

# ABSTRACT BOOK



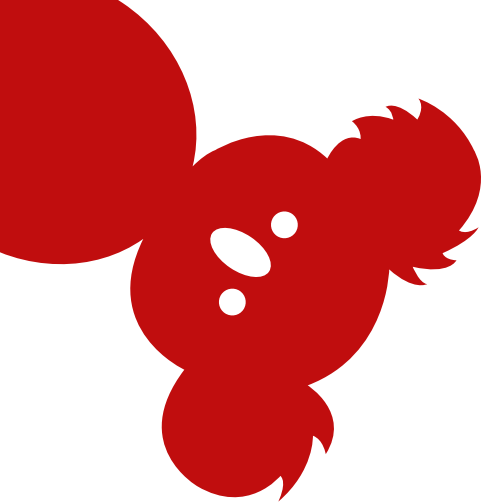
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**8<sup>th</sup> WORLD  
GLAUCOMA CONGRESS**  
MARCH 27 – 30, 2019 **MELBOURNE**



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# 8<sup>th</sup> WORLD GLAUCOMA CONGRESS MARCH 27 – 30, 2019 MELBOURNE

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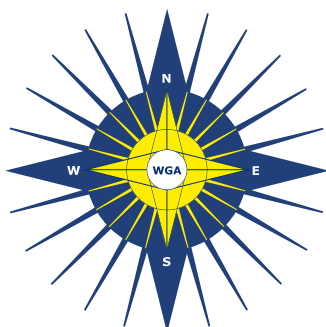
# TABLE OF CONTENTS

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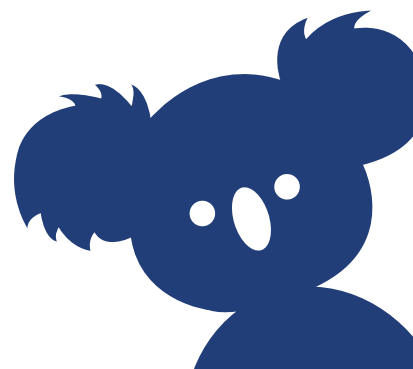
<b>Grand Rounds</b>	<b>1</b>
<b>Film Festival</b>	<b>18</b>
<b>Rapid Fire</b>	<b>49</b>
<b>Poster Abstracts</b>	<b>78</b>
• Epidemiology, Quality of Life and Health Economics	79
• Genetics, Genomics and Biomarkers	141
• IOP Physiology and Pathophysiology	164
• Laboratory Sciences	221
• Medical Treatment and Non-Incisional Surgery	256
• Other	341
• Structural and Functional Testing	424
• Surgery & Wound Healing	575
<b>Index</b>	<b>820</b>

**This is a searchable PDF.**

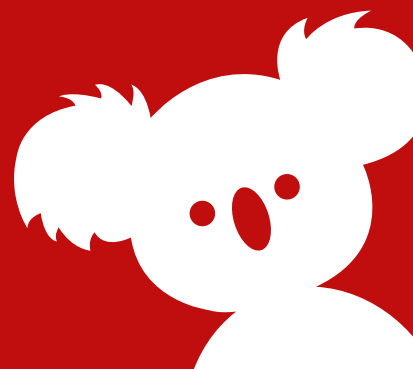
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# GRAND ROUNDS



## PL-S-1 BILATERAL CYSTOID MACULAR EDEMA FOLLOWING SLT BOTH EYES

Dr. Pankaj Bendale, India

One PACG patient underwent cataract surgery both eyes. Patient was still in need of ONE Antiglaucoma medication to control IOP in target range of 18 in both eyes.

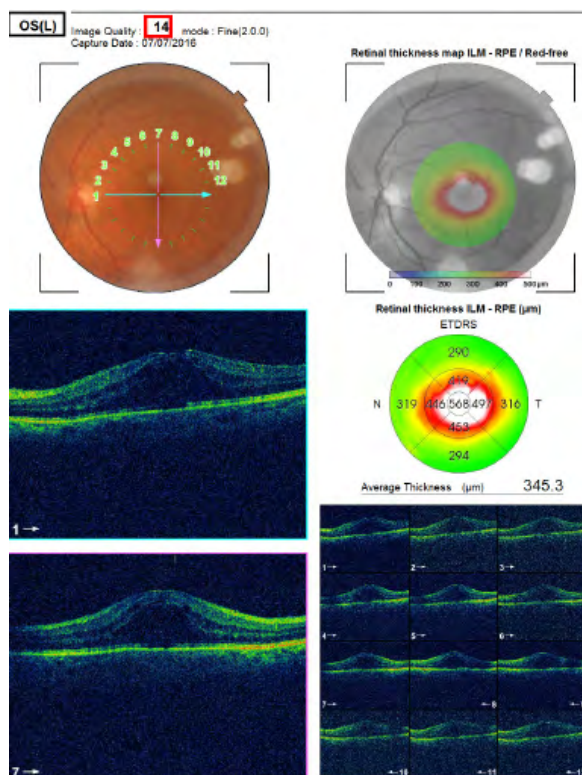
Three months post operative period, he was offered SLT both eyes. He underwent SLT 360 degree with 0.8 mJ energy & 95/98 shots in both eyes.

Two weeks later he came with good controlled IOP with diminution of vision and was found have CME both eyes.

Patient was advised & underwent Inj lucentis both eyes to which he responded very well with total resolution of CME after two inj of lucentis at one month interval in both eyes.

This case highlights issues about safety of SLT in early post operative period, cumulative exposure of energy during SLT & inadvertent Uveal energy exposure resulting in inflammatory CME at least in predisposed patient.

OCT images showing CME LEFT EYE.



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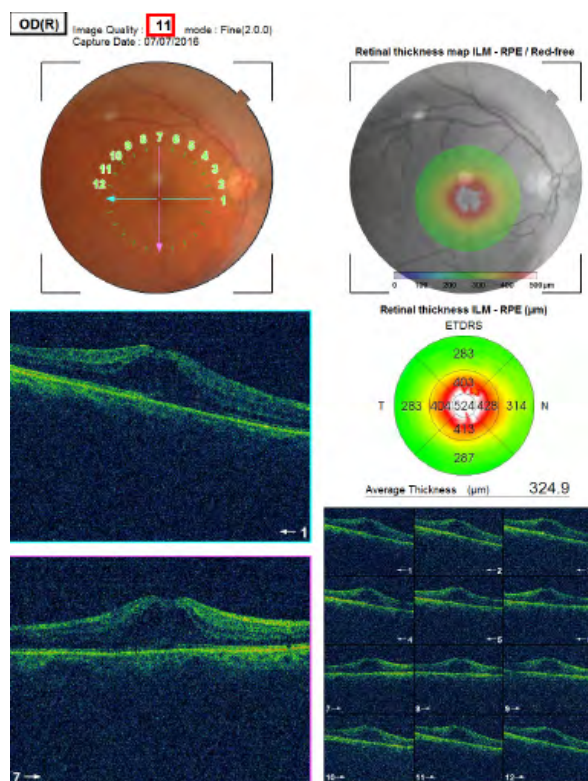
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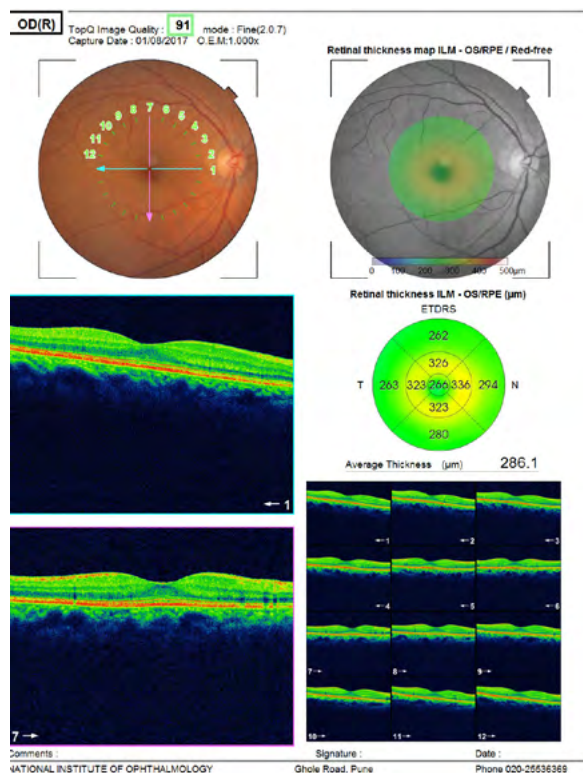
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## OCT Image showing CME Right eye



## OCT after two inj lucentis showing resolution of CME in Right eye



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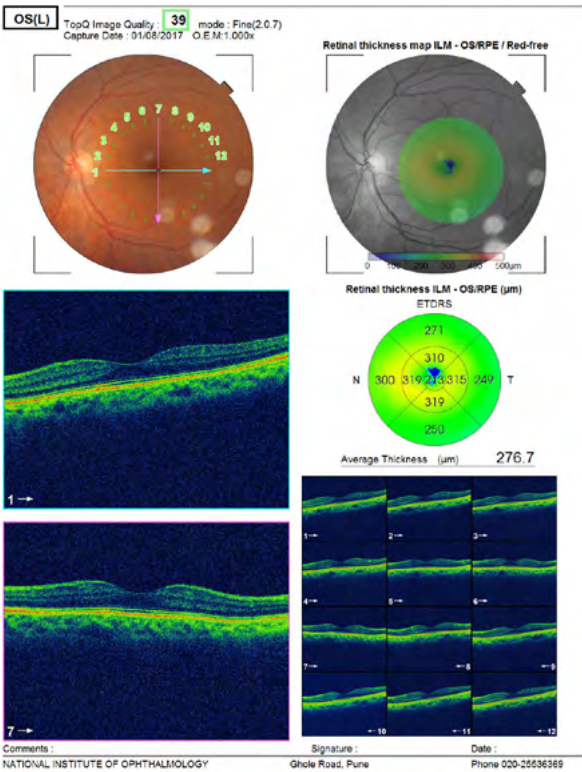
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OCT after two inj lucentis showing resolution of CME in Left eye



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**PL-S-2****'A STICKY SITUATION' - VITREOUS OCCLUSION OF TUBE OF A GLAUCOMA DRAINAGE IMPLANT**

Cheng M, Hughes L, Agarwal PK

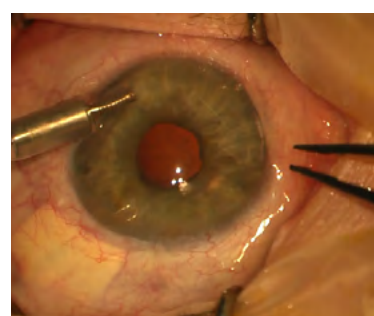
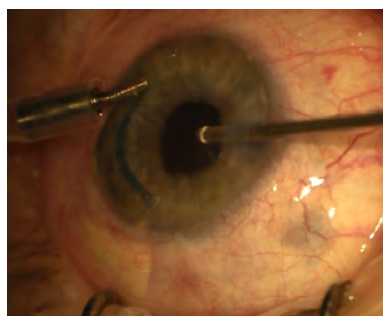
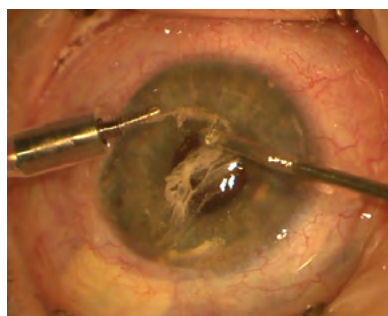
*Princess Alexandra Eye Pavilion, Edinburgh, United Kingdom***Case**

An aphakic 36-year old Caucasian female with juvenile idiopathic arthritis, chronic uveitis and secondary glaucoma, underwent bilateral 350-mm<sup>2</sup> Baerveldt glaucoma implantation with tube insertion into the anterior chamber (AC) in 2010. She presented 7 years later with painless reduction in vision in the left eye with best-corrected visual acuity (BCVA) from 6/6 to 6/18, a raised intraocular pressure (IOP) of 36mmHg and pregnant at 34 weeks' gestation.

The left AC was deep, cornea clear and the pupil peaked from vitreous prolapse anteriorly. The vitreous wick was drawn into and occluding the tube tip causing a shallow bleb. The optic disc was pale and cupped with a cup-disc ratio of 0.9, fundoscopy was normal with no retinal breaks or vitritis. There was no history of trauma or indication of labour.

**Method**

Medical treatment was limited due to pregnancy and so surgical management was indicated in this case. An AC maintainer was inserted. Anterior vitrectomy was performed following staining of the vitreous with intra-cameral triamcinolone. The vitreous plug now stained with triamcinolone, was removed from the tube lumen using end grasping forceps ab-interno. Trypan blue ophthalmic solution via a Rycroft cannula was flushed up the tube lumen ab-interno to assess flow through to the plate. This was repeated to ensure presence of reverse flow of trypan blue back into the AC, and complete patency of the tube lumen.

**Result**

Day 1 post operative IOP was 8mmHg without intraocular pressure lowering medication. The patient had a deep AC, round pupil, no vitreous occlusion of the tube tip and a good bleb. The IOP remained stable at 10mmHg at 2 weeks and 6 weeks post operatively whilst on reducing frequency topical steroids alone. She had an uneventful delivery of the baby.

**Conclusion**

Vitreous incarceration within the tube of a glaucoma drainage device can cause device failure, severely raised IOP and subsequent rapid progression of glaucoma with loss of vision. In addition, vitreous traction can lead to secondary retinal detachment. Occlusion can happen with tube placement in the AC, ciliary sulcus or pars plana. In this case, there was spontaneous occlusion several years later from the primary surgery with no identifiable cause. This was also during the third trimester of pregnancy when we expect intraocular pressure to decrease.

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Other management options include Nd:YAG vitreolysis or as a last resort, cyclodiode laser in patients with no remaining visual function. The combined procedure of a full pars plana vitrectomy, or at least an anterior vitrectomy at the time of glaucoma drainage device implantation, may benefit patients with aphakic glaucoma. However, the benefits need to outweigh the associated risk of posterior segment complications.

