (HS, N = 369) or to cataract surgery only (CS, N = 187). From 2 to 4 years follow-up, mean unmedicated IOP remained stable (HS: 16.6 ± 3.2); (CS: 17.4 ± 2.8). The total fraction of eyes requiring no medications was significantly higher in the HS group (65% vs. 41%, $p < 0.001$). Despite similar IOP among study subjects, there was a significant reduction in the cumulative risk of incisional glaucoma surgery at 4 years (1.9% vs. 6.9%, hazard ratio = 0.25, $p = 0.013$, logrank $p = 0.007$). There were no significant differences in other adverse events compared to 2 years.

Discussion

Hydrus microstent when combined with phacoemulsification results in stable IOP and medication reduction for up to 4 years postoperative. The treatment arm showed a significant reduction in risk of secondary incisional glaucoma surgery (trabeculectomy or tube shunt) despite similar IOP values. This may be due to significantly lower rates of medication use in the Hydrus group and therefore less medication adherence risk.[2] There were no significant changes in safety findings from the 2-year findings.

Conclusion

The addition of a Hydrus Microstent at the time of cataract surgery can significantly lower the risk of postoperative incisional glaucoma surgery.

Combined iStent Trabecular Micro-Bypass and Cataract Surgery in Japanese Glaucomatous Eyes

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Introduction

iStent trabecular micro-bypass was approved in Japan in 2016 as a treatment option for patients with open-angle glaucoma (OAG) undergoing cataract surgery. This post-market surveillance study provides the largest evidence on safety and clinical outcomes of iStent in Japanese patients.

Methods

This prospective study followed 232 eyes with primary OAG, exfoliation glaucoma, and normal-tension glaucoma who underwent combined iStent and cataract surgery across 23 sites in Japan over 24 months. Treatment outcomes measured included intraocular pressure (IOP) and number of glaucoma medications. Safety was assessed by reports of adverse events and complications.

Results

Mean preoperative IOP and medication use was 17.2 ± 4.1 mmHg and 2.2 ± 1.2, respectively. Among eyes with 24-month data, the mean IOP reduction (n = 173) was 2.8 ± 4.4 mmHg and mean medication reduction (n = 185) was 1.5 ± 0.1 (both $p < 0.0001$). The mean IOP and medication use at Month 24 were 14.1 ± 3.0 mmHg and 0.7 ± 1.2, respectively. Medication reductions were observed in 77.3% of eyes, with 71.7% and 56.6% achieving an IOP ≤ 18 mmHg and IOP ≤ 15 mmHg with fewer medications, respectively. Furthermore, 67.6% of eyes were medication-free vs. 3.2%, preoperatively ($p < 0.0001$). A high safety profile was observed overall with stent-related complications of 5.6% (i.e., occlusion, dislocation, or malposition). Only 6 eyes underwent additional glaucoma surgeries.

Conclusion

iStent trabecular micro-bypass stents implanted in conjunction with cataract surgery safely provided significant IOP and medication reductions out to 24 months in Japanese eyes. The results support the current evidence of the safety

and efficacy of iStent and its clinical and quality of life value to patients with OAG in Japan.

Effect of pharmacological inhibition of the chemokine CCL2 (MCP-1) with pegylated spiegelmer mNOX-E36 in a mouse model of glaucoma filtration surgery

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Introduction

Monocyte-chemoattractant protein 1 (MCP-1), a potent recruiter of monocytes, is increased in tears of glaucoma patients with early surgical failure.[1] mNOX-E36 (Noxxon, Germany) is an MCP-1 inhibitor proven to induce regression of liver fibrosis in murine models,[2] and has completed phase I trials in humans. This study evaluated the effect of treatment with mNOX-E36 compared to control on post-operative inflammation and fibrosis in a murine model of glaucoma filtration surgery (GFS).

Methods

GFS was performed on C57/BL6 mice, with 3 study arms: 1) subconjunctival and subcutaneous injections of spiegelmer control were given on Day 0 and Day 1 post-operatively; 2) Subcutaneous mNOX-E36 20mg/kg body weight, with subconjunctival injection of spiegelmer control, given on Day 0 and Day 1; 3) Subconjunctival injection of mNOX-E36 with subcutaneous spiegelmer control, given on Day 0 and Day 1. Blebs were harvested on Day 1 for multiplex assay of inflammatory cytokines, and on Day 7 for measurement of fibrotic proteins.

Results

mNOX-E36 treated arms showed lower levels of interferon-gamma and IL-15 in perible tissues than the control arm, with greater effect seen in the subconjunctival mNOX-E36 group (Interferon-gamma: $p = 0.026$; IL-15: $p = 0.024$) than in the subcutaneous mNOX-E36 group (Interferon-gamma: $p = 0.312$; IL-15: $p = 0.312$) (18 eyes/treatment arm, n = 6 samples/arm). Western blot analysis (15 eyes/treatment arm, n = 3 samples/arm) showed lower levels of collagen Ia1, fibronectin and Sparc protein expression in the mNOX-E36 treatment arms compared to controls at Day 7 postoperatively.

Conclusion

mNOX-E36 reduces expression of inflammatory cytokines IL-15 and interferon-gamma, and subsequent collagen Ia1 expression in conjunctival tissues following modified GFS. Subconjunctival delivery of mNOX-E36 is more effective than subcutaneous delivery in this model.

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Two-year multicenter outcomes of iStent inject trabecular micro-bypass in various types of glaucoma

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Introduction

This 9-surgeon pooled 2-year dataset, one of the largest yet reported, evaluates the performance and safety of 2nd-generation trabecular micro-bypass stents (iStent *inject*) implanted with cataract surgery.

Methods

Multi-surgeon, multi-center retrospective case series of iStent *inject* implantation with cataract surgery in eyes with various types of glaucoma or ocular hypertension. Efficacy was assessed by mean intraocular pressure (IOP) and medications (meds), and proportional analyses of IOP and medication burden. Safety measures included visual acuity, cup-to-disc ratio, visual fields, and adverse events and complications.

Results

340 eyes underwent iStent *inject* implantation with cataract surgery and completed 2 years of follow-up. Diagnoses included: primary open-angle glaucoma (67%), ocular hypertension/glaucoma suspect (8%), appositional angle-closure glaucoma (10%), and normal-tension glaucoma (6%). Preoperatively, mean IOP was 16.4 mmHg on 1.49 mean meds, and 35% of eyes had prior glaucoma procedures. Two years after surgery, mean IOP was 13.7 mmHg (16% reduction; $p < 0.0001$), and 77% of eyes had IOP ≤ 15 mmHg (vs. 49% preop). Mean number of meds reduced by 67% to 0.49 meds ($p < 0.0001$), and 74% of eyes were med-free (vs. 25% preop). Safety was favorable, similar to cataract surgery. Intraoperative and postoperative adverse events were generally infrequent, mild, and resolved without sequelae. A total of 7 eyes (all with more advanced glaucoma) had filtering surgery during the 2-year follow-up.

Conclusion

This large 2-year multi-center study showed sustained and significant IOP and medication reduction after iStent *inject* implantation with cataract surgery. Nearly three-quarter of eyes were med-free at 2 years. This comprises one of the largest real-world cohorts to-date on iStent *inject* and confirms existing evidence of the efficacy and safety of the stents.

Peripheral Anterior Synechiae Formation After Microhook Ab Interno Trabeculotomy

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Introduction

Peripheral anterior synechiae (PAS) sometimes emerges after microhook ab interno trabeculotomy (μLOT).[1] However, it had not been well-studied in detail. Therefore, we investigated PAS formation after μLOT with 360-degree gonio-images of Gonioscope GS-1 (NIDEK Co., Gamagori, Japan).

Methods

The research was single-center retrospective observational case series. The consecutive forty-two eyes of 42 subjects with open angle glaucoma were included; the eyes had undergone μLOT or combined μLOT and cataract surgery as an initial glaucoma surgery by a single glaucoma specialist (MT). Eyes with poor quality images, PAS prior to the surgery, and a history of uveitis or trauma were not included. The prevalence and the rates of PAS formation in total circumference, in the incision extent of μLOT, and in the non-incision extent of μLOT after the surgery were evaluated in the 16 iridocorneal angle images per eye.

Results

The mean patient age (± standard deviation [SD]) was 62.3 ± 17.8, and 16 (38%) were women. At 257 ± 245 days post-surgery, IOP decreased from 20.7 mmHg preoperatively to 13.7 mmHg postoperatively (34%) and the number of antiglaucoma medications decreased from 3.3 to 2.8 ($P < 0.01$, respectively). The prevalence of PAS formation was 83% of the subjects. Number of iridocorneal angle images that PAS detected was 3.9 in total (rate: 0.24), 2.8 in the incision extent (rate: 0.35) and 1.1 in the non-incision extent (rate: 0.13); the formation rate was significantly higher in the incision than non-incision extent ($P < 0.01$).

Conclusion

After μLOT, PAS formation was seen more frequently in the area where trabeculotomy performed than rest of the area.

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Groove Sclerectomy in Trabeculectomy

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Introduction

In trabeculectomy it is ideal to achieve flow of aqueous into the posterior subconjunctival tissues, which facilitates drainage into the orbital lymphatics to achieve a diffuse functioning bleb.

Method

In addition to making the standard perpendicular opening into the anterior chamber (AC) under the scleral trapdoor flap, a scleral groove is fashioned in the scleral bed to direct aqueous from this opening into AC to almost reach the posterior edge of the scleral bed.

The standard way of using a scleral punch is to take a perpendicular bite of scleral tissue. After the initial perpendicular bite, the scleral punch is angled so as to make it almost parallel with the scleral surface. It is important not to take a full thickness scleral bite, in which case flexible uveal tissue will obliterate the intended groove.

A scleral tunnel is made in the scleral bed with a 1.2 mm stab incision blade. The tunnel is then de-roofed to form a groove.

Results

When the scleral flap trapdoor is sutured, the scleral groove becomes a fistula with a square cross-section. The procedure can be viewed on youtube "Groove sclerectomy in Trabeculectomy".

The inner opening of the scleral tunnel-fistula can be made to be square cross-section by using the square profile Ong Scleral punch (Farocare Australia and Epsilon USA) instead of the standard round profile Kelly punch. A cross-section square hole has a larger cross-sectional area than a round hole, as the posterior edge of this scleral opening is limited by the iris root.

Conclusion

In conclusion, groove sclerectomy facilitates the formation of a fistula to drain aqueous from the anterior chamber to the posterior subconjunctival tissues, and the space under the scleral flap may facilitate bleb needling.

A Schlemm's canal microstent combined with cataract surgery in primary open angle glaucoma reduces the incidence of incisional glaucoma surgery at 4-years

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Purpose

The purpose of this study was to assess 4-year outcomes in patients who underwent cataract surgery alone compared to those who underwent cataract surgery combined with a Hydrus® Microstent.

Methods

Subjects with primary open angle glaucoma (POAG) and visually significant cataract with washed-out diurnal IOP 22 - 34 mmHg were randomized to undergo cataract surgery with or without a Hydrus Microstent. Scheduled study visits were conducted through 48 months. 556 eyes were randomized after cataract surgery to Hydrus (HS, N = 369) or no further treatment (CS, N = 187). The HS and CS groups did not differ with respect to baseline demographics or ocular characteristics. Pre-surgery washout diurnal IOP was 25.5 ± 3.0 vs 25.4 ± 2.9 mmHg ($p = 0.9$) and visual field mean deviation was -3.61 ± 2.49 dB vs -3.61 ± 2.60 dB ($p = 1.0$).

Results

At 4 years, the proportion of eyes requiring medications was significantly lower in the HS group (31% vs. 59%, $p < 0.001$). Among eyes that were medication free, the mean unmedicated IOP was unchanged vs 2 years (16.6 vs. 16.7 HS group and 17.4 vs. 17.3 CS group). There was a significant reduction in the cumulative risk of incisional glaucoma surgery at 4 years in the HS group (1.9% vs. 6.9%, Hazard Ratio = 0.25, $p = 0.013$, logrank $p = 0.007$).

Conclusion

Hydrus microstent with phacoemulsification results in sustained IOP and medication reduction for up to 4 years postoperative. The treatment arm showed a significant reduction in secondary incisional glaucoma surgery, possibly related to sustained 4-year reduction in medication use.

Nanophthalmos and Glaucoma: Treatment Outcomes with Different Surgical Strategies

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Introduction

Nanophthalmos is characterized by axial length < 20.50 cm without other malformations. Management of glaucoma in these patients is challenging and constantly evolving. The purpose of this study is to evaluate outcomes of different management strategies in patients with nanophthalmos and glaucoma.

Methods

In this prospective interventional study, consecutive patients with glaucoma who were confirmed to have nanophthalmos on biometry were enrolled (January2017-January2020). Their intraocular pressure (IOP), visual acuity (VA) and cup-disc ratio (CDR) were assessed at presentation and their axial length (AL), lens thickness (LT), anterior chamber depth (ACD), central corneal thickness (CCT) and keratometry (K) were recorded. Surgery was advised based on IOP control.

Results

Total 22 eyes of 15 individuals (11 females and 4 males) were enrolled with mean age of 31.95 ± 15.64 (median: 32) years and median CDR of 0.9 (range: 0.4-1) at presentation. The preoperative mean LT and ACD were 4.47 ± 0.79 mm and 2.22 ± 0.46 mm, respectively, and mean AL was 19.86 ± 2.98 mm with median: 20.46 mm. Mean of average K and CCT were 46.77 ± 6.49 and 534.19 ± 76.12 µm, respectively. Mean IOP at baseline was recorded as 34.18 ± 29.01 (median: 32) mmHg. Gonioscopy revealed a closed angle configuration in 14 eyes and plateau iris in 8 eyes which was confirmed with ultrasonic biomicroscopy. Twelve eyes underwent phacoemulsification with (6) or without (6) incisional goniotomy for IOP control. Trabeculectomy was warranted in 6 eyes while the remaining 4 eyes were controlled on topical glaucoma drugs with peripheral iridotomy only. IOP post-intervention was 18.45 ± 15.26 (range: 10-38) mmHg. None of the patients developed choroidal effusions or other posterior segment complications intra/post-operatively requiring intervention.

Conclusion

Eyes with nanophthalmos with glaucoma are quite refractory to medical therapy and although glaucoma filtering surgery has been the classical end management strategy for nanophthalmos with glaucoma, phacoemulsification with or without incisional goniotomy can also help control the IOP, without significant complications.

Clinical Profile and Outcomes of Ahmed FP7, FP8, AADI and Baerveldt BGI-350 Glaucoma Implant Surgeries at a Tertiary Eye Referral Center in the Philippines

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Introduction
Aqueous shunt surgery is performed in refractory glaucoma or in cases wherein conventional filtering surgery carries a high risk of failure. This retrospective study examined the clinical profile and outcomes of patients receiving the Ahmed FP7, Ahmed FP8, Aurolab AADI and Baerveldt BGI-350 implant.

Methods
Glaucoma patients on maximum-tolerated IOP-lowering medical therapy who were implanted with Ahmed FP7, Ahmed FP8, Aurolab AADI or Baerveldt BGI-350 were included. The primary outcome measure was (1) surgical failure. Secondary outcome measures were (1) change in intraocular pressure, (2) change in glaucoma medication use, (3) change in visual acuity and (4) surgical complications.

Results
A total of 100 patients were included: 44 received the Ahmed FP7 implant; 23 received the Ahmed FP8 implant, 30 received the AADI implant; 3 received the Baerveldt BGI-350 implant. IOP and number of medications decreased significantly for all groups following surgery. There were no significant differences in visual acuity change between groups. Failed cases accounted for 23% of outcomes. The cumulative probability of failure at 3 years was 64.2% in the Ahmed FP7, 43.9% in the Ahmed FP8, 35.1% in the AADI and 33.3% in the Baerveldt BGI-350 ($p = 0.541$). Fibrotic encapsulation of the base plate was the most common postoperative complication and was mainly seen in Ahmed valves.

Conclusion
Three-year survival rates are comparable between all four implant groups. The choice of implant in surgical cases should take into consideration its features, patient and disease characteristics, surgeon factors and therapeutic goals.

Figures, and illustrations

Table 1. Summary of patient demographics and preoperative data.

Parameter	Result (N=100 eyes)
Gender	
Male	52%
Female	48%
Mean age ± standard deviation, in years	42.65 years ± 23.359 years
Glaucoma Diagnosis	
Congenital Glaucoma	6 (6%)
JOAG	2 (2%)
POAG	7 (7%)
PACG	5 (5%)
Secondary Open Angle Glaucoma	12 (12%)
Secondary Angle Closure Glaucoma	68 (68%)
Laterality	
OD	50 (50%)
OS	50 (50%)
Prior Surgical Intervention	
Trabeculectomy	
Primary Trabeculectomy Only	29 (29%)
Primary and Repeat Trabeculectomy	7 (7%)
Bleb Revision	14 (14%)
Glaucoma Drainage Device Implantation	7 (7%)
Corneal Surgery	30 (30%)
Corneal Perforating Injury Repair	3 (3%)
Penetrating Keratoplasty	28 (28%)
Retinal Surgery	13 (13%)
Pars Plana Vitrectomy	13 (13%)
Scleral Buckling / Encircling Band Placement	3 (3%)
Silicone Oil Injection	9 (9%)
Silicone Oil Removal	9 (9%)
Lens Status	
Phakic	27 (27%)
Aphakic	9 (9%)
Pseudophakic	62 (62%)

Table 2. Summary of Intraoperative data.

Surgery Performed	
Glaucoma Drainage Device Implantation alone	95 (95%)
Combined Glaucoma Drainage Device Implantation, Phacoemulsification with PCIOL Implantation	3 (3%)
Combined Glaucoma Drainage Device and Boston Keratoprosthesis Implantation	1 (1%)
Combined Glaucoma Drainage Device Implantation and Penetrating Keratoplasty	1 (1%)
Type of Glaucoma Drainage Device Implanted	
Valved Shunts	**67 (67%)**
Ahmed FP7	44 (44%)
Ahmed FP8	23 (23%)
Non-valved Shunts	**33 (33%)**
Aurolab AADI	30 (30%)
Baerveldt 350mm2	3 (3%)
Glaucoma Drainage Device Plate Location	
Superotemporal	92 (92%)
Superonasal	1 (1%)
Inferotemporal	2 (2%)
Inferonasal	5 (5%)
Surgeon Experience	
Glaucoma Consultant	13 (13%)
Fellow-in-training	87 (87%)

Table 3. Comparison of mean IOP of valved and non-valved implant groups at different time points.

Time	Mean IOP (mmHg)									p-value
	Overall			Valved Implant Group			Non-valved Implant Group			
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	
Preoperative Period	100	30.77	15.087	67	30.94	15.993	33	30.42	13.283	0.873
Postoperative Day 1	100	11.95	11.489	67	10.84	9.651	33	14.21	14.437	0.168
Postoperative Week 1	96	10.79	9.306	64	8.97	6.216	32	14.44	12.896	**0.006***
Postoperative Month 1	97	14.81	9.171	65	14.63	9.105	32	15.19	9.441	0.780
Postoperative Month 3	77	14.65	8.988	59	14.49	8.468	18	15.17	10.777	0.782
Postoperative Month 6	59	15.00	8.402	45	15.36	8.650	14	13.86	7.735	0.565
Postoperative Year 1	42	13.10	5.754	30	13.77	6.202	12	11.42	4.209	0.236
Postoperative Day Year 2	22	14.41	10.559	13	12.77	4.086	9	16.78	16.029	0.394
Postoperative Day Year 3	8	14.13	3.944	5	15.40	4.450	3	12.00	2.000	0.268
Postoperative Day Year 4	4	13.75	6.238	3	15.00	7.000	1	10.00	.	0.599
Postoperative Day Year 5	3	18.67	2.309	2	18.00	2.828	1	20.00	.	0.667

Table 4. Comparison of mean IOP of specific implants at different time points.

Time	Mean IOP (mmHg)															p-value
	Overall			Ahmed FP7			Ahmed FP8			AADI			BGI-350			
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	
Preoperative Period	100	30.77	15.087	44	32.43	17.520	23	28.09	12.428	30	31.17	13.583	3	23.00	7.550	0.563
Postoperative Day 1	100	11.95	11.489	44	10.86	10.145	23	10.78	8.847	30	14.73	14.918	3	9.00	7.937	0.465
Postoperative Week 1	96	10.79	9.306	42	8.43	5.666	22	10.00	7.178	29	14.62	13.327	3	12.67	9.292	**0.045***
Postoperative Month 1	97	14.81	9.171	42	15.71	9.984	23	12.65	7.004	29	14.55	9.310	3	21.33	10.263	0.363
Postoperative Month 3	77	14.65	8.988	39	14.46	7.887	20	14.55	9.720	15	16.13	11.115	3	10.33	8.963	0.779
Postoperative Month 6	59	15.00	8.402	29	15.14	9.565	16	15.75	6.962	12	15.33	7.037	2	5.00	7.071	0.402
Postoperative Year 1	42	13.10	5.754	17	12.29	4.195	13	15.69	7.899	10	10.70	3.199	2	15.00	8.485	0.177
Postoperative Day Year 2	22	14.41	10.559	8	12.63	4.689	5	13.00	3.391	7	19.00	17.020	2	9.00	12.728	0.570
Postoperative Day Year 3	8	14.13	3.944	4	14.00	3.651	1	21.00	.	3	12.00	2.000	0	.	.	0.129
Postoperative Day Year 4	4	13.75	6.238	2	13.50	9.192	1	18.00	.	0	.	.	1	10.00	.	0.851
Postoperative Day Year 5	3	18.67	2.309	2	18.00	2.828	0	.	.	0	.	.	1	20.00	.	0.667

Table 5. Mean IOP decrease from baseline at different postoperative time points following glaucoma drainage implant surgery.

Time	Mean IOP decrease from Baseline (mmHg)*			p-value
	N	Mean	Standard Deviation	
Postoperative Day 1	100	18.820	15.581	**0.000***
Postoperative Week 1	96	20.167	15.961	**0.000***
Postoperative Month 1	97	15.804	16.701	**0.000***
Postoperative Month 3	77	16.338	17.152	**0.000***
Postoperative Month 6	59	18.322	16.595	**0.000***
Postoperative Year 1	42	18.500	13.018	**0.000***
Postoperative Year 2	22	15.500	15.519	**0.000***
Postoperative Year 3	8	11.750	16.149	0.079
Postoperative Year 4	4	7.000	10.488	0.274
Postoperative Year 5	3	8.333	5.508	0.120

Table 6. Comparison of Mean IOP decrease from baseline between valved and non-valved implant groups.

Time	Mean IOP decrease from Baseline (mmHg)*									p-value
	Overall			Valved Implant Group			Non-valved Implant Group			
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	
Postoperative Day 1	100	18.820	15.581	67	20.105	16.419	33	16.212	13.585	0.242
Postoperative Week 1	96	20.167	15.961	64	22.031	16.132	32	16.438	15.174	0.106
Postoperative Month 1	97	15.804	16.701	65	15.939	16.940	32	15.531	16.469	0.911
Postoperative Month 3	77	16.338	17.152	59	16.729	18.014	18	15.056	14.342	0.720
Postoperative Month 6	59	18.322	16.595	45	18.644	17.250	14	17.286	14.835	0.792
Postoperative Year 1	42	18.500	13.018	30	18.300	13.267	12	19.000	12.933	0.877
Postoperative Day Year 2	22	15.500	15.519	13	15.846	14.798	9	15.000	17.414	0.904
Postoperative Day Year 3	8	11.750	16.149	5	6.400	13.126	3	20.667	19.425	0.255
Postoperative Day Year 4	4	7.000	10.488	3	2.333	5.859	1	21.000	.	0.110
Postoperative Day Year 5	3	8.333	5.508	2	7.000	7.071	1	11.000	.	0.725

Table 7. Comparison of Mean IOP decrease from baseline between Ahmed FP7, Ahmed FP8, AADI and BGI-350 Groups

Time	Mean change in IOP from Baseline (mmHg)*															p-value
	Overall			Ahmed FP7			Ahmed FP8			AADI			Baerveldt BGI-350			
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	
Post-operative day 1	100	18.8200	15.58060	44	21.5682	18.12155	23	17.3043	12.42591	30	16.4333	13.86806	3	14.0000	12.49000	0.467
Post-operative day 7 (1 week)	96	20.1667	15.96092	42	23.7143	17.97869	22	18.8182	11.54138	29	17.0690	15.18912	3	10.3333	16.65333	0.217
Post-operative day 30 (1 month)	97	15.8041	16.70120	42	16.2143	18.18943	23	15.4348	14.75813	29	16.9655	16.50862	3	1.6667	8.38650	0.514
Post-operative day 90 (3 months)	77	16.3377	17.15150	39	18.1795	19.42986	20	13.9000	14.92754	15	15.5333	15.60616	3	12.6667	5.77350	0.802
Post-operative day 180 (6 months)	59	18.3220	16.59501	29	21.3793	18.92544	16	13.6875	12.78916	12	17.0833	16.08194	2	18.5000	3.53553	0.523
Post-operative day 365 (1 year)	42	18.5000	13.01828	17	20.6471	15.26000	13	15.2308	9.84170	10	21.1000	11.59933	2	8.5000	19.09188	0.426
2 years post-op	22	15.5000	15.51881	8	20.5000	17.08801	5	8.4000	5.77062	7	15.1429	20.08672	2	14.5000	2.12132	0.628
3 years post-op	8	11.7500	16.14886	4	8.7500	13.88944	1	-3.0000	.	3	20.6667	19.42507	0	.	.	0.456
4 years post-op	4	7.0000	10.48809	2	3.5000	7.77817	1	0.0000	.	0	.	.	1	21.0000	.	0.428
5 years post-op	3	8.3333	5.50757	2	7.0000	7.07107	0	.	.	0	.	.	1	11.0000	.	0.725

Table 8. Distribution of glaucoma medications at different time points and comparison of mean number of medications from baseline.

Time	N	Average Topical Medications					Average Topical and Systemic Medications				
		Mean	SD	Mean Change from Baseline	SD	p-value	Mean	SD	Mean Change from Baseline	SD	p-value
Baseline	100	**2.57**	1.047	N/A	N/A	N/A	**3.16**	1.089	N/A	N/A	N/A
Postoperative Day 1	100	**0.23**	0.649	2.34	1.257	**0.000***	**0.28**	0.753	2.88	1.365	**0.000***
Postoperative Week 1	96	**0.25**	0.665	2.333	1.311	**0.000***	**0.3**	0.809	2.885	1.457	**0.000***
Postoperative Month 1	97	**0.65**	0.878	1.907	1.355	**0.000***	**0.69**	0.906	2.454	1.486	**0.000***
Postoperative Month 3	77	**0.97**	1.112	1.662	1.401	**0.000***	**1.01**	1.153	2.234	1.521	**0.000***
Postoperative Month 6	59	**1.14**	1.042	1.576	1.316	**0.000***	**1.19**	1.121	2.186	1.444	**0.000***
Postoperative Year 1	42	**1.29**	1.195	1.31	1.388	**0.000***	**1.29**	1.195	2	1.379	**0.000***
Postoperative Year 2	22	**1.55**	1.335	1.182	1.181	**0.000***	**1.55**	1.335	1.727	1.42	**0.000***
Postoperative Year 3	8	**1**	1.309	1.5	1.69	**0.040***	**1**	1.309	2.375	1.847	**0.008***
Postoperative Year 4	4	**2.5**	1.291	0	1.155	1	**2.5**	1.291	0.5	1.732	0.604
Postoperative Year 5	3	**3**	1	-0.667	0.577	0.184	**3**	1	-0.333	1.155	0.667

Table 9. Distribution of glaucoma medications at different time points and comparison of mean number of medications from baseline.

Time	N	Medication Class									
		Beta-blocker		Alpha-agonist		Topical CAI		PGA		Oral CAI	
		N	%	N	%	N	%	N	%	N	%
Baseline	100	88	88.00%	78	78.00%	45	45.00%	46	46.00%	59	59.00%
Postoperative Day 1	100	10	10.00%	11	11.00%	1	1.00%	1	1.00%	5	5.00%
Postoperative Week 1	96	13	13.54%	8	8.33%	3	3.13%	0	0.00%	5	5.21%
Postoperative Month 1	97	35	36.08%	19	19.59%	5	5.15%	4	4.12%	4	4.12%
Postoperative Month 3	77	38	49.35%	21	27.27%	6	7.79%	10	12.99%	3	3.90%
Postoperative Month 6	59	38	64.41%	14	23.73%	7	11.86%	8	13.56%	3	5.08%
Postoperative Year 1	42	25	59.52%	19	45.24%	5	11.90%	5	11.90%	0	0.00%
Postoperative Year 2	22	12	54.55%	12	54.55%	6	27.27%	4	18.18%	0	0.00%
Postoperative Year 3	8	4	50.00%	1	12.50%	2	25.00%	1	12.50%	0	0.00%
Postoperative Year 4	4	4	100.00%	2	50.00%	2	50.00%	2	50.00%	0	0.00%
Postoperative Year 5	3	3	100.00%	2	66.67%	2	66.67%	2	66.67%	0	0.00%

Table 10. Comparison of baseline glaucoma medications between Ahmed FP7, Ahmed FP8, AADI and BGI-350 groups.

Glaucoma Drainage Implant	N	Number of Topical Medications		Number of Topical and Systemic Medications	
		Mean	Standard Deviation	Mean	Standard Deviation
Ahmed FP7	**44**	2.75	1.014	3.36	1.014
Ahmed FP8	**23**	2.39	0.988	3.04	1.107
AADI	**30**	2.50	1.042	3.07	1.048
BGI-350	**3**	2.00	2.000	2.00	2.000
p-value		0.397		0.142	

Table 11. Distribution of glaucoma medications at different time points and comparison of mean number of medications from baseline.

Time	Average Number of Topical and Systemic Glaucoma Medications												p-value
	Ahmed FP7			Ahmed FP8			AADI			BGI-350			
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	
Baseline	44	3.36	1.014	23	3.040	1.107	30	3.070	3.070	3	2.000	2.000	0.142
Postoperative Day 1	44	0.23	0.642	23	0.220	0.736	30	0.370	0.890	3	0.670	1.155	0.674
Postoperative Week 1	42	0.14	0.417	22	0.050	0.213	29	0.690	1.257	3	0.670	1.155	**0.009***
Postoperative Month 1	42	0.64	0.850	23	0.570	0.788	29	0.720	0.996	3	2.000	1.000	0.074
Postoperative Month 3	39	0.87	0.864	20	1.000	1.298	15	1.130	1.356	3	2.330	2.082	0.197
Postoperative Month 6	29	0.93	0.842	16	1.630	1.544	12	1.080	0.900	2	2.000	1.414	0.164
Postoperative Year 1	17	1.12	0.993	13	1.770	1.536	10	0.900	0.994	2	1.500	0.707	0.320
Postoperative Year 2	8	1.25	1.488	5	1.200	1.304	7	1.710	1.254	2	3.000	0.000	0.382
Postoperative Year 3	4	1.00	1.414	1	0.000	N/A	3	1.330	1.528	0	N/A	N/A	0.745
Postoperative Year 4	2	2.50	2.121	1	2.000	N/A	0	N/A	N/A	1	2.500	N/A	0.949
Postoperative Year 5	2	3.00	1.414	0	N/A	N/A	0	N/A	N/A	1	3.000	N/A	1.000

Table 12. Comparison of mean visual acuity of valved and non-valved implant groups at different time points.

Time	Mean Visual Acuity (LogMAR)									p-value
	Overall			Valved Implant Group			Non-valved Implant Group			
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	
Preoperative Period	100	1.174	1.037	67	1.181	0.975	33	1.159	1.169	0.922
Postoperative Day 1	100	1.347	1.034	67	1.312	0.961	33	1.419	1.181	0.631
Postoperative Week 1	96	1.179	0.926	64	1.157	0.861	32	1.222	1.056	0.750
Postoperative Month 1	97	1.096	0.924	65	1.052	0.836	32	1.186	1.090	0.504
Postoperative Month 3	77	0.992	0.920	59	0.980	0.892	18	1.030	1.033	0.841
Postoperative Month 6	59	1.171	1.009	45	1.200	0.975	14	1.080	1.147	0.702
Postoperative Year 1	42	1.124	1.021	30	1.196	1.013	12	0.943	1.064	0.475
Postoperative Day Year 2	22	1.258	1.041	13	1.108	0.843	9	1.475	1.300	0.431
Postoperative Day Year 3	8	0.825	0.908	5	0.860	1.165	3	0.767	0.404	0.901
Postoperative Day Year 4	4	1.551	1.143	3	1.235	1.166	1	2.500	.	0.446
Postoperative Day Year 5	3	1.869	1.456	2	1.554	1.908	1	2.500	.	0.755

Table 13. Mean visual acuity (LogMAR) at baseline and at different postoperative time points.

Period	Total				Ahmed FP7				Ahmed FP8				AADI				BGI-350				p-value
	N	Mean LogMAR	SD	Snellen	N	Mean LogMAR	SD	Snellen	N	Mean LogMAR	SD	Snellen	N	Mean LogMAR	SD	Snellen	N	Mean LogMAR	SD	Snellen	
Preoperative	100	1.17	1.037	13.00/200	44	1.21	1.050	12.00/200	23	1.12	0.832	15.00/200	30	1.10	1.175	15.00/200	3	1.77	1.102	3.00/200	0.747
Postoperative Day 1	100	1.35	1.034	8.00/200	44	1.31	1.007	9.00/200	23	1.32	0.888	9.00/200	30	1.42	1.192	7.00/200	3	1.40	1.301	7.00/200	0.972
Postoperative Week 1	96	1.18	0.926	13.00/200	42	1.25	0.957	11.00/200	22	0.98	0.622	20/192.00	29	1.20	1.064	12.00/200	3	1.47	1.160	6.00/200	0.684
Postoperative Month 1	97	1.10	0.924	16.00/200	42	1.11	0.893	15.00/200	23	0.95	0.730	20/179.00	29	1.17	1.083	13.00/200	3	1.30	1.402	9.00/200	0.828
Postoperative Month 3	77	0.99	0.920	20/196.00	39	1.09	0.992	16.00/200	20	0.76	0.622	20/115.00	15	0.95	1.031	20/178.00	3	1.44	1.157	7.00/200	0.492
Postoperative Month 6	59	1.17	1.009	13.00/200	29	1.27	1.047	10.00/200	16	1.07	0.846	17.00/200	12	0.99	1.091	20/196.00	2	1.60	1.840	4.00/200	0.767
Postoperative Year 1	42	1.12	1.021	15.00/200	17	1.35	1.154	8.00/200	13	0.99	0.790	20/195.00	10	0.83	0.929	20/135.00	2	1.50	1.984	6.00/200	0.553
Postoperative Year 2	22	1.26	1.041	11.00/200	8	1.08	1.023	16.00/200	5	1.16	0.542	13.00/200	7	1.45	1.283	7.00/200	2	1.55	1.908	5.00/200	0.891
Postoperative Year 3	8	0.83	0.908	20/133.00	4	0.90	1.341	20/159.00	1	0.70	.	20/99.00	3	0.77	0.404	20/116.00	0	.	.		0.979
Postoperative Year 4	4	1.55	1.143	5.00/200	2	1.35	1.623	8.00/200	1	1.00	.	20/200.00	0	.	.		1	2.50	.	CF @ 6 inches	0.820
Postoperative Year 5	3	1.87	1.456	2.00/200	2	1.55	1.908	5.00/200	0	.	.		0	.	.		1	2.50	.	CF @ 6 inches	0.755

Table 14. Mean visual acuity change (LogMAR) from baseline at different postoperative time points following glaucoma drainage implant surgery.

Time	N	Mean change in VA from Baseline (LogMAR)*		p-value
		Mean	Standard Deviation	
Postoperative Day 1	100	**-0.174**	0.654	**0.000***
Postoperative Week 1	96	**-0.028**	0.611	**0.000***
Postoperative Month 1	97	0.078	0.595	**0.000***
Postoperative Month 3	77	0.136	0.701	**0.000***
Postoperative Month 6	59	0.003	0.848	**0.000***
Postoperative Year 1	42	0.066	0.779	**0.000***
Postoperative Year 2	22	0.032	0.908	**0.002***
Postoperative Year 3	8	0.126	0.740	**0.028***
Postoperative Year 4	4	-0.101	0.082	**0.003***
Postoperative Year 5	3	-0.087	0.125	0.051

*Negative logMAR change indicates decline in VA.

Table 15. Comparison of Mean VA change (LogMAR) from baseline between Ahmed FP7, Ahmed FP8, AADI and BGI-350 Groups

Time	Mean change in VA from Baseline (LogMAR)															p-value
	Overall			Ahmed FP7			Ahmed FP8			AADI			Baerveldt BGI-350			
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	
Postoperative Day 1	100	-0.1735	0.65394	44	-0.0978	0.68674	23	-0.1952	0.60896	30	-0.3218	0.54138	3	0.3647	1.34296	0.243
Postoperative Week 1	96	-0.0279	0.61059	42	-0.0057	0.57622	22	0.0681	0.50431	29	-0.1668	0.60960	3	0.2998	1.57376	0.402
Postoperative Month 1	97	0.0781	0.59474	42	0.0869	0.59773	23	0.1702	0.39218	29	-0.0477	0.60438	3	0.4651	1.51502	0.377
Postoperative Month 3	77	0.1356	0.70065	39	0.1143	0.70466	20	0.2252	0.44615	15	0.0325	0.75620	3	0.3307	1.76085	0.826
Postoperative Month 6	59	0.0028	0.84775	29	-0.0670	0.85341	16	-0.0812	0.78197	12	0.1511	0.76340	2	0.7979	1.98136	0.489
Postoperative Year 1	42	0.0655	0.77864	17	-0.0709	0.76501	13	0.0497	0.38739	10	0.1512	0.90607	2	0.9000	2.12569	0.412
Postoperative Year 2	22	0.0315	0.90776	8	-0.0189	0.38630	5	0.1796	0.56256	7	-0.2494	1.20979	2	0.8464	2.04988	0.516
Postoperative Year 3	8	0.1256	0.73968	4	-0.2271	0.15029	1	0.2041	.	3	0.5698	1.15470	0	.	.	0.431
Postoperative Year 4	4	-0.1010	0.08177	2	-0.0536	0.07581	1	-0.0969	.	0	.	.	1	-0.2000	.	0.535
Postoperative Year 5	3	-0.0868	0.12472	2	-0.0301	0.10898	0	.	.	0	.	.	1	-0.2000	.	0.424

*Negative logMAR change indicates decline in VA.

Table 16. Distribution of outcomes among specific implant groups.

Outcome	Ahmed FP7		Ahmed FP8		AADI		BGI-350		Total	Percentage
	N	Percentage	N	Percentage	N	Percentage	N	Percentage		
Success	19	43.18%	7	30.43%	14	46.67%	1	33.33%	41	41.00%
Qualified Success	13	29.55%	9	39.13%	13	43.33%	1	33.33%	36	36.00%
Failure	12	27.27%	7	30.43%	3	10.00%	1	33.33%	23	23.00%
Total	44		23		30		3		100	

Table 17. Distribution of failure causes among specific implant groups.

FAILURE OUTCOME	Ahmed FP7		Ahmed FP8		AADI		BGI-350		Total
	N	Percentage	N	Percentage	N	Percentage	N	Percentage	
Inadequate IOP Control									0
Tube occlusion					1	4.35%			1
Plate encapsulation	1	4.35%	1	4.35%					2
Inadequate IOP lowering	2	8.70%			1	4.35%			3
Additional Glaucoma Surgery									0
Transscleral Diode Cyclophotocoagulation	2	8.70%					1	4.35%	3
Trabeculectomy	1	4.35%	1	4.35%					2
Secondary GDD Implantation	1	4.35%	1	4.35%					2
GDD Explantation									0
Recurrent conjunctival defect following capsule resection	2	8.70%	1	4.35%	1	4.35%			4
Spontaneous plate displacement	3	13.04%	2	8.70%					5
Plate displacement in a hypotonous eye			1	4.35%					1
Total (Percentage of all failed outcomes)	12	52.17%	7	30.43%	3	13.04%	1	4.35%	23

Table 18. Distribution of postoperative complications.

Complication	N	Percent of Total Population	Valved Implant				Non-valved Implant			
			Ahmed FP7		Ahmed FP8		AADI		Baerveldt BGI-350	
			N 44	Percent of Complications	N 23	Percent of Complications	N 30	Percent of Complications	N 3	Percent of Complications
Total	51	100.00%	19	37.25%	18	35.29%	12	23.53%	2	3.92%
Plate encapsulation	16	31.37%	6	37.50%	9	56.25%	1	6.25%	0	0.00%
Underwent capsule resection	11	21.57%	4	36.36%	6	54.55%	1	9.09%	0	0.00%
Conjunctival defect / plate exposure following resection	6	11.76%	3	50.00%	2	33.33%	1	16.67%	0	0.00%
Explanted glaucoma drainage implant due to recurrent conjunctival defect	4	7.84%	2	50.00%	1	25.00%	1	25.00%	0	0.00%
Hypotony	10	19.61%	2	20.00%	3	30.00%	4	40.00%	1	10.00%
Choroidal effusion	10	19.61%	2	20.00%	3	30.00%	4	40.00%	1	10.00%
Hypotonic maculopathy	4	7.84%	1	25.00%	1	25.00%	2	50.00%	0	0.00%
Anterior chamber shallowing / flattening	2	3.92%	0	0.00%	1	50.00%	1	50.00%	0	0.00%
Plate displacement / migration	1	1.96%	0	0.00%	1	100.00%	0	0.00%	0	0.00%
Explanted glaucoma drainage implant due to recurrent conjunctival defect	1	1.96%	0	0.00%	1	100.00%	0	0.00%	0	0.00%
Tube malposition	9	17.65%	6	66.67%	2	22.22%	1	11.11%	0	0.00%
Tube-cornea touch	6	11.76%	5	83.33%	0	0.00%	1	16.67%	0	0.00%
Tube-lens touch	2	3.92%	0	0.00%	1	50.00%	0	0.00%	0	0.00%
Posterior segment implantation	1	1.96%	0	0.00%	1	100.00%	0	0.00%	0	0.00%
Tube retraction	1	1.96%	1	100.00%	0	0.00%	0	0.00%	0	0.00%
Plate displacement	6	11.76%	3	50.00%	3	50.00%	0	0.00%	0	0.00%
History vitrectomy with or without band placement	2	3.92%	2	100.00%	0	0.00%	0	0.00%	0	0.00%
History of penetrating keratoplasty and scleral-fixated intraocular lens implantation	2	3.92%	1	50.00%	1	50.00%	0	0.00%	0	0.00%
History of vitrectomy and corneal surgery	1	1.96%	0	0.00%	1	100.00%	0	0.00%	0	0.00%
History of atopy and allergic conjunctivitis	1	1.96%	0	0.00%	1	100.00%	0	0.00%	0	0.00%
Explanted glaucoma drainage implant due to recurrent conjunctival defect	5	9.80%	3	60.00%	2	40.00%	0	0.00%	0	0.00%
Tube occlusion	5	9.80%	0	0.00%	2	40.00%	3	60.00%	0	0.00%
Vitreous	3	5.88%	0	0.00%	1	33.33%	2	66.67%	0	0.00%
Iris	1	1.96%	0	0.00%	1	100.00%	0	0.00%	0	0.00%
Membrane	1	1.96%	0	0.00%	0	0.00%	1	100.00%	0	0.00%
Malignant glaucoma	3	5.88%	1	33.33%	0	0.00%	1	33.33%	1	33.33%
Other Complications	3	5.88%	1	33.33%	1	33.33%	1	33.33%	0	0.00%
Non-clinically significant conjunctival leak	1	1.96%	0	0.00%	0	0.00%	1	100.00%	0	0.00%
Corneal decompensation (multiple surgeries)	1	1.96%	0	0.00%	1	100.00%	0	0.00%	0	0.00%
Cataract formation	1	1.96%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Descemet membrane detachment	1	1.96%	1	100.00%	0	0.00%	1	100.00%	0	0.00%

Figure 1. Mean IOP of valved and non-valved implant groups from baseline to 5 years.

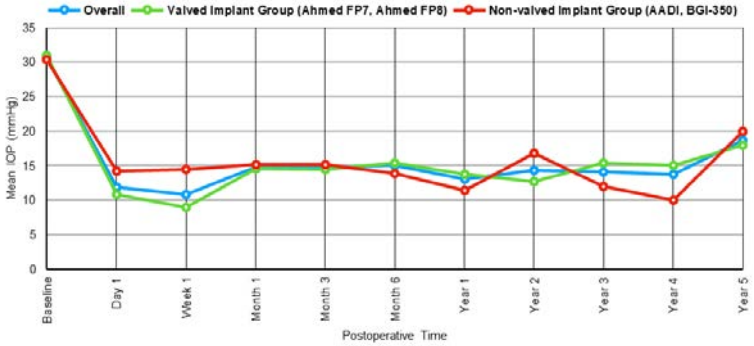


Figure 2. Mean IOP of specific implant groups from baseline to 5 years.

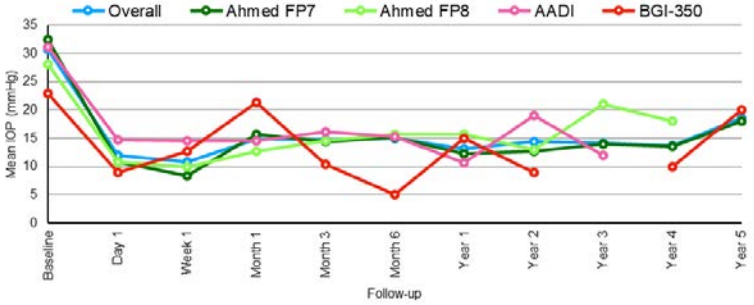


Figure 3. Mean postoperative IOP decrease of valved and non-valved implant groups.

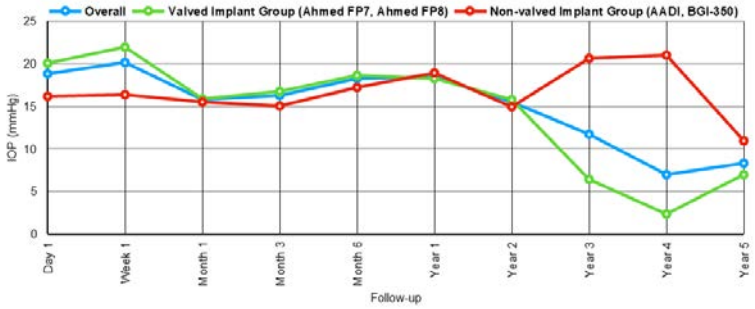


Figure 4. Mean IOP decrease from baseline of different implant groups.

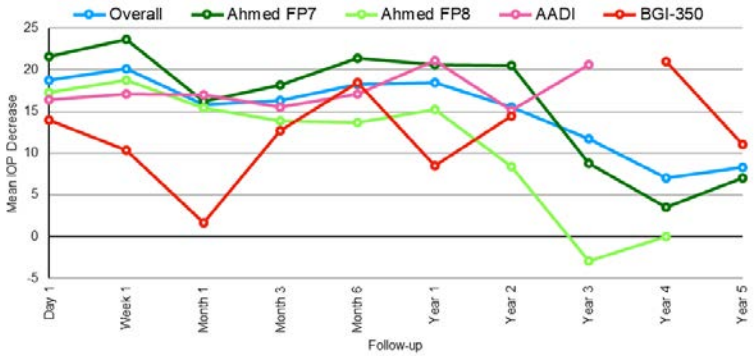


Figure 5. Average medication use at different time points.

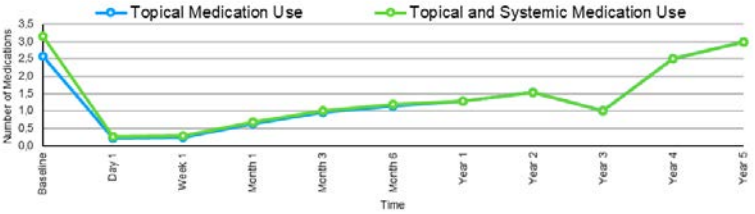


Figure 6. Proportion of glaucoma medication use at different time points

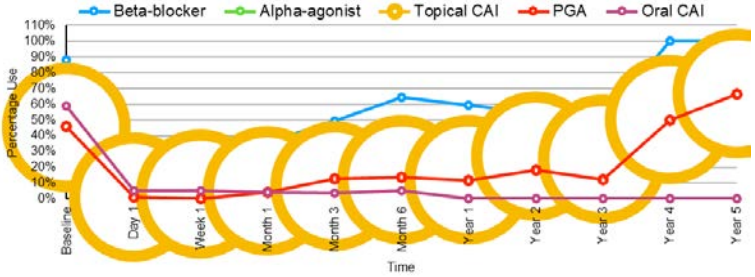


Figure 7. Comparison of average topical and systemic medication use among valved and non-valved implant groups.

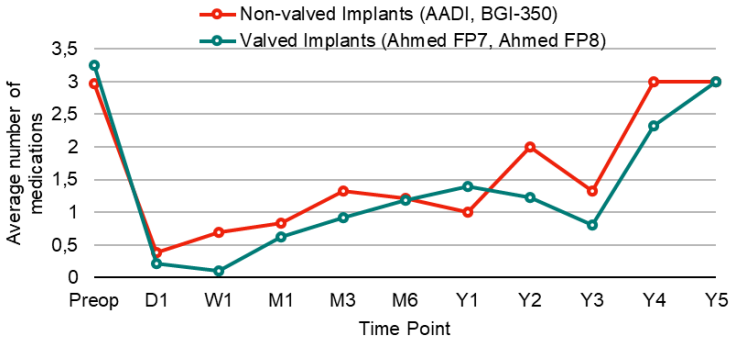


Figure 8. Comparison of average topical and systemic medication use among specific implants

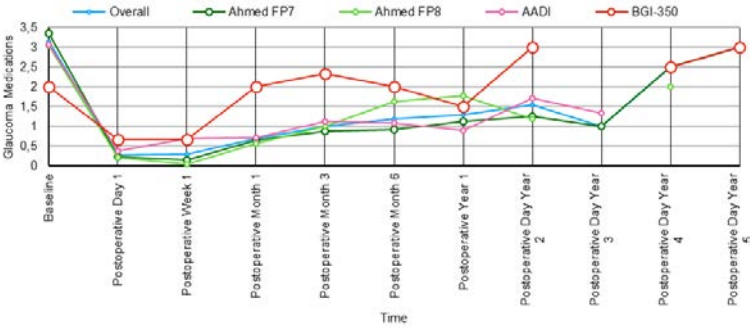


Figure 9. Mean visual acuity (LogMAR) of different implant groups at different postoperative time points

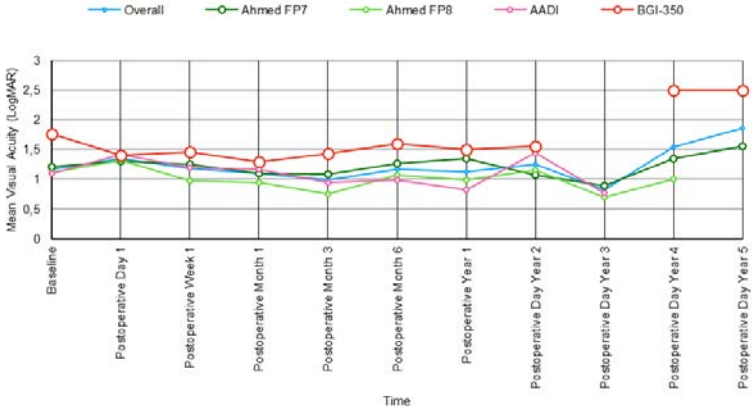


Figure 10. Comparison of mean visual acuity (LogMAR) change of different implant groups at different postoperative time points

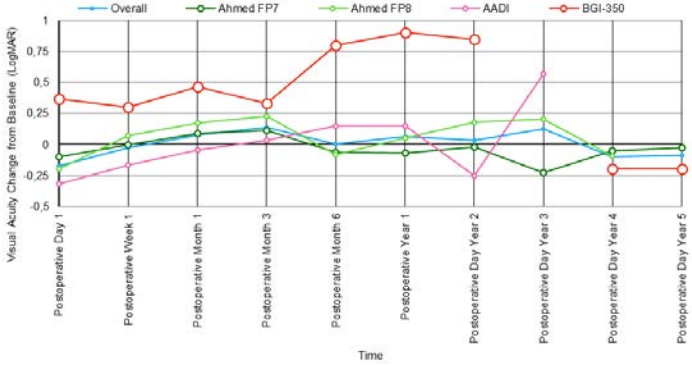


Figure 11. Kaplan-Meier Survival Analysis comparing valved and non-valved groups.

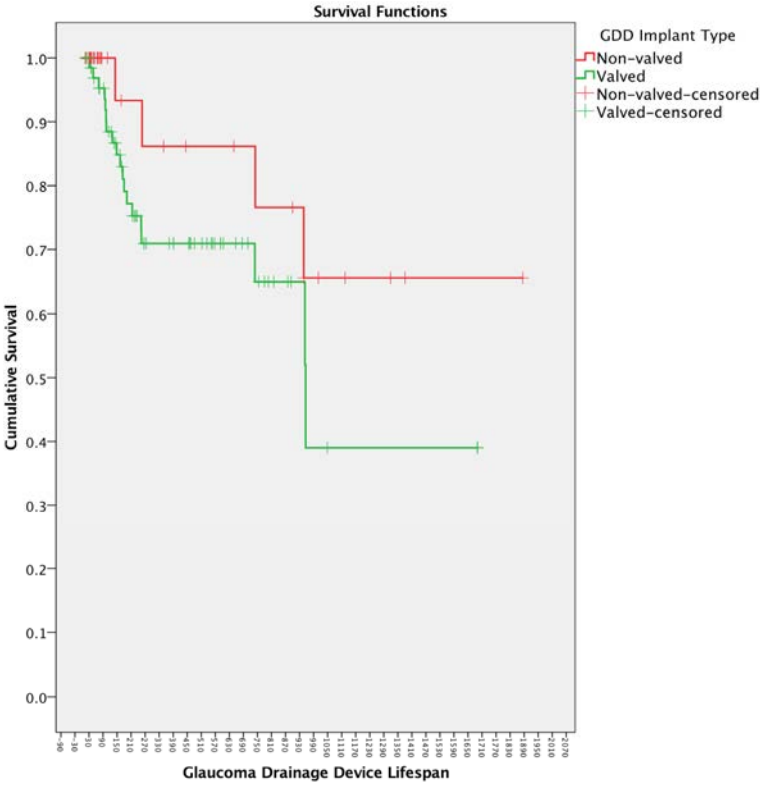
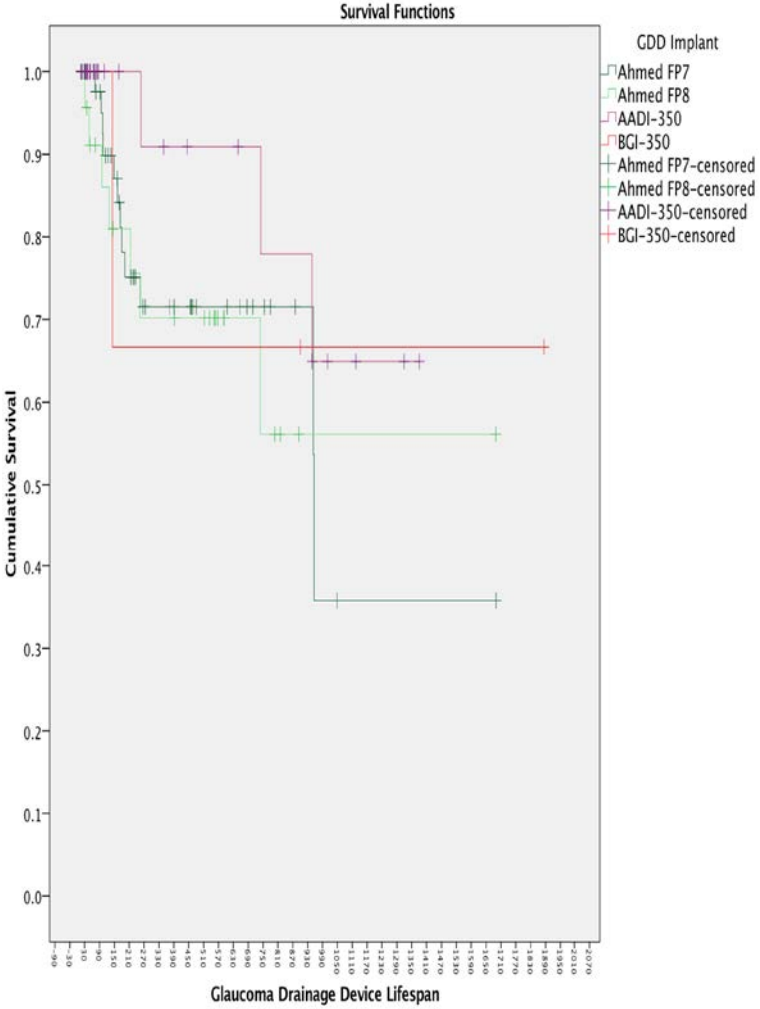


Figure 12. Kaplan-Meier Survival Analysis comparing specific implants.



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Association between factors and IOP after microhook ab interno trabeculotomy in eyes with primary open angle glaucoma

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Introduction

Microhook *ab interno* trabeculotomy (mLOT) is a simple procedure that lowers IOP without damaging the conjunctiva. In this study, we investigated factors that influenced an adequate decrease in IOP 6 months after mLOT.

Methods

This study included 53 eyes of 39 patients (67.5 ± 12.6 years old, male: female = 21:32, MD: -13.4 ± 8.4 dB) with primary open-angle glaucoma who underwent mLOT at Tohoku University Hospital. Spearman's rank correlation coefficient was used to evaluate the relationship between preoperative IOP and the postoperative decrease in IOP just after surgery and after 1 day, 1 month, 3 month, and 6 months. We defined a successful outcome as an IOP decrease of at least 20% after 6 months, no need for additional invasive treatment, and no increase in eye drop score. Groups with and without successful outcomes were compared with the Wilcoxon test.

Results

The 6-month IOP decrease was correlated with age ($r = -0.33$, $p = 0.04$), preoperative eye drop score ($r = -0.41$, $p = 0.01$), day-1 IOP decrease ($r = 0.38$, $p = 0.02$), 1-month IOP decrease ($r = 0.81$, $p < 0.001$), and 3-month IOP decrease ($r = 0.71$, $p < 0.001$). A successful outcome was obtained in 33 of the 53 cases in this study. Among preoperative factors, age (unsuccessful: success = 60.7 ± 15.21: 70.9 ± 9.46, $p = 0.01$) and preoperative eye drop score (unsuccessful: success = 3.47 ± 1.50: 4.46 ± 1.52, $p = 0.04$) were correlated to a successful outcome.

Conclusion

A good prognosis for patients undergoing mLOT and a successful outcome depend on the postoperative IOP decrease on day 1, age, and preoperative eye drop score.

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Laser Treatment

The deepening of anterior chamber in malignant glaucoma patients undergoing low dose laser cycloplasty: a multi-centered clinical trial

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Introduction

Malignant glaucoma (MG) first reported by Von Graefe in 1869,[1] typically is known as a rare but serious complication of intraocular surgery.[2] With the successful use of transscleral cyclophotocoagulation (CPC) in MG cases, CPC was recommended as an early treatment for MG cases unresponsive to medical therapy.[3,4] We developed the concept of low dose laser cycloplasty (LPCP) for the treatment of malignant glaucoma (MG) and aimed to evaluate the changes of anterior chamber depth (ACD) in MG undergoing LDCP.

Methods

In this prospective, multicentered, non-controlled clinical trial, MG patients underwent LDCP. LDCP caused laser cauterization and morphological remodeling of the ciliary body in the range of 2 clock hours to relieve the ciliary ring block. The major outcome measure was the recovery of ACD at 1 month.

Results

Until January 2020, 21 participants (23 eyes) were enrolled in this study and all completed 1 month follow up. Three (13.0%) were men. Mean IOP decreased from 38.1 ± 13.4mmHg at baseline to 15.8 ± 4.7 mmHg at the 1-month visit ($P < 0.001$, paired t test). Mean ACD increased from 0.91 ± 0.66 mm at baseline to 1.94 ± 0.68 mm at the 1-month visit ($P < 0.001$). 17 of the 23 eyes (73.9%) achieved deepening of the central and peripheral anterior chamber (AC).

Conclusion

LDCP can significantly deepen ACD and lower IOP of MG, which supports the use of this technique in cases of MG.

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Medical Treatment

Severity and time course of conjunctival hyperemia in subjects with open-angle glaucoma/ocular hypertension treated with omidenepag isopropyl

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Introduction

Omidenepag, the active metabolite of omidenepag isopropyl (OMDI), is a selective non-prostaglandin, prostanoid EP2 receptor agonist that significantly reduces intraocular pressure (IOP) in subjects with open-angle glaucoma/ocular hypertension. The most frequent adverse event (AE) in subjects receiving OMDI 0.002% monotherapy in clinical trials was conjunctival hyperemia (CH), with rates of 15-20%. This post-hoc analysis of AEs and biomicroscopy results from the Phase 3 RENGE (NCT02822729) and PEONY (NCT02981446) trials assessed the severity and time course of CH in subjects receiving OMDI 0.002% monotherapy.

Methods

The RENGE trial included 85 subjects treated with OMDI once daily for 52 weeks, whereas the PEONY trial included 184 subjects treated with OMDI once daily for 3 months. Slit-lamp biomicroscopy was performed right before the 09:00 IOP measurement at each study visit for grading of CH.

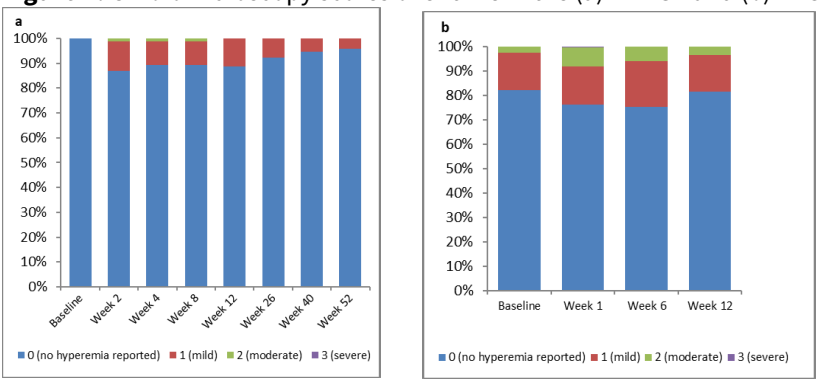
Results

The rates of CH in the RENGE and PEONY trials were 18.8% and 11.9%, respectively, with most cases of CH being mild and transient and none resulting in study discontinuation. In RENGE, the mean ± SD time to CH onset, calculated based on AEs reported in post-hoc analysis, was 16.3 ± 33.9 days, and its mean ± SD duration

was 225.9 ± 139.0 days. In PEONY, the mean ± SD time to CH onset was 17.3 ± 21.1 days, and its mean ± SD duration was 44.7 ± 42.6 days.