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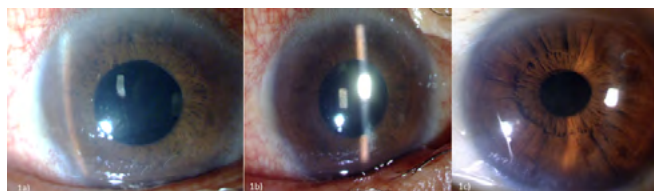
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**PL-S-3****UNUSUAL CASE OF PUPILLARY BLOCK SIXTEEN YEARS AFTER PHACOEMULSIFICATION: A DIAGNOSTIC CHALLENGE!**

Natasha Gautam Seth\*, Faisal Thattaruthody, Srishti Raj, Sushmita Kaushik, Surinder Singh Pandav  
*Advanced Eye Centre, Postgraduate Institute of Medical Education and Research Chandigarh, India*

**Grand Round**

A 75 year old female presented with sudden onset painful diminution of vision, redness and watering in right eye for 5 days. The patient underwent right and left eye uncomplicated cataract surgery 16 years and 8 years back respectively followed by good postoperative visual gain. There was no history of ocular trauma/drug use/ systemic illness or any similar episodes in the past. Patient was referred to our centre for raised intraocular pressure (IOP); the IOP recorded outside was 42 mmHg, for which she was started on maximum oral and topical antiglaucoma medications.

**Examination**

Her best corrected visual acuity (BCVA) in R/E was Snellen equivalent 6/60, with IOP of 18 mmHg on maximum antiglaucoma medication. There was shallow anterior chamber both centrally and peripherally with iridocorneal touch (figure 1a and 1b). The IOL appeared to be in normal plane. No posterior capsular rent could be observed on iatrogenic dilatation. The examination of other eye was normal (figure 1c) with wide open angles on gonioscopy.

**Differential diagnosis**

Masquerade, Spontaneous pupillary block, Spontaneous aqueous misdirection, Spontaneous serous choroidal effusion

**Challenge**

- Spontaneous pupillary block: Usually after Intracapsular cataract extraction. Rarely after phacoemulsification (PE): 2 cases reported in literature within 6 months of PE <sup>1,2</sup>.
- Spontaneous aqueous misdirection as well as spontaneous serous choroidal effusion rare after a decade of uneventful phacoemulsification
- Masquerade: No systemic history/ complaints, no family history/ risk factor for carcinoma

**Further investigations**

**Ultrasound (USG):** No choroidal effusion/mass lesion ruling out masquerade

**Ultrasound biomicroscopy (UBM):** IOL was in normal position while iris was pushed forward to back of cornea, grossly enlarging the posterior chamber (figure 2a). Had it been spontaneous aqueous misdirection or spontaneous serous Choroidal effusion, it would have pushed the whole lens iris diaphragm forward.

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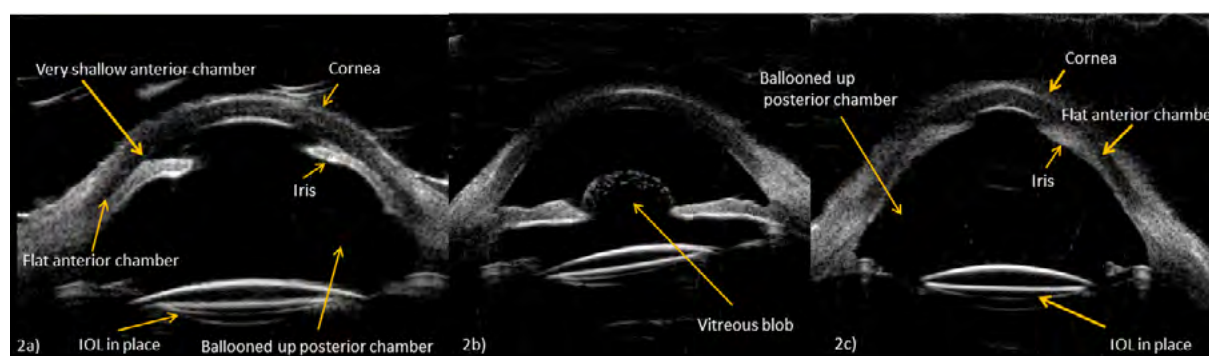
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## Provisional Diagnosis: Spontaneous Pupillary Block



### Clinical Course and Patient outcome:

	BCVA	IOP (AGM)	Clinical picture and UBM	Modification of treatment
Day 1	6/60	18 mmHg (Maximum oral and topical agm))	IOL was in normal position while iris was pushed forward to back of cornea, grossly enlarging the posterior chamber (figure 2a)	<b>Topical Steroid and cycloplegic added for inflammation</b> <b>Plan: laser iridotomy after control of inflammation</b>
Day 3	6/60	2 mmHg (on oral and topical agm, Steroids and cycloplegics)	Anterior chamber (AC) deepened and pigment admixed vitreous was seen as a blob in the pupillary area (figure 2b)	<b>All antiglaucoma drugs stopped</b> <b>Topical steroid cycloplegic continued</b> <b>Short course of oral steroids</b> <b>Planned for Laser Iridotomy</b>
Day 8	CF 3m	64 mmHg (without AGM)	AC was completely Flat AC (figure 2c)	<b>PLAN- taken up for surgery</b>
<b>Surgery : Limited vitrectomy (anterior and posterior chamber) and peripheral iridectomy</b>				
<b>Surgical key steps:</b> An enlarged peripheral iridectomy was made superiorly and limited vitrectomy was done in posterior chamber to clear the vitreous. No posterior capsule breach was seen but small zonular dehiscence was noted at 11 o'clock through which vitreous egress was seen. The triamcilonone assisted vitrectomy was done till whole of <b>posterior chamber</b> was clear.				
Post-operative Day 1	6/36	12 (without AGM)	Well formed anterior chamber with flattening of iris diaphragm	<p>Figure 3a: Clinical photograph showing a deep anterior chamber. Figure 3b: B-scan ultrasonography showing a deep anterior chamber.</p>
Post-operative 1 year	6/9	10 (without AGM)	Deep Anterior chamber (figure 3)	

### The probable hypothesis

There was some dehiscence during the previous cataract surgery but since the anterior vitreous phase was intact, so the course was uneventful 16 years back. As the vitreous liquefied with ageing it might have egressed through the dehiscence into the posterior chamber, collected behind the iris, pushing it forward and closing the angles. Our case classically demonstrates the phases of '*vitreous degeneration and repair*' described by *Irwine et al.*<sup>3</sup>

## Conclusion

This patient highlights the unusual mechanism of secondary angle closure due to pupillary block. Careful clinical examination added by UBM helped us manage this case successfully. The posterior chamber was made free of vitreous and a large iridectomy was created opposite the suspected site of dehiscence so as to prevent recurrence of pupillary block.

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2. Nagamoto S, Kohzuka T, Nagamoto T. Pupillary block after pupillary capture of the AcrySof intraocular lens. *J Cataract Refract Surg*. 1998;24:1271-4.
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**PL-S-4****A CASE REPORT OF SECONDARY ANGLE CLOSURE GLAUCOMA WITH MICROSPHEROPHAKIA IN A YOUNG FEMALE**

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*Dr. Gowri J Murthy, Chief, Glaucoma Services, Prabha Eye Clinic and Research Centre, Bangalore.*

*Dr. Jyothi Kattige, Consultant, Glaucoma Services, Prabha Eye Clinic and Research Centre, Bangalore.*

A 25 year old woman presented with complaints of gradual progressive painful diminution of vision in the right eye, since 3 months.

**Examination**

The best corrected visual acuity was hand movements in the right eye(RE) and 6/9+2 in the left eye(LE), near vision in the RE was not recordable and LE was n6. Slit lamp examination revealed a shallow anterior chamber depth of van hericks grade 2 in the RE and grade 3 in the LE. Relative afferent pupillary defect was noted in the RE. Intraocular pressure recorded with Perkin's tonometer was 52/20 mmHg in the RE and LE respectively. Gonioscopy revealed 360 degree synechial angle closure in the RE, with occludable angles in the LE. Optic nerve head in the RE showed cupping of 0.9 CDR and LE 0.4 CDR.

**Gonioscopy showing iris silhouetting the edge of the spherical lens Edge of the lens seen in a dilated pupil examination Gonioscopy showing synechial angle closure.**

**Investigations**

Visual fields in the RE was not recordable and the LE showed an edge defect. A central corneal thickness of  $501 \pm 3.8 \mu$  in the RE and  $515 \pm 0.6 \mu$  in the LE was noted. OCT showed advanced RNFL thinning in all the quadrants in the RE and LE was normal.

UBM showed increased lens thickness and a spherical lens profile in both the eyes and angle closure in the RE. Shallow anterior chamber depth (2.32mm right eye and 2.71mm left eye) with increased lens thickness (RE of 5.10mm and 5.01mm in the LE) noted. With an axial length of 21.05mm in the RE and 21.07mm in the LE.

**Management**

Peripheral laser iridotomy was performed in both the eyes. Despite a patent PI, angles did not open. However, intraocular pressure was medically controlled following the procedure in both the eyes

Post dilatation the edge of the lens was seen inferiorly at the pupillary margins. Short stature was noted in the subject. We are investigating her further to rule out any systemic associations.

**Discussion**

Microspherophakia is characterized by an increased anteroposterior diameter and a reduced equatorial diameter of the crystalline lens leading to a spherical configuration. It is seen either as an isolated anomaly or along with systemic disorders like Weill–Marchesani syndrome, Marfan syndrome, Alport syndrome, Klinefelter syndrome, and Mandibulofacial dystostosis.

Causes for poor vision in Microspherophakia are lenticular myopia and angle closure glaucoma. Mechanism of glaucoma is due to pupillary block. Acute angle closure can result from pupillary block due to anterior dislocation of the crystalline lens when associated with weak zonules. Such recurring pupillary block results in synechial angle closure resulting in chronic angle closure glaucoma.

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The case here is illustrative of angle closure glaucoma in both the eyes, with increased lens thickness, a spherical profile of the lens and shallow anterior chamber depth suggestive of Microspherophakia in the absence of lenticular myopia with glaucomatous cupping (0.9CDR) with closed angles in the RE, with preserved vision and occludable angles in the LE. In the LE, clear lens extraction with scleral fixated IOL is required in case of failure of maximal medical therapy or subluxation of lens. However, the RE may require a combined lens extraction and trabeculectomy.

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**PL-S-5****CASE OF ACQUIRED ANIRIDIA WITH RAISED INTRA-OCULAR PRESSURE AND ABSENT RETINAL CIRCULATION**

Kedarisetti Kiran Chandra\*, Uday Tekchandani, Madhuri Akella, Faisal Thattaruthody, Surinder Singh Pandav

*Advanced Eye Centre, Postgraduate Institute of Medical Education and Research Chandigarh, India*

**Grand Round**

A 23-year-old Asian female presented with gradual, painless and progressive diminution of vision in the left eye (LE) since a year. She also noticed disappearance of her LE iris 6 months back. She consulted a local ophthalmologist where she was diagnosed to have glaucoma in both eyes and was started on treatment. She presented to us with uncontrolled high Intraocular Pressures (IOP) on maximum therapy.

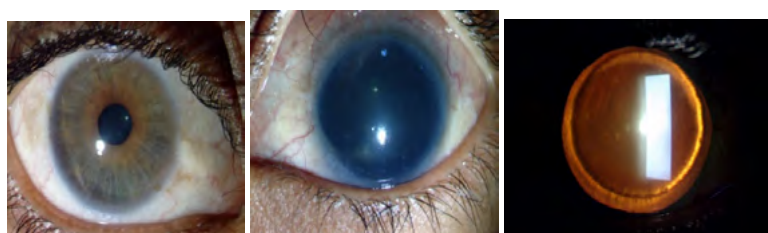


Figure (1A): RE Anterior Segment; (1B): LE Anterior Segment; (1C): LE on retro-illumination

**Examination**

At presentation, the best corrected visual acuity (BCVA) was 6/9 in right eye (RE) and light perception in LE. IOP was 12 mmHg on bimatoprost, dorzolamide and timolol in RE and 50 mmHg on dorzolamide and timolol in LE. Anterior segment examination of the RE was unremarkable (Figure 1 A). There was no iris tissue visible in LE suggestive of aniridia (Figure 1 B) with visible clear lens and zonules on retro-illumination (Figure 1C). Gonioscopy of the RE showed open angles with prominent iris processes (Figure 2A) and LE showed a stump of iris tissue at the root and ciliary body processes (Figure 2B). Posterior segment examination revealed a cup disc ratio of 0.9 with an inferior notch and diffuse retinal nerve fibre layer thinning in the RE (Figure 2C) and a total cup with diffuse thinning of retinal nerve fibre layer and absent retinal vessels in the LE (Figure 2D).

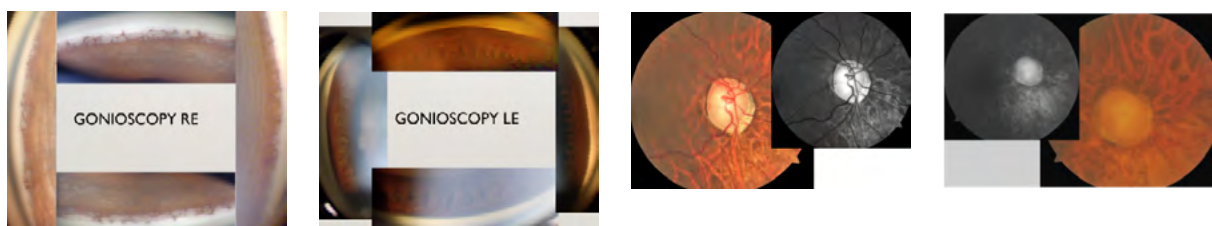


Figure (2A) Gonioscopy of RE and (2B) LE ; (2C)Posterior Segment photo of RE and (2D) LE

**Past History**

The patient had old photos (1 year back) which showed normal iris in both eyes (Figure 3). There was no history of trauma, ocular infection, contact lens usage or ocular surgery in the past. She had no systemic illness or drug allergy.