Tables, figures, and illustrations

Figure 1. CH biomicroscopy scores over time in the (a) RENGE and (b) PEONY trials



Conclusion

CH in most subjects treated with OMDI 0.002% in the PEONY and RENGE trials was mild and transient, with none leading to study discontinuation.

Spectrum-6: Randomized phase 2 trial evaluating the safety and efficacy of omidenepag isopropyl 0.002% once and twice daily in subjects with primary open-angle glaucoma/ocular hypertension

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Introduction

Omidenepag, the active metabolite of omidenepag isopropyl (OMDI), is a selective non-prostaglandin, prostanoid EP2 receptor agonist. Thisrandomized, double-masked, parallel-group, multicenter phase 2 Spectrum-6 trial (NCT03858894) compared OMDI 0.002% twice-daily (BID) and once-daily (QD) in subjects with primary open-angle glaucoma/ocular hypertension.

Methods

After a ≤ 4-week washout, subjects were randomized 1:1 to OMDI QD (8:00 PM, vehicle at 8:00 AM, n = 50) or BID (8:00 PM and 8:00 AM, n = 48) for 6 weeks. Intraocular pressure (IOP) was measured at 8:00 AM, 12:00 PM, and 4:00 PM at baseline and at Weeks 2 and 6. The primary efficacy endpoint was IOP at each timepoint at Weeks 2 and 6. Adverse events (AEs) were evaluated.

Results

After washout, the baseline mean ± SD diurnal IOP was similar in the BID (25.4 ± 2.9 mmHg) and QD (24.6 ± 1.9 mmHg) QD groups. Clinically significant reductions observed in both groups at Weeks 2 and 6. Least-squares mean ± SE IOP differences (BID versus QD) did not differ significantly at Weeks 2 (0.44 ± 0.68 to 1.08 ± 0.65 mmHg) and Week 6 (0.36 ± 0.63 to 0.68 ± 0.68 mmHg) (all $P > 0.05$). AEs (41.7% vs. 14.0%) and ocular AEs (37.5% vs. 10.0%) were more frequent in the BID than in the QD group. Rates of conjunctival hyperemia, and ocular hyperemia were 12.5%, and 10.4%, respectively, in the BID group and 0%, and 2.0%, respectively, in the QD group. Four subjects in the BID group, but none in the QD group, discontinued OMDI prematurely owing to AEs.

Conclusion

OMDI BID is not superior to OMDI QD in lowering IOP and has a poorer safety profile. OMDI QD is therefore the preferred dosing.

Evaluation of eye irritation profile and drop volume consistency in ophthalmic solutions used for glaucoma treatment

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Introduction

We reported the use of an *in vitro* model to evaluate safety of two new generic ophthalmic formulations, Latanost® (latanoprost) and Latacom® (latanoprost and timolol) by utilizing the three-dimensional reconstructed human cornea-like epithelium (RhCE) tissue constructs in the assessment of ocular irritation.

Methods

In vitro irritation test was conducted on Latanost® (LTN) and Latacom® (LTC) and their corresponding innovators, Xalatan® (XLT) and Xalacom® (XLC) respectively by using RhCE. According to the OECD guidelines No. 492 on the testing of chemicals, the ophthalmic formulations were assessed *via* topical exposure of the formulations on *in vitro* RhCE tissue. Cell viability was measured by MTT assay. Cell viability of below than 60% of the negative control is classified as irritant. Relative cell viability of each tissue was calculated as % of the mean of the negative control tissues.

Results

The mean cell viability percentage of LTN and XLT was 70.5% and 75.7% respectively whereas for LTC and XLC, the percentage viability was 95.3% and 85.7% respectively. The two new generic formulations (LTN and LTC) did not reduce the cell viability of the RhCE tissue to ≤ 60%. Thus, both can be considered as non-irritant.

Conclusion

Conclusively, all test products, both innovator and newly developed generic alike, showed no ocular irritation *in vitro* when tested. The results from this study could

be used as an initial screening of ocular discomfort for our new eye drop formulations.

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Miscellaneous

Effectiveness of a new medication reminder mobile phone application in improving adherence in glaucoma patients

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Introduction
Medication use can decelerate the progressive visual field loss caused by glaucoma, but non-adherence with glaucoma medications remains a primary treatment challenge. 'TAKE YOUR MEDS' is a new smartphone reminder application collaboratively developed by the Faculty of Medicine, Faculty of Information Science and Technology, and Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia to improve glaucoma patients' adherence towards their medications.

Methods
A pre-post intervention study.

Results
The study consisted of three phases. The first phase was the development of the reminder application prototype using the Waterfall method. The second phase was divided into Alpha and Beta testing. 10 normal subjects were recruited during Alpha testing, and 18 new bugs were detected. In Beta testing, 15 glaucoma patients were recruited, the mean age being 65 years old. Mean anti-glaucoma medications used were 3 types. A feasibility test was performed to assess the patients' perspectives on the functionality and graphic features of the application. More than 50% of the patients were in agreement that 'TAKE YOUR MEDS' app was organized, visually appealing, able to record compliance data and serve its purpose as a reminder application. The final phase, which is currently ongoing,

involves a validation study of the new reminder application in monitoring glaucoma patients' adherence towards their medications.

Conclusion

'TAKE YOUR MEDS' is a useful tool for reminding glaucoma patients to take their medications. This, in turn, may improve medication adherence in these patients and help in delaying the progression of glaucoma.

Is intraocular pressure measured by rebound tonometer in infants affected by different corneal thickness?

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Introduction

Measuring intraocular pressure (IOP) in infants is difficult. Rebound tonometers are a popular choice. Doughty et al.[1] showed corneal thickness affected Goldmann applanation tonometer readings in adults. In children, a positive correlation with CCT[2,3] on different instruments were reported. Rapid change in CCT[4-9] is seen in premature neonates. Grover et al.[10] found no correlation of IOP readings in his cohort. This study is the first longitudinal observation of CCT change correlated with IOP readings.

Methods

A prospective cohort of premature infants were subjected to measurements of IOP with the I-Care II tonometer and CCT was measured with the Pach-Pen pachymeter. Measurements were taken at 2 different timepoints, 1st ROP examination and at term. Exclusion criteria included abnormal eye, abnormal cornea, enlarged cornea (HCD:10.0mm). Statistical analysis was performed with the SAS program (Michigan). Paired t-test assessed change over time. Correlation of CCT change with IOP were analysed with Pearson's correlation and regression analysis.

Results

A total of 63 infants completed readings for both timepoints. Left eye findings were used for further analysis. Mean IOP at first examination was 12.7 [SD: 3.3] mmHg and at Term 13.7 [SD: 3.1], $p = 0.11$. The mean CCT was 626.7[SD:71.66 µm at first examination. Regression analysis showed CCT decreased by -11.4 µm/week. At Term, mean CCT was 568.61 [SD:51.74], a change of -56.9 µm, $p < 0.001$. There was no correlation between CCT and IOP at both timepoints ($R2 = 0.17$, $p = 0.16$) and ($R2 = -0.01$, $p = 0.93$) respectively.

Conclusion

Intraocular pressure measured with rebound tonometer (I-Care II, Finland) in premature infants was not affected by change in CCT. The baseline mean IOP for this cohort at term was 13.7 mmHg and central corneal thickness was 568.6 µm.

Tables, figures, and illustrations

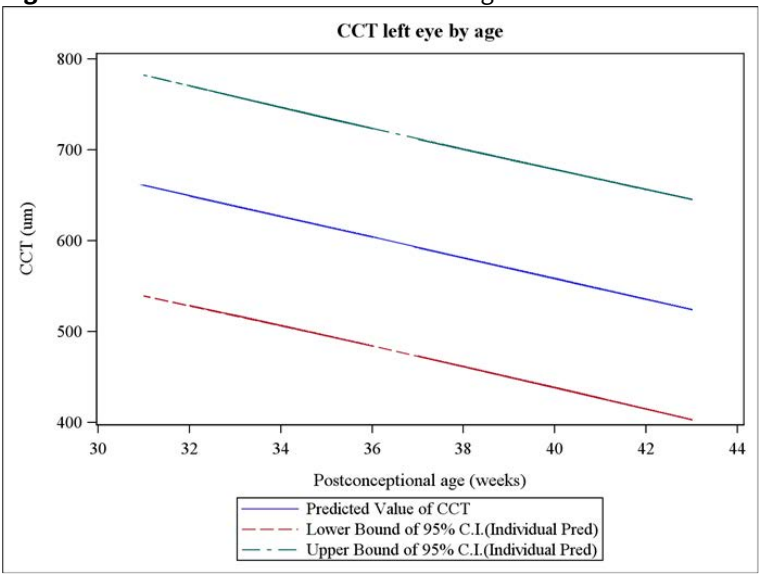
Table 1. Mean (SD) IOP and vCDR recorded at different time-points of each eye by clinical examination (CDR-BIO)

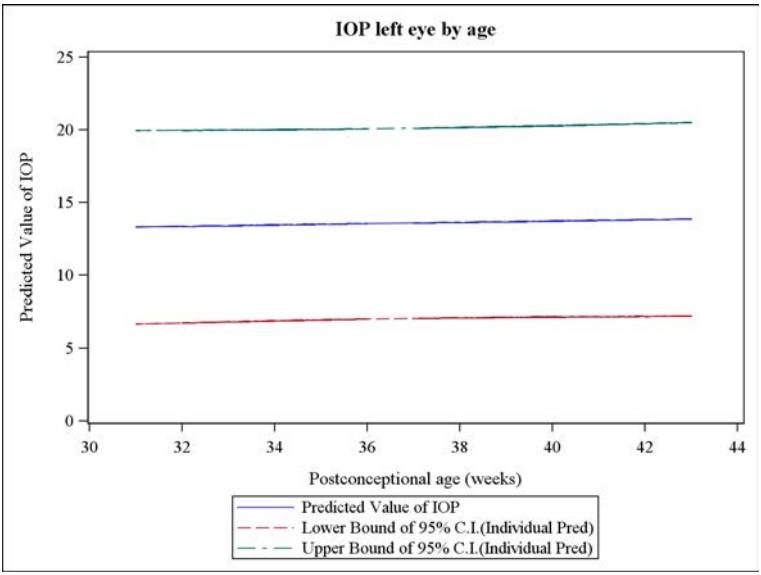
Variable	N	Right Eye (OD)	Left Eye (OS)	p value
vCDR clinical exam (BIO) at Exam 1	73	0.30 (0.12)	0.30 (0.12)	0.67
vCDR clinical exam (BIO) at Exam 2	74	0.35 (0.13)	0.34 (0.14)	0.48
IOP (mmHg) at 4-6 weeks	74	12.7 (3.2)	12.9 (3.1)	0.54
IOP (mmHg) at term	74	13.7 (3.2)	14.1 (3.3)	0.14
CCT at 4-6 weeks Timepoint 1	63	626.7 (71.7)	618.8 (72.9)	0.11
CCT at term Timepoint 2	63	568.6 (51.7)	563.9 (50.5)	0.12

Table 2. Spearman Correlation Coefficient values for, N = 63 at Timepoints 1 and 2

	Central corneal thickness (CCT)		CDR by BIO		Intraocular pressure (IOP)	
	Timepoint 1	Timepoint 2	Timepoint 1	Timepoint 2	Timepoint 1	Timepoint 2
CCT	1.000	1.000	-0.096 0.456	0.109 0.395	0.177 0.164	-0.010 0.936
CDR by BIO	-0.096 0.456	0.109 0.395	1.000	1.000	0.016 0.904	0.213 0.094
IOP	0.177 0.164	-0.010 0.936	0.016 0.904	0.213 0.094	1.000	1.000

Figure 1. Correlation of CCT and IOP with age





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POSTER PRESENTATION ABSTRACTS

Basic Research and Pathogenesis

Neovascular Glaucoma, Experience in Penang Hospital

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Introduction

Neovascular glaucoma (NVG) is a secondary, refractory condition that accounts for 0.7-5.1% of known glaucoma cases in Asia. The aim of this study is to report the epidemiology, treatment, and outcome of NVG in Penang Hospital ophthalmic centre.

Methods

In this retrospective study, medical records of patients diagnosed as NVG in Penang Hospital from June 2018 until January 2020 were reviewed.

Results

NVG was diagnosed in 30 patients, in whom 40 eyes met the follow-up requirements. Patient age ranged from 29 to 78 years (mean 61.5 years). Twenty-eight eyes were from female patients and the rest male. In this series, the main cause of NVG was diabetic eye disease (DED, 85%), followed by central retinal vein occlusion (12.5%) and chronic uveitis (2.5%). All patients were given maximally tolerated medical treatment. In addition, 4 eyes required glaucoma drainage device implant (10%) while another 10 eyes had trans-scleral cyclophotocoagulation (TSCPC, 25%) to further reduce intraocular pressure (IOP). antivascular endothelial growth factor was injected intracamerally in 2 eyes (5%) and intravitreally in 13 eyes (32.5%). Visual acuity improved in 6 eyes (15%),

remained unchanged in 18 eyes (45%) and worsened in 16 eyes (40%). Twenty-eight (70%) achieved IOP less than 21 mmHg. Only 3 eyes (16.7%) achieved good IOP control without any anti-glaucoma medication.

Conclusion

DED was found to be the commonest cause of NVG in Penang Hospital. Most of the patients underwent TSCPC due to poor visual prognosis and refractory glaucoma. Twelve eyes (30%) failed to achieve IOP less than 21 mmHg despite treatment and 40% of eyes suffered reduced visual acuity.

Effect of trans-resveratrol against excitotoxic retinal and optic nerve injury in rats

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Introduction

Retinal and optic nerve damage in glaucoma involves excitotoxicity via N-methyl-D-aspartate (NMDA) receptors. Since, *trans*-resveratrol is known to provide neuroprotection by inhibiting NMDA receptors, we investigated its protective effects against NMDA-induced retinal and optic nerve injury.

Methods

Sprague-Dawley rats were divided into 4 groups that received vehicle (PBS), NMDA and *trans*-resveratrol 0.4 or 4 nmol 24 hours prior to NMDA, bilaterally and intravitreally. Seven days post-injection, rats were euthanized, eyes were enucleated, and retinae were isolated for H&E staining. Optic nerves were isolated for toluidine blue staining.

Results

Retinal morphometry showed that fractional ganglion cell layer (GCL) thickness with inner retina (IR), numeric retinal cell density within GCL and IR and the linear retinal cell density within GCL were significantly low in NMDA compared to PBS-treated group ($p < 0.05$). The same parameters were significantly greater in both *trans*-resveratrol-treated groups compared to NMDA group ($p < 0.05$). No differences were observed between two dose groups. Optic nerve morphology was in accordance with the retinal morphology, however, *trans*-resveratrol 4 nmol caused significantly lesser degeneration compared to 0.4 nmol ($p < 0.05$) (Figure 1).

Conclusion

Trans-resveratrol protects against NMDA-induced retinal and optic nerve damage at a dose of 4 nmol in rats. Grant number FRGS/1/2018/SKK O8/UITM/02/7 by Ministry of Education, Malaysia is acknowledged.

Tables, figures, and illustrations

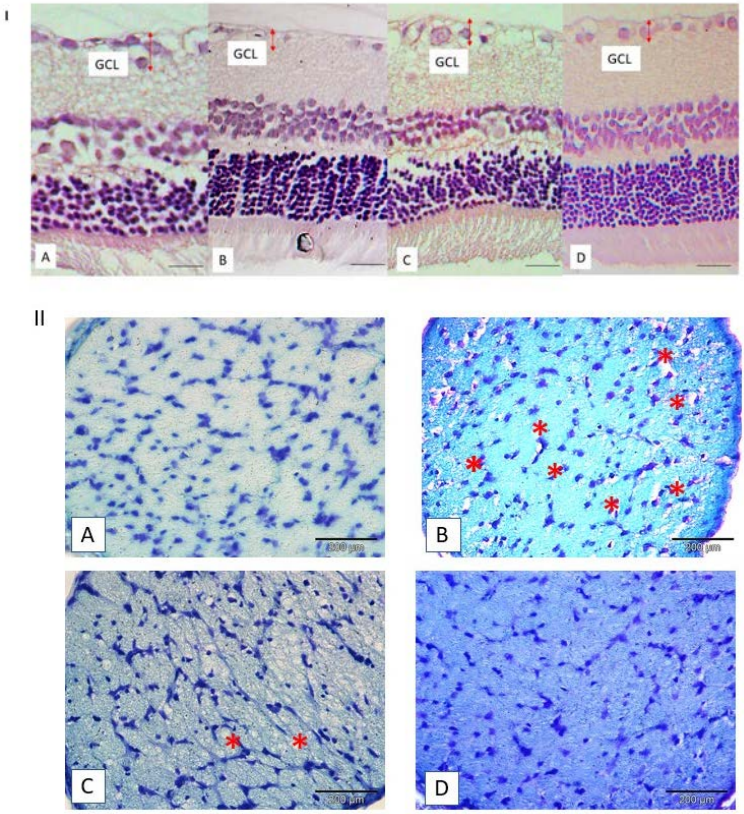

Figure 1. Effect of *trans*-resveratrol on (I) retinal (II) optic nerve morphology. Treatment was given with (A) vehicle (B) NMDA (C) *trans*-resveratrol 0.4 nmol (D) *trans*-resveratrol 4.0 nmol. *Indicates degenerating fibers with vacuolation.

Comparison study on clinical presentation, severity, and progression in primary angle closure between male and female

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Introduction

Primary angle-closure disease (PACD) is more common among females. However, males are not excluded from this blinding disease. There is limited study on clinical presentation, severity, and progression of PACD between male and female. Our objective was to compare the clinical presentation, severity, and progression of PACD between male and female.

Methods

A retrospective record review study was conducted on PACD patients who attended the glaucoma clinic, Hospital Universiti Sains Malaysia, (Kelantan, Malaysia) between January 2006 and February 2020. Data extracted from the medical records includes age, clinical presentation, management and diagnosis at initial presentation and recruitment. The progression was based on structural and functional changes of optic nerve head.

Results

A total of 32 (64 eyes) subjects were recruited: 21 female and 11 male, with a mean age of 67 SD 9 years. The diagnosis at initial presentation; PACS (24), PAC (10) and PACG (30). There was significantly higher incidence of AAC in females compared to males ($p = 0.030$). Laser peripheral iridotomy was done more in females compared to males ($p = 0.037$). There was significant difference of disease progression between sexes after 6.3 SD 3.8 years follow up. However, males tend to progress faster once they develop optic neuropathy ($p = 0.003$).

Conclusion

Although PACD is not common in males, they are still at risk to develop PACD. They tend to present with chronic disease and progress faster once optic neuropathy sets in. Males with PACG warrant aggressive treatment to prevent progression.

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Effect of leukotriene antagonist on wound healing after glaucoma implant surgery in rabbits

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Introduction

The purpose of this study was to investigate the antiscarring effect of leukotriene antagonist(montelukast) on glaucoma drainage implant surgery in a rabbit model.

Methods

After Ahmed valve implantation, we injected montelukast intraperitoneally daily in 12 New Zealand white rabbits. In control group, saline was injected intraperitoneally. We measured IOP using TonoVet. Histochemical staining and immunohistochemistry were done.

Results

Degree of cellularity was smaller in the montelukast group than the control group at post op 2 weeks and 4 weeks. Inner collagen-rich layer was thinner in the montelukast group than the control group at post op 4 weeks and 8 weeks. Area of alpha-smooth muscle actin expression was smaller in the montelukast group at post op 4 weeks and 8 weeks.

Conclusion

Intraperitoneal montelukast injection following glaucoma drainage implantation showed reduced fibrosis in rabbits. Montelukast may be useful as an antiscarring agent after tube surgery.

Screening for Anxiety and Depression Among Glaucoma Patients using the Hospital Anxiety and Depression Scale (HADS-P)

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Introduction

Glaucoma patients suffer from undiagnosed and untreated psychiatric disorders often.[8-13] This study aims to determine the percentage of anxiety and depression among glaucoma patients screened at the Rizal Medical Center using the Filipino version of the Hospital Anxiety and Depression Scale (HADS-P) as a screening tool. Risk factors correlating with anxiety and depression were evaluated.

Methods

Using an analytical cross-sectional study, patients diagnosed with glaucoma from ages 18-90 years were recruited. Patients with coexisting eye problems and psychiatric disorders were excluded. The HADS-P was administered to screen for depression and anxiety. Data were analyzed using Strata SE Version 13. Percentage of anxiety and depression was tabulated at 95% confidence interval with correlating risk factors analyzed using the odds ratio and logistic regression.

Results

Sixty-eight glaucoma patients with an average age of 63.6 ± 11.5 years old were included. Male:female ratio was 1:2. Using the HADS-P, 19.1% of patients screened positive for anxiety and 5.1% for depression. Anxiety was significantly associated with age less than 58 years old ($P = 0.026$), higher MD of the worse eye ($P = 0.019$), a higher difference in MD between both eyes ($P = 0.019$), and secondary glaucoma ($P = 0.023$). Depression was significantly associated with higher MD of the better eye ($P = 0.036$) and secondary glaucoma ($P = 0.037$).

Conclusion

This pioneer study in the Philippines showed that glaucoma patients screened positive for anxiety and depression using the HADS-P. The percentage of anxiety was higher than depression which was comparable to previous studies.[8,10-12] The HADS-P may be helpful in identifying patients that may need referral to Psychiatry.

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Wnt/β-catenin Signaling Pathway in a Rat Model of Ocular Hypertension: a Pilot Study

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Introduction

Pathophysiology of glaucoma is still unknown, and current treatment for glaucoma still has many limitations. Recently, of *Wnt*/β-catenin signaling pathway has gained attention for novel therapeutic target to treat various neurodegenerative diseases. Our study investigates the involvement of *Wnt*/β-catenin signaling pathway in retinal ganglion cell (RGC) damage and aqueous humor outflow pathway in a rat model of ocular hypertension (OHT).

Methods

Fifteen Sprague Dawley rats were used for the experiment, and animals were divided into the non-OHT control (n = 5) and OHT group (n = 10). Circumlimbal suture was performed in unilateral eyes of the rats, and intraocular pressure (IOP) was measured before and immediately after the procedure and daily until 1 week, and weekly until 1 months of the suture. Immunohistochemistry for β-catenin was conducted to examine the activation of Wnt/β-catenin signaling pathway in RGCs and anterior segment structures. Quantitative RT-PCR was performed to investigate the expression levels of various Wnt ligands.

Results

After the circumlimbal suture, IOP was immediately elevated up to mid-fifties, and maintained at mid and high twenties until the animal sacrifice. Increased β-catenin expression was detected in RGCs of OHT eyes compared to control. β-catenin expression was also upregulated in trabecular meshwork, ciliary body, and iris of OHT eyes. For each Wnt ligands, Wnt 3, Wnt3a, Wnt 6, Wnt7a, and Wnt8a expression was upregulated in the retinas of OHT eyes, while Wnt5a and Wnt7a expression was increased in the anterior segment of OHT eyes.

Conclusion

Wnt/β-catenin signaling pathway was activated in both RGCs and TM of OHT eyes, and certain Wnt ligands were upregulated upon OHT insult.

Inhibited effect of a novel RGD peptide Hydrogel on the β1-integrin/FAK/Akt signal pathway in Tenon's capsule fibroblasts

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Introduction

Tenon's capsule fibroblasts are the main cellular components of filtration tract scar that limit the success rate of Glaucoma filtration surgery (GFS). The key process of fibroblast proliferation involves the activation of integrin which is one of the receptors in the membrane of fibroblast and a series of changing of cell biological behavior which is evoked by the integrin combined with relative lagend. Peptides that contain the RGD sequence can compete with RGD containing insoluble matrix proteins for binding to the integrin receptor and thus prevent the downstream signaling pathway. Increasing evidence supports that β1-integrin and FAK/Akt, the important components of the integrin signal pathway, have association with excessive fibrosis in pulmonary fibrosis, and skin hypertrophic scar.

Methods

After dividing Tenon's capsule fibroblasts into four groups, the three experimental groups were treated with different concentrations of RGD peptide hydrogels for 24h. Western blot assay, reverse transcriptase-polymerase chain reaction were used to detect the expression levels of integrin β1, FAK protein and Akt protein, gene transcription level, and cell proliferation was measured by Cell Counting Kit-8.

Results

The results of WB showed that the expression of integrin 1, FAK protein and Akt protein in the cells of the experimental group decreased ($^*P < 0.05$), The results of RT-PCR showed that the expression of integrin 1, FAK protein and the relative transcription level of Akt in the cells of the experimental group were significantly down-regulated ($^*P < 0.05$), The results of CCK8 showed no significant difference in OD value between the experimental group and the normal control group ($^*P > 0.05$).

Conclusion

Our study demonstrated that RGD peptide hydrogels could inhibit integrin1/FAK/Akt signaling pathway in Tenon's capsule fibroblasts and indicated that it could prevent scarring formation after glaucoma filtration surgery.

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Inhibitive effect of TAK-242 on Tenon's capsule fibroblasts proliferation in rat eyes

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Introduction

Glaucoma filtration surgery is the golden standard for lowering intraocular pressure in glaucoma. The success rate is often limited by postoperative scarring of the filter passage. Tenon's capsule fibroblasts are the main cellular components of filtration tract scar, which have been studied to reduce scar formation by inhibiting the proliferation of tenon's cystic fibroblasts. TAK-242 is a cyclohexene derivative that blocks toll-like receptor 4 signal path specifically which plays an important role in organ fibrosis diseases and inhibits the production of cytokines mediated by TLR4 selectively. TLR4 may be associated with the scarring of the filter passage after glaucoma surgery.

Methods

SD rat Tenon's capsule fibroblasts were extracted and cultured, then the cells were divided into normal control group, lipopolysaccharide group and TAK-242 group. The expressions of TLR4, transforming growth factor-β1 and interleukin-6 in each group were detected by Western blot and reverse transcriptase-polymerase chain reaction. Cell proliferation was detected by CCK-8.

Results

Double immunofluorescent labeling in the extracted cells showed negative keratin staining and positive vimentin staining. Western blot showed that the LPS group had the highest expression of TLR4 and TGF-β1 ($P < 0.01$). Enzyme linked immunosorbent assay also showed that the secretion of IL-6 was the highest in LPS group ($P < 0.01$). But there was no significant difference in TLR4 and TGF-1, as well as IL-6 expressions between the TAK-242 group and the normal control group ($P > 0.05$). RT-PCR showed that the IL-6 mRNA expression in LPS group was the highest in the three groups ($P < 0.01$).

Conclusion

TAK-242 inhibits the proliferation of LPS induced Tenon's capsule fibroblasts and the release of inflammatory factors by regulating the TLR4 signaling pathway,

providing a new idea for reducing the scarring of the filter passage after glaucoma filtration surgery.

Tables, figures, and illustrations

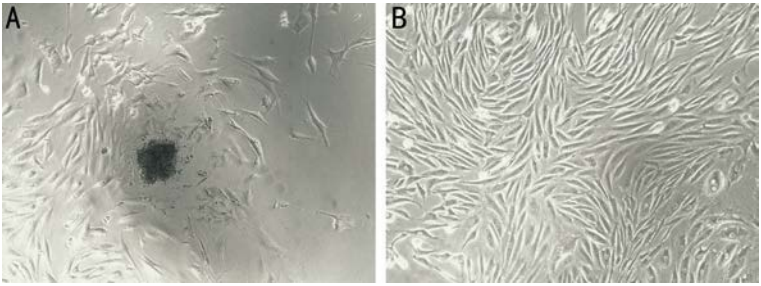

Figure 1. Primary culture of SD rat Tenon's capsule fibroblasts (100×). A: In the center, tissue fragments digested by trypsin. The cells migrate from the tissue fragments and divide and proliferate. The cells are spindle shaped or spindle-shaped, and a few are triangular. B: The cells are arranged in bundles or spirals after confluence

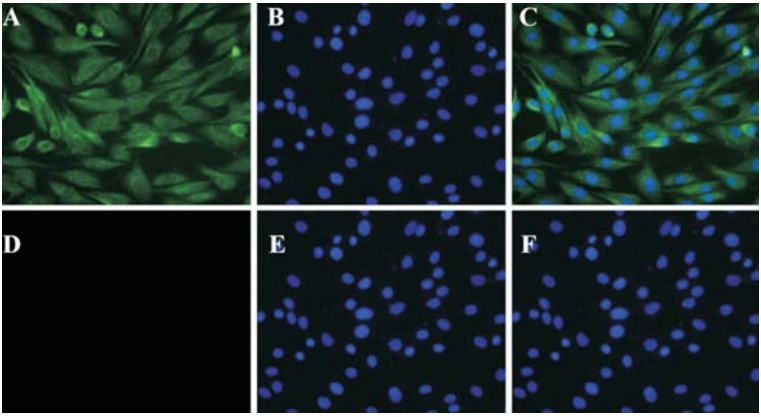

Figure 2. Identification of keratin vimentin: double immunofluorescent labeling (400×). A-C: Vimentin staining was positive, green fluorescence was seen in the cytoplasm (A), blue fluorescence was seen in the nucleus (B), and C was co-development of cytoplasm and nucleus. D-F: Keratin staining was negative, cytoplasm red fluorescence was not visible (D), the nucleus was blue fluorescence

(E), and only the nucleus fluorescence could be seen in the cytoplasm co-development (F).

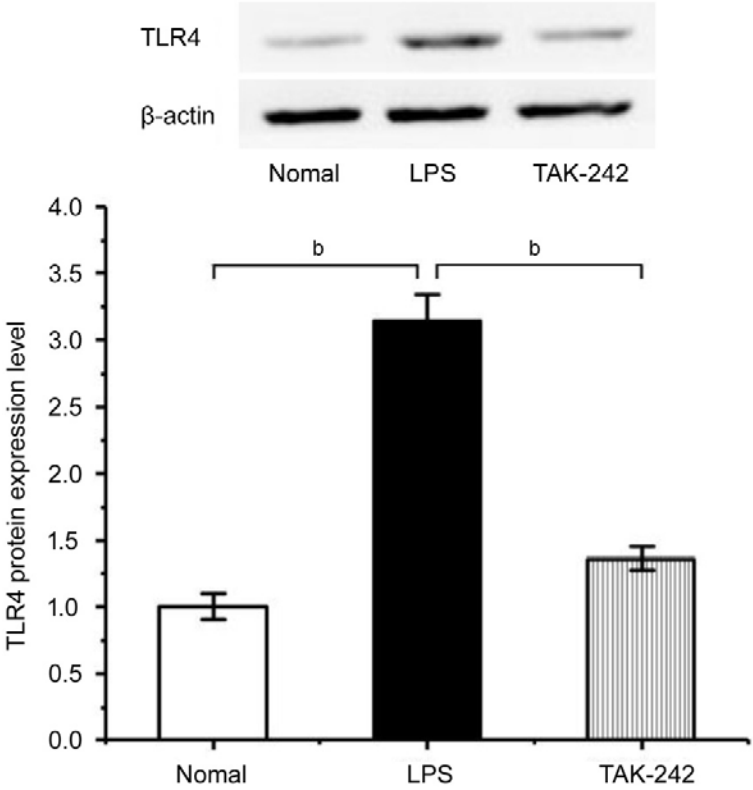

Figure 3. Expression of TLR4 protein in each group was detected by Western blot. After LPS intervention, TLR4 protein expression level in the LPS group increased significantly compared with that in the normal control group ($^{b}P<0.01$). In the TAK-242 group, TLR4 protein expression was significantly lower than that in the LPS group due to the intervention of TAK-242 ($^{b}P<0.01$). There was no significant difference between TAK-242 group and normal control group ($P > 0.05$).

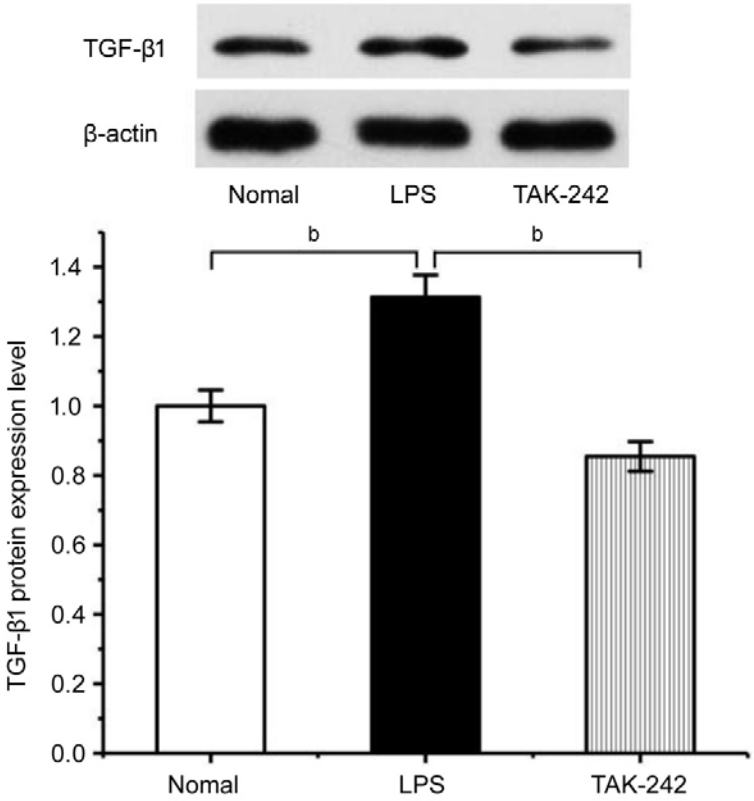

Figure 4. Western blot analysis of protein expression of TGF-β1 in each group. After the intervention of LPS, the protein expression level of TGF-β1 in the LPS group was significantly increased compared with that of the normal control group ($^{b}P < 0.01$). In the TAK-242 group, the protein expression of TGF-β1 was significantly lower than that of the LPS group due to the intervention of TAK-242 ($^{b}P < 0.01$). However, compared with the normal control group, the expression level of TGF-β1 protein in TAK-242 group decreased slightly, and the difference have no statistics significance ($P > 0.05$).

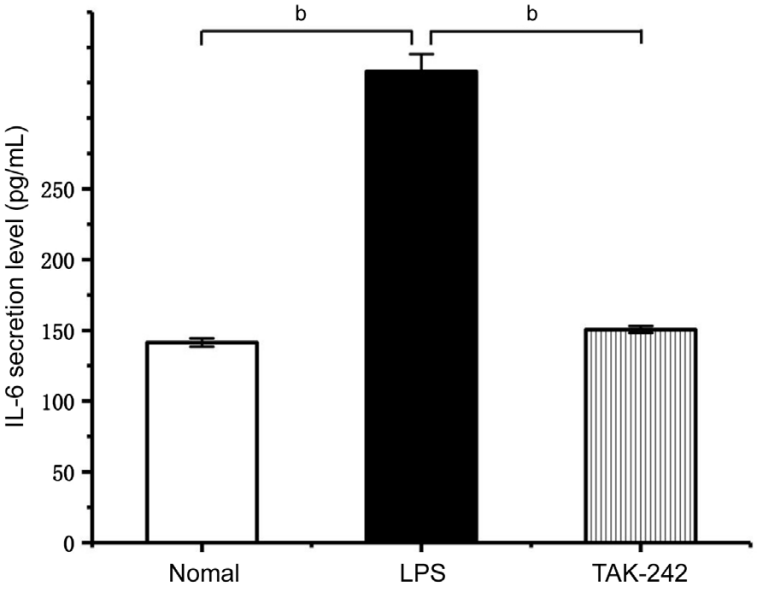

Figure 5. ELISA detect the secretion level of IL-6 in each group. After LPS intervention, IL-6 secretion level in the LPS group was significantly increased compared with that in the normal control group ($^{b}P < 0.01$). In the TAK-242 group, IL-6 secretion level was significantly lower than that in the LPS group due to the intervention of TAK-242 ($^{b}P < 0.01$). There was no significant difference in IL-6 secretion level between the TAK-242 group and the normal control group ($P > 0.05$).

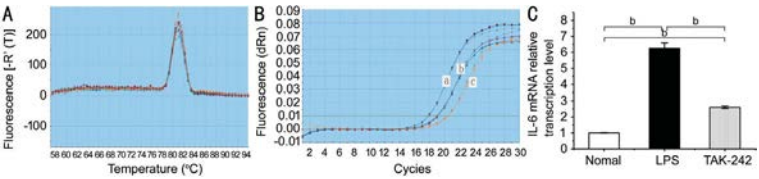

Figure 6. RT-PCR detect the relative transcription levels of IL-6 mRNA in each group. A: Solubility curve. B: The amplification curve: a stands for LPS group; b stands for group TAK-242; c is the normal control group. All curves are unimodal distribution and the peak is concentrated. C: After the intervention of LPS, the relative transcription level of IL-6 mRNA in the LPS group was significantly raised compared with that in normal control group ($^{b}P < 0.01$). In the TAK-242 group, the relative transcription level of Il-6 mRNA was significantly lower than that in the LPS

group due to the intervention of TAK-242 ($^{b}P < 0.01$). Compared with the normal control group, the relative transcription level of IL-6 mRNA increased in the TAK-242 group ($^{b}P < 0.01$)

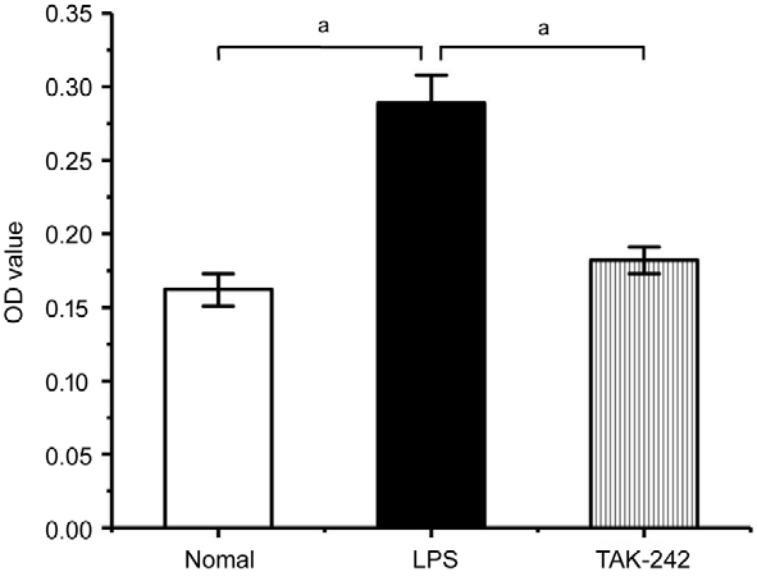

Figure 7. CCK-8 detect cell proliferation in each group. OD value in the LPS group increased significantly compared with that in the normal control group after LPS intervention ($^{a}P < 0.05$). In the TAK-242 group, OD value decreased significantly compared with LPS group due to the intervention of TAK-242 ($^{a}P < 0.05$). However, there was no significant difference in OD value between the TAK-242 group and the normal control group ($P > 0.05$).

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Medication Adherence among Elderly Patients with Glaucoma: A Systematic Review

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Introduction

Glaucoma is one of the leading causes of blindness globally. Intraocular pressure (IOP) reduction is the main goal of glaucoma treatment. To achieve a maximum IOP lowering effect, glaucoma medications are used over a long period or life-long. Therefore, medication adherence plays a pivotal role in treating glaucoma. The purpose of our study is to investigate medication adherence among elderly patients with glaucoma.

Methods

This systematic review was done by searching on Pubmed and Cochrane Library from 2014 to 2019 using the following keywords: “adherence”, “medication”, “glaucoma” and “elderly”. Full text paper written in English that include elderly patients with glaucoma as subjects will be reviewed. Review articles were excluded.

Results

We identified several studies consisted of cross-sectional studies and cohort studies with a total number of 6180 subjects. There was inconsistent result regarding medication adherence in elderly glaucoma patients. Three cross sectional studies show that over 50% of the patients has poor medication adherence. Meanwhile other studies indicate that most of patients, ranging from 61.4%-80.6%, adhere well to glaucoma medications. Significant factors related to poor medication adherence were forgetfulness, older age, males and number of medications prescribed.

Conclusion

Medication adherence among elderly patients was ranging from poor to good adherence. Further research with larger sample is needed to determine factors associated with poor medication adherence among elderly patients with glaucoma, for a better strategy to cope up with.

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Topical *trans*-resveratrol reduces intraocular pressure via A1 adenosine receptor in steroid- induced oculohypertensive rat model

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Introduction

Glaucoma, a leading cause of irreversible blindness worldwide is associated with raised intraocular pressure (IOP). Steroid-induced glaucoma is a common type of secondary glaucoma, associated with increased IOP and excessive extracellular matrix deposition in the trabecular meshwork. Currently available antiglaucoma treatments aim to reduce IOP, however they often have suboptimal efficacy and associated with side effects affecting patient compliance. This study evaluated the oculohypotensive effects of topical *trans*-resveratrol (TR) in steroid-induced oculohypertensive (SIOH) rats and whether this effect is mediated by adenosine receptors (AR).

Methods

Involvement of AR was studied by observing the oculohypotensive effect of TR by pre-treating the animals with AR subtype-specific blockers. We also looked at the involvement of ERK1/2, PLC and increased MMP secretion in the aqueous humour as a downstream mechanism of AR involvement in TR-induced oculohypotension.

Results

Topical TR 0.2% produced maximum IOP reduction and twice-daily dose for 3-week significantly sustained the IOP reduction in SIOH rats. The oculohypotensive effect of TR was inhibited with adenosine A1AR antagonist pre-treatment. TR-induced MMP-2 secretion was antagonised when SIOH rats were pre-treated with A1AR, PLC and ERK1/2 inhibitors.

Conclusion

IOP reduction induced by TR involves agonistic action at the A1AR leading to PLC activation, ERK1/2 phosphorylation and elevated MMP-2 level. Further investigations are warranted to fully understand the mechanisms of *trans*-resveratrol as a potential future antiglaucoma drug.

Epidemiology and Economic Evaluation

Prevalence and projection of glaucoma cases worldwide in 2040

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Introduction

Glaucoma is the leading cause of global irreversible blindness. Present estimates of global glaucoma prevalence are not up-to-date and focused mainly on European ancestry populations. We systematically examined the global prevalence of primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG) and projected the number of affected people in 2040.

Methods

We performed a systematic review and meta-analysis by using PubMed, Medline, and Web of Science for population-based studies of glaucoma prevalence published up to November 2019. The population aged 40-80 years along with 95% credible intervals (CrIs) were used to project the prevalence of glaucoma.

Results

The global prevalence of glaucoma for population aged 40-80 years is 3.54%. The prevalence of POAG is highest in Africa and the prevalence of PACG is highest in Asia. In 2013, the number of people (aged 40-80 years) with glaucoma worldwide was estimated to be 64.3 million, increasing to 76.0 million in 2020 and 111.8 million in 2040. men were more likely to have POAG than women. people of African ancestry were more likely to have POAG than people of European ancestry and people living in urban areas were more likely to have POAG than those in rural areas.

Conclusion

Prevalence of people with glaucoma worldwide projected to increase to 111.8 million in 2040. People residing in Asia and Africa are more likely to affect. These

estimates are important in guiding the designs of glaucoma screening, treatment, and related public health strategies.

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Association between Glaucoma Management and Depression risk in Taiwanese Glaucoma patients

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Introduction

It has been noted that the level of depression was found to be significantly higher in primary angle-closure glaucoma (PACG) patients than in primary open-angle glaucoma (POAG) patients and controls.

Methods

To investigate the association between glaucoma management and depression risk in Taiwanese glaucoma patients.

Results

The glaucoma patient was significantly associated with increased risk of depression compared with the controls (HR = 1.39, 95% CI = 1.22-1.58). Further analysis shows that the POAG and PACG patient had a 1.30-fold (95% CI = 1.14-1.62) and a 1.42-fold (95% CI = 1.21-1.68) increased risk of depression, respectively. The risk of developing depression was significantly increased with the increasing frequency of visits (p for trend < 0.0001). The glaucoma with the highest level of visit frequency even had a 3.90-fold increased risk of depression than the controls (HR = 3.90, 95% CI = 3.17-4.79). The risk of developing depression was also increased with multiple glaucoma medication usage (p for trend = 0.0002). Furthermore, consistent results were observed that the depression incidence in glaucoma cohort was greater than the incidence in comparison cohort under each different status of demographic factors and comorbidities.

Conclusion

Higher depression risk was noted in patients with more frequent visits and

multiple glaucoma medication uses.

Glaucoma Treatment Adherence: A Great Challenge

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Introduction

Poor compliance to glaucoma medications is a growing concern in the effectiveness of medical treatment in glaucoma. Despite hindrance of compliance to eyedrops, patient often hesitant to reveal eyedrop instillation difficulties with healthcare personnel. As a follow-up measure in the office hour clinic, managing problem of non-compliance and to ensure correct drop administration technique to patient is challenging.

Methods

This cross-sectional study recruited 40 glaucoma inpatients from January 2019 until December 2019. Ophthalmic nurse interviewed patients using a predetermined checklist which includes duration of glaucoma, number of eyedrops, administration techniques with any spacing, barriers to compliance and side effect of medication as well as glaucoma complication. The patients were enquired to demonstrate their techniques of instilling eyedrops and any problems that they encountered. Counselling and teaching regarding correct method of eyedrops instillation by ophthalmic nurse would be conducted throughout their ward admission.

Results

85% of them were compliant. Majority 75% of patients applied eyedrops by themselves. 80% of them practiced correct technique of putting eyedrops in which 100% tilted their head back before instilled drops, 95% pulled down lower eyelid prior instillation, 98% looked up then instilled eyedrops at inferior fornix and 85% applied digital pressure to the tear drainage system at the nasal corner of the closed eyelids. 75% implemented correct spacing with five minutes elapse between administration of a different eyedrops.

Conclusion

Level of compliance of glaucoma medication among respondents was high in this study. It is golden opportunity to educate patient or helper during each admission or clinic review to ensure the effectiveness in glaucoma therapy.

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Primary angle-closure glaucoma in the young: a separate entity or a mere coincidence

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Introduction

Primary angle-closure glaucoma in the young (PACGY) is defined as PACG occurring in those aged ≤ 40 years due to onset of presbyopia after this age. Owing to a considerably larger proportion of younger population in our country, we aimed to study the etiology, profile and outcomes of PACGY in Indian population

Methods

Patients with established glaucoma, aged ≤ 40 years at the time of diagnosis with occludable /closed angles in ≥ 180° of angle circumference on Goldmann two mirror gonioscopy were recruited prospectively from June 2017 to December 2019.UBM was used to determine the mechanism. Outcomes following any intervention was determined.

Results

107 PACG eyes of 68 patients were enrolled. Mean age was 33.5 ± 6.3 years. 38/68 (55.9%) patients were males. The mean baseline intraocular pressure (IOP), visual acuity (VA) and cup disc ratio (CDR) was 31.1 ± 13.1 (10-60) mmHg, 0.6 ± 0.8(0-2.7) LogMAR and 0.9 ± 0.1 (0.3-1.0) respectively. 35/107 (32.7%), 32/107 (29.9%), 15/107 (14%) and 22/107 (20.6%) eyes had plateau iris, relative pupillary block, ciliary body cyst and high lens vaulting respectively. 10/107 (9.3%) eyes were associated with nanophthalmos. 52/107 (48.6%) eyes required surgical intervention. 29/52 eyes underwent trabeculectomy, 15/52 eyes underwent lens extraction,2/52 eyes underwent combined phacoemulsification+trabeculectomy and 6/52 eyes underwent phacoemulsification+incisional goniotomy. Mean IOP and VA at last visit was 14.7 ± 4.8 (6-25) mmHg and 0.7 ± 0.8 (range:0-2.7) LogMAR. 6/52 (11.5%) eyes progressed to malignant glaucoma following surgery.

Conclusion

PACGY presents a spectrum which is quite severe at presentation, is associated with high incidence of complications like malignant glaucoma. Plateau iris and

relative pupillary block comprises the main pathological mechanism of angle closure. Thus, PACGY needs to be treated as a separate entity for better management and prognostication.

Prevalence of glaucoma in patients having diabetic retinopathy

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Introduction

The objective of this study was to determine the prevalence of primary open-angle glaucoma (POAG), primary angle-closure glaucoma (PACG), neovascular glaucoma (NVG) and other glaucomas in diabetic retinopathy patients, and severity of glaucoma at detection.

Methods

A cross-sectional study was conducted where 150 consecutive patients were enrolled from the Retina service after identification of previously untreated diabetic retinopathy from January 2019 to February 2021. After meticulous history and general physical examination, ocular examination which included anterior segment evaluation, applanation tonometry and gonioscopy were done. Fundus was examined to look for features of glaucoma and diabetic retinopathy status. Patients suspected to have glaucoma underwent Humphrey Visual Field Analysis and severity of glaucoma was detected based on Hodapp Parish Anderson criteria.

Results

Among 150 patients enrolled in study, 43/150(28.67%) patients had evidence of glaucoma. 2/43 patients (4.65%) had NVG, 19 patients (44.19%) had primary angle closure (PAC), 12 patients (27.91%) had PACG, and 10 patients (23.25%) had POAG. 31 patients with PAC and PACG underwent YAG PI. Twenty-nine of 43(67.44%) glaucomatous patients had mild visual field defect, 8(18.604%) had a moderate defect and 6 (13.95%) had severe visual field defect according to Hodapp Parish Anderson criteria, taking worse eye into consideration. Increasing age, moderate non-proliferative diabetic retinopathy, narrow anterior chamber, intraocular pressure greater than 16 mmHg, intraocular pressure difference of ≥ 2mmHg between eyes and a cup disc ratio > 0.6:1 were more frequently seen in diabetic retinopathy eyes with glaucoma.

Conclusion

The prevalence of glaucoma in patients having Diabetic Retinopathy was found to be 28.67%, therefore screening for glaucoma is essential. As two-thirds of the glaucomatous eyes had primary angle closure disease, identifying a shallow AC and gonioscopy prior to dilation is imperative.

Microspherophakia: epidemiology and visual outcomes- A tertiary centre perspective

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Introduction

Microspherophakia can lead to vision threatening complications if not detected and treated early. This study was undertaken to evaluate the visual outcomes and factors affecting them in these patients.

Methods

Records of admitted patients with microspherophakia between 2015-2019 were reviewed. Data with respect to the age of presentation to our center, symptomatology, visual acuity, highest baseline intraocular pressure (IOP), surgical intervention and visual outcomes were recorded. An attempt was made to telephonically collect data.

Results

59 patients (118 eyes) with microspherophakia were admitted. Median age of presentation was 108 months (1-720). Median age for symptoms to start was 72 months (0- 696). 22 patients could be contacted telephonically. Mean duration of treatment at referring center was 44.6 months (0-300) with a mean lag time of 13.63 months (0-120) to present to us. Only 5/22 patients (22.7%) recalled IOP being checked at referring center, while 9/22 patients with complaint of low vision were just refracted. 41/59 patients required bilateral surgical intervention (subluxation/glaucoma). 51 eyes had glaucoma (43.2%) of which 16 had buphthalmos. 11 patients were bilaterally blind (38.9%) while 7 had unilateral blindness (18.4%) even after surgery. Lens extraction was performed in 84 eyes (71.2%), IOL implantation in 26 eyes (22%) and trabeculectomy for IOP control in 13 eyes (11%).

Conclusion

43% eyes had secondary glaucoma at presentation. 57% of patients had blindness in at least one eye. Ophthalmologists need to perform comprehensive ocular evaluation, refer early and advise life-long follow up to achieve optimal visual outcomes.

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Glaucoma Imaging and Diagnosis

Optical Coherence Tomography Angiography Capillary Perfusion and Capillary Flux Index in Primary Open Angle Glaucoma Eyes

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Introduction

The role of microvasculature and blood flow have been known as an important factor in the pathophysiology of glaucoma. In this circumstance, optical coherence Tomography Angiography (OCT-A) is a new imaging modality that can be used to examine the vasculature in various retinal layers. In this study, we used the Cirrus HD-OCT (Carl Zeiss Meditec, Dublin, CA) with the AngioPlex algorithm to measure the capillary perfusion (P) and capillary flux index (FI) of the optic nerve head in Vietnamese Primary Open Angle Glaucoma eyes.

Methods

This was an observational study of healthy subjects and primary open angle glaucoma (POAG) patients.

Results

Mean capillary perfusion (P) and Capillary Flux Index (FI) of the optic nerve head was significantly lower in all quadrants in POAG eyes compared with healthy eyes (P: 41.73 ± 3.25% and 45.48 ± 1.55%, respectively; $p < 0.01$; and FI: 0.29 ± 0.16 and 0.41 ± 0.99, respectively; $p < 0.01$). In POAG eyes, we found the correlation between MD and PSD with P and FI ($p < 0,01$ and $p < 0.05$, respectively), however, there is no similar correlation in healthy eyes. For differentiate glaucoma eyes from healthy eyes, the AUROC is 0.85 ($p < 0.01$) and cut-off point is 43.05 with P, and AUROC is 0.81 ($p < 0.01$) and cut-off point is 0.39 with FI.

Conclusion

Optical coherence tomography angiography capillary perfusion and capillary flux index is a useful diagnosis technique for differentiate POAG eyes from healthy eyes.

Factors Associated with Macular Vessel Density Measured by Optical Coherence Tomography Angiography in Healthy and Glaucomatous Eyes

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Introduction

To investigate the factors associated with macular vessel density and analyze their effects according to the glaucoma stage.

Methods

A total of 56 healthy eyes and 147 open-angle glaucomatous eyes were studied. All eyes underwent optical coherence tomography and visual field examinations. Clinical variables were compared according to the glaucoma stage. Relationships between macular vessel density and other variables were analyzed.

Results

Age (P = .010) and signal strength (P < .001) were associated with macular vessel density in healthy eyes. In glaucomatous eyes, age, signal strength, ganglion cell-inner plexiform layer thickness, and mean deviation correlated with macular vessel density (all P ≤ .005). Macular vessel density had a stronger correlation with mean deviation (R2 = 0.240) than with ganglion cell-inner plexiform layer thickness (R2 = 0.153) in glaucomatous eyes. Age and signal strength were correlated with macular vessel density in early (P = .017 and all P ≤ .012, respectively) and moderate glaucoma (P = .002 and all P ≤ .001, respectively). In advanced glaucoma, ganglion cell-inner plexiform layer thickness (P = .004) and signal strength (all P < .001) were associated with macular vessel density.

Conclusion

Signal strength was the most significant factor associated with macular vessel density in healthy and glaucomatous eyes. Macular vessel density of glaucomatous eyes showed a stronger correlation with function than with structure. Age was correlated with macular vessel density in early and moderate glaucomatous eyes, and ganglion cell-inner plexiform layer thickness was correlated with macular vessel density in advanced glaucomatous eyes. Factors associated with macular vessel density seem to vary according to the glaucoma stage.

Factors contributing to long-term optic nerve head parameters on HRT in primary congenital glaucoma

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Introduction

To evaluate scanning laser ophthalmoscopy, Heidelberg Retinal Tomograph (HRT), at ≥ 4 years after surgery, with baseline clinical features and intraocular pressure over time in primary congenital glaucoma (PCG) eyes.

Methods

An ambispective study was conducted on 76 eyes of 68 PCG patients who underwent combined trabeculotomy and trabeculectomy in childhood and HRT after ≥ 4 years. File review was done for baseline IOP, cup disc ratio (CDR), age at surgery, age at final examination, mean and fluctuations in follow-up IOP. HRT parameters and clinical data were correlated using Spearman correlation.

Results

There was a statistically significant positive correlation between baseline CDR with final HCDR ($r = 0.27$, $p = 0.021$), final VCDR ($r = 0.35$, $p = 0.003$) and change in CDR ($r = 0.54$, $p < 0.0001$). There was also a significant correlation between age at surgery with final HCDR ($r = 0.37$, $p = 0.012$) and final VCDR ($r = 0.29$, $p = 0.01$). Age at final examination correlated significantly with final HCDR ($r = 0.37$, $p = 0.001$) and final VCDR ($r = 0.38$, $p = 0.002$) and duration of follow-up with final HCDR ($r = 0.24$, $p = 0.04$). There was a statistically significant, negative correlation between baseline IOP and final rim area ($r = -0.30$, $p = 0.014$) and age at surgery with final rim area ($r = -0.3$, $p = 0.007$). PCG eyes having a baseline CDR > 0.8 had a significantly higher VCDR at final review when compared to those with baseline CDR of < 0.6 and 0.6 to 0.8, 0.75 vs 0.60 vs 0.53, $p = 0.03$. PCG eyes with a baseline CDR of ≥ 0.6 showed a significant progression in CDR value, when compared to those with a CDR of <0.6, which generally showed a regression, 0.18 vs -0.15, $p < 0.0001$. PCG eyes with a high baseline IOP of > 3 5 mmHg, were associated with a significantly smaller rim area compared to eyes having 25-35 mmHg and < 25 mmHg eyes, 1.24 vs 1.37 vs 1.78

mm^2, p = 0.04. Eyes with a higher mean follow up IOP, > 15 mmHg, had a greater final HCDR compared to those with 11-15 mmHg and < 11 mmHg eyes,0.78 vs 0.71 vs 0.58, p = 0.04

Conclusion

Baseline CDR, baseline IOP, age at surgery and higher mean IOP on follow up correlated significantly with final CDR and rim area and could be used as a means of grading severity, as well as for prognostication in PCG eyes.

Effect of image quality fluctuations on the repeatability of thickness measurements in swept-source optical coherence tomography

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Introduction

This study investigated the effect of image quality fluctuations on the repeatability of thickness measurements in the peripapillary retinal nerve fibre (PP-RNFL) and ganglion cell-inner plexiform (GC-IPL) layers using swept-source OCT (SS-OCT).

Methods

Three consecutive OCT scans were performed on each 56 normal subjects prospectively. Finally, 168 SS-OCT results were analysed. All subjects were divided into three groups based on tertile values of the mean absolute difference of image quality score as low- (LIQD), moderate- (MIQD), and high- (HIQD) image quality score difference groups. A linear mixed model was used to compare the measured thickness among the three groups. Intraclass correlation coefficients (ICCs) were used to determine repeatability.

Results

Thickness values showed no difference among the groups. Even with high ICC values (> 0.9), several sectors showed significant differences in the ICC values in intergroup comparisons of the PP-RNFL and GC-IPL sectors. For LIQD-HIQD and MIQD-HIQD, most PP-RNFL sectors showed significant differences, except at the superior, nasal, superonasal, and nasoinferior sectors. For GC-IPL sectors, the LIQD-HIQD comparison showed significant differences in the temporosuperior ($p = 0.012$), inferior ($p < .001$) and temporoinferior ($p = 0.042$) sectors. Significant differences existed in the average GC-IPL ($p = 0.009$), nasoinferior ($p = 0.035$), and inferior sectors ($p < .001$) for MIQD-HIQD comparison.

Conclusion

With higher image quality fluctuations, the repeatability of SS-OCT decreased in several PP-RNFL and GC-IPL sectors considered as clinically relevant in evaluating

glaucoma status. Therefore, maintaining high-quality image status is essential to enhance the reliability of SS-OCT.

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Investigations and outcomes of glaucoma suspects referred to a tertiary referral centre compared to national recommendations

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Introduction

A leading cause of irreversible blindness, glaucoma presents a significant public health challenge. Our ageing population and synchronous rise in the burden of glaucoma necessitates efficient diagnostic and treatment pathways. Primary open-angle glaucoma is silent and progressive, the majority of cases are detected opportunistically in the community.

Methods

707 patients attended 5 ophthalmologists in Sligo University Hospital with a new referral within the 2-month time period of October-November 2019. Thirty-seven were referred as new glaucoma suspects. The clinic notes were available for thirty-four patients and retrospectively reviewed via the electronic database 'Medisoft'. The performed investigations documented were compared to the NICE guideline (2017) recommendations which include visual field assessment, optic nerve assessment, IOP (Goldmann applanation), gonioscopy, central corneal thickness and baseline optic nerve head image or OCT.

Results

IOP measurement (Goldmann applanation) and optic nerve assessment were performed and documented in the majority of patients (91 and 100%, respectively). Other investigations as recommended by the NICE guidelines included gonioscopy, central corneal thickness and baseline optic nerve head image or OCT, noted in 47%, 29% and 65% of cases, respectively. Visual field assessments were performed or scheduled for about half of the patients (59%). Of those commenced on treatment (24%, n = 8), few had central corneal thickness (n = 2) or baseline optic nerve head image noted (n = 4).

Conclusion

In this hospital based descriptive audit we assessed the work-up of potential glaucoma suspects. No single medical test for glaucoma has perfect sensitivity and specificity, glaucoma detection is an ambiguous area, with overlap in early

glaucoma and normal individuals. Clinical judgment may supersede guidelines. This audit highlights the existence of a monitoring need in suspect glaucoma – 29% (n = 10) were kept under suspect surveillance with another appointment arranged. The first visit discharge rate (47%, n = 16) suggests a high number of false positive referrals.

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Comparative study of RFNL thickness and ONH parameters for screening, early detection and assessment of glaucoma progression measured by Cirrus HD-OCT

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Introduction

The purpose of the study was to evaluate and compare the ability of RNFL thickness and ONH parameters measured by Cirrus HD-OCT to differentiate between healthy, glaucoma suspect with ocular hypertension and progressive glaucomatous eye.

Methods

A retrospective cross-sectional study conducted on 185 eyes of 185 patients who were selected randomly. Among them 74 were in screening group, 44 in glaucoma suspect group and 67 in disease progression group. All subjects underwent complete ophthalmic examination along with topography by Cirrus HD-OCT 400. After data collection ANOVA, ROC curve test was done to measure AUCs to understand the parameter's discriminating capability between the groups.

Results

Mean RFNL thickness was 85.76 ± 23.29 µm in glaucoma screening group. Gradual decrease in thickness observed in glaucoma suspect and glaucoma progress group by mean value of 74.55 ± 14.66 µm and 64.39 ± 15.26 µm respectively. The effected quadrant also showed difference in different groups. Among the ONH parameters, rim area showed highest value of 1.28mm^2 in glaucoma screening group. Average cup disc ratio, vertical cup disc ratio and cup volume showed lowest value in glaucoma screening group when compared with glaucoma suspect and glaucoma progress group ($p < 0.05$).