## Ancillary Investigations

24-2 Visual fields showed a superior arcuate scotoma corresponding to the disc changes in the RE (Figure 4A). Optical coherence Tomography showed a loss of double hump pattern in the RE with retinal nerve layer thinning in three quadrants (Figure 4B). The axial length of the RE was 24.66 mm and LE was 26.44mm.

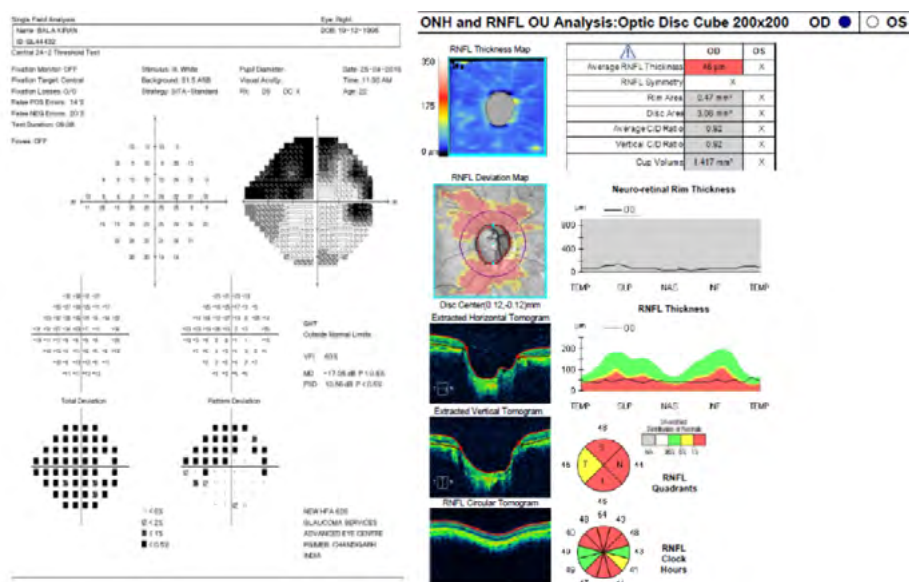


Figure (4A) Visual fields of right eye (4B) Optical Coherence Tomography of right eye

## Other Investigations

- Fundus Fluorescein Angiography:
  - Choroidal flush was seen in both eyes at 13secs.
  - No retinal vasculature was visualised in the LE

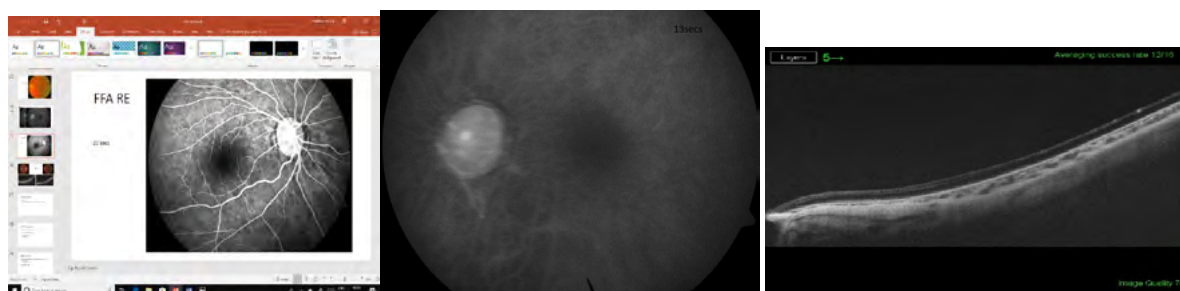


Figure (5A): Fundus fluorescein angiography of RE and (5B) LE. (5C): OCT of LE

- Ocular coherence tomography of the RE was unremarkable. LE showed loss of foveal contour and loss of differentiation of retinal layers with thinned out choroid.
- Cardiology Evaluation was done to rule out any systemic illness causing obstruction.
- 2D Echocardiography of the heart and carotid artery doppler was unremarkable.

- USG Abdomen was within normal limits.

### Clinical Diagnosis

- RE Juvenile Open Angle glaucoma
- LE Acquired aniridia with absent retinal circulation with raised IOP

### Challenges

- Probable Cause for aniridia
- Reason for absent retinal circulation
- Reason For high intra-ocular pressures despite poor perfusion
- Risk of similar progression in the other eye
- Cosmetic correction

### Clinical course

RE trabeculectomy without Mitomycin C was done. Diode Laser Cyclophotocoagulation (DLCP) of 270 degrees was done in the LE.

IOP was 12mmHg and 14mmHg in the right and left eye respectively off drugs at the last follow-up (6 weeks post trabeculectomy in RE).

### Probable Hypothesis

The Aniridia and absence of retinal circulation could be due to ischemia leading to atrophy. The question arises whether the alteration of blood flow and structural loss is just a consequence of the glaucomatous disease or a primary vascular pathology leading to iris atrophy or possibly an underlying disease that potentially might be involved in the pathogenesis of glaucomatous optic neuropathy. Iris atrophy could be caused by viral infections; however, total loss of structure is not a known entity.

### Further Plan

A thorough literature search revealed no case of spontaneous onset aniridia with vision loss. MR Angiography of the ophthalmic artery is planned to find the site of blood flow obstruction. We will also be looking at Iris Angiography of the right eye to look for any filling defects and do viral PCR for any possible viral aetiology.

### Conclusion

This is an unusual case of juvenile glaucoma and acquired aniridia where the cause of complete loss of iris tissue remains uncertain.

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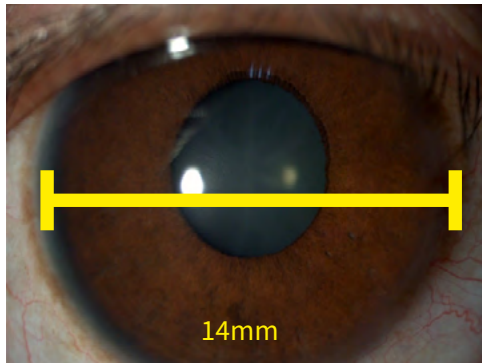
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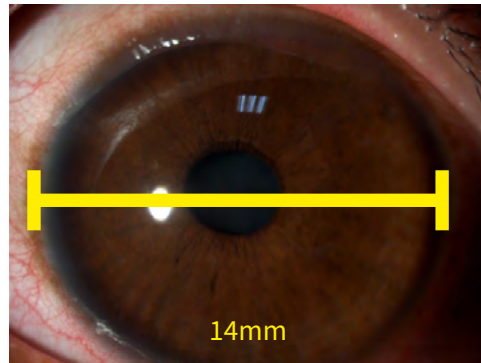
**PL-S-6****UNILATERAL OPEN ANGLE GLAUCOMA IN AN ADULT WITH LARGE CORNEAS**

Marc Alfred C. Mangahas MD, John Mark S. De Leon MD

A 29-year-old male consulted for intermittent right sided headache for the past 3 months. On exam the right eye (OD) had poorer vision at 20/160 (-2.75~-1.50 X 120) while the left eye (OS) was 20/20 (-0.25~-1.75 X 120). Slit lamp biomicroscopy showed bilateral symmetrical enlarged clear corneas [Horizontal: 14mm, both eyes (OU) OU, Vertical: 13mm OD, 12.5mm OS, Fig 1]

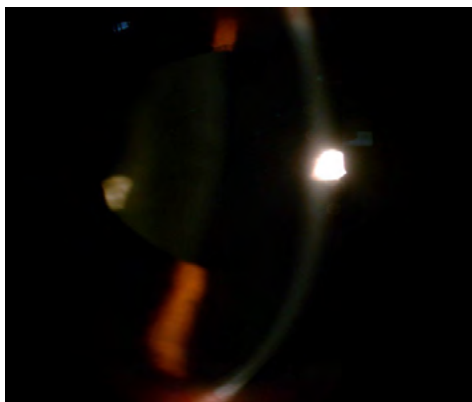


**Figure 1A OD**

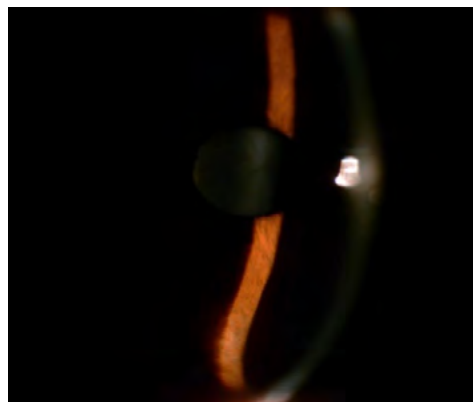


**Figure 1B OS**

Intraocular pressures (IOPs) were 56 mm Hg, OD and 18 mm Hg, OS. Anterior chambers were deep with posterior bowing (Fig. 2 A and B) of the peripheral iris, OU.



**Figure 2A OD**



**Figure 2B OS**

No Krukenberg spindles, no anterior chamber pigment, no iris atrophy or mid-peripheral iris transillumination defects were observed. There was iridodonesis and phacodonesis, OU. The lenses were clear and centered. Gonioscopy, OU showed 360 degrees of open angles with deep (+3), symmetrical and uniform pigmentation (Fig. 3A and 3B).



**Figure 3A OD**



**Figure 3B OS**

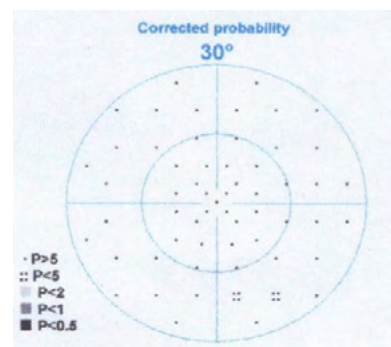
Fundus examination showed advanced optic nerve cupping, OD and a normal disc, OS (Fig. 4A and 4B). Perimetry, OS showed no visual field defect (Fig. 4C)



**Figure 4A OD**



**Figure 4B OS**



**Figure 4C Perimetry OS**

Corneas were thin (OD: 466  $\mu\text{m}$ , OS: 465  $\mu\text{m}$ ) with normal endothelial cell counts. Ultrasound biomicroscopy (UBM), OU showed deep anterior chambers with prominent and long hyperechoic zonules (Fig. 5A orange arrow).



**Figure 5A UBM OS**

Laser iridotomy, OS reversed the posterior bowing of the peripheral iris while OD, due to uncontrolled glaucoma medical therapy, eventually underwent glaucoma filtering surgery.

Anterior megalophthalmos is characterized by bilateral congenital enlargement of the cornea and the anterior segment of the globe. Pigment dispersion<sup>1</sup> is listed as an associated finding including iridonesis/phacodonesis<sup>2</sup>

What we found unusual about this case is the unilateral advanced glaucoma, OD without any evidence of glaucoma, OS. Although OU presented with reverse pupillary block iris configuration and very pigmented trabecular meshworks, there were no signs of pigment dispersion that could have predisposed to the advanced glaucoma that only manifested, OD.

We hypothesize that the mechanism of the glaucoma, OD was probably due to another secondary open angle glaucoma etiology such as an abundance of trabecular meshwork mesenchymal tissue or goniodysgenesis proposed as the etiology of increased IOP in anterior megalophthalmos by other studies.<sup>1</sup>

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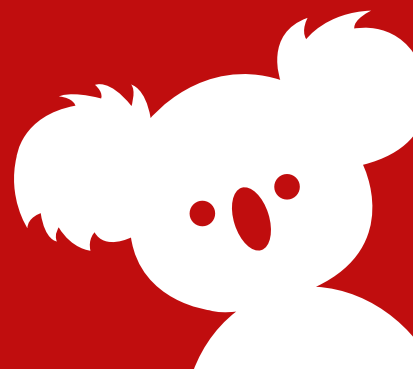
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# FILM FESTIVAL



**FF-01****A DEVICE GLAUCOCLAW MEANT TO TREAT CHRONIC ANGLE CLOSURE GLAUCOMA**

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**Kiranjit Singh\*<sup>1</sup>**<sup>1</sup>*Anterior Segment, Dr Daljit Singh Eye Hospital, Amritsar, India*

We present a new device called Glaucoclaw in management of refractory chronic angle closure glaucoma. It is a PMMA device similar to iris claw lens, but with a central ring and five claws arranged circumferentially. The device is fixed anterior to iris and acts by opening up the angles and preventing reformation of goniosynechia.

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**FF-02****A NOVEL SURGICAL TECHNIQUE FOR AN EASY AND PRECISE INSERTION OF THE DRAINAGE DEVICE TUBE**

Waldo Loayza\*, Vanessa Valderrama<sup>1</sup>, Joseph Maita<sup>1</sup>, Fernando Iyo<sup>1</sup>

<sup>1</sup>National Institute of Ophthalmology - Peru, Lima, Peru

**Purpose**

The use of drainage devices is an effective surgical treatment for the management of ocular hypertension. The aim of the study is describing a series of cases in which drainage device implant surgery is carried out by canalizing and inserting the tube with a 21 G needle intracamerally.

**Methods**

Epidemiological and clinical data were collected, as well as the position of the drainage tube in the anterior chamber using ultrasound biomicroscopy (UBM) and optical coherence tomography (OCT) of the anterior segment.

**Surgical technique**

Prior subconjunctival anesthesia of lidocaine, perilibotomy and subtenon dissection is performed to place the device and suture with polyester 5/0 to fixate the plate, the length of the tube is measured to be placed in the anterior chamber and the excess is trimmed, then through a paracentesis a 21G needle (bent in its proximal third to 60 degrees) is inserted to the anterior chamber and externalizes through the sclera 3 mm from the limbus and then the tube is inserted into the needle with the help of a forceps, the tube and the needle are inserted back into the anterior chamber, giving the final position of the tube, securing the tube to the sclera with 10/0 nylon and finally the conjunctiva is sutured.

**Results**

A reduction in intraocular pressure was observed in all patients, as well as a reduction in the number of antiglaucomatous drugs, there were no changes in the best corrected visual acuity, all patients had a precise position of the tube in relation to the iris and the endothelium, in addition to the ease and stability during its execution, there were no major complications such as diplopia, implant exposure or corneal decompensation.

**Conclusions**

The technique of implanting the drainage device with the tunneling of the tube through the anterior chamber is an effective and safe surgical technique for drainage device implantation as well as the final position of the tube in the anterior chamber.

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**FF-03****A NOVEL TECHNIQUE FOR MANAGEMENT OF TUBE MIGRATION AFTER GLAUCOMA DRAINAGE DEVICE IMPLANT**

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Madhuri Akella<sup>\*1</sup>, Natasha Seth<sup>1</sup>, Ajay Jurangal<sup>1</sup>, Faisal Thattaruthody<sup>1</sup>, Surinder Pandav<sup>1</sup>

<sup>1</sup>*Advanced Eye Centre, Post Graduate Institute of Medical Education and Research, Chandigarh, India*

Tube migration is a late complication after glaucoma drainage implants. The conventional method for its management include conjunctival- tenon dissection, bringing out the tube from its tract, trimming and re-insertion, which is a cumbersome procedure. In this video, we describe a novel technique for tube trimming using a simple internal approach, which avoids the complex conventional dissection.

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**FF-04****A NOVEL TECHNIQUE FOR MANAGING PERSISTENT HYPOTONY FOLLOWING AUROLAB AQUEOUS DRAINAGE IMPLANT.**

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Surinder Pandav<sup>\*1</sup>, Natasha Gautam Seth<sup>1</sup>, Faisal Tattaruthodi<sup>1</sup>, Madhuri Akella<sup>1</sup>, Manpreet Kaur<sup>1</sup>

<sup>1</sup>*Advanced Eye Center, Postgraduate Institute of Medical Education & Research, Chandigarh, India*

This video shows use of a releasable suture to treat persistent hypotony, in a 4 year old child with chronic anterior uveitis, following a non-valved glaucoma drainage device implantation. The hypotony and related complications were successfully reversed by ligating the tube using this technique. At 1.3 year follow-up, she had intraocular pressure of 10 mmHg without anti-glaucoma medication.

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**FF-05****AADI: NEW GDD ON THE BLOCK – LOW IN COST BUT IS IT HIGH IN PERFORMANCE?**

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Vanita Pathak Ray<sup>\*1</sup>, Isha Gulati<sup>2</sup>, Divya Rao<sup>2</sup>

<sup>1</sup>*Glaucoma, Centre for Sight*, <sup>2</sup>*LV Prasad Eye institute, Hyderabad, India*

Access to valveless GDD around the world was limited by its cost, until the arrival of indigenously manufactured AADI. It is capable of achieving significantly low IOP, with lesser number of medications. Further f/u is required to assess its sustainability, as this affordable GDD will have a tremendous impact in the quest to prevent needless blindness in low-to-middle income countries worldwide.

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## FF-06

### AHMED VALVE IMPLANT FOR BEGINNERS

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Pankaj Bendale\*<sup>1</sup>

<sup>1</sup>*Glaucoma, National Institute Of Ophthalmology, Pune, India*

Simplified steps for Ahmed Glaucoma implant for beginners. Ahmed valve is required in various situations like Uveitic Glaucoma, Neovascular glaucoma, POST VR surgery Glaucoma, failed trabeculectomy cases. mastering this technique make life easy when we are managing difficult glaucomas with very good vision potential.

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## FF-07

### BLEB LEAK

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SW Wong<sup>\*1</sup>, S Karandikar<sup>1</sup>, F Stringa<sup>1</sup>, V Shankar<sup>1</sup>

<sup>1</sup>Ophthalmology, NHS, Royal Burnley Hospital, Burnley, United Kingdom

We demonstrate the surgical technique of late bleb leak repair in a 76-year-old lady who had right trabeculectomy and MMC 5 years ago for POAG. On presentation, she had IOP of 1mmHg. Siedel's test was briskly positive and the leaking fistula was in direct communication with the anterior chamber. Tutuplast patch graft was used to cover the fistula as the overlying scleral flap has melted.

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## FF-08

### BLEB RESCUE OPERATIONS

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Talvir Sidhu<sup>\*1</sup>, Vipul Singh<sup>1</sup>, Ramanjit Sihota<sup>1</sup>, Tanuj Dada<sup>1</sup>

<sup>1</sup>*Ophthalmology, All India Institute of Medical Sciences, New Delhi, India*

‘Bleb rescue operations’ video describes management of bleb related complications like bleb leaks, bleb thinning with or without scleral thinning. It may be simple bleb leak needing a bare sclera technique or bleb sparing epithelial exchange. Scleral thinning may be tackled with scleral graft or ologen acting as a support tissue or Maumenee’s repair.

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**FF-10****DEALING WITH COMPLEX NEOVASCULAR GLAUCOMA PRESENTATIONS**

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Francesc March De Ribot<sup>\*1</sup>, Anna March de Ribot<sup>1</sup>, Teresa Torrent<sup>1</sup>, J. Tarrús<sup>1</sup>

<sup>1</sup>*University Hospital, la bisbal, Spain*

Patient with advanced neovascular glaucoma treated with Ahmed valve, presented with tube in the anterior chamber, prominent iris neovessels, bad dilation, retraction of the pupillary margin and a dense cataract. Phacoemulsification was realized using trypan blue and a poor dilation. The vitrectomy identified a vitreous hemorrhage and a tractional retinal detachment realizing segmentation and delamination and endolaser. Diabetic retinopathy can present in challenging conditions. Neovascular glaucoma and tractional retinal detachment represent an advanced diabetic damage in the eye.

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**FF-11****FAMILY SCREENING- AN EFFECTIVE APPROACH TO COMBAT GLAUCOMA BLINDNESS.**

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Srinivasan Kavitha<sup>1</sup>, Pavan Kumar<sup>1</sup>, Rengaraj Venkatesh<sup>1</sup>

<sup>1</sup>*Glaucoma, Aravind Eye Hospital, Pondicherry, India*

Glaucoma is a leading cause of irreversible blindness. Early detection, treatment leads to preservation of sight & quality of life. Positive family history is an important risk factor for glaucoma. Screening first degree relatives of patients with primary glaucoma who have a higher prevalence as compared to population prevalence is important. We describe novel ways of doing family screening.

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## FF-12

### HOW TO FIX AND PREVENT A SHORT TUBE

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Daniela Alvarez Ascencio<sup>\*1</sup>, Jesus Jimenez-Roman<sup>1</sup>, Mauricio Turati-Acosta<sup>1</sup>

<sup>1</sup>*Glaucoma, Asociacion Para Evitar la Ceguera en Mexico, Mexico City, Mexico*

In this film we focus on fixing and preventing one problem: short tubes. We show a case in which the surgeon extends a tube using an angiocatheter. After detailed description of the technique, we show several examples and surgical pearls of how to measure, insert, and cut the tube in order to acquire an adequate length and direction.

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## FF-13

### HOW TO INSERT THE ISTENT INJECT ( G2 )

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Lance Liu\*<sup>1,2</sup>

<sup>1</sup>GIRU, Royal Victorian Eye & Ear Hospital, East Melbourne, <sup>2</sup>Preston Eye Clinic, Melbourne, Australia

This video is a step-by-step guide on how to insert the iStent Inject® (G2) with some tips on how to achieve a successful outcome. After performing preoperative gonioscopy, one needs to maximize the intraoperative view of the patient's angle to identify the anatomical landmarks before inserting the iStent, aided by endpoints illustrated in the video. At the end of the case, one may then overfill the anterior chamber to improve the function of the iStent.

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## FF-14

### INNOVATIONS IN TRABECULECTOMY

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Shreya Nayak<sup>\*1</sup>, Prakhyat Roop<sup>2</sup>, Talvir Sidhu<sup>2</sup>, Tanuj Dada<sup>3</sup>

<sup>1</sup>Dr. Rajendra Prasad Centre for Ophthalmic Sciences, <sup>2</sup>Dr. Rajendra Prasad Center for Ophthalmic Sciences, All India Institute of Medical Sciences(AIIMS), <sup>3</sup>Dr. Rajendra Prasad Center for Ophthalmic Sciences, All India Institute of Medical Sciences, New delhi, India

In a developing country, innovations in filtering surgery is the need of the hour. This video is a collection of techniques which increase outflow alongwith trabeculectomy through deep sclerectomy, multiple site spacers or autologous spacers like a scleral strip. Another low cost procedure is using intravenous cannulas in place of drainage tubes. The aim is providing affordable and safe surgery.

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**FF-15****I-OCT GUIDED BLEB SPARING EPITHELIAL EXCHANGE**

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Jyoti Shakrawal<sup>\*1</sup>, Dewang Angmo<sup>1</sup>, Tanuj Dada<sup>1</sup>, Ramanjit Sihota<sup>1</sup>

<sup>1</sup>*Ophthalmology, Rgc, Aims, New Delhi, India*

We described a bleb revision of thin, avascular bleb by using i-OCT. Conjunctiva dissected along the margin of bleb. Epithelium over the bleb was stained with trypan-blue(0.06%). Stained epithelium peeled off from bleb, preventing damage to underlying bleb by i-OCT visualization. Finally, bleb was covered by adjacent healthy conjunctiva. This technique gives us a functional bleb postoperatively.

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**FF-16****ISTENT INJECT - HOW TO DEAL WITH OVER-IMPLANTATION**

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Bryan C. H. Ang<sup>\*1</sup>, Leonard Yip<sup>1</sup>

<sup>1</sup>*Department of Ophthalmology, National Healthcare Group Eye Institute, Tan Tock Seng Hospital, Singapore, Singapore*

The iStent Inject has emerged as a useful modality in glaucoma treatment. While safe and straightforward to implant, Over-Implantation may sometimes occur. We demonstrate a novel method of managing Over-Implantation. Steps include: Circling the implant circumference, Pulling trabecular meshwork tissue away from the flange, Tumbling out the implant, Reloading, and finally, Reimplanting the iStent.

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**FF-17****MANAGEMENT OF CYCLODIALYSIS: COMING A FULL CIRCLE**

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Subodh Lakra<sup>\*1</sup>, Harathy Selvan<sup>2</sup>, Shikha Gupta<sup>3</sup>

<sup>1</sup>*Glaucoma Services, Rajendra Prasad Center For Ophthalmic Sciences, AIIMS,* <sup>2</sup>*Glaucoma Services, Rajendra Prasad Center For Ophthalmic Sciences, AIIMS,* <sup>3</sup>*Glaucoma Services, Rajendra Prasad Center For Ophthalmic Sciences, AIIMS, New Delhi, India*

Cyclodialysis is quite a challenge to manage surgically. Here we review ab interno techniques of endocyclohexy using modified sewing machine technique (single suture, single knot) and endocyclotomade using endocapsular ring (haptic of PMMA PCIOL or CTR) with or without simultaneous iridodialysis repair (single point pivot technique) and associated lenticular subluxation (triple dialysis repair).

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## FF-18 NIGHTMARES IN GLAUCOMA SURGERY

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Neha Midha<sup>\*1</sup>, Talvir Sidhu<sup>1</sup>, Arjun Desai<sup>1</sup>, Tanuj Dada<sup>1</sup>

<sup>1</sup>All india Institute of Ophthalmic Sciences, Delhi, India

Management of intraoperative and postoperative complications of glaucoma surgery, poses a substantial challenge to the surgeons. Four unique surgical scenarios have been compiled in this video - phacomorphic glaucoma with phakic IOL in situ; non resolving dellen post trabeculectomy; ciliary staphyloma post trabeculectomy; and cyclodialysis cleft with post traumatic hypotonic maculopathy.

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**FF-19****OPTIC RECONSTRUCTIVE SURGERY IN TREATMENT OF ACUTE ANGLE CLOSURE**

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**Natalia Volkova\***<sup>1</sup>*<sup>1</sup>1st Ophthalmology Surgery department, scientific department, Irkutsk Branch of S. Fyodorov Eye Microsurgery Federal State Institution, Irkutsk, Russian Federation*

49 patients with acute angle closure complicated by paralytic mydriasis underwent phacoemulsification with IOL implantation in capsular bag, anterior chamber angle reconstruction and pupil formation with original closed iridoplasty method were performed. Complete hypotensive effect without additional medication was achieved. Technique proved safety, efficacy and pathogenetically proved treatment.

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## FF-20 OVERCOMING BLINDNESS

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Rick Trevino<sup>\*1</sup>, Stephanie Schmiedecke Barbieri<sup>1</sup>

<sup>1</sup>Rosenberg School of Optometry, San Antonio, United States

Blindness from glaucoma is largely preventable when you diagnose the condition early, receive proper treatment and comply with therapy. Tanya shares how one person went from normal vision to NLP in 10yrs from glaucoma. She inspires us to listen to our bodies, to ask questions, and to not be afraid. Through low vision rehabilitation, she remains independent and functional in a visual world.

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**FF-21****RECURRENT AQUEOUS MISDIRECTION – CAN IZHV PASS WHERE PPV FAILED?**

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Vanita Pathak Ray<sup>\*1</sup>, Isha Gulati<sup>2</sup>, Divya Rao<sup>2</sup>, Varun Malhotra<sup>3</sup>

<sup>1</sup>*Glaucoma, Centre for Sight*, <sup>2</sup>*L V Prasad Eye Institute*, <sup>3</sup>*Centre for Sight, Hyderabad, India*

A PACG patient presented with flat AC and Recurrent Aqueous-Misdirection (RAM) after PPV and AGV. She was managed with IZHV through a corneal-wound, with an anterior-vitrector. Complete hyaloid-ectomy was ensured with a primary-posterior-capsulectomy. In 13 months f/u VA was 20/30 with controlled IOP and deep AC. RAM can be managed by the anterior route after failed PPV, with no further relapse.

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## FF-22

### REMODELLING OF AN AVASCULAR BLEB

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Nawazish F. Shaikh<sup>\*1</sup>, Viney Gupta<sup>1</sup>

<sup>1</sup>*Department of Ophthalmology, Dr. Rajendra Prasad centre of ophthalmic sciences, AIIMS, New Delhi, India*

We describe a relatively non invasive technique of remodelling the avascular bleb with an Amniotic membrane graft (AMG), that we found to be safe, easy and effective in improving bleb morphology.