Conclusion

The results of the study indicate that both RNFL and ONH parameters measured by Cirrus HD-OCT are useful for screening, early detection and to assess the glaucoma progression by differentiating values between normal and glaucomatous eye.

References

1. Cirrus HD-OCT, RNFL thickness, ONH, Glaucoma screening

Glaucoma Surgery

Six-Month Results of Molteno3®SL Implantation for Refractory Glaucoma in Asian's Eyes at Selayang Hospital

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Introduction

To report six-month follow-up data on Molteno3®SL implantation for refractory glaucoma in Asian's eyes at Hospital Selayang.

Methods

Prospective, case series. Patient with refractory glaucoma, defined as uncontrolled intraocular pressure (IOP) of more than 21 mmHg despite maximal antiglaucoma medication, previously failed surgical treatment or combination of both. Seven eyes were included and underwent implantation of Molteno3®SL implant and were follow up for six months. Main outcome measures were IOP. Other outcome measures were number of medications and postoperative complication.

Results

Among seven eyes, three were advance primary open angle glaucoma and remaining were secondary glaucoma. Average preoperative IOP was 25 mmHg and average post-operative IOP was 15 mmHg. Four eyes had stent removal at 6 weeks, 8 weeks, 12 weeks and 20 weeks respectively. All eyes achieved qualified success. One case developed immediate post-operative complication which was hypotony and resolved without complication.

Conclusion

Molteno3®SL implant able to control the IOP of refractory glaucoma in Asian's eyes after six months.

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XEN Glaucoma Implant for Treatment of Steroid Induced Glaucoma

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Introduction

Steroid-induced glaucoma is a common scenario seen. It poses a challenge in the management. To report the efficacy and safety of the Xen-45 gel stent in eyes with steroid respond glaucoma.

Methods

Retrospective observational case series of two steroid responder patients with medically uncontrolled glaucoma using Xen-45 implantation. Both patients had at least 10 months follow-up. Primary outcome measures included visual acuity, intraocular pressure (IOP), degree of inflammation and ocular hypotensive medications. Data were collected preoperatively and 1 day, 1 week, 1, 3, 6, and 9 months postoperatively. Postoperative complications included hypotony and decompressive retinopathy. The requirement for further glaucoma surgery, including bleb needling were documented.

Results

Preoperatively all patients were on at least three ocular hypotensive medications and were on syrup glycerol and oral acetazolamide. Both preoperative IOP was 40. Postoperative IOP was 8 and 10. At 10 months follow-up, IOP showed 75% reduction of IOP and reduction in IOP-lowering medication. Bleb needling with 5-fluorouracil was performed in both patients. Symptomatic hypotony occurred but not requiring further interventions. No decompressive retinopathy was found at last follow-up.

Conclusion

The Xen-45 implant is an effective treatment for steroid responder glaucoma, offering dramatic IOP lowering. However, complications including hypotony can still occur.

Anterior chamber parameters and intraocular pressure changes after phacoemulsification in eyes with primary angle-closure glaucoma

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Introduction

Phacoemulsification is proven to reduce intra ocular pressure (IOP) in glaucoma, especially in angle closure group.[1] Anterior segment optical coherence tomography (AS-OCT) shows new parameters that might be beneficial to further classify primary angle closure glaucoma (PACG).[2] Correlation between anterior chamber parameters and reduction of IOP post phacoemulsification in PACG is not yet established.

Methods

This is a prospective correlative study on 33 patients, aims to assess correlation between anterior chamber parameters and IOP changes after phacoemulsification in PACG patients.

Results

There are significant changes in IOP between preoperative versus 1 month, 1 year and 2 years after surgery (16.27 ± 4.44 mmHg vs 12.25 ± 3.51 mmHg, 13.5 ± 0.78 mmHg and 13 ± 0.70 respectively). Percentage of success IOP control without drug increase exponentially within 1 month, and slowly decreased within 1 and 2 years postoperatively (93.8%, 75% and 45%). There was no correlation between preoperative anterior chamber parameters and postoperative IOP in 1 month, 1 year and 2 years, but there was negative correlation between lens vault (LV) and IOP 1 day postoperative (r -0,36, p 0,043).

Conclusion

Phacoemulsification lowers IOP and reduces need of anti-glaucoma drug. There was no correlation between anterior chamber parameters and IOP changes, but LV correlates moderately with IOP in day-1 postoperative.

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12-Month Clinical Outcomes of Combined Phacoemulsification and Ab Interno Trabeculectomy for Open-Angle Glaucoma in the United Kingdom

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Background/Objectives

To describe intraocular pressure (IOP) and ocular hypotensive medication outcomes of combined phacoemulsification and ab interno trabeculectomy with the Kahook Dual Blade (KDB; New World Medical, Inc, Rancho Cucamonga, CA) in adults with cataract and open-angle glaucoma (OAG).

Methods

Retrospective chart review of existing medical records. Data collected included intraocular pressure (IOP) and IOP-lowering medication use preoperatively and through up to 24 months postoperatively. Paired t-tests were utilized to compare preoperative to postoperative mean IOP and mean medications used.

Results

Data from 32 eyes of 26 subjects were analyzed. Subjects were predominantly Caucasian (25/26) had mean (standard error) age of 79.3 (1.2) years, and eyes had moderate-advanced OAG (mean visual field mean deviation -8.3 [1.3] dB). Mean IOP was 19.8 (0.8) mmHg at baseline and 15.5 (0.6) mmHg ($p < 0.0001$) after mean follow-up of 11.5 (1.0) months; IOP reductions of > 20% were achieved in 20/32 eyes (62.5%). Mean medication use declined from 2.4 (0.2) medications per eye at baseline to 0.5 (0.2) at last follow-up ($p < 0.0001$); 23/32 eyes (71.9%) were medication-free at last follow-up. No vision-threatening complications were observed.

Conclusion

Combined phacoemulsification and ab interno trabeculectomy with the KDB safely provided mean IOP reductions of 19% and mean IOP medication reductions of 83% after mean follow-up of 12 months in eyes with moderate to advanced OAG. This procedure provides medication-independence in most eyes with statistically and clinically significant IOP reductions.

Glaucoma management among Filipinos with Boston Keratoprosthesis Type I: a case series

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Introduction

Boston keratoprosthesis implantation is a rare procedure that affords patients with corneal blindness a chance to have better vision. Glaucoma, a serious complication of the procedure, must therefore be managed adequately to achieve good visual outcomes. This series aims to present three Filipino patients with Boston keratoprosthesis who were co-managed by the Glaucoma Service.

Methods

Medical records of the patients were retrieved and reviewed. Informed consent was also obtained.

Results

Two patients had Boston keratoprosthesis alone: one had intraocular pressure that was medically managed, the other one had uncontrolled intraocular pressure despite maximal medical therapy and transscleral diode cyclophotocoagulation. The third patient underwent simultaneous Boston keratoprosthesis and glaucoma drainage device implantation and had an unremarkable postoperative course.

Conclusion

Managing glaucoma in patients with Boston keratoprosthesis, specifically in evaluating the severity of glaucoma, monitoring intraocular pressures and progression of the disease, and managing glaucoma in this subset of patients, remain to be a challenge among ophthalmologists. This case series summarizes current management options for these patients, and especially highlights the possibility of better outcomes for concurrent implantation of Boston keratoprosthesis and glaucoma drainage device. Further studies, however, are needed to establish this positive outcome on Filipino patients.

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Two-step procedure achieving intraocular pressure target of coincident cataract and glaucoma

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Introduction

The management of coincident cataract and glaucoma is still challenging for Ophthalmologists. As techniques improved, glaucoma surgeons began to do combined procedure to achieve target of intraocular pressure and improve the visual acuity in the same event, but in several circumstances, the approach might not be advantage. Option of sequential (two steps) surgery should be considered. Purpose of this study is to report number of two steps procedure of patients with coincident glaucoma and cataract and successful of intraocular pressure control in Cicendo Eye Hospital.

Methods

This is a descriptive study. We collected medical records of patients with coincident cataract and glaucoma which are undergoing two steps procedure within 2 years. Data regarding intraocular pressure (IOP) and glaucoma medications were collected up to 3 months postoperatively after the last (second) surgery.

Results

Total 35 eyes of 34 patients were included in this study. Twenty-eight cases underwent trabeculectomy prior to cataract surgery. Most cases have duration between two procedures less than 6 months. There is no significant difference in IOP pressure between duration of less than 3 months and more than 3 until 6 months (p; 0.675). Regarding to intraocular pressure, there was a significant difference between IOP 1 month (mean 21.4 ± 9.4mmHg) after prior surgery and 3 months after the last surgery (mean 15.7 ± 6.1) with p: 0.001

Conclusion

Two-step procedure in case of coincident glaucoma and cataract can provide successful postoperative intraocular pressure control after three months after last surgery.

Outcome of Cataract Extraction in Patients with Phacomorphic Angle Closure

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Introduction

Cataract extraction is the treatment of choice for phacomorphic angle closure. However, final outcome of visual acuity and IOP control may vary significantly between cases. This study evaluates the clinical characteristics and postoperative outcomes of cataract extraction in patients with phacomorphic angle closure.

Methods

Retrospective analysis of 26 consecutive patients with phacomorphic angle-closure from January 2015 to December 2018 was performed. Patients were treated for intraocular pressure (IOP) reduction followed by urgent cataract extraction. The method of choice of cataract extraction was phacoemulsification. Small incision cataract surgery (SICS) was performed when ocular condition was unsuitable for phacoemulsification. Patient demographics, clinical findings, and treatment result were recorded.

Results

A total of 26 patients with phacomorphic angle-closure were included in this study. The preoperative mean IOP was 33.46 ± 9.67 mmHg and the average preoperative best-corrected visual acuity (BCVA) was 1.76 ± 0.58 LogMAR. Fifteen eyes underwent phacoemulsification and 11 underwent SICS. At the first month follow-up after cataract surgery, the mean IOP was 14.24 ± 4.92mmHg and BCVA was 0.30 ± 0.51 LogMAR. There is a significant adverse association between postoperative visual acuity with the increase of IOP preoperatively ($p = 0.035$) and duration of symptoms ($p = 0.000$).

Conclusion

Most patients have good IOP control with cataract extraction alone, while few others need additional glaucoma medication. However, the final visual outcome is hampered by prolonged IOP rise and delay in diagnosis. Quick referral, diagnosis, and definitive treatment may improve final outcome in cases of phacomorphic angle-closures.

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Glaucoma drainage device: long-term results

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Introduction

Glaucoma is a leading cause of irreversible blindness, with 6.6% of blindness in Malaysia attributed to glaucoma.[1] Glaucoma drainage devices (GDD) have been successful in reducing intraocular pressure (IOP), preventing glaucoma progression and subsequent visual impairment, however published long-term data regarding its success are limited.

Methods

Data of patients who underwent Ahmed valve and Baerveldt implant surgery in UKMMC between 2001 and 2019 were reviewed retrospectively with information on 91 eyes of 89 patients obtained. IOP and number of glaucoma medications were noted preoperatively, at latest review and at years 1, 5, 10 and 15 postoperatively. Postoperative complications and further surgery or procedures were evaluated.

Results

Mean IOP preoperatively and on latest review was 29.3 ± 11.3 and 15.3 ± 6.9 mmHg respectively. Number of glaucoma medication preoperatively and on latest review was 4.0 ± 0.8 and 1.4 ± 1.6. Mean IOP and number of glaucoma medications at 1, 5, 10 and 15 years were 14.9 ± 5.9, 17.7 ± 10.2, 15.6 ± 10.0 and 18.3 ± 10.7 mmHg, and 1.3 ± 1.5, 1.8 ± 1.5, 1.8 ± 1.7 and 1.8 ± 1.8 respectively. Postoperative complications requiring intervention occurred in 52.7% of case, which are comparable to other long-term data.[2]

Conclusion

GDD surgery can confer sustained IOP reduction with reduced number of glaucoma drops for prolonged period postoperatively.

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Malignant glaucoma: Is zonulectomy and iridectomy mandatory with anterior vitrectomy

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Introduction

We are proposing a novel management strategy for malignant glaucoma which can be performed immediately at the outset of detection of this dreaded complication by the operating anterior segment surgeon himself and has a good success rate.

Methods

Limbal entry was used to inflate the anterior chamber with healon and release the peripheral anterior synechiae. It was then replaced with irrigation cannula on a continuous mode to prevent any AC shallowing thereafter during vitrectomy. 23G/25G trocar cannula was used to enter 3.5mm superotemporally through pars plana route and anterior vitrectomy was performed. Vitrectomy was continued till anterior chamber deepened and resolution of malignant glaucoma was envisaged.

Results

11 eyes of 11 patients of malignant glaucoma were reviewed. Mean age was 52.3 ± 17.01 (range 26-73) years. Baseline intraocular pressure (IOP) and visual acuity (VA) at presentation was 39.82 ± 12.82 (range: 14-58) mmHg and LogMAR 1.30 ± 0.86(range:0.20-2.40) respectively. 9/11(81.8%) eyes were associated with PACG. 6/11 (54.5%) eyes had cataract surgery including 3 SICS, 4/11 (36.4%) had trabeculectomy and 1/11 (9.1%) eyes had combined Phaco-trabeculectomy as their precipitating surgery. 5/11 (45.5%) eyes were associated with intra or post-operative flat anterior chambers as complication. When unsuccessful (10/11), these eyes underwent anterior vitrectomy by the new method. Post Intervention IOP and VA was 14.50 ± 2.07(range:12-18) mmHg and LogMAR 1.54 ± 0.83 (range: 0.3-2.4) respectively.

Conclusion

Single port pars plana anterior vitrectomy with limbal infusion sufficed to treat malignant glaucoma as a standalone measure in 100% eyes. It is safe, easier to

perform and can be performed by anterior segment surgeons and avoids the need for zonulectomy and iridectomy

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Surgical Outcomes of Aurolab Aqueous Drainage Implant (AADI) in Selayang Hospital

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Introduction

Aurolab aqueous drainage implant (AADI) is a non-valved device useful in refractory glaucoma to achieve low intraocular pressure (IOP) when other methods have failed. The purpose of this study is to report a year outcome of AADI glaucoma tube implantation in eyes with Refractory Glaucoma in Selayang Hospital.

Methods

This was a retrospective case series. Patients that have undergone AADI surgery between November 2017 and December 2019 were reviewed. Primary outcome measure was IOP post implantation. Secondary outcome measure were additional anti-glaucoma medications and post-operative complications. Success was defined as complete when the intraocular pressure (IOP) was between 6 and 21 mmHg without antiglaucoma medication. Success was defined as qualified if requiring additional anti-glaucoma medications.[1]

Results

A total of nine eyes of eight patients were included with patients age ranged between 11 to 70 years old. One patient had juvenile glaucoma and the remaining were cases of secondary glaucoma. Five patients had multiple surgeries prior to AADI implantation. Mean pre-operative IOP was 27 mmHg and mean post-operative IOP was 18 mmHg. Three eyes achieved complete success and five eyes achieved qualified success. There was one patient (one eye) lost to follow-up. Two patients developed post-operative complications. One patient had conjunctival dehiscence with exposed plate which required removal of AADI three months postoperative, and the other patient had conjunctival abscess which was treated with antibiotics. Three eyes had stent removal at 3 weeks, 4 months and 6 months respectively.

Conclusion

AADI appears to be effective for controlling IOP in refractory glaucoma patients.

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Surgical Outcome of Glaucoma Drainage Device in Neovascular Glaucoma: 3-year review

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Introduction

Neovascular glaucoma (NVG) is a severe complications of ocular ischemia condition. Glaucoma drainage device (GDD) implantation has been used as a primary treatment option in NVG due to the higher risk of trabeculectomy failure in these patients.

Methods

This is a 3-year retrospective study of all GDD cases on NVG patients in Hospital Sultanah Bahiyah, from year 2016 till year 2018, with follow-up up to 1-year postoperation. Success was defined as intraocular pressure (IOP) between 6 and 21 mmHg with retention or improvement of presenting visual acuity (VA), further divided into qualified success (with) and complete success (without anti-glaucoma). Exclusion criteria included defaulted follow-up, transfer to other hospitals and incomplete data.

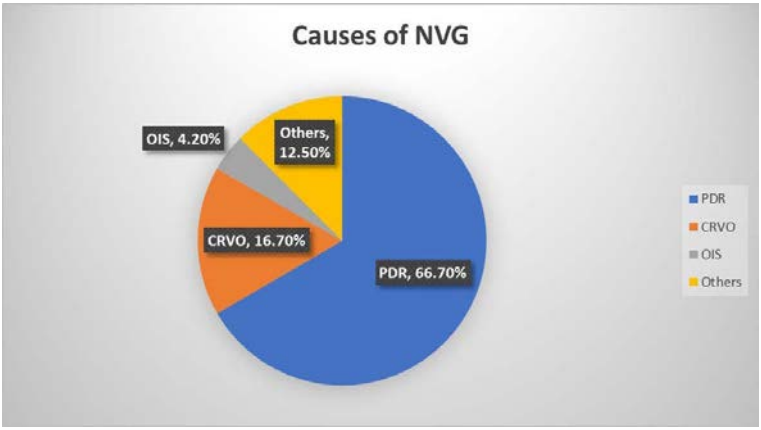
Results

A total of 23 NVG patients (24 eyes) underwent GDD in 3 years. Causes of NVG were mainly proliferative diabetic retinopathy (n = 16, 66.4%), retinal vascular occlusion (n = 4, 16.7%) and ocular ischemic syndrome (n = 1, 4.2%). All of our patients underwent Ahmed valve GDD implantation due to less risk of hypotony. Complete success rate at 1 year was 29.2% and qualified success rate was 54.2%. Mean IOP reduction post-GDD was 19.67 ± 8.07mmHg ($p < 0.005$). 75% of patients had equal or improved postoperative VA. However, there was no significant difference in VA pre- and post-GDD. Complications which required additional surgeries included hypotony (n = 4, 16.7%), aqueous misdirection (n = 1, 4.2%) and severe inflammation (n = 1, 4.2%).

Conclusion

Primary GDD demonstrated good surgical outcome in IOP reduction for NVG patients. It may recommend as primary approach in NVG as trabeculectomy often has more failure issues.

Tables, figures, and illustrations



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Early experience of glaucoma specialists on a gel microstent implant

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Introduction

This case series evaluates the IOP lowering and safety of a gel microstent implant among glaucoma specialists in Manila, Philippines.

Methods

This was a retrospective study of XEN45® (Allergan, Dublin, CA, USA) microstent implantations performed by four glaucoma specialists of the Department of Health Eye Center, East Avenue Medical Center from June to October 2019. The cases included first time implantations by the specialists guided by experienced industry staff. Outcome measures defined complete surgical success as achieving ≥ 20% IOP reduction from baseline without medications, while qualified success was the same endpoint on medications. Failure was requiring needling or filtering surgery.

Results

Twenty-nine eyes of twenty-six patients were included (60% male). Twenty-two (73%) were standalone procedures and seven (27%) were combined with phacoemulsification. Average follow up was 208 days post implantation (84 to 365 days). Mean age was 61.5 (20 to 79) years. 80.8% had POAG, 8% had JOAG, 4% had SOAG (Sturge Weber) and 8% was steroid-induced glaucoma. Mean preoperative IOP was 22.16 ± 6.66 mmHg which dropped to 12.04 ± 2.78 mmHg ($t = 8.84$, $p = 0.0001$). Median pre-op medications were 3 (IQR = 3–4) which decreased to 0 (IQR = 0–1) ($z = 4.74$, $p = 0.0001$) post-operatively. Postoperative needling was done on four patients (13.79%). Seven (24.14%) had hyphema. Revision for fibrosis around the tube was done on one patient (3.45%). Three (10.34%) had choroidal effusion and one had hypotony maculopathy (3.45%) all of which resolved spontaneously. Complete surgical success was achieved in 66%, while qualified success in 10% of the patients at the last follow up visit.

Conclusion

First time staff-guided implantation of a gel microstent is effective and safe among glaucoma specialists.

Tables, figures, and illustrations

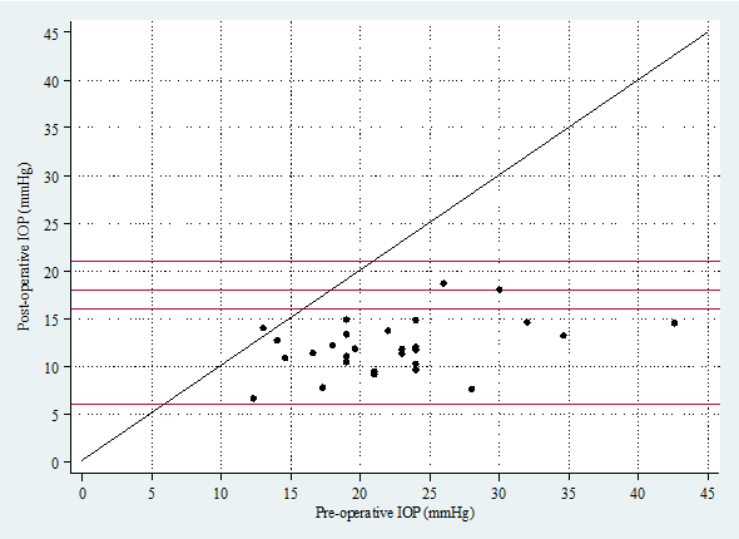

Figure 1. Scatter Diagram of the Pre-operative IOP (abscissa) and Post-operative IOP (ordinate) with Absolute IOP targets at 6mmHg, 16mmHg, 18mmHg, and 21mmHg

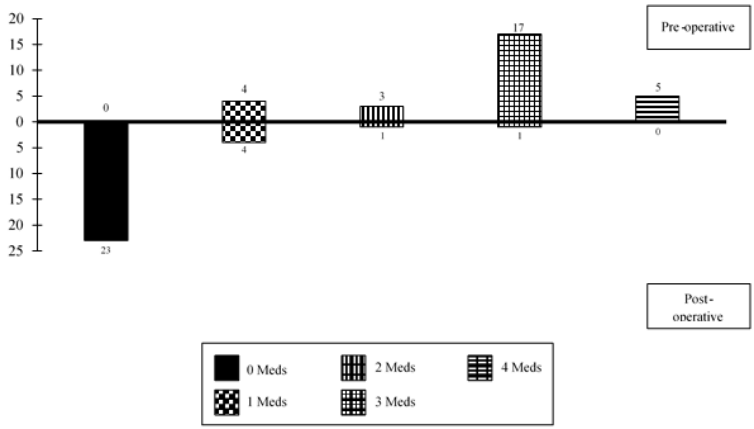

Figure 2. Bar Diagram of the Pre-operative and Post-operative Number of Medications

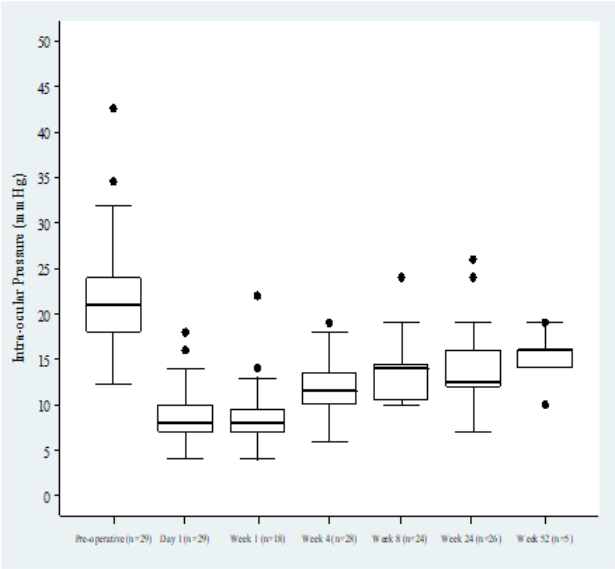

Figure 3. Box-Plot Representation of Intra-ocular Pressure Values: Median Values (Dark Lines),
25th and 75th Percentiles (Boxes), and 5th and 95th Percentiles (Bars)

Comparison between MMC 0.02%/Ologen and MMC 0.02% as an adjuvant to trabeculectomy: A four-year review

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Introduction

Augmentation of trabeculectomy with antimetabolite such as mitomycin C (MMC) has been used to improve the long-term success of lowering intraocular pressure (IOP) and reduce bleb failure. However, MMC is associated with high risk of blebitis and endophthalmitis. An alternative is Ologen (OLO), a biodegradable porous collagen implant that provides a pre-extracellular matrix for tissue repair. Conflicting results were seen in studies conducted using OLO alone as adjuvant for trabeculectomy. We investigated whether an addition of OLO implant improves the outcome of trabeculectomy enhanced with MMC 0.02%.

Method

A four-years (2016-2019) retrospective review of medical records of 39 patients who underwent trabeculectomy with MMC 0.02% with OLO (18) and MMC 0.02% alone (21) in UKM Medical Centre. Outcomes included IOP reduction, number of anti-glaucoma medication reduction and post-operative complications.

Results

Mean age was 61 ± 16.1 years old in MMC/OLO group and 69 ± 12.2 years old in MMC group alone. Majority of participants were male (77.8% MMC/OLO group vs. 61.9% MMC alone group) and from Chinese ethnicity (66.7% MMC/OLO group vs. 57.1% MMC alone group). Mean rank IOP reduction was more significant in MMC/OLO group (-8.06 ± 9.59 mmHg) compared to MMC alone group (-8.71 ± 9.61 mmHg) ($Z = 2.9$, $p = 0.003$). Mean rank of number of anti-glaucoma medication reduction was also more significant in MMC/OLO group (-2.7 ± 1.5) compared to MMC alone group (-3.4 ± 1.0) ($Z = 3.5$, $p = 0.001$). Complication rates were 39% in MMC/OLO group and 38.1% in MMC alone group. However, 2 cases of endophthalmitis were observed in MMC alone group compared none in MMC/Ologen group.

Conclusion

Use of OLO implant as additional adjuvant therapy to MMC proves to be superior to MMC alone in the long-term control of IOP and safety in trabeculectomy. Combination OLO/MMC can be used as adjuvant to improve the success rate of trabeculectomy.

Five-year experience with trabeculectomy

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Introduction

To study the outcome of trabeculectomy in Hospital Melaka.

Methods

Medical records of all patients who underwent trabeculectomy between January 1, 2013 and January 31, 2018 who were followed up for two years postoperatively in Hospital Melaka were retrospectively reviewed.

Results

A total number of 83 eyes with the age of patients range between 17 to 92 years underwent primary trabeculectomy (n = 20,24.1%), combine trabeculectomy with cataract surgery (n = 61,73.5%), repeat trabeculectomy (n = 1,1.2%), and combine repeat trabeculectomy with cataract surgery (n = 1,1.2%). The disease spectrum includes primary open-angle glaucoma (POAG) (46 patients, 55.4%), primary angle-closure glaucoma (PACG) (11 patients, 13.3%), secondary glaucoma (22 patients, 26.5 %) and juvenile glaucoma (4 patients, 4.8%). Preoperative mean intraocular pressure (IOP) was (22.53 ± 6.49) mmHg as compared to postoperative mean IOP of (14.29 ± 4.02) mmHg, (14.72 ± 4.32) mmHg and (13.75 ± 4.28) mmHg at 6-month, 12-month and 24-month respectively. Seventy seven percent of eyes (n = 64) achieved complete success (CS), 21.7% (n = 18) with qualified success (QS) and only 1.2% (n = 1) failed at 6 months. At twelve months, trabeculectomy with CS was 61.4% (n = 53), QS was 37.3% (n = 31) and failure was 1.2% (n = 1). Fifty one percent (n = 42) attained CS and 46% (n = 38) with QS at 24 months postoperative. Two patients that failed had undergone glaucoma drainage device implantation.

Conclusion

This study concluded that trabeculectomy performed in Hospital Melaka has produced significant success and comparable to other studies.[1-4]

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Effectiveness of Intracameral Moxifloxacin Endophthalmitis Prophylaxis for Trabeculectomy at Aravind Eye Hospitals

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Importance

The effect of intracameral (IC) moxifloxacin prophylaxis in preventing acute post-operative endophthalmitis, a rare but potentially visually devastating surgical complication, remains unstudied for glaucoma surgery.

Objective

To analyze the effectiveness of IC moxifloxacin prophylaxis in reducing acute post-operative endophthalmitis after trabeculectomy and combined trabeculectomy/cataract extraction.

Design, Setting, Participants

A retrospective clinical-registry analysis of patients undergoing either trabeculectomy or trabeculectomy/cataract extraction at Aravind Eye Hospital (AEH) between 2009-2018 (inclusive). Electronic health record data were analyzed before and after implementation of routine IC moxifloxacin, and acute postoperative endophthalmitis rates compared.

Exposures

During 2015, routine IC moxifloxacin prophylaxis was added in a stepwise fashion throughout AEHs. Date of implementation was used to create Group 1 (without IC moxifloxacin prophylaxis) and Group 2 (with IC moxifloxacin prophylaxis).

Main Outcomes and Measures

The primary outcome was the difference in acute (≤6 weeks) post-operative endophthalmitis between Group 1 vs. Group 2. Review of culture results, visual acuity (VA) and intraocular pressure (IOP) was also performed for cases of endophthalmitis.

Results

38,900 eyes (Group 1) did not receive IC moxifloxacin while 19,086 eyes (Group 2) did. While the rate of non-infectious post-operative complications was not significantly different,1 (0.81% vs. 0.67%, p = 0.07), there was a significantly lower rate of acute post-operative endophthalmitis in Group 2 vs. Group 1 (0.03% vs. 0.08%, p = 0.03). Patients receiving IC moxifloxacin had an approximately 2.5-times lower odds of infection (OR 0.39 for Group 2 vs. Group 1, 95% CI 0.16-0.95), and almost 4-times lower odds after adjustment for covariates (OR 0.26 for Group 2 vs. Group 1, 95% CI 0.09-0.74). The rate of early post-operative infection after IC moxifloxacin introduction was lower for patients undergoing both trabeculectomy alone (0.09 to 0.03%, p = 0.27) and combined trabeculectomy/cataract extraction (0.08 to 0.03%, p = 0.06). While most cultures yielded no growth, there was no staphylococcus or gram-negative growth for patients in Group 2 who received IC moxifloxacin.

Conclusions and relevance

IC moxifloxacin prophylaxis was associated with a nearly 4-fold lower rate of early postoperative endophthalmitis in patients undergoing trabeculectomy or combined trabeculectomy/cataract extraction.

Surgical outcomes of Juvenile Open-Angle Glaucoma in Hospital Melaka

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Introduction

Primary juvenile-onset open-angle glaucoma (JOAG) is a rare open angle glaucoma where most patients will eventually require surgery. Trabeculectomy, is the common type of surgery done with high reported success rate. However, vision-threatening complications such as hypotony maculopathy has made glaucoma drainage device (GDD) a reasonable alternative. To date, there are still limited studies on GDD among JOAG patients as it is usually used for refractory cases where conventional surgery has failed.