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**FF-23****SAVING THE ENDOTHELIUM- REPOSITIONING THE SHUNT TUBE**

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Chan Yun Kim<sup>\*1</sup>, Hyoung Won Bae<sup>1</sup>, Wungrak Choi<sup>1</sup>, Eun Woo Kim<sup>1</sup>

<sup>1</sup>*Ophthalmology, Yonsei University College of Medicine, Seoul, Korea, Republic Of*

One of the major complications of tube implantation is corneal endothelial cell loss. If the cell count is dropped, considering removal or the positional change of the valve. If the intraocular pressure is well controlled, it is better to change the position rather than removing the valve. In this video, we will present how to change the tube position from anterior chamber to ciliary sulcus.

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**FF-24****SURGICAL MANAGEMENT OF POST-TRAUMATIC CYCLODIALYSIS CLEFT AND HYPOTONOUS MACULOPATHY**

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Nkechinyere Judith Uche<sup>\*1</sup>, Sirisha Senthil<sup>1</sup>

<sup>1</sup>*Glaucoma, Lv Prasad Eye Institute, Hyderabad, India*

Complications of cyclodialysis cleft include severe hypotony and its sight threatening complications. While majority respond to conservative management, refractory cases require surgical closure of the cleft. We shall demonstrate a stepwise approach and share practical tips to the management of this rare complication in a case of posttraumatic cyclodialysis cleft with hypotonous maculopathy

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**FF-25****TRABECULECTOMY WITH OLOGEN IMPLANT WITH RELEASABLE SUTURE & ITS RELEASE DURING POST OP PERIOD**

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**Pankaj Bendale<sup>\*1</sup>**<sup>1</sup>*Glaucoma, National Institute Of Ophthalmology, Pune, India*

Trabeculectomy success depends on good surgical technique and meticulous post operative follow up to achieve good filtration success in all cases. Use of ologen combining with releasable suture gives us optimum control on post operative IOP management. Regular digital massage, regular post operative steroid eye drop and timely release of releasable suture are game changers.

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## FF-26

### TUBE EXPOSURE REPAIR SUBMISSION

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*Sandra Fernando Sieminski*

Tube exposure can be caused by a multitude of factors including micro motion of the tube with eye movement, ocular inflammation, patch graft melt, and friable conjunctiva. This video demonstrates three steps to achieve success in repairing an exposed tube in a patient with a history of prior exposure. The first step includes moving the tube to a different location, such as from the anterior chamber to the ciliary sulcus. The second step involves repositioning the tube under a long scleral tunnel. The last step describes avoiding conjunctival tension by suturing the conjunctiva to the patch graft rather than reapproximating at the limbus.

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**FF-27****TUBE IN TUBE: A SOLUTION FOR RETRACTED AHMED GLAUCOMA VALVE TUBE**

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Natasha Gautam Seth<sup>\*1</sup>, Faisal Thattaruthody<sup>1</sup>, Surinder Pandav<sup>1</sup>

<sup>1</sup>*Ophthalmology, Postgraduate Institute of Medical Education and Research, Chandigarh, India, Chandigarh, India*

Tube retraction after Ahmed glaucoma valve (AGV) implantation is a known complication. The commonly employed management option is AGV tube extender which is expensive and bulky. We describe the successful management of this complication by using a novel technique of connecting the silicon tube segment to the existing tube, to lengthen the tube so that it could be placed in anterior chamber again.

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**FF-28****UNUSUAL PRESENTATIONS IN SECONDARY GLAUCOMA**

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Francesc March De Ribot<sup>\*1</sup>, Anna March de Ribot<sup>1</sup>, Teresa Torrent<sup>1</sup>, J. Tarrús<sup>1</sup>

<sup>1</sup>*University Hospital, la bisbal, Spain*

Patient with a history of 6 months of retinal detachment treated with scleral buckle. Exploration with 30 mmHg, occluded angles, cellularity, cataract, and a retinal detachment. During phacoemulsification, because of the IOP and the narrow anterior chamber, a corneal epithelial cyst was observed. Due to the continuous narrowing of the anterior chamber, it was necessary to make a vitrectomy before being able to put the IOL because of the incapacity for creating a space. Secondary glaucomas represent a challenge.

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**FF-29****WALK WITH ME - COUNSELING IN GLAUCOMA**

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Mayuri Khamar<sup>\*1</sup>, Vandana Nath<sup>2</sup>, Viraj Vasavada<sup>3</sup>, Shail Vasavada<sup>4</sup>

<sup>1</sup>*Glaucoma Center, <sup>2</sup>Gurukul Road, Near Shreeji Complex, Memnagar, <sup>3</sup>Cornea, <sup>4</sup>Cataract, Raghudeep Eye Hospital, Ahmedabad, India*

Glaucoma a chronic disease is a leading cause of irreversible blindness needs regular treatment monitoring investigations etc. The aim of counseling is to make patients accept existence of disease, its sequelae, provide insight into its nature, making him party in treatment plan. This film shares pearls of counseling for patients, to adhere to follow-up, medications and appropriate interventions.

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## FF-30

### WHAT HAPPENS TO THIS SURGERY?

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Francesc March De Ribot<sup>\*1</sup>, Anna March de Ribot<sup>1</sup>, Teresa Torrent<sup>1</sup>, J. Tarrús<sup>1</sup>

<sup>1</sup>*University Hospital, la bisbal, Spain*

Patient with hypertension, glaucoma and narrow anterior chamber scheduled for femtosecond cataract, the docking produced BP elevation and pain. Surgery presented iris herniated through the incisions, anterior chamber narrowing, increased tone and pain. Intraoperative examination revealed choroidal detachment. The first report of this event, it was considered aqueous misdirection.

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## FF-31

### WORM IN THE EYE? LOOK CLOSER!

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Sushmita Kaushik\*<sup>1</sup>

<sup>1</sup>*Advanced Eye Centre, Postgraduate Institute of Medical Education and Research, Chandigarh, India*

A 2-month-boy was brought with sudden appearance of “blood and a worm” in the right eye, with no trauma history. Examination revealed a detached posterior embryotoxon pulling the iris inferiorly, iris processes typical of Axenfeld Rieger’s anomaly. Ultrasound Biomicroscopy showed a normal pupil beneath the pulled over iris, which was excised using a vitrectomy cutter, resulting in a round pupil.

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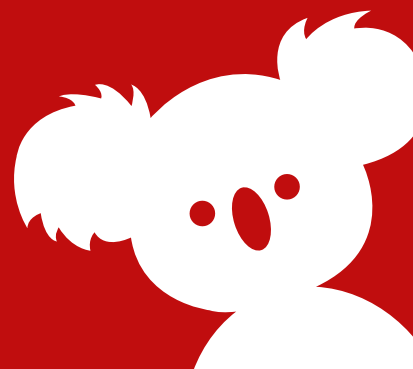
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# RAPID FIRE



**O-FR-04 / P-FS-164****COMPARISON OF BLEB MORPHOLOGY BY CONJUNCTIVAL INCISION AFTER TRABECULECTOMY**

Hailong Huang<sup>1</sup>, Wenjun Bao<sup>1</sup>, Kazuhide Kawase<sup>\*1</sup>, Akira Sawada<sup>1</sup>, Tetsuya Yamamoto<sup>1</sup>

<sup>1</sup>Gifu University Graduate School of Medicine, Gifushi, Japan

**Purpose**

To compare the difference of filtration bleb morphology by conjunctival incision after trabeculectomy with anterior-segment optical coherence tomography (AS-OCT) .

**Methods**

AS-OCT ( SS-1000 CASIA, Tomey, Japan) was conducted at 1, 3 and 6months postoperatively in 34 eyes of 34 cases who underwent trabeculectomy and satisfied with the selection criteria during the period from December 2015 to December 2016 at the Gifu University Hospital. The patients were divided into two groups according to the conjunctival incision site: limbal-based incision group (n=15) and fornix-based incision group (n=19). AS-OCT images were taken along with the meridional line from the corneal limbus through the central part of the scleral flap to the fornix. The bleb height, the bleb length, conjunctival thickness of the thinnest part of conjunctiva, and bleb area were measured and compared between the two groups.

**Results**

No significant differences were found in length and area of the filtration bleb between the two groups. The conjunctival thickness of the thinnest part of the filtration bleb was thinner in 3 and 6 months in the limbal-based incision group. The blebs height was higher in the limbal-based group only at 1 month (p = 0.035, 0.012, 0.027: Mann-Whitney U test). Lower intraocular pressure was achieved by the longer filtering bleb in the fornix-basal incision group (p = 0.0259) , while it was done by the longer filtration bleb and the larger bleb area in the limbal-basal incision group (p = 0.039, P=0.041: Spearman correlation coefficient).

**Conclusions**

Difference of conjunctival incision method in trabeculectomy does not result in difference in the filtration bleb length and area, but the thinnest part of the conjunctiva may be thinner in the limbal-basal incision method. In addition, the difference in morphology of the filtration blebs affects the intraocular pressure.

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**O-TH-01 / P-WT-107****SPONTANEOUS NORMAL TENSION GLAUCOMA IN AGED MARMOSETS**

Takayuki Harada<sup>\*1</sup>, Takahiko Noro<sup>1,2,3</sup>, Kazuhiko Namekata<sup>1</sup>, Atsuko Kimura<sup>1</sup>, Nanako Hashimoto<sup>1</sup>, Keiko Moriya-Ito<sup>1</sup>, Xiaoli Guo<sup>1</sup>, Chikako Harada<sup>1</sup>, Tadashi Nakano<sup>2</sup>, Takashi Inoue<sup>3</sup>, Erika Sasaki<sup>3</sup>

<sup>1</sup>Tokyo Metropolitan Institute of Medical Science, <sup>2</sup>Department of Ophthalmology, Jikei University School of Medicine, Tokyo, <sup>3</sup>Central Institute for Experimental Animals, Kawasaki, Japan

**Purpose**

The common marmoset (*Callithrix jacchus*) is a non-human primate that provides valuable models for neuroscience and aging research due to its anatomical similarities to humans and relatively short lifespan. This study was carried out to examine whether aged marmosets develop spontaneous glaucoma, as seen in humans.

**Methods**

We examined 36 aged marmosets (average age 11.3 years) by ophthalmoscopy and applanation tonometry. In some animals, we monitored their retinas and the brain in more detail using spectral domain optical coherence tomography (SD-OCT), multifocal electroretinogram (mfERG) and magnetic resonance imaging. We also examined the flow velocity of the ophthalmic artery, cerebrospinal fluid (CSF) pressure, genetic mutations in MYOC, OPTN and WDR36, and histopathology of the retina, optic nerve and brain.

**Results**

We found that 4 of 36 marmosets presented with normal tension glaucoma (NTG)-like characteristics: no changes in the intraocular pressure, but SD-OCT demonstrated the thinning of the lamina cribrosa and ganglion cell complex, and mfERG showed impaired retinal activity. Consistent with the mfERG data, these marmosets had reduced number of cells in the ganglion cell layer. In NTG marmosets, blood flow of the ophthalmic artery and CSF pressure were decreased and the atrophy of the visual cortex was detected. In addition, expression levels of the oxidative stress marker (4-HNE) were increased in the retina and blood, and those of brain-derived neurotrophic factor (BDNF) and TrkB were decreased in the retina, optic nerve and CSF in NTG marmosets. There were no genetic mutations in MYOC, OPTN and WDR36.

**Conclusions**

In this study, we identified spontaneous glaucoma in aged marmosets, using various *in vivo* imaging techniques and highlighted similarities between human and marmoset glaucoma. Furthermore, we found that decreased neurotrophic factor signalling and increased oxidative stress is a risk factor for marmoset glaucoma, similar to humans. Considering the relatively short lifespan of marmosets, aging research concerning visual and brain function can be performed speedily in this non-human primate. Our findings will encourage development of new research methods in studies of chronic neurodegenerative diseases including glaucoma.

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**O-TH-06 / P-FS-070****COMBINED OPTICAL COHERENCE TOMOGRAPHY AND VISUAL FIELD ENDPOINTS TO IMPROVE FUTURE GLAUCOMA CLINICAL TRIALS****Zhichao Wu<sup>1,2,3</sup>, Felipe Medeiros<sup>2</sup>**<sup>1</sup>*Ophthalmology, Department of Surgery, Centre for Eye Research Australia, East Melbourne, Australia,*<sup>2</sup>*Department of Ophthalmology, Duke Eye Center, Durham,* <sup>3</sup>*Department of Ophthalmology, University of California, San Diego, La Jolla, United States***Purpose**

Due to the slowly progressive nature of glaucoma, there have been concerns that short-term clinical trials that evaluate new treatments compared to current treatments would have prohibitively large sample size requirements, when based on conventional visual field (VF) endpoints. In recent years, optical coherence tomography (OCT) imaging has emerged as a powerful tool for capturing progressive neuroretinal changes in glaucoma eyes, and thus show promise as a method for improving the feasibility of such trials. This study therefore sought to determine whether the addition of OCT imaging could reduce the sample size requirements of future glaucoma clinical trials.

**Methods**

Sample size estimates were obtained by using a computer simulation model that reconstructs 24-2 VF and OCT imaging results over time (Wu *et al*, *Ophthalmology*, 2017; Wu *et al*, *AJO*, 2017; Wu & Medeiros, *Sci Reports*, 2018). Real-world estimates of rates of change and variability used in the model were obtained from a cohort of 182 eyes from 115 participants with glaucoma under routine clinical care with  $\geq 5$  reliable VF and OCT results over a 2-year period. These estimates were then combined to create “real-world” VF mean deviation (MD) and spectral-domain OCT retinal nerve fiber layer (RNFL) thickness measurements. Simulations were performed for a clinical trial scenario where VF and OCT imaging were performed at 12 visits over 2-years, assuming that a new treatment halted VF and OCT progression in various proportions of participants (or “responders” to the new treatment). Treatment efficacy was then evaluated using linear mixed models by comparing the difference in the rate of MD and RNFL thickness change over time between groups.

**Results**

For a new treatment that halted VF and OCT progression in 30% of participants under routine care, 315 and 223 participants would be required per group to detect a significant treatment effect with 90% power when using VF and OCT imaging endpoints alone. However, this was reduced to 170 participants per group if both VF and OCT endpoints were used (accounting for the increased false-discovery rate with multiple testing). Overall, using combined VF and OCT imaging endpoints led to a 45-47% reduction in sample size requirements compared to using VF endpoints alone for various treatment effect sizes.

**Conclusions**

Combining OCT and VF endpoints have the potential to substantially improve the feasibility of future glaucoma clinical trials.

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**O-TH-05 / P-FS-294****IN VITRO AND IN VIVO DELIVERY OF A SUSTAINED RELEASE NANOCARRIER-BASED FORMULATION OF AN MRTF/SRF INHIBITOR IN CONJUNCTIVAL FIBROSIS**

Aristides Tagalakakis<sup>1</sup>, Shivam Madaan<sup>2</sup>, Scott Larsen<sup>3</sup>, Richard Neubig<sup>4</sup>, Sheng Lim<sup>5,6</sup>, Cynthia Yu-Wai-Man<sup>\*5,6,7</sup>

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**Purpose**

Sustained drug delivery is a large unmet clinical need in glaucoma. We hypothesized that a nanocarrier formulation of a Myocardin-Related Transcription Factor/Serum Response Factor (MRTF/SRF) inhibitor, CCG-222740, could be used as a sustained release antifibrotic therapy in glaucoma filtration surgery.<sup>1,2</sup>

**Methods**

The nanocarrier formulation of CCG-222740 was prepared by the thin film hydration technique using the liposomes DOTMA and DOPE in a 1:1:1 molar ratio (DOTMA:DOPE:CCG-222740). Nanocarrier size, zeta potential and morphology were determined by dynamic light scattering, laser Doppler anemometry and transmission electron microscopy, respectively. We tested the effect of the nanocarrier CCG-222740 formulation on *ACTA2* gene expression using real-time quantitative PCR and on cell viability in human conjunctival fibroblasts. Drug release studies were performed using high performance liquid chromatography. We validated our results using a randomized, prospective, masked-observer study of 18 New Zealand white rabbits undergoing glaucoma filtration surgery. The animals received intraoperative 0.2 mg/ml mitomycin-C [N=6] or a postoperative subconjunctival injection of 68 µg nanocarrier CCG-222740 [N=6] or empty liposomes [N=6]. Bleb morphology was recorded over 30 days. Tissue sections on day 30 were immunohistochemically assessed. We analyzed our results using the Kaplan-Meier curve Log-rank test and Student's *t*-test.

**Results**

The vesicles were spherical particles of  $137.0 \pm 7.1$  (SEM) nm,  $+63.0 \pm 1.5$  mV and  $0.39 \pm 0.02$  polydispersity index (Figure 1B). In vitro, nanocarrier CCG-222740 was not cytotoxic and decreased *ACTA2* gene by 61.0% ( $p = 0.026$ ) and 71.2% ( $p = 0.033$ ) at 5 and 10 µM, respectively, compared to empty liposomes. There was a sustained cumulative drug release of 32.1%, 45.1%, 63.7%, 79.8% and 93.1% at 1, 3, 6, 9 and 14 days. In vivo, nanocarrier CCG-222740 doubled bleb survival from  $11.0 \pm 0.6$  days for empty liposomes to  $22.0 \pm 1.3$  days ( $p = 0.001$ ). Nanocarrier CCG-222740 significantly decreased conjunctival scarring compared to empty liposomes using H&E, picrosirius red, Gomori's trichrome and alpha smooth muscle actin staining. There were no local or systemic adverse effects and drug levels were undetectable in the aqueous and vitreous.

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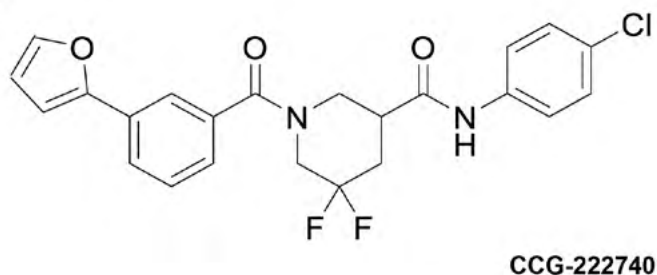
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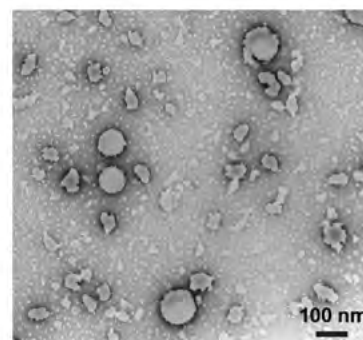
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Figure 1

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B



## Conclusions

A nanocarrier-based formulation of an MRTF/SRF inhibitor represents a safe and sustained release drug delivery system that could be used to prolong bleb survival and to prevent conjunctival fibrosis after glaucoma filtration surgery.

## References

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**O-FR-10 / P-FS-143****RISK FACTORS FOR CORNEAL ENDOTHELIAL CELL LOSS AFTER TRABECULECTOMY WITH MITOMYCIN C**Tomomi Higashide\*, Tsubasa Nishino<sup>1</sup>, Kimikazu Sakaguchi<sup>1</sup>, Yutaro Yamada<sup>1</sup>, Kazuhisa Sugiyama<sup>1</sup><sup>1</sup>Ophthalmology, Kanazawa University Graduate School of Medical Science, Kanazawa, Japan**Purpose**

To investigate postoperative changes in corneal endothelial cell density (ECD) after trabeculectomy with mitomycin C (MMC) and risk factors for ECD decrease.

**Methods**

Retrospective review of consecutive glaucoma cases who underwent trabeculectomy with an intra-operative application of MMC. The types of glaucoma included were primary open angle glaucoma (POAG), exfoliation glaucoma (XFG), neovascular glaucoma (NVG), and uveitic glaucoma (UG). The postoperative ECD changes compared to preoperative ECD and risk factors for ECD decrease were analyzed using mixed-effects models.

**Results**

This study included 162 eyes of 136 patients. Postoperative ECD measurements were performed  $3.7 \pm 1.8$  times (mean  $\pm$  standard deviation) during a median follow-up period of 34 months. The mean intraocular pressure decreased from  $25.3 \pm 9.6$  mmHg to  $9.2 \pm 2.3$  mmHg postoperatively. The marginal mean (standard error) ECD decrease at 24 months was 9.3 (1.3) % in all cases; ECD changes (%) =  $-0.23T - 3.73$  [ $p < 0.001$ , T = time point of ECD measurement (months)]. The marginal mean ECD decrease at 24 months was 18.2 (3.1) % and 20.6 (4.7) % in eyes with XFG and UG, respectively, which was significantly greater than 4.8 (1.8) % in eyes with POAG ( $p < 0.001$ , each), after accounting for the variability in the number and time point of ECD measurements. Multivariate mixed-effects model analyses showed that type of glaucoma (XFG and UG) and older age were significantly associated with larger ECD decrease, and preoperative factors (oral carbonic anhydrase inhibitor and vitrectomy) and postoperative choroidal detachment were significantly associated with a declining trend of ECD over time.

**Conclusions**

The type of glaucoma (XFG, UG) and older age were risk factors for larger ECD decrease after trabeculectomy with MMC.

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**O-FR-05 / P-FS-196****MULTICENTER, RANDOMIZED STUDY OF A SCHLEMM'S CANAL MICROSTENT FOR REDUCTION OF IOP IN PRIMARY OPEN ANGLE GLAUCOMA (THE HORIZON TRIAL)**Cathleen McCabe<sup>\*</sup>, TW Samuelson<sup>1</sup><sup>1</sup>MN Eye, Minnesota, United States**Purpose**

To evaluate the safety and effectiveness of a new Schlemm's canal microstent to lower diurnal IOP and medication use in patients with primary open angle glaucoma (POAG) and cataract.

**Methods**

HORIZON is a prospective, multicenter, randomized, controlled clinical trial comparing concurrent phacoemulsification with a Schlemm's canal microstent (Hydrus Microstent, Ivantis Inc, Irvine, CA) to phacoemulsification alone. Eligible subjects had mild to moderate POAG treated with 1-4 topical hypotensive medications, age related cataract, and washed out diurnal IOP (DIOP) of 22-34 mmHg. Following successful phacoemulsification and lens replacement, study eyes were randomized 2:1 into Hydrus Microstent (HM) or cataract surgery only (CS) groups. Follow-up was conducted at 1 and 7 days, and at 1, 3, 6, 12, 18 and 24 months postoperatively. Study eyes were evaluated at each follow-up visit for IOP, medication use, visual acuity, ocular health and adverse events. Medication wash out was repeated at 12 and 24 months and DIOP measured in order to assess treatment effect without the influence of topical hypotensive medications.

**Results**

556 eyes from 556 subjects were randomized to HM (N=369) or CS (N=187). There were no significant differences between groups in age, sex, ethnicity, baseline visual acuity or glaucoma severity. Screening IOP was  $18.0 \pm 3.1$  mmHg on  $1.7 \pm 1.0$  glaucoma medications. Pre operative unmedicated DIOP was  $25.5 \pm 3.0$  mmHg in the HM group and  $25.4 \pm 2.9$  mmHg in the CS group. At 24 months, the mean reduction in DIOP was  $-7.5 \pm 4.1$  mmHg in the HM group and  $-5.3 \pm 3.9$  mmHg in the CS group (difference =  $-2.3$  mmHg, 95% CI  $-3.0$  to  $-1.6$ ,  $p < 0.001$ ) and mean medication count was reduced 82.4% in the HM group vs. 58.8% in the CS group (difference = 23.6%,  $p < 0.001$ ). Follow up BCVA and VF changes were equivalent in both groups. The HM group was associated with transient postoperative hyphema and focal adhesions near the device, but significantly higher rates of IOP elevated  $>10$  mm Hg over baseline and rescue filtration surgery were observed in the CS group. There were no differences in other safety outcomes.

**Conclusions**

This study demonstrated that concurrent Schlemm's canal stenting in patients undergoing cataract surgery is safe and effective in lowering IOP and medication use compared to cataract surgery alone at 24 months.

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**O-FR-09 / P-FS-248****LENS EXTRACTION WITH OR WITHOUT GONIOSYNECHIALYSIS IN PRIMARY ANGLE CLOSURE DISEASE FOR ANGLE PARAMETERS ASSESSMENT**Jyoti Shakrawal<sup>\*</sup>, Dewang Angmo<sup>1</sup>, Tanuj Dada<sup>1</sup>, Suresh Kumar Yadav<sup>1</sup>, Ramanjit Sihota<sup>1</sup><sup>1</sup>Ophthalmology, Rpc, Aioms, New Delhi, India**Purpose**

Comparative evaluation of phacoemulsification (phaco) alone Versus phacoemulsification combined with Goniosynechialysis (phacoGSL) in Primary Angle Closure Disease (PACD) for angle parameters assessment.

**Methods**

120 PACG patients were screened, out of which 80 patients uncontrolled on maximal hypotensive therapy were recruited. Patients were randomized into 2 groups and underwent phaco alone in Group 1 or phacoGSL (Fig 1) in Group 2. Primary outcome measure was intraocular pressure (IOP) reduction. Secondary outcome measures included the change in anterior chamber angle parameters namely angle opening distance (AOD), trabecular-iris space area (TISA) and trabecular iris angle (TIA), best corrected visual acuity (BCVA) and the reduction in the number of glaucoma medications. The patients were followed for 6 months. Qualified success was defined as IOP  $\leq$  18 mmHg using  $\leq$  3 glaucoma medications at the last follow up

**Results**

30 and 34 patients were included in the Group 1 and 2 respectively for analysis. The mean preoperative IOP in two groups was  $32.48 \pm 6.76$  mmHg and  $34.17 \pm 5.33$  mmHg,  $p=0.34$ . There was a significant decrease in postoperative IOP in both the groups at each follow-up. Mean IOP was  $13.77 \pm 1.66$  mmHg and  $13.60 \pm 1.61$  mmHg at 6 months in Group 1 and 2 respectively ( $p=0.001$  both groups). However, no remarkable change in the IOP was measured between 2 groups after surgery at 6 months ( $p=0.74$ ). Significant widening of the angle parameters was noted at 6 months with an increase as compared to baseline values. (Fig 2) Although, the difference between the 2 groups was not significant ( $p>0.05$ ). There was a significant improvement in logMAR BCVA in both the groups at 6 months; Group 1 ( $0.33 \pm 0.21$  to  $0.06 \pm 0.11$ ;  $p=0.001$ ) and Group 2 ( $0.43 \pm 0.15$  to  $0.11 \pm 0.14$ ;  $p=0.002$ ). Also, there was a significant reduction in the number of ocular hypotensive medications at last visit; Group 1 ( $3.88 \pm 0.50$  to  $1.70 \pm 0.66$ ;  $p=0.002$ ) and Group 2 ( $4.14 \pm 0.50$  to  $2.05 \pm 0.54$ ;  $p=0.003$ ). The change in IOP over 6 months showed statistically significant positive correlation with lens thickness/ axial length. In both the groups, the change in IOP showed a negative correlation with change in all angle parameters at 6 months (Fig 3), which was not statistically significant

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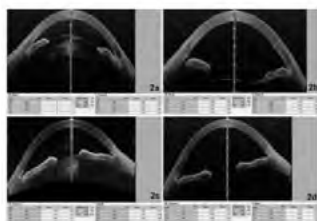
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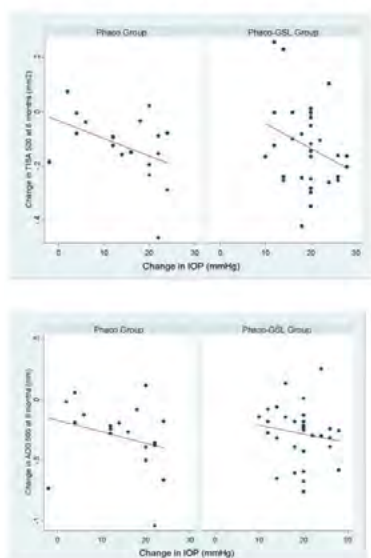
**Fig. 1 Images of the anterior chamber angle under gonioscopic visualization during phaco-GSL.**



**Fig. 2 ASOCT image illustrating the changes of the anterior chamber angle and ACD after phaco (2a,2b) and phaco-GSL (2c,2d).**



**Fig. 3 Representative scatter plots of the average change in IOP against AOD 500 change and TISA 500 change at 6 months in both groups.**



## Conclusions

Both phaco and phacoGSL are associated with a significant reduction in IOP along with a noteworthy widening of the anterior chamber angle parameters. Both procedures succeeded in reducing the necessity of glaucoma medications postoperatively in PACD eyes

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**O-FR-07 / P-FS-187****POST-OPERATIVE OUTCOMES OF REVISION SURGERY FOR FAILED XEN IMPLANTS AT A UK TERTIARY EYE CENTRE**Emma Linton\*, Leon Au<sup>1</sup><sup>1</sup>Ophthalmology, Manchester Royal Eye Hospital, Manchester, United Kingdom**Purpose**

The XEN implant is a minimally invasive glaucoma surgery (MIGS) device implanted ab-interno to reduce intraocular pressure in glaucoma. 12-month follow-up data for the XEN implants inserted by one surgeon at our tertiary centre previously showed that these are a safe and effective treatment option.<sup>1</sup> Infrequently, the stents fail to drain post-operatively usually due to scarring of the conjunctiva around the stent. Little data has been published thus far on the success rates of revision surgery. We report the post-operative outcomes of patients undergoing Xen implant revision surgery at a single tertiary eye centre, with up to 3 years follow-up.