Methods

A retrospective comparative case study. We reviewed 15 eyes of 10 patients with underlying JOAG. They underwent surgical intervention between 2013 and 2019 and were followed up for at least 12 months postoperatively in Hospital Melaka. Two types of filtering surgery were performed, trabeculectomy with mitomycin C (N = 10) and Ahmed Glaucoma Valve implantation (N = 5). Complete success was defined as an IOP < or = 21 mmHg, qualified success as IOP < or = 21 mmHg with use of glaucoma medications, and failure as IOP > 21 mmHg despite medical therapy. The surgical technique used to perform the procedures was reviewed and the significant complications noted.

Results

The IOP and glaucoma medications were significantly reduced throughout the 12 months postoperatively in both groups. Complete success was achieved in all patients of both types of filtering surgery during final follow up. However, the rate of postoperative complications related to hypotony is slightly higher in trabeculectomy group.

Conclusion

Augmented trabeculectomy and GDD implantation among JOAG patients has an equal success rate. However, we observe a slightly higher rate of hypotony in

trabeculectomy group. Further multicentred data collection is needed for further evaluation.

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Glaucoma drainage devices treatment outcomes: a three-year review

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Introduction

Glaucoma drainage devices are preferred for secondary glaucoma or in eyes with previous intraocular surgeries.

Methods

A retrospective study was conducted in patients aged 18 years or older with primary glaucoma and previous intraocular surgery or secondary glaucoma who underwent glaucoma drainage device implantation (Ahmed valve AGV FP7 or Baerveldt BG101-350) from 2 hospitals from January 2011-December 2015 (3 years follow up). The primary outcome measure was failure (IOP outside target range: 5-18 mmHg 3 months postoperatively, severe vision loss, progression to no light perception, or further glaucoma surgery). Secondary outcomes measure included IOP, medications, complications, and interventions.

Results

Thirty patients were included. Six patients received Ahmed valve and 24 patients received Baerveldt implant. Failure rate was higher in Ahmed valve (66.7%) as compared to Baerveldt group (41.7%) ($p = 0.378$). Mean preoperative IOP was 44.3 ± 5.1 mmHg in Ahmed valve and 35.8 ± 11.0 mmHg in Baerveldt group. Mean postoperative IOP was higher in Ahmed valve (14.0 ± 9.6 mmHg) as compared to Baerveldt group (13.2 ± 4.4 mmHg) ($p = 0.584$) at 3 years follow up. The mean number of antiglaucoma used in Ahmed valve was 3.2 ± 1.5 and 3.5 ± 1.3 in Baerveldt group ($p = 0.538$). Progression to no perception of light (n = 4, 66.7% and 2, 8.3% in Ahmed and Baerveldt groups respectively) and persistent corneal oedema (n = 9, 37.5% in Baerveldt and none in Ahmed valve group) were the commonest complications. More interventions were needed in Baerveldt group.

Conclusion

Both implants were effective to reduce the IOP. Failure rate was lower in Baerveldt group.

Ab-externo XEN gel tube implantation in patient with post corneal keratoplasty

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Introduction

Steroid induced glaucoma is common after prolonged steroid usage in post cornea transplant patient. It threatens graft survival and lead to irreversible glaucomatous optic neuropathy. To report efficacy and safety of ab-externo XEN gel tube implantation in eyes with post corneal keratoplasty.

Methods

Retrospective case series study of successful XEN implantation via ab-externo approach in patients diagnosed with refractory steroid-induced glaucoma post cornea keratoplsty. Preoperatively, all patients had uncontrolled IOP range from 20-45 mmHg despite maximum topical and oral medication as well as selective laser trabeculoplasty in one patient. All patients had at least 3 months follow up pre and post operation. The outcomes include best corrected visual acuity, IOP control, number of antiglaucoma post operation, complications of operation and cornea graft status.

Results

All patients achieved significant reduction of IOP and numbers of topical anti-glaucoma. No significant intra-operation and post-operation complication due to ab-externo approach. Cornea graft remained clear postoperatively

Conclusion

Ab-externo XEN gel tube implantation is a safe approach and effective treatment option in refractory steroid induced glaucoma post cornea keratoplasty.

Outcome of phacoemulsification combined with goniosynechialysis on primary angle closure glaucoma

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Introduction
To assess the effects of phacoemulsification and goniosynechialysis on anterior chamber angle and intraocular pressure in patients with primary angle closure glaucoma and cataract.

Methods
A retrospective, interventional case series on 46 eyes of 46 patients. Outcomes included mean IOP reduction, reduction in IOP-lowering medications and anterior chamber parameters obtained by AS-OCT.

Results
After 6 months of follow up, mean postoperative intraocular pressure was 17.93 ± 1.26 mmHg and significantly lower compared with preoperative intraocular pressure ($p < 0.001$). Intraocular pressure was less than 18 mmHg in 40 eyes (86.96 %) without medications; 6 were controlled with medications. There was significant increase of mean anterior chamber depth (ACD) before surgery (1.99 ± 0.29 mm) and after surgery (3.50 ± 0.35 mm) with $p < 0.001$. This result was similar to the AOD750 and the TIA750 with $p <0.001$.

Conclusion
Combined phacoemulsifcation and goniosynechialysis reduces intraocular pressure, medication requirements and improves the structures of anterior chamber in primary angle closure glaucoma.

Keywords
phacoemulsification, goniosynechialysis, angle closure glaucoma

Avoiding BAK in postop eye drops reduces the need for subconjunctival 5FU injection post-trabeculectomy

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Introduction

Subconjunctival fibrosis is one of the main causes of failure of glaucoma filtration surgery. It can result in absence of a filtration bleb, small scarred bleb or cystic bleb. 5-fluorouracil and mitomycin C and topical steroids have been used to suppress subconjunctival fibrosis.

Methods

A study was done analysing the number of post-operative subconjunctival 5FU injections for trabeculectomy on pseudophakic eyes prior to and following the change to a BAK-free regimen. The cohort consisted of 16 consecutive cases who had primary trabeculectomy and did not have intraoperative mitomycin C or 5FU. The trabeculectomy surgery included a groove sclerectomy procedure.

Group A were 8 eyes of patients who had Chlorsig, Maxidex and Prednefrin Forte eye drops tds. Group B were 8 eyes who had Chlorsig-Dexamethasone and Optive-Dexamethasone tds eye drops post-operatively.

Results

Group B (BAK-free) patients required fewer post-operative 5-FU subconjunctival injections (average 2.9, range 1-5 injections) compared to Group A (BAK) patients (average 7.3, range 4-18 injections). This difference was statistically significant ($P = 0.02$, unpaired t-test).

All patients had functioning blebs and did not require glaucoma medications to maintain target intraocular pressure. The Group B (BAK-free) patients had a more diffuse bleb than the Group A (BAK) patients.

Conclusion

The results demonstrated that when BAK was eliminated from postoperative eye drops in trabeculectomy, the number of postoperative 5FU injections was reduced.

Tanito Micro-hook for ab interno trabeculotomy for exfoliation glaucoma and primary angle-closure glaucoma

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Introduction

Tanito microhook is a simple, reusable and low-cost device for ab interno trabeculotomy in glaucoma. We retrospectively evaluated the surgical effect of ab interno trabeculotomy using Tanito microhook combined with cataract surgery for glaucoma.

Methods

This retrospective study included 27 eyes with primary open angle glaucoma (POAG), 43 eyes with primary angle closure glaucoma (PACG) and 26 eyes with exfoliation glaucoma (XFG) treated with Tanito microhook trabeculotomy.
The intraocular pressure (IOP) and number of antiglaucoma medications at preoperatively and 6 months postoperatively were analyzed.

Results

Mean preoperative IOP of POAG was 17.60 mmHg, and 13.31mmHg at 6 months after surgery ($P < 0.0001$). In PACG, mean preoperative IOP was 16.37 mmHg, 12.45 mmHg at 6 months after surgery ($P < 0.0001$). In XFG, mean preoperative IOP was 18.88mmHg, and 13.00mmHg at 6 months after surgery ($P < 0.0001$). The average number of glaucoma medications in all groups were reduced from 2.13 to 0.66 ($P < 0.0001$) .

Conclusion

Tanito microhook trabeculotomy combined with cataract surgery showed a significant IOP reduction in POAG, PACG and XFG at 6 months after surgery. It is necessary to analyze the long -term results of surgical effect of Tanito microhook trabeculotomy.

Late-onset, bleb-associated endophthalmitis caused by *Staphylococcus aureus*

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Introduction

Bleb-associated endophthalmitis (BAE) are potentially sight-threatening complications of trabeculectomy and is associated with poor visual outcomes. BAE denotes an ocular infection with involvement of the vitreous, which usually develops months or years after glaucoma filtering surgery. The purpose of this case report was to present a case about late onset BAE caused by *Staphylococcus aureus.*

Methods

A 55-year-old male presented with a 3-days history of left eye pain, redness, hypopyon decreased visual acuity dan hypotony with Seidel test positive. He had a history of primary open-angle glaucoma that was treated with a combined procedure of cataract surgery and trabeculectomy in the left eye ten years earlier. His visual acuity had decreased from 6/20 to light perception. This patient showed signs of HELP syndrome (hypotony, endophthalmitis, leak, pain) but no previous history of using anti-fibrotic agents. BAE causative organisms cultures grew the *S. aureus,* a frequent cause of acute-onset endophthalmitis. The patient underwent treatment with pars plana vitrectomy, vitreous taps, administered intravitreal antibiotic, and prescribed hourly topical antibiotic. Six months after his last treatment, his left eye shows no residual infection, and vision corrects to 1/60.

Results

One case of late onset BAE with visual improvement after early vitrectomy, intravitreal, oral and topical antibiotic treatment.

Conclusion

Despite the poor prognoses of both BAE and ocular *S. aureus* infection, proper treatment can yield an adequate result, as demonstrated in this case.

Tables, figures, and illustrations

Figure 1a.

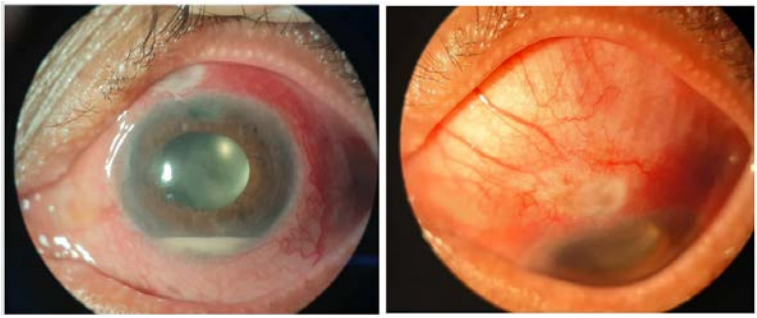

Figure 1b.

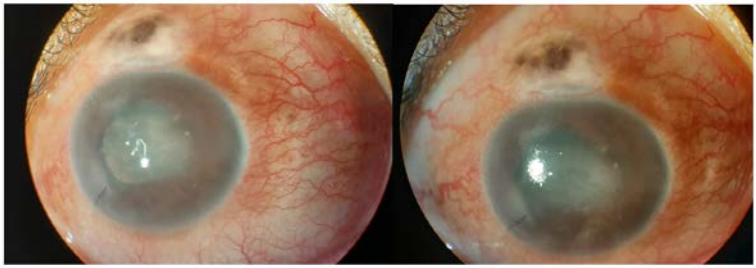

Figure 1a. Slit-lamp photography of the affected eye. Day 1 shows conjunctival hyperaemia, an opaque, avascular bleb, corneal oedema, hypopion and anterior segment inflammation. **1b.** Follow-up appearance at 6 months, fianl visual acuity was 1/60 after treatment. Comparative follow-up photography demonstrates gradual resolution.

Figure 2. Ocular ultrasound showed dense vitreous condensations more prominent in the posterior quadrant. There was no choroidal detachment associated with hypotony in this patient.

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Hypertensive Phase on Virna Glaucoma Implant

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Introduction

Glaucoma as the leading cause of permanent blindness can be difficult to manage. For cases unresponsive with medications or trabeculectomy, treatment with glaucoma drainage device (GDD) offers a beneficial solution. Despite the advances and variety of GDD, there is a chance of intraocular pressure (IOP) elevation post-implantation that may be detrimental to the optic nerve, that is called the hypertensive phase (HP). This study aimed to assess the progression of HP after the new nonvalved GDD, Virna Glaucoma Implant (VGI) surgery.

Methods

Retrospective study including all glaucoma patients who underwent VGI implantation with HP during 1st January 2017 to 30th June 2019. Hypertensive phase was defined as IOP > 21 mmHg during the first 6 months after surgery without tube obstruction or extrusion. All data were analysed after 6 months follow-up.

Results

Forty-nine eyes with HP experienced peak IOP around 1 month post-implantation with a median of 29 (8-47) mmHg. Most frequent diagnosis (12 subjects) was glaucoma secondary to silicone oil injection. Majority of cases resolved with medical treatments alone while 8 subjects needed bleb injection or aspiration. Pre-implantation number of medications was reduced after surgery (p = 0,00). Nearly all subjects (92%) with HP had successful IOP control after 6 months follow-up with 10% became medications-free.

Conclusion

Hypertensive phase following VGI implantation may occur 1 month after surgery and generally subsided by 6 months follow-up with treatments.

Tables, figures, and illustrations

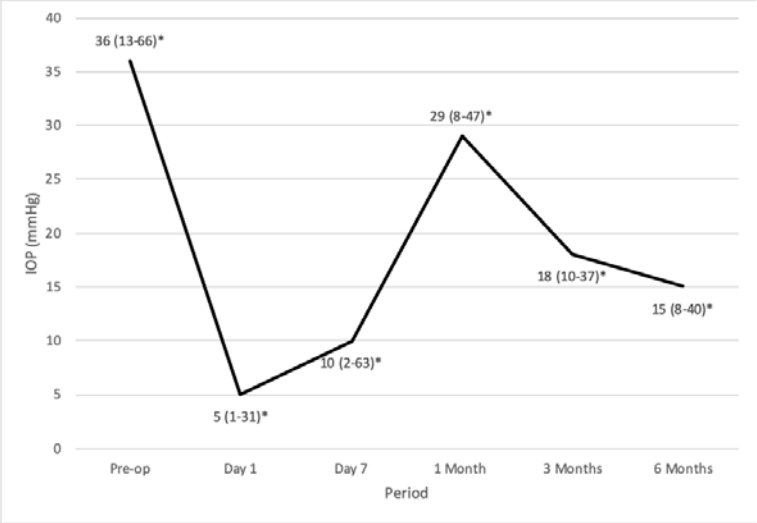

Figure 1. Intraocular pressure before implantation until 6 months follow-up. *Median (min-max).

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Incisional goniotomy: A savior in cases of failed trabeculectomy in adult glaucomas

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Introduction
To evaluate the intraocular pressure (IOP) lowering efficacy and safety of incisional goniotomy with or without phacoemulsification in patients with failed trabeculectomy

Methods
Patients with previous history of failed/ failing trabeculectomy were enrolled. Incisional goniotomy was performed. Goniosynechiolysis was performed if needed. Patient profile, IOP, number of medications and adverse events, were analyzed during at least a 6-month follow-up period. Success was defined as IOP ≤18mmHg with or without medications.

Results
16 eyes (16 patients) included in this study, 87.5% eyes had severe glaucoma. IOP decreased from 24.37 mmHg ± 5.77 to 15.8 ± 3.19 mmHg at 6 months (P = 0.004); with mean reduction in IOP of 37.14 ± 14.87% at the final follow-up. Medication use decreased from 2.81 ± 0.91 to 1.27 ± 0.9 (P = 0.009). 2 patients had IOP < 18mmHg without medications (12.5%) and 5 patients were on single medication (31.25%) at the final follow up. Complications were hyphema (25%; 4 eyes), IOP spike (12.5%; 2 eyes) and cyclodialysis (6.5%; 1 eye). Cumulative survival probability at the end of 6 months was 87.5%. Cumulative probability of survival for IOP < 15mmHg at 6 months was 68.75%

Conclusion
Incisional goniotomy combined with or without phacoemulsification resulted in a significant and sustained reduction in IOP in cases with failed trabeculectomy, along with a significant decrease in number of glaucoma medications at 6 months of follow-up. It's safer and can help defer re-trabeculectomy,

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Prolene suture assisted trabeculectomy in NVG: a novel approach

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Introduction

This is an innovative technique developed to be used in refractory glaucoma like NVG where failure rate of trabeculectomy is very high. It causes delayed bleb failure and maintaining the controlled IOP by making a prolene bed.

Methods

A prospective interventional case series done over 20 cases of NVG with vision of HM to FC 5 fts and IOP 40-52 mmHg. All pts were with vaso-occlusive disorders with uncontrolled IOP with maximal medical t/t. We gave Anti VEGF and did surgery within 7 days by making a prolene bed after using mitomycin C followed by closure of scleral flap and regularly followed up for 18 months. During follow up these pt are also given intravitreal inj Ranibizumab every 6 months interval.

Results

Significant decrease in IOP immediate post-op without change in V/A. Later on, IOP was 10-20 mmHg in all cases except in 2 where IOP again rises up to 21-30 mmHg with medication during 2-6 months and in 4 cases during follow up period of 12-18 months

Conclusion

This new technique showed success by controlling IOP in ≈ 80% cases of NVG with better symptomatic relief.

A Guide to Hypotony Challenges After Trabeculectomy

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Introduction

Hypotony with flat anterior chamber (FAC) is one of the most common complication of trabeculectomy. Some preventive procedures have been attempted but the incidence of this complication still often occurs.

Methods

Systematic review was performed using keyword and MeSH terminology to identify published article on Pubmed, Cochrane Library (CENTRAL), Science direct, Clinical Key, Google Scholar and Hand Searching. Articles included were full-text case series or case report without time limits.

Results

Three case series and one case report of management of hypotony after trabeculectomy were found in bibliographic databases. We identified 120 patients with hypotony after trabeculectomy was managed by pharmacology and interventional treatment. Outcome measured was IOP, BCVA and reformation of AC. All patients received pharmacological treatment, 79 patients had injection of viscoelastic substance and 9 patients had second injection. Fourteen patients had second surgery. All patients had good outcome compared to their basic condition with close monitoring.

Conclusion

For grade 1 and 2 flat anterior chamber patient should receive medical treatment and bandage contact lens applied to the eyes**.** In patients whose anterior chamber reform is not achieved with pharmacological treatment, viscoelastic injection was performed. Viscoelastic injection can be used for 2 times. If reformation still cannot be achieved with viscoelastic injection, secondary suturing is required.

Comprehensive management should be implemented in hypotony cases, tailored treatment modalities based on condition and the last careful follow up is required**.**

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Modified Trabeculectomy with Releasable Sutures: A Secure Way of Successful Glaucoma Filtration Surgery

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Introduction

The purpose of this study was to describe a modified surgical technique with releasable sutures and evaluate its safety and efficacy in lowering intraocular pressure (IOP) in glaucoma patients.

Methods

This was a randomized-controlled prospective clinical trial that included 80 eyes of 70 patients diagnosed with primary open-angle glaucoma. They were divided into two groups: the 'trabeculectomy with single suture (group A) and the 'modified trabeculectomy with releasable sutures (group B) with adjunctive application of mitomycin-C (MMC) in both groups. In the modified technique the sides of the triangular sclera flap are closed with releasable sutures. The main outcome results included the cumulative probability of surgical success, IOP values, complications and the number of antiglaucoma drugs needed.

Results

There was a highly significant reduction in IOP to baseline values in both groups at the last visit at 24 months. Group B achieved higher success rate with fewer early and late postoperative complications ($P < 0.05$). Shallow anterior chamber and iridocorneal touch occurred significantly less in group B than in group A. No significant adverse effects were caused by this modified technique with releasable sutures.

Conclusion

Both procedures appear to be equivalent in lowering IOP in surgical management of glaucoma. But Modified trabeculectomy with releasable sutures could be an efficient, relatively safer technique for a successful trabeculectomy due to fewer early complications related to excessive aqueous outflow than single suture.

The efficacy of combined phacotrabeculectomy in primary angle-closure glaucoma: A one-year follow-up

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Introduction

Cataract and glaucoma frequently coexist in the same eye.[1] Phacotrabeculectomy is one of the treatment options.[2] However, outcome reports are lacking. Therefore, we conducted this study to evaluate the efficacy of combined phacotrabeculectomy in patients with PACG.

Methods

This is a retrospective study of PACG patients who underwent phacotrabeculectomy during 2016-2019 (39 eyes). Intraocular pressure (IOP), logMAR, and the number of anti-glaucoma medication were analysed. The primary outcome was surgical success at 12-month according to predefined criteria. Signed-rank test was done to measure significance. Scatter plot represents correlation and analyzed by Pearson's correlation. A P-value < 0.05 considered significant.

Results

The mean logMAR and IOP was significantly decreased at postoperative ($P < .001$). Postoperative IOP measurements were significantly lower than the preoperative value at all follow-ups ($P < .001$). Scatter plot showing negative correlation in IOP changes before and after surgery at 12-month follow-up ($r = 0.829$, $P < .001$) (Figure 1). However, > 90% eyes still needed medications at 12-month postoperative. Success was achieved in 95% eyes (Table 1).

Conclusion

Phacotrabeculectomy appears to be an effective procedure at improving visual acuity and lowering IOP while glaucoma medication remains needed to maintain IOP.

Tables, figures, and illustrations

Table 1. Success criteria

Criteria	Condition		N (%)
Complete success	IOP ≤ 21mmHg	Without medication	3 (7.7%)
Qualified success		With medication	34 (87.2%)
Failure	IOP ≥ 21mmHg	With or without medication	2 (5.1%)

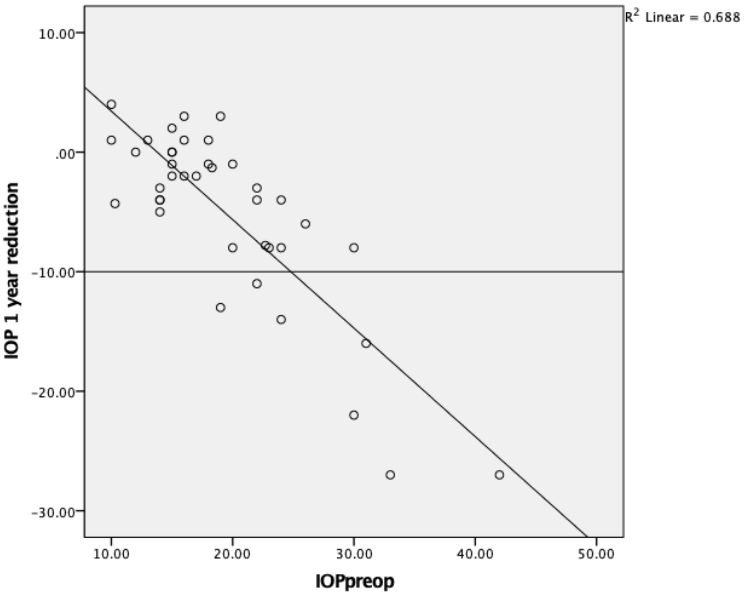

Figure 1. Scatter plot.

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Outcome of Augmented Trabeculectomy in Traumatic Angle Recession Glaucoma: A Case Series

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Introduction

Traumatic glaucoma often caused abnormal elevation of intraocular pressure (IOP). Augmented trabeculectomy with mitomycin C is commonly performed which associated with better outcome.[1] The aim of this case series is to study the outcome of augmented trabeculectomy in post-traumatic angle recession glaucoma (ARG) patients of a tertiary centre in Malaysia.

Methods

Retrospective study of post-traumatic ARG patients who underwent augmented trabeculectomy from 10/07/18 to 25/09/18. Surgeries were done by two glaucoma specialists using similar technique. Baseline visual acuity (VA) and IOP were compared to last visit of post-operative parameter, including post-operative procedures.

Results

A total of 5 cases were analysed. All patients had blunt trauma secondary to high velocity injury with male predominant (80%). Mean baseline IOP and VA were 51.0mmHg and 0.68 (logMAR) respectively. The patients were followed up for a mean of 14.0months. Mean post-operative IOP reduced to 14.0mmHg at last follow up. 2 patients (40%) had complete success and 60% patients had partial success. In the partial success group, all had subconjunctival 5-FU injection, which was given as early as postoperative 2 weeks. Vision at last visit dropped by 2 lines or more in 2 patients which attributed to progressive cataract formation.

Conclusion

Augmented trabeculectomy showed a good outcome in traumatic ARG patients in our case series. With timely wound modulating therapy, the bleb showed good survivability and high success rate up to two years post filtration surgery.

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The Role of Microinvasive Glaucoma Surgery (MIGS) in Uncontrolled Glaucoma During Perinatal Period: A Case Report

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Introduction

Managing glaucoma in a pregnant patient is indeed challenging, with dilemmas commonly focus on the best treatment modality that can save the mother's vision, while ensuring the health of the baby. The complexities involved on how to protect the best interest of both, frequently lead to compromise on either side, with mother usually becomes the volunteer victim. We are reporting a case of advanced secondary glaucoma, with initial difficulty to convince the patient for glaucoma surgery but eventually treated with XEN implantation.

Method

Case report.

Results

Madam NF is a 33-year-old Malay lady with bilateral advanced diabetic eye disease and left eye (LE) developed secondary open angle glaucoma after diabetic vitrectomy done one year ago. Her left visual acuity was 6/120 and vertical cup-to-disc (VCDR) ratio was of 0.9. Despite on maximally tolerated anti-glaucoma eyedrops her LE intraocular pressure (IOP) increased during her 3rd trimester of pregnancy. A thorough and repeated counselling regarding her glaucoma condition and options available was explained to patient and her husband. However, both of them keen for surgical intervention only after delivery, hence a XEN gel implant was implanted at 2 weeks postpartum without complication. She was given intensive corticosteroid eyedrops and 5-fluorouracil injection postoperatively. Her IOP remained stable without any anti-glaucoma eyedrops throughout her 6 months follow up.

Conclusion

Implantation of Xen gel stents may give a promising outcome in difficult situation. It may have advantages over standard filtering surgery as the procedure is shorter with lower complication and sufficient regulation of IOP.

Modified CO_2 Laser-assisted Deep Sclerectomy in Uveitic Glaucoma

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Introduction

To evaluate the clinical safety and efficacy of modified CO2 laser-assisted deep sclerectomy surgery (CLASS) in patients with uveitic glaucoma (UG).

Methods

We reviewed 48 eyes, comparing control primary open angle glaucoma (POAG) patients (n = 25) to UG patients (n = 23). CLASS procedures were modified according to characteristics of Chinese patients. Intraocular pressure (IOP) and glaucoma medications at the preoperative examination were compared with those at baseline, 1 week and at 1, 3, 6, and 12 months postoperative examination. Complete success was defined as 5≤IOP≤18 mmHg and reduced by at least 20% from the baseline without medications.

Results

Statistically significant reduction in mean IOP and in the mean number of medications from preoperative levels occurred in both groups at 12 months follow-up ($P < 0.001$).

Conclusion

Complete success was seen in 16 eyes in the control group (64.0%) and 14 eyes (60.9%) in the UG group ($P = 0.828$). Modified CLASS is presently an effective and safe procedure for patients with UG.

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Tables, figures, and illustrations

Table 1. Modified CLASS in uveitic glaucoma: preoperative and postoperative comparisons.

	POAG		UG		
Variable	**n**	**%**	**n**	**%**	**p value**
IOP (mmHg) (mean ± SD)					
Preoperation	30.0 ± 7.3		34.9 ± 9.4		0.049
Postoperation (6 months)	13.6 ± 2.7		14.8 ± 6.6		0.418
Postoperation (12 months)	14.0 ± 2.2		14.2 ± 4.2		0.825
Glaucoma medications (mean ± SD)					
Preoperation	3.4 ± 0.5		3.2 ± 0.4		0.177
Postoperation (6 months)	0.2 ± 0.5		0.7 ± 0.9		0.024
Postoperation (12 months)	0.4 ± 0.6		0.8 ± 1.2		0.148
Surgical outcomes (12 months)					
Qualified success	24	96	20	87	0.257
Complete success	16	64	14	60.9	0.823

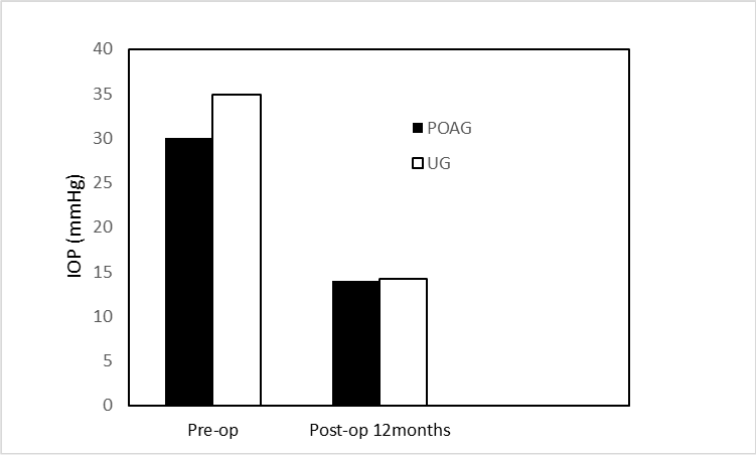

Figure 1. Comparison of mean preoperative and postoperative IOP in control and UG eyes. The change in IOP between the two groups was not statistically significant at the 12-month follow-up (P = 0.049 preoperative; P = 0.825 at 12 months).

Table 2. Postoperative complications in primary open angel glaucoma and uveitic glaucoma with modified CLASS.

	POAG		**UG**		
Variable	**n**	**%**	**n**	**%**	**p value**
Eyes with complications					0.263
Yes	8	32.0	11	47.8	
No	17	68.0	12	52.2	
Number of complications (mean ± SD)	0.32 ± 0.48		0.48 ± 0.51		
Type of complications					
PAS	7	28.0	9	39.1	0.414
Hyphema	0		1	4.3	0.292
Hypotony	1	4.0	0		0.332
Filter scar	0		2	8.7	0.132

To evaluate feasibility, safety and efficacy of incisional goniotomy combined with phacoemulsification in primary angle-closure glaucoma

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Introduction

Goniotomy is a relatively non-invasive procedure that can be easily combined with phacoemulsification in any stage of glaucoma. In this study, we aim to evaluate the intraocular pressure (IOP)–lowering efficacy and safety of goniotomy with phacoemulsification in mild, moderate and advanced staged primary angle closure glaucoma (PACG).

Methods

Consecutive patients with PACG undergoing phacoemulsification plus goniotomy were enrolled in this study. Following phacoemulsification and IOL implantation, incisional goniotomy was performed by using a disposable Microvitreo-retinal blade through two side ports ranging from 90-210° in extent. Patient demographic, clinical data, including baseline and postoperative IOP, number of medications used post-operatively and adverse events, were analyzed over follow-up period. Success was defined as IOP ≤18mmHg with or without medications.

Results

Of the 46 eyes (41 patients) included in this study, 78% eyes were classified as having severe glaucoma. The mean IOP decreased from 27.86 mmHg ± 7.86 to 14.17 ± 3.67 mmHg at mean duration of 10.41 ± 5.25 months postoperatively ($P < 0.001$); with mean percent reduction in IOP of 29.2 ± 23.49%. Hypotensive medication use decreased from median 3(0-5) to 2 (0-4), respectively ($P < 0.001$). There were 7(15.2%) eyes which required 0 hypotensive medication after surgery. The most common complication was hyphema (28%; 13 eyes).

Conclusion

Single-use blade assisted incisional goniotomy combined with phacoemulsification resulted in a significant and sustained reduction in IOP in

cases with angle closure glaucoma, both mild and advanced staged along with a significant decrease in number of glaucoma medications.