**Methods**

A retrospective, non-randomised interventional case series of patients undergoing revision surgery of failed XEN implant was undertaken. Pre- and post-operative intraocular pressure (IOP), number of medications, number of interventions and conversion rates to filtration surgery were collected.

**Results**

151 XEN implants were inserted over a 5 year period by a single glaucoma surgeon with a revision rate of 13.9% (21 eyes). One eye (4.8%) was converted intra-operatively to conventional filtration surgery due to non-functioning Xen implant. Medical records were not available for analysis of 4 patients.

Of the remaining successful cohort, the mean pre-operative IOP was 25.8mmHg (SD 8.2) on 2.2 drops (range 1-3). At one month this reduced to 14.3mmHg (SD 4.4) on 0.2 drops (range 0-2). At three months mean IOP was 13.9mmHg (SD 3.0) on 0.4 drops (range 0-3). At the last review (range 1-33 months post revision), mean IOP was 15mmHg (SD 4.5) on 0.5 drops (range 0-3). 18.8% of eyes underwent bleb intervention during post-operative follow-up (number of interventions range 0-2).

2 eyes (12.5%) required further surgical intervention due to failure of XEN revision to control IOP. 1 patient (6.3%) developed blebitis and endophthalmitis at the previous trabeculectomy site 3 months post-op. One patient developed post-operative hypotonous maculopathy that resolved without intervention.

**Conclusions**

This data shows that surgical revision of a non-functioning XEN implant can be a safe and effective approach to reducing intra-ocular pressure and number of topical anti-glaucoma medications used. As with any bleb-based procedure, some patients require post-operative interventions to optimise their outcome. Rarely, the XEN implant may not be functioning and the surgeon should be prepared to convert to another traditional filtration procedure where necessary.

**References**

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**O-TH-08 / P-FS-094****INTERIM RESULTS OF A PROSPECTIVE, RANDOMIZED PHASE 2 STUDY EVALUATING THE SAFETY AND EFFICACY OF TRAVOPROST INTRAOCULAR IMPLANTS**Annabelle Ang, Robert Edward Ang<sup>\*1</sup><sup>1</sup>*Glaucoma, Asian Eye Institute, Makati City, Philippines***New Information**

Asia Pacific Association of Cataract and Refractive Surgery Congress 2018. New data will be presented.

**Purpose**

This US IND phase 2 study evaluates the safety and efficacy of two Travoprost Intraocular Implants, one with a fast-elution rate and one with a slow-elution rate (referred to as iDose-slow and iDose-fast) compared to Timolol Ophthalmic Solution, 0.5%, in subjects with OAG or OHT, either on no ocular hypotensive medication or using up to 3 medications. The iDose is a novel sustained-release travoprost implant.

**Methods**

This is a prospective, randomized, double-masked, active-controlled, parallel-group, multicenter US IND phase 2 trial. A total of 22 investigative sites (21 in the US and one in the Philippines) participated in this study that enrolled phakic or pseudophakic subjects aged  $\geq 18$  years diagnosed with mild to moderate OAG or OHT on 0 to 3 medications, with a baseline mean unmedicated diurnal IOP of 21-36 mmHg in the study eye (a washout was required for subjects on ocular hypotensive medications). Qualified subjects were randomized (1:1:1) to implantation with iDose-fast or iDose-slow as a standalone procedure, or medical treatment with topical timolol BID. Key study assessments included: BCVA, pachymetry, VF, endothelial cell density, biomicroscopy, gonioscopy, ophthalmoscopy (including C/D ratio), and AEs.

**Results**

A total of 154 subjects were randomized to the study: iDose-slow (n=54), iDose-fast (n=51), timolol (n=49). All subjects have completed the 12-week follow-up visit with continued ongoing follow-up through 3 years. Initial efficacy was demonstrated through Week 12 with all 3 study groups achieving at least 30% IOP reduction. An excellent safety profile was observed with no reports of hyperemia, intraoperative or serious ocular AEs to date in the iDose groups. Subjects continue to be followed-up per study design. Longer term outcomes will be reported at the time of presentation.

**Conclusions**

The 3-month interim results of this prospective randomized double-masked phase 2 trial demonstrate initial efficacy of both the iDose-fast and iDose-slow implants out to 12 weeks with at least 30% IOP reduction. An excellent safety profile was observed with no hyperemia, intraoperative or serious ocular AEs reported to date in either of the iDose groups. Travoprost Intraocular Implants (iDose) showed favorable efficacy and safety in this study. The iDose implant has the potential to change the treatment paradigm in glaucoma.

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**O-FR-01 / P-FS-123****XEN GEL STENT SURGERY IN PATIENTS WITH OPEN ANGLE GLAUCOMA: TWO-YEAR RESULTS**

Alice Di Domenico\*, Giorgio Enrico Bravetti<sup>1</sup>, Kevin Gillmann<sup>1</sup>, Harsha L Rao<sup>2</sup>, Tun Wang Ch'ng<sup>1</sup>, André Mermoud<sup>1</sup>, Kaweh Mansouri<sup>1</sup>

<sup>1</sup>Glaucoma Research Center Montchoisi Clinic, Lausanne, Switzerland, <sup>2</sup>Narayana Nethralaya, Hulimavu, Bangalore, India

**New Information**

This abstract has been presented to ECRS Vienna 2018. We have been able to follow up more patients for this study since then.

**Purpose**

To evaluate the 2-year treatment outcomes of XEN gel stent (Allergan Inc., Irvine, USA) in glaucoma patients.

**Methods**

Prospective, single-center interventional study. One hundred forty-nine eyes of 113 patients with open angle glaucoma. Consecutive eyes with uncontrolled intraocular pressure (IOP) despite medical treatment were included to undergo either standalone XEN or combined XEN-Phacoemulsification surgery ("XEN+cataract"). Primary efficacy outcome was success; defined as "complete" when the unmedicated IOP was below 16 mmHg over the 2-year period and "qualified" when the IOP was below 16 mmHg with or without medications. Similar outcomes were also defined at an IOP level of 18 mmHg. Secondary measures were mean reduction in IOP and in the number of medications, and the rates of reoperations.

**Results**

One hundred-nine eyes (84 patients, mean age: 74.3 years) underwent XEN+cataract surgery and 40 eyes (29 patients, mean age: 74.7 years) standalone XEN surgery. Overall, 129 eyes (86.6%, 96 eyes of 75 patients of XEN+cataract and 33 eyes of 24 patients of XEN alone surgery) completed the study. Mean medicated IOP was  $20.0 \pm 7.5$  at baseline and  $14.2 \pm 3.7$  mmHg at 2 years ( $p < 0.01$ ), a 29.1% IOP reduction. Mean medications dropped from  $2.0 \pm 1.3$  preoperatively to  $0.6 \pm 0.9$  at 2 years ( $p < 0.001$ ). Complete success was achieved in 48.1% of eyes using the  $<16$  mmHg and in 51.2% using the  $<18$  mmHg threshold. Needling was performed in 58 eyes (45%). In all, 9.2% underwent reoperations.

**Conclusions**

After 2 years, XEN gel stent surgery achieved a clinically and statistically significant reduction in IOP and number of anti-glaucoma medications.

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**O-FR-02 / P-FS-277****OUTCOMES OF COMBINED TRABECULOTOMY WITH TRABECULECTOMY IN CHILDREN WITH ANIRIDIA AND SECONDARY GLAUCOMA**

Nkechinyere Judith Uche<sup>1</sup>, Rashmi Krishnamurthy<sup>1</sup>, Anil K Mandal<sup>1</sup>, Sirisha Senthil<sup>1</sup>

<sup>1</sup>*Glaucoma, Lv Prasad Eye Institute, Hyderabad, India*

**Purpose**

To report the clinical features and treatment outcomes of combined trabeculotomy with trabeculectomy (CTT) in children with Aniridia and secondary glaucoma

**Methods**

Medical records of 72 eyes of 39 children with aniridia and secondary glaucoma from 1997 to 2015 operated at our institute with a minimum follow up of 6 months were included. Clinical and demographic details were obtained. All children underwent combined trabeculotomy with trabeculectomy with Harms trabeculotome. Success was defined as complete when IOP was  $>5$  and  $\leq 21$  mm Hg without antiglaucoma medications (AGM) and qualified when AGM were required. Eyes with IOP  $>21$  mmHg, needing repeat surgical intervention or loss of light perception was considered failure. Surgical outcomes were evaluated using Kaplan-Meier analysis.  $P < 0.05$  was considered statistically significant and statistical analysis was performed with 'R' software (3.3.2).

**Results**

The median age at glaucoma diagnosis was 1 month (IQR: 3 days, 3 months). There were 23 males (59%) and 16 females (41%). There was history of parental consanguinity in 30.7% (12 children), nine children (23%) had nystagmus, one child had a history of previous nephrectomy for Wilms tumour. Total aniridia was noted in 58 eyes and 14 eyes had partial aniridia. Corneal edema was noted in 34 eyes (47.2%) and enlarged corneal diameter in 32 eyes (44.4%), limbal stem cell deficiency with corneal vascularization was seen in 3 eyes. Associated pathology seen were, 11 eyes (15%) with cataract (posterior subcapsular in 5 eyes, lamellar in 4 eyes and anterior polar in 2 eyes), retino-choroidal coloboma in 1 eye and foveal hypoplasia in 4 eyes. After CTT, the median IOP reduced from 28mmHg (26, 30) to 16 mmHg (14, 21) with a median follow up of 5.43 years (IQR: 3.05, 8.65), ( $P < 0.0001$ ). Median number of AGM postoperatively was 1 (0,2). The median Log MAR visual acuity ( $n=32$  eyes) was 1.20 (0.8, 2.78). Complete success was 79.5% at 1 year, 77.9% at 2 years, 71% at 3 years, was 69% at 4 years until 9 years. Qualified success at 1 year was 83.6%, 2 years was 82.1% maintained until 12 years. Eight eyes (11%) required repeat intervention for IOP control. Median number of surgeries was 1 (1,1). Time to repeat glaucoma surgery was 3.43 (0.92, 4.31) years.

**Conclusions**

Primary trabeculotomy with trabeculectomy had good success rate in children with Aniridia and secondary glaucoma.

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**O-FR-11 / P-FS-275****GONIWASH: A NEW SURGICAL APPROACH COMBINED WITH CATARACT SURGERY TO LOWER INTRAOCULAR PRESSURE IN PSEUDOEXFOLIATION SYNDROME**

Van Tao Tran\*, Kaweh Mansouri<sup>1</sup>, Andre Mermoud<sup>2</sup>

<sup>1</sup>*Glaucoma Research Center, Montchoisi Clinic, Swiss Vision Network, Lausanne, Switzerland,*

<sup>2</sup>*Glaucoma Center, Clinic Montchoisi, Lausanne, Switzerland*

**Purpose**

Pseudoexfoliation syndrome (PEXS) is a common finding in elderly patients and is related to intraocular pressure (IOP) elevation. Goniowash is a new surgical technique, developed at our center, to remove PEX material from the iridocorneal angle with the aim of lowering IOP postoperatively. We assessed the long-term efficacy of this method on IOP and best corrected visual acuity (BCVA) after cataract surgery in patients with PEXS.

**Methods**

Retrospective study of 190 eyes of 122 patients with PEX syndrome and PEX glaucoma, who underwent routine cataract surgery combined with Goniowash. BCVA, IOP and medication status were recorded for all patients during 5 years of follow-up.

**Results**

Data from 190 eyes of 122 patients (mean age,  $73.8 \pm 7.7$ ) were available at 5 years. Mean BCVA increased from 0.60 to 0.95 ( $p < 0.001$ ) one year after surgery. This effect remained stable throughout the follow-up period ( $p < 0.001$ ). Mean IOP decreased from 26.4 mmHg preoperatively to 15.9 mmHg postoperatively at one year ( $p < 0.001$ ), 16.11 ( $p < 0.001$ ) at 3 years and 16.82 ( $p < 0.001$ ) at 5 years. Mean number of ocular hypotensive medications pre and postoperatively decreased from 1.5 to 0.37 ( $p < 0.001$ ) (75% reduction). No unexpected and severe adverse events related to the surgical procedure were reported for any of the patients.