Laser Treatment

Treatment outcome of trans-scleral cyclophotocoagulation (TSCPC) on the reduction of intraocular pressure (IOP) in Hospital Sultanah Nur Zahirah

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Introduction

Glaucoma is the leading cause of irreversible blindness in the world. The prevalence of glaucoma is estimated to accounts for 3.4% of the world population. Those afflicted with the disease and living in developing countries have higher risk to develop advance glaucoma that progressively leads to blindness. Trans scleral cyclophotocoagulation (TSCPC) is a cyclodestructive procedure to reduce the intraocular pressure (IOP) by using laser beam to destroy the ciliary body epithelium that produces the aqueous humor. The objective of this study was to evaluate the effectiveness as well as the outcomes of TSCPC in Hospital Sultanah Nur Zahirah patients with various types of advanced glaucoma.

Methods

A retrospective analysis was conducted in Ophthalmology Clinic, Hospital Sultanah Nur Zahirah, Kuala Terengganu in which the data of patients who underwent TSCPC with diode laser from January 2016 to December 2018 were collected via hospital's Electronic Medical Record (EMR). Data included were patient's demographic details, types of advanced glaucoma, number of medications used and intraocular pressure of pre and post procedure. Patient's underlying illness and comorbidities were also taken into account to determine other risk factors that might affect the efficacy of TSCPC procedure.

Results

A total of 34 patients (n = 36 eyes) were included in this study. Out of the 34 patients, 19 of them (54.5%) were males. The mean age for the study population was 55.3 ± 11.8 years (age range from 20 - 74 years old). The glaucoma subtypes

treated included neovascular glaucoma (66.7%), primary open-angle glaucoma (11.1%), uveitic glaucoma (8.3%), traumatic glaucoma (5.6%), exfoliative glaucoma (2.8%), aphakic glaucoma (2.8%) and primary angle-closure glaucoma (2.8%). The mean pre-procedure IOP was 46.9 ± 12.2 mmHg and the mean at third and sixth months post-procedure IOP were 37.6 ($p < 0.05$) and 27.8 ($p < 0.05$) mmHg respectively. The mean IOP 12 months post- procedure was 31.2 ± 18.3 mmHg ($p< 0.05$). The mean number of IOP-lowering medications used pre-procedure was 2.4 ± 1.4; the mean number of medications used at the 12-month post-procedure visit was 0.9 ± 0.9 ($p < 0.05$).

Conclusion

The results of our study support the evidence that TSCPC with diode laser is effective in lowering IOP in our centre. TSCPC is also a safe procedure for IOP reduction if the appropriate diode laser settings are used. Our study also shows that TSCPC is more cost effective in terms of managing glaucoma patients as the medications used post procedure were also significantly reduced.

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Endocyclophotocoagulation: an adjunct or a savior in glaucoma

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Introduction

Endocyclophotocoagulation (ECP) is a minimally invasive glaucoma surgery (MIGS) procedure in which an endoscope is used to directly visualize the ciliary epithelium and photocoagulate it using guided laser delivery system build into the endoscopic probe

Methods

Patients diagnosed with glaucoma (both primary and refractory) were enrolled in the prospective study from January 2019 to December 2019. Endocyclophotocoagulation alone or in combination with phacoemulsification was used. Limbal route was used to visualize the ciliary process after injecting visco-cohesive OVD and 23G ECP was used for directed laser delivery. End point was achieved when the colour of ciliary process turns pale.

Results

Ten eyes of 10 patients were included in the study. There were 7 males and 3 females. Mean Age was 42.6 ± 18.3(15-70) years. Mean preoperative baseline IOP, CDR and Visual Acuity was 41.3 ± 11.6 (28-60) mmHg, 0.9 ± 0.01(0.7-1.0) and Log MAR 1.7 ± 1.15 (0.4-3.0) respectively. 4/10 eyes had aphakic glaucoma, 2/10 eyes had glaucoma secondary to operated vitreoretinal surgery and 4/10 eyes had primary angle-closure glaucoma. 6/10 (60%) eyes underwent ECP and 4/10 (40%) eyes underwent phacoemulsification+ECP. Mean postoperative IOP at 1 week, 1 month, 3 months and 6 months was 16.86 ± 6.23 (6-24) mmHg, 25.83 ± 16.2 (12-36) mmHg, 16.2 ± 9.8 (8-18) mmHg and 18.1 ± 12.1 (6-48) mmHg, respectively. The mean number of medications at final visit were 3.2 ± 0.3 (0-5). The mean difference between the final visit and baseline was 23.2 mmHg (56.3%) [p = 0.02, paired T test]. Complications observed were corneal edema in 4 eyes and hyphema in 1 eye during 1st postoperative week**.**

Conclusion

Endocyclophotocoagulation can be used as an adjuvant to lower IOP in Patients who are undergoing phacoemulsification and also as a savior for refractory cases.

The Effectivity of Selective Laser Trabeculoplasty (SLT) in Treating Normal Tension Glaucoma (NTG): A Systematic Review and Meta-Analysis

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Introduction

Normal tension glaucoma (NTG) is a progressive optic neuropathy with IOP that never exceeds 21 mmHg. In Asia, NTG contributes to 52%-92% cases of primary open-angle glaucoma (POAG). The main goal of glaucoma treatment is a reduction of intraocular pressure (IOP). Selective laser trabeculoplasty (SLT) is a well-established procedure that has been shown to be effective in treating POAG. However, evidence regarding the efficacy of SLT in NTG is minimal. Therefore, the purpose of this study is to investigate the efficacy of SLT in treating NTG.

Methods

Literature searches were conducted in Pubmed, Cochrane and Scholar for articles published within the past 5 years using “SLT”, “selective laser trabeculoplasty”, “NTG” and “normal tension glaucoma” as keywords. Full text articles written in English that included NTG patients underwent SLT will be reviewed.

Results

We included a meta-analysis that included five studies of NTG patients treated by SLT. Our results indicated that, IOP were significantly lower in patients post SLT within 1 month follow up. The meta-analysis showed that intraocular pressure decreased significantly between pre SLT (mean difference = 14.53; $p < 0.0001$) and post SLT (mean difference = 11.88; $p < 0.0001$).

Conclusion

SLT significantly lowered IOP in NTG patients with statistically significant results. Further research, particularly experimental studies with adequate samples, is needed.

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Effectiveness and Safety of Transscleral Diode Laser Cyclophotocoagulation for Refractory Glaucoma in a Tertiary Hospital in Bangladesh

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Introduction

Transscleral diode laser cyclophotocoagulation (TSDLCP) is a cyclodestructive procedure that lowers intraocular pressure by thermal destruction of ciliary body epithelium and stroma. When intraocular pressure remains uncontrolled despite medication, surgical intervention may be required to preserve optic Nerve function.

Methods

All patients included in the study were diagnosed with refractory glaucoma with uncontrolled intraocular pressure on medical treatment. The study included 98 eyes of 98 patients who underwent TSDLCP therapy. Follow up was 3 months. Outcome measures were intraocular pressure control, assessment of visual acuity and complications.

Results

The mean age was 49.56 ± 14.079 years. Females were 52 (53.1%) while the males were 46 (46.9%). There was significant decrease in the mean intraocular pressure (IOP) from 39.71 mmHg to 16.19 mmHg with mean percentage reduction of 59.28%. Significant success was seen in females more than males (p value 0.006). Visual acuity remained stable in 89 (90.82%) eyes and deteriorated in 9 (9.18%) eyes at the last visit. None of the patients had improvement in visual acuity. There was subjective improvement of symptoms like pain. Immediate postoperative complications included early post procedure pain and conjunctiva hyperemia in 89 (90.8163 %) eyes, conjunctiva burns in 4 (4.0816%) eyes, corneal burn in 1 (1.0204%) eye, hyphaema in 2 (2.0408%) eyes, moderate uveitis in 1 (1.0204%) eye and scleral burn in 1 (1.0204%) eye. Re-treatment was considered in the 31 (31.60%) eyes that didn't achieve target IOP.

Conclusion

TSDLCP therapy is an effective and safe procedure for patients with refractory glaucoma.

Role of Micropulse Transcleral Cyclophotocoagulation as an Adjunctive Treatment in Primary and Secondary Glaucoma Among Paediatric Patients

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Introduction

To evaluate intermediate-term efficacy and safety of micropulse transcleral cyclophotocoagulation (MP-TSCPC) in primary and secondary glaucoma among paediatric patients in Kuala Lumpur Hospital.

Methods

A prospective case series of paediatric patients < 12 years old with uncontrolled intraocular pressure (IOP) of more than 21mmHg despite on antiglaucoma medications, previously failed surgical procedure (trabeculotomy alone or with trabeculectomy + mitomycin-C) or combination of both. Laser setting was 2W of 810nm infrared diode laser set on micropulse delivery mode for 160 s with 25% duty cycle. All cases had 3 months follow-up. Main outcome is monitoring the reduction of intraocular pressure while secondary outcome is complications of procedure.

Results

A total of 14 eyes of 12 patients (58.3% male) were included with mean age of 5.1 years. Secondary glaucoma represents majority of diagnosis in 9 patients (71.4%). Mean pretreatment IOP was 32.9mmHg. Post MP-TSCPC, mean IOP reduced significantly to 19.9mmHg (39.5% reduction) at week 1, 23.6 mmHg (32.18% reduction) at first month and 27.0mmHg (17.9% reduction) at third month. Success of IOP reduction rate is observed to decrease over the three months. No major complications encountered, except one patient had vitreous hemorrhage post procedure.

Conclusion

Paediatric glaucoma is a major therapeutic challenge. MP-TSCPC is observed to be a safe procedure and well tolerated by paediatric patients. However, its role is for temporary IOP control before further definitive surgical intervention.

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Transient Blindness in Advanced Glaucoma Patients After Local Anaesthesia

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Introduction

Transscleral cyclophotocoagulation laser (TSCPC) is widely used in management of glaucoma and this procedure is usually done under local anaesthesia (LA). LA poses its own risk. Vision loss is one of the uncommon but a devastating complication.

Methods

Retrospective, two case reports of patients planned for TSCPC under LA.

Results

Two patients (72 and 81 years old) with advanced glaucoma were planned for TSCPC to lower intraocular pressure (IOP). The first patient was given peribulbar anaesthesia (2.5 ml lignocaine 2% + 2.5 ml bupivacaine 0.5%) and proceeded with TSCPC. Immediately post TSCPC, patient complained of no perception to light (NPL). For the second patient, sub-Tenon anaesthesia (1.5 ml lignocaine 2% + 1.5 ml bupivacaine 0.5%) was given. Post injection of LA, patient complained of total loss of vision and TSCPC was abandoned. After 12 hours, the first patient recovered vision fully while the second patient's vision was two lines in Snellen chart worse than original visual acuity. Anterior segment and fundus examinations on both patients revealed no significant findings.

Conclusion

In advanced glaucoma, the vulnerable optic nerve is compromised by LA. This may lead to amaurosis or wipe-out syndrome that result in transient blindness. Necessary precautions must be taken in advanced glaucoma patients who are undergoing procedure under LA and must be warned beforehand on sight-threatening complications.

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Early Selective Laser Trabeculoplasty Experience in a Tertiary Referral Center: Outcomes and Predictors of Success

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Introduction

Selective laser trabeculoplasty is an established treatment option for primary open angle glaucoma by reducing intraocular pressure thru its biologic effects on the trabecular meshwork. Its efficacy is widely documented but its range of effect is wide. No local studies have been conducted to report the applicability or reproducibility of the results to the local setting. The variability in the success ratio suggests that the effect of SLT may be influenced by various factors and underlines the importance of identifying the predictors for success of SLT.

Methods

A retrospective case review of eyes that underwent SLT was performed. Baseline characteristics were gathered to identify correlation with treatment outcomes.

Results

Baseline characteristics suggest a population with more severe glaucoma. There was a 13% decrease in IOP across all diagnoses, suggesting severity could have affected the treatment response. There was no significant change in visual acuity and number of medications used across follow-ups. Worse visual acuity and more medications at baseline were predictors of poor response. Older age and higher baseline IOP were predictors of good response. Primary angle-closure cases had higher failure rates, but association is unclear. None of the baseline characteristics and none of the earlier follow-ups were predictors of treatment failure.

Conclusion

SLT among patients seen at our tertiary hospital had a mean decrease in IOP of 13% with worse visual acuity and more medications predicting poor response while elevated IOP and older age predicted good response. Earlier follow-ups did not predict failure at final follow-up. None of the baseline variables predicted failure.

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Five-year follow up of 360 degree contiguous selective laser trabeculoplasty as an adjuvant in open-angle glaucoma receiving medical therapy

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Introduction

Glaucoma being a progressive disease requires topical eye drops, laser or surgery to lower intraocular pressure.

Methods

Retrospective review of open angle glaucoma (OAG) patients, on maximum medical therapy who underwent 360 degree contiguous selective laser trabeculoplasty (SLT). Patients were followed up to 5 years. Patients needing repeat SLT, surgical intervention, Intraocular pressure (IOP) control of less than 20% from baseline and cyclophotocoagulation were deemed treatment failure.

Results

The variables were analysed descriptively, and inferentially using paired t-test. Total of 38 eye were analysed with equal numbers of males and female. The age ranged between 39 to 88 years old, with mean of 63.0 years old (sd = 2.72). Majority were on 4 medications (n = 22; 57.9%), followed by 3 medications (n = 8; 21.1%). At the end of 5 years, 24 eyes (63%) remained in the study. 14 eyes were lost to follow up.10 eyes achieved intervention free disease control (42 %). There was a significant reduction noted for IOP ($p < 0.05$) mean difference of IOP in mmHg 10.4 (sd 2.04) from baseline to Year 5 follow up. The remaining 14 required further intervention, 25% (n = 6) eyes trabeculectomy,8% (n = 2) eyes transscleral cyclodiode photocoagulation and 25% (n = 6) patients required repeat SLT.

Conclusion

Our study shows that SLT is effective as an adjuvant therapy in 40% of cases in lowering IOP over 5 years. However,60% of patients required further intervention such as cyclophotocoagulation, surgery or repeat SLT.

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Medical Treatment

Intracameral recombinant tissue plasminogen activator (r-TPA) as the primary treatment for secondary pupillary block

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Introduction

Severe anterior chamber inflammation following acute endophthalmitis can lead to synechiae formation causing secondary pupillary block. Traditionally, pupillary block is being treated with laser peripheral iridotomy which potentially aggravates the pre-existing inflammatory condition. We are reporting the effectiveness of r-TPA for secondary pupillary block condition in an eye with severe endophthalmitis.

Methods

Case report.

Results

We presented a case of acute endophthalmitis following complicated cataract extraction. Patient had severe anterior chamber reaction causing seclusio papillae and iris bombe with 360 degree iridocorneal touch. One hour post injection of intracameral r-TPA, iris bombe was noted to resolve completely with significant deeper anterior chamber and the pupil became slightly larger. The clearer anterior segment view enables the pars planar vitrectomy and intraocular lens extraction to be performed with significant visual gain postoperatively.

Conclusion

Intracameral use of r-TPA is an effective treatment of endophthalmitis and secondary pupillary block with significant anterior segment fibrin reaction.

The Role of Ranibizumab for Neovascular Glaucoma: A Systematic Review and Meta-Analysis

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Introduction

The management of neovascular glaucoma (NVG) is still unsatisfied due to its complexity. The principle of NVG management is treating the underlying disease and reducing the intraocular pressure. Many investigations verify that anti vascular epithelial growth factor (anti-VEGF) is effective in reducing NVG due to its ability to inhibit the intraocular neovascularization and ease the leakage from new vessel. One of the anti-VEGF that has proven to be effective is Ranibizumab. The aim of this study is to investigate the role of Ranibizumab in NVG patients.

Methods

The systematic review search was conducted from Pubmed, MedLink and Cochrane Controlled Trials Register. Studies in English and human subjects were included. The measured outcomes were intraocular pressure (IOP) and best-corrected visual acuity (BCVA).

Results

We included 67 eyes in three studies consisted of interventional prospective studies of NVG patients treated with Ranibizumab. The result of the mean difference of the IOP was 31.48 ($p < 0.00001$; 95%, CI = 26.73 to 36.22). Another result of our study showed that the mean difference of BCVA was 0.24 ($p < 0.002$; 95% CI = 0.09 to 0.39).

Conclusion

Based on this systematic review and meta-analysis, Ranibizumab was considerably safe as an adjuvant therapy of NVG to reduce IOP and increase BCVA, combined with other procedures such as trabeculectomy and panretinal photocoagulation. Further studies are still needed to determine the long-term effect of Ranibizumab in NVG patients.

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A Case of Delayed-Onset Bleb-Related Endophthalmitis

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Introduction

Bleb-related endophthalmitis (BRE) is one of the serious complications of glaucoma surgery. Onset of infection can be anytime from the first few weeks up to years later. BRE is an emergency condition that needs immediate and intensive treatment. This report illustrates a case of delayed-onset bleb-related endophthalmitis and the treatment.

Methods

This is a case report of a 50-year-old woman with a history of left eye re-trabeculectomy 17 years ago. She came to the hospital with pain, redness, and blurred vision in the left eye. We examined and found visual acuity was hand movement, mixed injection, superior, thin-avascular bleb, hazy cornea, hypopyon, and cell in the anterior chamber. Posterior segment was difficult to examine due to hazy cornea. We hospitalized and treated the patient with intravitreal injection of vancomycin and ceftazidime, pars plana vitrectomy (PPV), vitreous tap for culture and sensitivity test, irrigation aspiration of hypopyon, and vancomycin and ceftazidime eye drop hourly.

Result

The first day after PPV and intravitreal injection of antibiotics, the patient felt more comfortable, the pain was reduced. However, her vision had decreased to light perception, with still hazy cornea, but hypopyon was no longer exist, posterior segment obscured, and intraocular pressure (IOP) was normal with eyedrop and oral antiglaucoma. A week and a month after surgery, the patient felt better with no pain in her eye, the sign of inflammation and infection was decreased, fundoscopy became clearer with retina attached, and IOP was controlled with antiglaucoma eye drops. However, there was no improvement in visual acuity. Culture of vitreous tap grew no organism.

Conclusion

BRE is a potentially devastating complication of trabeculectomy. Visual outcome is still uncertain, usually poor, even if recommended treatment is performed immediately.

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Prospective single centre study comparing ocular surface conditions in glaucoma patients with existing corneal disorders switching from preserved prostaglandin analogues monotherapy to preservative free tafluprost

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Introduction

Glaucoma medications are often preserved with agents such as benzalkonium chloride (BAK), which commonly lead to ocular surface diseases (OSD). This study investigates the effect on tolerability and OSD when switching to a preservative-free (PF) prostaglandin (PG) analogue: tafluprost 0.0015%.

Methods

Prospective, single-centre, open label, non-randomized, observational study, to evaluate the ocular surface, subjective symptoms and change of mean IOP in glaucoma patients switching from preserved PG monotherapy to PF tafluprost. Patients with primary open angle glaucoma and ocular hypertension with a score of above 1 on the National Eye Institute (NEI) ocular surface staining scale were recruited and analysed at baseline (visit 0), 1 month (visit 1) and 3 months (visit 2).

Results

A total of 28 patients were analysed, using the parametric paired t-test. Wilcoxon signed rank test was applied when the assumptions for paired t-test were not fulfilled. There was a significant improvement in fluorescein staining score (NEI) with a mean reduction score of 1.96 (SD = 1.53), ($p < 0.0001$); and significant reduction in conjunctival hyperaemia ($p < 0.0001$ [Bulbar] and $p < 0.05$ [Palpebral]); from baseline to Visit 2. The OSD Index questionnaire also showed a mean reduction of 4.14 from baseline to visit 2 (SD = 8.20), ($p < 0.05$). The IOP was maintained with no significant change from baseline. There were no significant changes noted for TBUT as well. Three participants recorded reactions, in which itchiness was the commonest.

Conclusion

Switching patients to PF tafluprost 0.0015% showed significant improvements in OSD with minimal side effects, while the IOP was maintained with no significant change after switching.

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Efficacy of latanoprostene bunod 0.024% ophthalmic solution as a treatment option for open-angle glaucoma and ocular hypertension: a systematic review and meta-analysis

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Introduction

Latanoprostene bunod 0.024% has been approved by the US Food and Drug Administration (FDA) in 2017. This is a new treatment option for open-angle glaucoma and ocular hypertension. It treats glaucoma in two distinct ways. It works by increasing aqueous humor outflow through the uveoscleral pathway and by releasing nitric oxide to increase outflow through the trabecular meshwork and Schlemm's canal. The aim of this study was to assess the existing literature of latanoprostene bunod efficacy as a treatment option for open-angle glaucoma and ocular hypertension.

Methods

This systematic review was performed by searching on Pubmed, Embase, Cochrane Library Databases, Science Direct, and Google Schoolar using the following keywords: "latanoprostene bunod", "glaucoma" and "intraocular pressure". We included English-language published literature, human subject research, and randomized controlled trial studies. Outcome measures included intraocular pressure (IOP) reduction and adverse events of the medication.

Results

Seven studies evaluating a total of 2,154 individuals were included in this research. Latanoprostene bunod was statistically significant in reducing intraocular pressure ($P < 0.0001$). From fixed effect model analysis with little heterogeneity ($I^2 = 48\%$; $P = 0.07$), pooled risk ratio between latanoprostene bunod and control was 0.98 ($P < 0.0001$; 95% CI: 0.72-1.22). No statistically significant differences were found between the adverse effects in patients with latanoprostene bunod and those without.

Conclusion

Latanoprostene bunod was effective and safe in lowering intraocular pressure. It can be used as an alternative treatment option for glaucoma. However, further studies with larger sample sizes, better-defined groups, and comparative effectiveness research are required to obtain more conclusive results.

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Efficacy of netarsudil 0.02% ophthalmic solution in the treatment of open-angle glaucoma and ocular hypertension: a systematic review and meta-analysis

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Introduction

Netarsudil 0.02% is a new medication that has been approved by the US Food and Drug Administration (FDA) in 2017. This drug is used for the treatment of open-angle glaucoma and ocular hypertension. It works by increasing aqueous humor outflow through the trabecular meshwork pathway. The aim of this study was to assess the existing literature of netarsudil efficacy as a treatment for open-angle glaucoma and ocular hypertension.

Methods

A systematic review of the literature was conducted by searching on Pubmed, Embase, Cochrane Library Databases, Science Direct, and Google Schoolar using the following keywords: “netarsudil”, “glaucoma” and “intraocular pressure” from 2017 to 2020. We searched literature that compare netarsudil treatment with placebo or another glaucoma medication. Outcome measures included intraocular pressure reduction and adverse events of the treatment.

Results

Six studies evaluating a total of 2832 individuals were included in this systematic review. From random effect model analysis with little heterogeneity ($I^2 = 83\%$; $P < 0.00001$), pooled risk ratio between netarsudil and control was 0.93 ($P < 0.00001$; 95% CI: 0.72-1.18). No treatment-related serious adverse event was reported. The most frequent ocular adverse event was conjunctival hyperemia.

Conclusion

Netarsudil was safe and effective in reducing intraocular pressure. Therefore, netarsudil can be considered for glaucoma medication. However, further comparative effectiveness research is required to obtain more conclusive results.

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Variability in number of drops per multi-dose eyedrop bottles for glaucoma medications

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Introduction

Difficulty in instilling eye drops is a concern for it may cause a progression of blindness in glaucoma patients. Early depletion of eye drops before the next medication refill is a common issue faced by patients, resulting in poorer compliance to the therapy. We hypothesise the drop volume inconsistency is due to eye drop bottle-related mechanics during drop instillation.[1] To improve a generic prostaglandin analogue eye drop formulation, we examined the drop volume consistency of eye drop bottles from different manufacturers.

Methods

Ten eye drop bottles of different volumes were obtained from different manufacturers. The drop volume consistency was assessed by expelling 10 droplets from the bottles filled with 2.5mL water at 90° angle and the drop weight was measured. The relative standard deviation was calculated and cumulative weight of 10 drops was plotted. Similarly, drop consistency test was performed on the selected bottle filled with 2.5mL latanoprost 0.005%w/v solution, Latanost®. The volume (µL) of the droplet was determined from the drop weight (water: 1 g = 1 mL, Latanost®: 1.01 g = 1 mL).

Results

The results suggested a significant variability in the number of drops per bottle from different manufacturers. Bottle from manufacturer C demonstrated high drop consistency with low percentage standard deviation and near linear regression. Using bottle C, the drop volume of Latanost® was estimated at 25.30 ± 1.87 µL. A 2.5 mL latanoprost 0.005% w/v solution will yield approximately 99.36 ± 7.52 drops per bottle.

Conclusion

The design of the eye drop nozzle could determine the consistency of medication delivery significantly. Selecting the eye drop bottle with high consistency in drop delivery could help to reduce treatment cost by preventing early exhaustion and improving medical treatment compliance.

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Miscellaneous

Obstructive sleep apnea goes unnoticed

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Introduction

Obstructive sleep apnea (OSA) has been overlooked in patient with glaucoma. OSA increases cerebrovascular morbidity and inadvertently worsens glaucoma. We highlight an asymptomatic patient who had early diagnosis of normotensive glaucoma (NTG) and OSA with cerebrovascular lesion with the aid of macular layer segmentation.

Methods

Case report.

Results

A 67-year-old gentleman with underlying diabetes mellitus and hypertension came for eye assessment. He was asymptomatic and no family history of glaucoma. He was low myopic with 6/9 vision. Intraocular pressures (IOP) were 10mmHg bilaterally with open angle. His fundus showed high cup disc ratio, right 0.8 and left 0.9 with pink rim and generalized thinning especially at inferior and temporal. Left Humphrey visual field (HVF) consistent with optic disc and optical coherence tomography (OCT) retinal nerve fiber layer (RNFL) changes. Right eye showed normal HVF and OCT peripapillary RNFL however OCT detected early structural changes on macular RNFL and ganglion cell layer. These revealed bilateral asymmetry glaucomatous changes with low IOP as insignificant IOP fluctuations on 48 hours phasing. There was no nocturnal hypotension during admission. Therefore, proceed with polysomnography sleep study which reported severe OSA. Computed tomography brain showed old lacunar infarction. Considering the optic disc, OCT abnormalities and HVF glaucomatous changes, he was treated as bilateral NTG and severe OSA with lacunar infarct is the main risk factor.

Conclusion

OSA may associate with NTG. Sleep study is crucial for NTG patients. Asymmetry of posterior pole algorithm and thinning of inner macular layers could help in discrimination between healthy and early glaucoma. Treatment may reduce NTG progression and control systemic illness that associated with OSA.

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Central Retinal Vein Occlusion in Primary Angle Closure Glaucoma: A Case Report

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Introduction

Central retina vein occlusion (CRVO) is a multifactorial disease with glaucoma as one of the well-recognized ocular risk factors. Although rare, primary angle-closure glaucoma (PACG) should be borne in mind in patient with CRVO. This case report aims to describe the association between PACG and CRVO, and its management.

Methods

We reported a case of patient with PACG that had subsequent CRVO and macular edema, that treated with surgical and medical interventions. We performed visual acuity measurement, intraocular pressure (IOP) monitoring, gonioscopy, Humphrey visual field examination, optical coherence tomography (OCT) of the optic disc and macula, and OCT angiography.

Results

A 66-year-old presented with blurry vision on the right eye with history of high IOP. He was diagnosed with PACG of both eyes. Combined surgery, phacoemulsification and trabeculectomy with mitomycin C for the right eye and laser peripheral iridotomy for the left eye, was done to the patient. Intraocular pressure was maintained ever since. Unfortunately, postoperative fundus evaluation of the right eye revealed CRVO with macular edema. The patient got multiple injections of intravitreal bevacizumab, yet there were recurrences of macular edema.

Conclusion

In PACG, CRVO may result from high IOP and large cup-to-disc ratio that cause mechanical changes at the level of lamina cribrosa. Control of IOP in PACG is important to prevent this event, it can be achieved with surgery and laser interventions. As for the CRVO, multiple injection of intravitreal anti-VEGF with close monitoring is essential to halt the progression of macular edema and achieved a good anatomical and functional outcome.

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Glaucoma Community-based Augmented Review and Empowerment (G-CARE)

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Introduction

Glaucoma is a leading cause of irreversible blindness in Singapore. We propose a comprehensive Community and Home Eye Screening program with an added glaucoma screening component (G-CARE) to better detect glaucoma and offer earlier intervention to reduce direct medical cost.[1] This is achieved by upskilling nurses and optometrist to perform the eye screening. The aim is to create a cost-effective siting of eye care in the community.

Methods

The first level screenings are performed by nurses and second level screenings are performed by optometrists. Note: Details of Torchlight Eye Screening Test and Glaucoma Screening Questionnaire in poster/presentation.
The current screening components include:

	Tests for glaucoma screening	Equipment used
FiLCES by PHCT nurses	Torchlight Eye Screening Test – Shadow's Test	Torchlight
SeLECT by OVS optometrists	1. Intraocular Pressure (IOP) Test 2. External eye examination 3. Internal eye examination	1. I-care tonometer 2. Slit-lamp biomicroscope 3. Fundus camera

With upskilling training modules, the improved screening components include:

	Tests for glaucoma screening	Equipment used
FiLCES by PHCT nurses	1. Refined TEST – Shadow's Test 2. Intraocular Pressure (IOP) Test 3. Glaucoma Screening Questionnaire (GSQ)	1. Torchlight 2. I-care tonometer 3. Added to screening form
SeLECT by OVS optometrists	1. Intraocular Pressure (IOP) Test 2. External eye examination 3. Internal eye examination 4. Mydriatic & Anesthetic drops to improve eye examinations	1. I-care tonometer 2. Slit-lamp biomicroscope 3. Fundus camera 4. Use of the eye drops (pending MOH approval)

Results

By improving glaucoma screening components, we increased the detection of glaucoma-associated abnormalities from 3.8% to 8.0%. The second level correlation data assessment is currently in progress. Projected cost-savings range from SGD$10.00--39.00/patient. The hospital achieves manpower cost-savings of SGD$75,000/year with ophthalmologist-extenders. Routine clinical skills assessment of nurses and optometrists ensures consistent clinical correlation. The correlation coefficient for the shadow's test was 0.98 and iCare was 0.99.

Conclusion

G-CARE provides a cost-effective, appropriate siting of eye care to provide glaucoma screening.

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A case of malignant glaucoma after uneventful phacoemulsification: case report and literature review

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Introduction

To report a case of malignant glaucoma after uneventful cataract operation.

Methods

Case report and literature review.

Results

A 61-year-old lady presented in our emergent department due to elevated intraocular pressure (IOP). The patient received uneventful cataract surgery in left eye 2 weeks ago. Post-operative vision improved initially but deteriorated again 3 days after the operation. At examination, visual acuity was hand motion and IOP was around 50mmHg. Left eye showed loss of anterior chamber (AC) with severe corneal edema. The patient was treated with 20% mannitol infusion, topical Combigan, and topical Azopt. Intraocular pressure decreased to around 25 mmHg but climbed up to 50 mmHg in 2 hours. The patient received 25-gauge pars plana vitrectomy with limited infusion, capsulotomy, and reformation of anterior chamber. After the operation, AC was reformed and IOP was kept under 20 mmHg without any medications.

Conclusion

Aqueous misdirection refractory to medical treatment can be managed with minimal pars plana vitrectomy with controlled infusion effectively and timely.

Binocular recurrent intraocular pressure surge during hemodialysis in a patient with monocular neovascular glaucoma --- a case report and literature review

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Introduction

To report a case of monocular neovascular glaucoma (NVG) with bilateral intraocular pressure surge during hemodialysis.

Methods

Case report and literature review.

Results

A 58-year-old man with previous treated proliferative diabetic retinopathy (PDR) presented to our clinic due to undurable episodes of severe headache with ocular pain in left eye during hemodialysis for several months. The patient had diabetes mellitus, end-stage renal disease under hemodialysis, three-vessel disease with bypass under two anti-coagulants. He had received pan retinal photocoagulation (PRP) and cataract surgery years ago. Vitreous hemorrhage (VH) and microhyphema was noticed at examination. Microhyphema-related IOP elevation was suspected initially. However, spontaneous hyphema developed during anterior chamber tapping. Anterior chamber irrigation, pars plana vitrectomy (PPV), supplementary PRP, and intravitreal injection of Bevacizumab were arranged urgently, and IOP decreased temporarily. However, asymptomatic IOP elevation upto 40 mmHg was also noticed in the fellow eye, where no NV was noticed. Intraocular pressure in the fellow eye returned to 10 to 20 after administration of mannitol during hemodialysis and decrease of hemofiltration rate. However uncontrollable IOP and NV developed in left eye with IOP climbed up to more than 60 mmHg 2 months later. The patient received cyclocryotherapy for IOP control due to residual poor vision.

Conclusion

IOP surge during hemodialysis is a very thorny condition in NVG. IOP elevation should be suspected and evaluated if patient complained about headache or

ocular pain. Concomitant hyperosmotic agents and adjustment of filtration rate might improve IOP control in non-NVG eyes.

Determinants of postdilation intraocular pressure in an elderly Chinese population with high prevalence of occludable angles

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Introduction

This study aimed to identify acute angle closure (AAC) risk following pharmacologic mydriasis and the factors affecting post-mydriatic intraocular pressure (IOP) in a population with a high prevalence of angle closure disease.

Methods

In total, 460 individuals aged ≥72 years were enrolled in this cross-sectional community-based screening program (The ShihPai Eye Study). IOP was measured at baseline and 1 hour after mydriasis. Individuals with a post-mydriatic IOP spike of > 6 mmHg received indentation gonioscopy and IOP-lowering medication. Linear regression analysis was used to identify ocular parameters associated with post-mydriatic IOP elevation.

Results

The mean age of the participants was 77.8 ± 4.1 years, and 65.4% of them were men. In total, 21 eyes of 16 participants (3.48%) had post-mydriatic IOP spikes (range: 6–13.7 mmHg); among them, 15 eyes had an IOP of > 21 mmHg. None of the participants developed AAC. All eyes with IOP spikes were phakic, except for one with pseudophakic angle closure. Analysis of 381 participants with at least one phakic eye revealed that higher post-mydriatic IOP and IOP changes were associated with narrower angle grading, more extensive peripheral anterior synechiae, shallower central anterior chamber, and thicker lens. According to multiple linear regression analysis, post-mydriatic IOP was independently associated with baseline IOP and factors suggestive of crowded anterior chamber based on gonioscopic findings and central or peripheral anterior chamber depth evaluation in conjunction with lens thickness.

Conclusion

Post-mydriatic IOP should be measured in phakic eyes with a crowded anterior chamber. Post-mydriatic IOP spikes can be effectively blunted with intervention to prevent AAC.

Lens-Induced Glaucoma in a Tertiary Centre in Southern of Malaysia

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Introduction

Lens-induced glaucoma (LIG) is common in developing countries due to the delay in cataract removal. In Malaysia, untreated cataract is one of the major causes of blindness and low vision accounting for 58.6%.[1]

Methods

The aim of this study is to retrospectively determine the clinical presentation, management and outcome of LIG in Hospital Sultanah Aminah from January 2015 to January 2020.

Results

Eighty-two patients (83 eyes) with LIG were included. The mean age at presentation was 63.8 years and mostly were men (45 patients, 54.9%). Phacomorphic glaucoma (46 eyes, 55.4%) was the main cause of LIG, followed by phacolytic glaucoma (20 eyes, 24.1%) and subluxated crystalline lens (17 eyes, 20.5%). Majority of patients presented with visual acuity of hand movement or worse (63 eyes, 75.9%) with a mean intraocular pressure (IOP) of 40.9mmHg. 55 eyes (66.3%) underwent phacoemulsification, 15 eyes (18.1%) underwent extra-capsular cataract extraction, 10 eyes (12.0%) underwent intracapsular cataract extraction and 3 eyes (3.6%) underwent small incision cataract surgery. 6 eyes (7.2%) were left aphakic. Vision improved to 3/60 or better as seen in 65 eyes (78.3%). IOP reduced with a mean value of 16.3 mmHg at 6 months post-operation. There was a statistically significant difference between IOP at presentation and IOP at 6 months post operation ($P < 0.001$). 53 eyes (63.9%) were successfully able to maintain target IOP of less than 17 mmHg postoperatively without antiglaucoma agents till last follow up.

Conclusion

The main cause of LIG in our study was phacomorphic glaucoma resulting from delayed treatment of senile cataract. Timely detection by primary physician and

public awareness is essential for early cataract intervention. Cataract surgery proved to be effective in lowering IOP and visual recovery in patient with LIG.

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Long-term effect of chair-based stretching exercise on the intraocular pressure and quality of life in primary open-angle glaucoma patients

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Introduction

Exercise is found to modify the prognosis of many chronic diseases. An exercise regime that is safe for visual field impaired with minimal effect on intraocular pressure (IOP) is limited. Chair-based stretching exercise (CBSE) has the potential as an ideal exercise regime for such condition. Our objective was to evaluate the long-term effect of CBSE on the IOP and quality of life (QoL) among primary open-angle glaucoma (POAG) patients.

Methods

A randomised controlled trial was conducted in Hospital Universiti Sains Malaysia, Malaysia between August 2017 and January 2019. A total of 60 POAG patients who were ≥ 50 years old with good compliance to IOP lowering agents were recruited. They were randomised into two groups: group A with regular CBSE (30) and group B without CBSE (30). IOP monitoring was conducted every three months for a year. QoL evaluation using Bahasa Malaysia version of Glau-QoL© 36 questionnaire was conducted at baseline and after a year of follow-up.

Results

There was no significant difference in age ($p = 0.970$) and sex ($p = 0.184$) between the groups. Using repeated measure ANOVA, there was no statistically significant difference of IOP between group A and B ($p = 0.958$). However, there was reduction trend of IOP in group A. There was also no significant difference in total QoL score between the two groups, but a significant improvement in anxiety score (domain of QoL) after a year of regular exercise in group A was observed ($p = 0.007$).

Conclusion

CBSE reduces anxiety in POAG patients but without any significant effect on IOP.

POAG patients should be encouraged to adhere to a certain type of exercise to remain physically active.

The Impact of Glaucoma Severity on Quality of Life Measured by the GQL-15: a meta-analysis

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Introduction

Glaucoma is the second leading cause of blindness worldwide. This loss of vision could give adverse effects on several aspects, including quality of life (QoL). 15-items Glaucoma Quality of Life questionnaire (GQL-15) is a disease-specific questionnaire to measure QoL in glaucoma patients. This study aimed to undertake a systematic literature review to examine the QoL implications of glaucoma measured by GQL-15.

Methods

A comprehensive literature search was conducted using the online PubMed database to identify relevant articles published before December 31, 2019, to identify QoL on patients with glaucoma. Pertinent studies were then identified. Studies included were those written in English and using the GQL-15 questionnaire.

Results

Eight studies were found comprised of 889 patients with glaucoma and 405 patients without glaucoma. There is a statistically significant difference in QoL between patients with and without glaucoma (standard mean difference [SMD] = 1.01, 95% confidence interval [CI]: 0.85-1.17, $P < 0.00001$). GQL-15 scores also showed significantly lower QoL with the increase of glaucoma severity. Moreover, each subscale of the questionnaire was found significantly worse in patients with glaucoma compared to those without, with central and near vision affected the most.

Conclusion

GQL-15 helps us understand the glaucoma patients' perception of QoL. While an increase in glaucoma severity leads to poorer glaucoma-related QoL, a successful treatment also lead to a better QoL. More research should be conducted regarding glaucoma QoL, especially to ensure a more patient-centered intervention.

Tables, figures, and illustrations

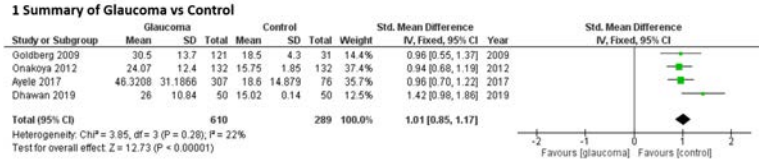

Figure 1. QoL between glaucoma and non-glaucoma patients

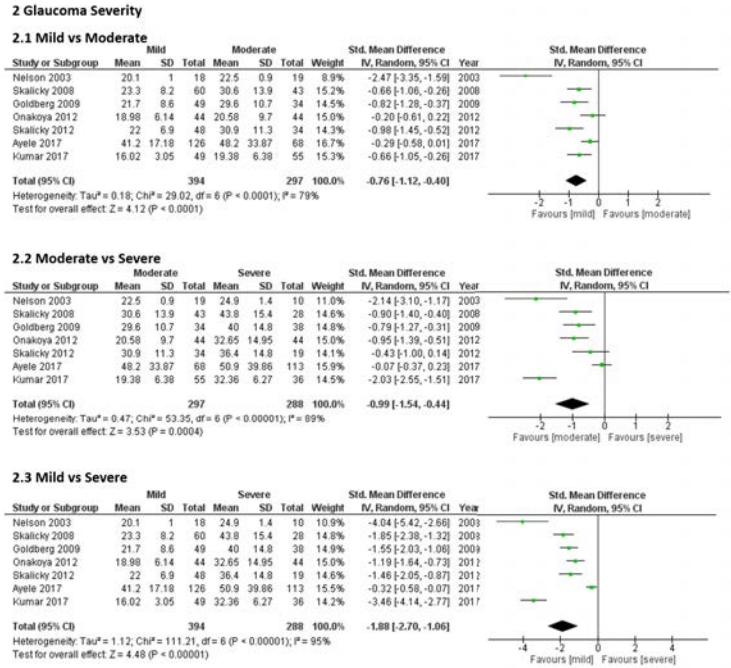

Figure 2. QoL between each glaucoma severity

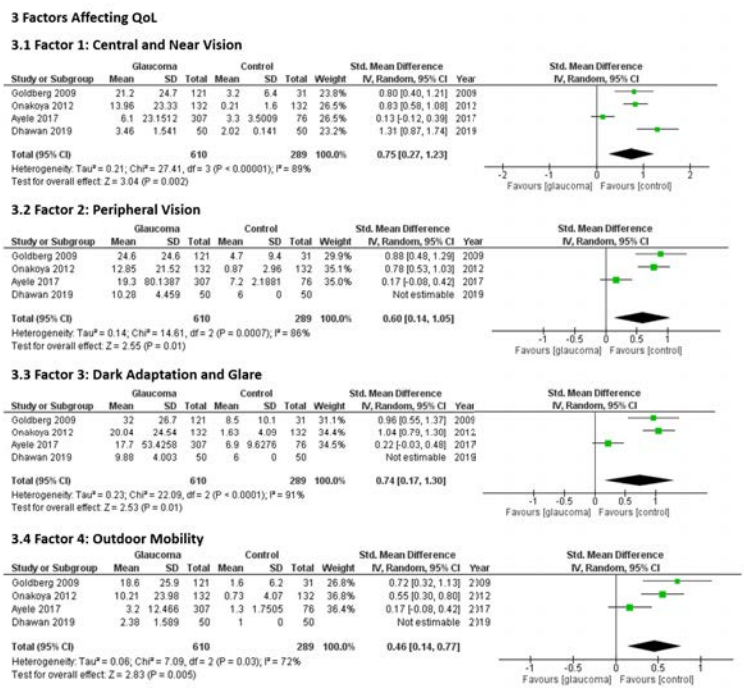

Figure 3. Factors assessed in GQL-15 between glaucoma and non-glaucoma patients

Co-existence of primary congenital glaucoma and juvenile-onset open-angle glaucoma in a single Filipino family: A case series

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Introduction

Childhood glaucoma is divided into primary congenital glaucoma (PCG), which occurs from birth to early childhood, and juvenile primary open-angle glaucoma (JOAG), diagnosed between 4 years to early adulthood. Their genetic basis and clinical presentation differ with only few reports on their co-existence, mostly occurring in different generations. The aim of this report is to present two different childhood glaucomas in one family.

Methods

A two-generation Filipino family wherein two offspring diagnosed with childhood glaucoma from unaffected parents was recruited. Sibling A was diagnosed to have JOAG at 9 years of age while the sibling B was diagnosed with PCG at birth. Affected and unaffected family members underwent a comprehensive eye exam including visual acuity assessment, slit-lamp examination, intraocular pressure (IOP) measurement, dilated fundus examination, and gonioscopy. Family history of eye disease was also obtained from both parents. The affected family members were screened for mutations in genes known to cause early-onset glaucoma using whole exome sequencing.

Results

Case 1 (sibling A) is a 9-year-old female with a history of cognitive developmental delay. Upon examination, the IOP was 32 mmHg on both eyes and total cupping on the right eye and a 0.9 cup-to-disc ratio on the left eye. She was diagnosed with JOAG and underwent trabeculectomy. Eventually, glaucoma drainage device insertion was done after which the IOP was maintained between 8 mmHg to 12 mmHg. Case 2 (sibling B), on the other hand, is a female with whitish opacity on both eyes noted at 6 months of age. The IOP was 26 and 27 mmHg on the right and left eye respectively, with enlarged corneal diameter, presence of Haab striae, and high cup to disc ratio in both eyes. She was diagnosed with PCG and underwent trabeculotomy with trabeculectomy on both eyes and eventually glaucoma

drainage device implantation. The target IOP was reached after cyclophotocoagulation on both eyes.

Conclusion

This is the first report of a Filipino family with co-existence of JOAG and PCG in one generation. Clinical data suggests that sibling A had a long-standing disease prior to initial ophthalmologic examination, and this underscores the importance of screening other family members. Information gathered from genetic testing may be used to counsel family members about recurrence risk in future offspring.

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Tables, figures, and illustrations

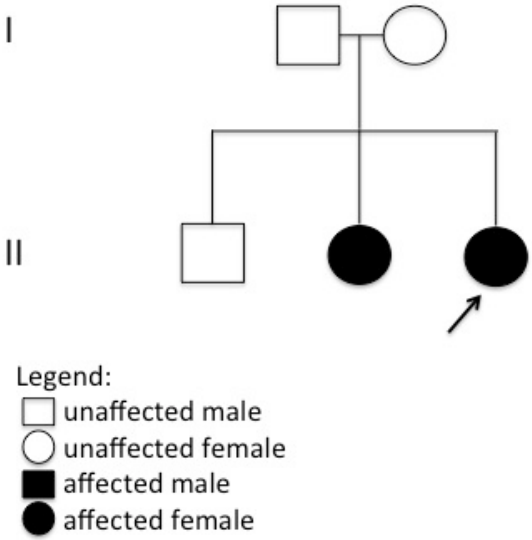

Figure 1. Pedigree of a Filipino family with PCG and JOAG.

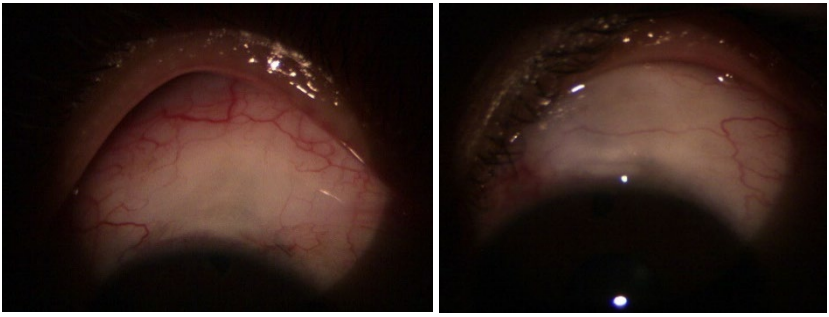

Figure 2. Sibling A, post trabeculotomy with trabeculectomy, OU.

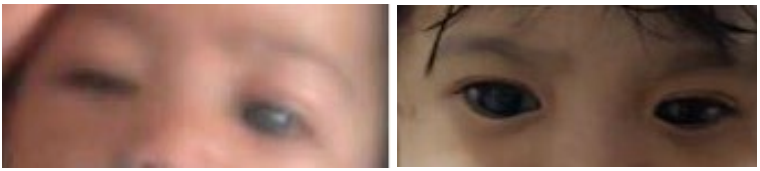

Figure 3. Sibling B, at 6 months and 3 years of age

"Imo" system stimulus sizes for measuring the central visual field in preperimetric glaucoma

Taimu Sato[1], Mai Sugiyama[1], Kazuko Omodaka[1], Mio Niitsuma[1], Toru Nakazawa[1]
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Introduction
Visual field (VF) examinations commonly use stimulus size III. However, the central ten degrees has many retinal ganglion cells, and this functional redundancy can affect measurements of the central VF. Here, we used a head-mounted perimetric device "Imo" to determine whether smaller stimulus sizes could detect central VF abnormalities in patients with preperimetric glaucoma (PPG).

Methods
In 24 eyes of 15 normal controls and 22 eyes of 17 PPG patients, we used the Imo 24 plus (1-2) test sequence with stimulus sizes Ⅱ or Ⅲ. We measured pattern deviation (PD) within the central 24 degrees and 10 degrees, divided into overall, upper, and lower areas, and within the Garway-Heath map. We compared PD measurements made with each stimulus size and used the area under the receiver operating characteristics curve (AUC) to determine the power of each stimulus size to detect PPG.

Results
Only stimulus size Ⅱ measurements were significantly different between groups within the central 24 and 10 degrees, (-1.80 ± 0.38, -2.36 ± 0.71, $p < 0.05$). Upper-VF measurements within the central 24 and 10 degrees significantly differed between groups for both sizes Ⅱ and Ⅲ ($p < 0.05$). Garway-Heath measurements in the upper nasal sector were significantly different between groups for both sizes Ⅱ and Ⅲ ($p < 0.001$). The AUC for the overall, upper, and lower VF areas was higher for size Ⅱ (0.75, 0.78, 0.61, respectively) than Ⅲ (0.71, 0.74, 0.55, respectively).

Conclusion
The Imo system with index size Ⅱ could detect central VF abnormalities in PPG with greater power than with size Ⅲ.

Successful topical Ganciclovir Management of Medically Uncontrolled Failed Trabeculectomy in Undetected Cytomegalovirus Endotheliitis

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Introduction

Cytomegalovirus can cause anterior uveitis with ocular hypertension. Basis on the therapy of ganciclovir, intraocular pressure (IOP) usually can be controlled. We reported a case of undetected CMV endotheliitis with successful topical ganciclovir management after failed trabeculectomy.

Methods

Case report.

Results

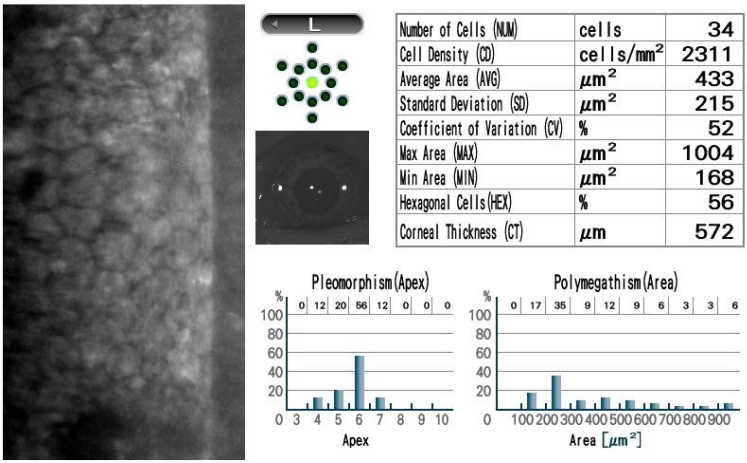
A 56-year-old man had recurrent anterior uveitis with high IOP in his left eye for the last 5 years. He was referred to our hospital because of uncontrolled IOP after failed trabeculectomy. Five months earlier, uneventful cataract surgery was performed in his left eye, but IOP started to be out of control after cataract surgery. Then trabeculectomy was performed four months later but in vain. At his first visit, the IOP in his left eye was 38 mmHg with topical timolol, brinzolamide, 0.1% fluorometholone, and oral acetazolamide three times daily. The main features in his left eye were cornea edema with multiple small mutton white keratic precipitates (KPs) and 2+ flare in aqueous. A flat bleb with congested conjunctiva was noted. Specular microscopy showed the reduced number of endothelial cells 2311/mm².The real time PCR (RT-PCR) for CMV-DNA in aqueous sample was positive. Under the impression of CMV anterior uveitis, the patient was treated with topical 0.2% ganciclovir four times daily, 1% prednisolone acetate four times daily, brinzolamide and brimonidine twice daily. The IOP reduced to mmHg and KPs decreased as well 7 days later. Further surgical intervention for controlling IOP was postponed. There was no relapsed anterior uveitis in these 2 years.

Conclusion

Patients have anterior iritis with relapsed attacks of elevated IOP should be considered for CMV infection. We reported successful topical ganciclovir management of failed trabeculectomy in a case of undetected CMV uveitis. Early

detection of CMV infection and immediate antiviral treatment could control IOP well, postpone surgery and prevent vision loss.

Tables, figures, and illustrations



Number of Cells (NUM)	cells	34
Cell Density (CD)	cells/mm^2	2311
Average Area (AVG)	μm^2	433
Standard Deviation (SD)	μm^2	215
Coefficient of Variation (CV)	%	52
Max Area (MAX)	μm^2	1004
Min Area (MIN)	μm^2	168
Hexagonal Cells(HEX)	%	56
Corneal Thickness (CT)	μm	572

Cogan-Reese syndrome: a case report of a 57-year-old female with Cogan-Reese syndrome

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Introduction

Iridocorneal endothelial syndrome is characterized by a unilateral abnormal proliferation of the corneal endothelium that can lead to varying degrees of corneal edema, iris atrophy and secondary angle closure glaucoma. Cogan-Reese syndrome is one of the three clinical variants of ICE syndrome along with Chandler syndrome and Essential Iris Atrophy. The incidence of Cogan-Reese syndome is unknown and is usually sporadic in presentation. No consistent association to other ocular or systemic disease has been found and familial cases have been very rare. It is more common in females between the 2nd and 5th decade. The etiology of Cogan-Reese syndrome is not well understood. However, it has been theorized that an underlying viral infection with herpes simplex or Epstein-Barr virus incites inflammation at the level of the corneal endothelium resulting in its abnormal proliferation and migration onto the trabecular meshwork and peripheral iris resulting in peripheral anterior synechiae and characteristic iris changes. Secondary glaucoma, corneal edema and decompensation are the main sight threatening complications.

Methods

Case report.

Results

We present a case of a 57-year-old female who presented with gradual blurring of vision on the left eye. On examination of the left eye, BCVA was 20/80. A “beaten metal” appearance of the posterior corneal surface was seen as well as pigment deposits on the endothelium (Fig. 1-A). Clusters of hyperpigmented iris nodules overlying the stroma with matted appearance; correctopia and ectropion uvea was also noted as well as lens opacity NO5C5 (fig. 1-B). Intraocular pressure was 13 mmHg. Gonioscopy showed high peripheral anterior synechiae of less than 180 degrees (fig. 1-C). Fundus showed cup disc ration of 0.2. The right eye was within normal limits. Cogan-Reese syndrome was diagnosed clinically. Optic nerve OCT and visual field tests were within normal limits. Central corneal thickness was at

566 um. Specular microscopy showed cell density of 1468, polymegathism (CV 42) and pleomorphism (HEX 31). Characteristic ICE cells with dark areas surrounded by a white border were seen (fig. 2-B). The patient underwent phacoemulsification with posterior chamber intraocular lens implantation. The surgery was unremarkable and the visual acuity was 20/40 on the first postoperative day. Corneal edema was noted and was treated with NaCl eyedrops. Postoperative specular microscopy showed a decrease in cell density of 1076, polymegathism (CV 124) and pleomorphism (17). Central corneal thickness was at 610 um consistent with corneal edema. Final visual acuity after one month was 20/20 with decreased corneal edema. Patient was advised close serial monitoring for corneal decompensation, development of secondary glaucoma and ICE membrane migration on the anterior capsule edge and intraocular lens surface.

Conclusion

The diagnosis of Cogan-Reese syndrome was based on the presence of unilateral characteristic iris changes, presence of anterior synechiae, corneal edema and identification of abnormal corneal endothelium biomicroscopically and with the use of specular microscopy which showed pathognomonic ICE cells. Patients with Cogan-Reese syndrome usually present with unilateral glaucoma or corneal decompensation, which are late complications of the disease. Interestingly, the patient was diagnosed early without having said complications. Treatment for Cogan-Reese syndrome includes management of corneal decompensation and control of glaucoma. The prevalence of glaucoma in eyes with ICE syndrome was reported to range from 46% to 82% and was notably higher in Cogan-Reese syndrome; hence, monitoring is essential in patients diagnosed with Cogan-Reese syndrome because of the progressive sight-threatening complications associated with the disease.

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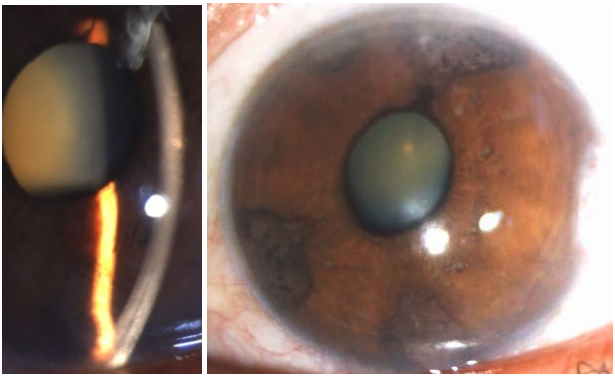

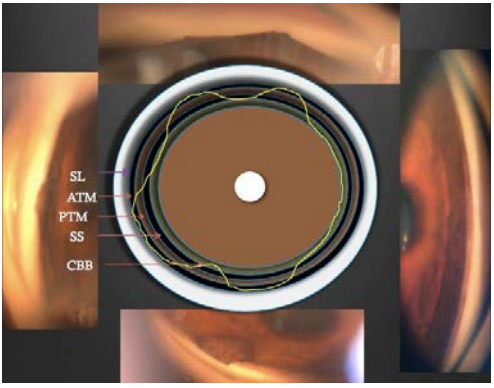

Figure 1. (A) Anterior segment photo of left eye showing pigment deposits and "beaten metal" appearance of the corneal endothelium. (B) Clusters of hyperpigmented iris nodules overlying the stroma with matted appearance, correctopia and ectropion uvea. (C) Gonioscopy of left eye showing multiple high peripheral anterior synechiae.

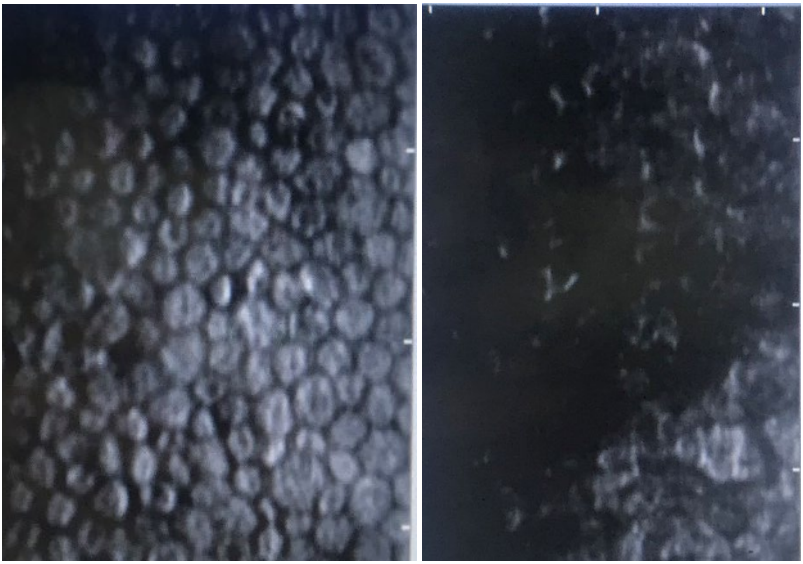

Figure 2. (A) Specular microscopy of the right eye showing normal endothelial cells. (B) Specular microscopy of the left eye showing abnormal endothelial cells with large spaces between cells. The colors of the cells are reversed with black surrounded by a white border, which is characteristic of "ICE cells".

Sex difference of axial elongation rate and ocular biometry in junior high school students

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[1]Ophthalmology, Kagoshima University Hospital, Japan

Introduction

Myopia is a risk factor of open-angle glaucoma. Therefore, it is important to understand the myopic changes in children. The purpose of this study was to see sex difference of relationship between ocular biometry and axial elongation or its rate in junior high school students.

Methods

A prospective cohort study (UMIN000015239) comprised 146 right eyes of junior high school students. All participants underwent optical axial length, anterior chamber depth and lens thickness measurement for three years (13 to 15 years). Axial elongation was calculated by 3rd year result minus 1st year result. Growth rate change was calculated by axial elongation of second half period minus that of first half period. Spearman's correlation was used to investigate the correlation between ocular 1st year biometry and axial elongation or growth rate change.

Results

Seventy-three boys and 73 girls were analyzed. In boys, the eyes with larger axial elongation tended to have longer axial length and thinner lens thickness at 1st year. In girls, the eyes with larger axial elongation tended to have longer axial length and deeper anterior chamber depth at 1st year ($|r| = 0.24$ to 0.37). In boys and girls, the eyes with larger growth rate change tended to have shorter axial length at 1st year ($|r| = 0.40$ to 0.44).

Conclusion

In boys and girls, axial elongation tend to increase in the eyes with myopic ocular biometry at 1st year, but the axial elongation rate tended to accelerate in the eyes with hyperopic ocular biometry at 1st year in junior high school students. This result suggests that pupillary block force may accelerate the axial elongation.

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The objectives of Asian Journal of Ophthalmology are as follows:

- To provide a platform for the publication of information with a focus on Ophthalmology in Asia.
- To disseminate information that will improve the care of patients with all types of ophthalmological disorders, with a special focus on glaucoma.
- To increase the understanding of such disorders through reporting of educational activities.
- To publish the results of research programmes to expand knowledge about the causes, prevention, and treatment of ophthalmological disorders.
- To work closely with Asian and international researchers to achieve these aims.
- To provide a forum for young and relatively inexperienced researchers to present their research results as Original Articles via an international platform.
- To maintain and promote relationships with any organization with similar goals.

Although the focus of Asian Journal of Ophthalmology mainly was on glaucoma with close ties to the South-East Asian Glaucoma Interest Group (SEAGIG) in the past, the journal now focuses on the entire spectrum of Ophthalmology.

The Asian Journal of Ophthalmology and Kugler Publications have started to collaborate since mid 2012 on the publication of the journal. A new website has been launched (www.asianjo.com), which facilitates all aspects of the peer-review and publication process, from manuscript submission to publication.

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