**Conclusions**

Goniowash combined with cataract surgery provides stable and long-lasting improvement in BCVA, decrease in IOP and hypotensive medications. In conclusion, Goniowash combined with a standard cataract surgery, is a safe procedure for long term IOP reduction and may be an alternative for patients with pseudoexfoliation syndrome and elevated IOP.

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**O-TH-07 / P-WT-282****PROGRESSION IN PERIMETRICALLY NORMAL EYES OF OPEN-ANGLE GLAUCOMA PATIENTS WITH UNILATERAL VISUAL FIELD LOSS: AN EIGHT-YEAR-FOLLOW-UP STUDY**Xiang Fan<sup>\*1</sup>, Lingling Wu<sup>1</sup><sup>1</sup>Ophthalmology, Beijing Key Laboratory of Restoration of Damaged Ocular Nerve, Peking University Third Hospital, Beijing, China**Purpose**

To evaluate the progression of standard automated perimetry (SAP) for preperimetric open-angle glaucoma (OAG) and explore the relating factors.

**Methods**

OAG patients with unilateral field loss detected by SAP (Octopus, G2 program) were examined with the Heidelberg Retina Tomography II (HRT-II) at baseline. Beta-Zone parapapillary atrophy ( $\beta$ -zone PPA) was defined as a region of chorioretinal atrophy with visible sclera and choroidal vessels adjacent to the optic disc and measured by HRT-II. Visual field examinations were followed by a series of SAP examinations for the perimetrically normal eyes administered over eight years. During follow-up, the relationship between the progression of SAP from normal to abnormal and baseline records including best corrected visual acuity (BCVA), refractive error (RE), intraocular pressure (IOP), central corneal thickness (CCT), glaucomatous optic neuropathy (GON) rate and parameters on HRT-II including the area of  $\beta$ -zone PPA ( $\beta$ -zone-area) and ratio of  $\beta$ -zone-area to disc area ( $\beta$ -zone/DA) were analyzed; especially, differences of mean IOP, IOP decrease rate, medications between “progression” and “non-progression” of SAP tests were also compared.

**Results**

Forty-eight perimetrically normal eyes of 48 participants had complete data and a qualifying follow-up. 22 eyes (46%) developed abnormal SAP results after 4 to 90 months. “Progression” eyes showed greater GON rate, SAP-MD, SAP-LV and CDR, LCD, CSM in HRT-II, especially greater  $\beta$ -zone-area and  $\beta$ -zone/DA, at baseline than “non-progression” eyes ( $p < 0.05$ ), while BCVA, RE, IOP, CCT at baseline and mean IOP, IOP decrease rate and medications during follow-up were similar between the two groups ( $p > 0.05$ ).

**Conclusions**

In perimetrically normal eyes of OAG patients, almost one half progressed on SAP within 8 years. Severity of GON especially evaluated by HRT-II and even normal SAP results at baseline were related to such progression.  $\beta$ -zone PPA was related to preperimetric glaucoma progression.

**Conclusions**

In perimetrically normal eyes of OAG patients, almost one half progressed on SAP within eight years. Severity of GON especially evaluated by HRT-II and even normal SAP results at baseline were related to such progression.  $\beta$ -zone PPA was related to preperimetric OAG progression.

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**O-FR-08 / P-FS-167****AB INTERNO GEL IMPLANT FOR THE TREATMENT OF REFRACTORY GLAUCOMA: RESULTS FROM THE INTERNATIONAL GLAUCOMA SURGERY REGISTRY (IGSR)**

Nathan Kerr<sup>\*1,2</sup>, Gok Ratnarajan<sup>3</sup>, Andrew Scott<sup>4</sup>, Keith Barton<sup>4</sup>

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**Purpose**

To evaluate the safety and efficacy of ab interno gel implant insertion for the surgical treatment of glaucoma refractory to topical medications.

**Methods**

Data were analysed from the International Glaucoma Surgery Registry, a worldwide registry with users in over 20 countries that collects high-quality prospective data on the real-world outcomes of glaucoma surgery. Patients with glaucoma refractory to topical medications (n = 148) underwent ab interno gel implant insertion (XEN; Allergan, Dublin, Ireland). The main outcome measures were mean intraocular pressure (IOP) change, glaucoma medication use, ocular adverse event incidence, and requirement for further surgery.

**Results**

The mean  $\pm$  standard deviation (SD) baseline IOP was  $22.8 \pm 8.0$  mmHg and the mean number of topical ocular hypotensive medications was  $2.8 \pm 1.0$  (SD). There were no serious intraoperative events. Mean IOP reduced 34% at 12 months from baseline to  $15.1 \pm 5.9$  mmHg ( $P < 0.05$ ) and mean medication usage was reduced to  $1.0 \pm 1.2$  medications ( $P < 0.05$ ). The most common complication was a transient IOP  $< 6$  mmHg (n = 11). Needling was required in 27 eyes (18%). Six eyes (4%) required further glaucoma surgery, most commonly a glaucoma drainage device.

**Conclusions**

Ab interno gel implant insertion has a favourable safety profile and provides an effective approach to controlling IOP in patients with refractory glaucoma. The IGSR has the potential to make a major contribution to our understanding of optimal surgical treatments through its worldwide reach and consistency of data collection to enable future treatment comparisons.

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**O-FR-03 / P-FS-166****TRABECULAR MICRO-BYPASS WITH CATARACT SURGERY FOR PATIENTS WITH GLAUCOMA: A SYSTEMATIC REVIEW AND META-ANALYSIS**

Nathan Kerr<sup>1,2</sup>, Colin Clement<sup>3</sup>, Paul Healey<sup>4</sup>, Dominic Tilden<sup>5</sup>, Lara Aghajanian<sup>5</sup>

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**Purpose**

Minimally invasive glaucoma surgery (MIGS) is an emerging and innovative treatment modality for the management of open angle glaucoma (OAG). This study aims to systematically identify and quantitatively evaluate the efficacy of iStent Trabecular Micro-Bypass devices in conjunction with cataract surgery (CS) in patients with OAG. The analysis synthesises available data for iStent in the published literature and provides support for randomised controlled trial (RCT) evidence through the inclusion of non-RCTs and real-world studies.

**Methods**

A systematic literature review was undertaken in August 2018 to identify RCTs and non-RCTs of iStent and iStent Inject (Glaukos Corporation, San Clemente, CA) implantation in conjunction with CS in patients with OAG. There were no exclusion criteria for RCTs. Non-RCTs with at least 6 months follow up and greater than 10 patients were included. Weighted mean differences (WMDs) for continuous outcomes, including intraocular pressure (IOP) and medication use, were calculated using the mean change between pre and post stent implantation measurements (baseline values were used as controls). Meta-analyses were performed using the random-effects model in Review Manager 5.3 to obtain WMDs and 95% confidence intervals (CIs). Treatment success rates, including the proportion of patients medication free at study endpoint, were meta-analyzed using MetaXL (v.5.3) to produce weighted summaries of proportions using a random effects model.

**Results**

Four RCTs and twenty-one non-RCTs with up to five years follow-up were identified reporting on 2,074 eyes. Mean pre-operative (medicated) IOP ranged between 17-20 mmHg across the majority of studies. Implantation with two iStent devices in conjunction with CS resulted in a mean reduction in IOP of 3.42 mmHg (95%CI: 2.11-4.73) and a weighted mean reduction of 1.18 (95%CI: 1.01-1.35) ocular hypotensive medications per patient after 12 months of follow-up. Similar results were obtained at final follow-up (6-60 months), with a 3.33 mmHg (95%CI: 1.99-4.67) reduction in IOP and 1.11 (95%CI: 0.93-1.30) fewer medications. At 12-24 months, 61.6% (95%CI: 48.2-74.2) of patients were free of hypotensive medication.

**Conclusions**

iStent implantation in conjunction with CS is associated with a clinically relevant and long-term reduction in IOP. This benefit is further characterized by a sustained reduction in ocular hypotensive medication burden.

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**O-FR-06 / P-FS-082****REAL WORLD MIGS: AUSTRALIAN & NEW ZEALAND EXPERIENCE OF > 1000 HYDRUS MICROSTENT IMPLANTS WITH 1 TO 3 YEAR FOLLOW UP.**Ashish Agar<sup>\*1</sup><sup>1</sup>Ophthalmology, Prince of Wales Hospital, University of New South Wales, Sydney, Australia**Purpose**

Although MIGS devices offer new surgical options for glaucoma most published data refers to formal clinical trials and as an adjunct to cataract surgery. Their use in surgeon defined cases and as solo operations is of relevance to clinicians operating in their local settings. We aimed to evaluate the 'real world' safety and efficacy outcomes for the Hydrus microstent (Ivantis, Irvine CA) in Australia & New Zealand to provide long term data from clinical practice in our region.

**Methods**

The study was conducted with 14 surgeons in 9 clinics across Australia & New Zealand from 2014-2018. All Hydrus cases were 'real world' with unrestricted surgeon discretion and no exclusion, covering the full range of glaucoma from mild to advanced, including refractory glaucoma. Microstents were implanted ab-interno, in combination with cataract surgery or as standalone surgery, in phakic and pseudophakic eyes. Participating surgeon data at each site was entered into the global SPEC-TRUM registry database via a secure web portal. This included baseline demographic and ocular status, medications, IOP, visual field mean deviation (MD), prior ocular surgery and serious adverse events. Follow-up comprised at least one visit between 1 and 3 months and annually thereafter.

**Results**

1116 eyes undergoing Hydrus implantation were enrolled. 821 (74%) were in combination with cataract surgery (CC) and 295 (26%) were performed standalone (SA). The SA cohort had more severe glaucoma (MD -9.6 vs -6.1 dB), more frequent prior glaucoma surgery, filtration or MIGS (19% vs 4%) and higher baseline IOP and medications (18.4±5.9 vs 21.4±7.6 mmHg and 2.1±2.2 vs 2.8±1.1 medications) than the CC cohort. Follow-up was complete at 1 year in 69%, 2 years in 35% and 3 years in 12%. At the 1, 2 and 3 year follow-ups CC cases had IOP reductions compared to baseline of 22%, 20%, and 21% ( $p < 0.05$ ) and medications reduced by 58%, 47%, and 50% ( $p < 0.05$ ). For the SA cohort IOP was reduced by 30%, 30%, and 35% ( $p < 0.5$ ) and medications by 38%, 39%, & 47% ( $p < 0.5$ ) at 1, 2 and 3 years. Significant adverse events were transient iritis (5%) and peripheral anterior synechiae (8.9%, associated with device obstruction in 7.3%).

**Conclusions**

In clinical settings that reflect everyday practice the Hydrus microstent is effective in reducing IOP and medications at up to 3 years. It is a safe & versatile MIGS option for the full range of glaucoma severity, both with concurrent cataract surgery, and importantly also as a standalone glaucoma procedure.

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**O-TH-10 / P-FS-280****WOUND HEALING AND ITS POTENTIAL BIOMARKERS IN HUMAN TEAR AFTER TRABECULECTOMY**Natalia Volkova\*, Tatiana Iureva<sup>1</sup><sup>1</sup>*1<sup>st</sup> Ophthalmology Surgery Department, Scientific Department, Irkutsk Branch Of S. Fyodorov Eye Microsurgery Federal State Institution, Irkutsk, Russian Federation***Purpose**

To quantify the expression of potential biomarkers of wound healing in tears and to compare the level of biomarkers in groups with complete and qualified success and in the control group after trabeculectomy.

**Methods**

Enzyme-linked immunosorbent assay (ELISA) determined the levels of interleukin 8 (IL8), interleukin 6 (IL6), and the isoforms 121, 165 of family of vascular endothelial growth factor A (VEGF A) in the basal tear in pg/ml the day before, on the 3<sup>rd</sup> day and two months after surgery. Group 1–patients with complete success (n=29), group 2–patients with qualified success (n=54), group 3 (control)–healthy (n=18). Student's T-test and Kaplan-Meier analysis were used to compare cytokine level and to assess long-term results. P<0.05 was considered significant.

**Results**

Before surgery, IL8 level was 301.7±165.4 (1<sup>st</sup> group), 933.7±272.7 (2<sup>nd</sup> group) <sup>p1-2<0.05</sup>, and 338.28±140.4 (3<sup>rd</sup> group) <sup>p2-3<0.05</sup>. On the 3<sup>rd</sup> day after surgery IL8 level was 325.1±105.7 (1<sup>st</sup>) and 389.4±176.7 (2<sup>nd</sup>). After 2 months IL8 level was 243.8±126.7 (1<sup>st</sup>) and 231.8±65.7 (2<sup>nd</sup>). Before the surgery IL6 level was 37.8±8.7 (1<sup>st</sup>), 48.3±13.9 (2<sup>nd</sup>) <sup>p1-2<0.05</sup>, 8.04±4.42 in the 3<sup>rd</sup>, <sup>p1-3<0.05, p2-3<0.05</sup>. On the 3<sup>rd</sup> day the IL6 level was 34.3±19.2 (1<sup>st</sup>) and 66.1±18.7 (2<sup>nd</sup>) <sup>p1-2<0.05</sup>. After 2 months, IL6 level was 13.9±6.05 (1<sup>st</sup>) and 13.45±6.14 (2<sup>nd</sup>). Before the surgery isoform VEGF A level was 851.4±369.4 (1<sup>st</sup>), 895.8±205.7 (2<sup>nd</sup>), 164.65±120.7 in the control, <sup>p1-3<0.05, p2-3<0.05</sup>. On the 3<sup>rd</sup> day its level was 597.7±224.7 (1<sup>st</sup>) and 712.5±305.7 (2<sup>nd</sup>), <sup>p1-2<0.05</sup>. After 2 months – 98.5±212.7 (1<sup>st</sup>) and 795.8±270.9 (2<sup>nd</sup>), <sup>p1-2<0.05</sup>. IL8, IL6 were significantly different between the groups with glaucoma and the control (p < 0.05). Patients with qualified success of trabeculectomy had higher values of biomarkers (p < 0.05).

**Conclusions**

The levels of inflammatory cytokines IL8, IL6 and isoforms 121, 165 of angiogenic cytokine VEGF A are signs of initial tissues inflammation of the ocular surface. The expression of VEGF isoforms confirms the long-term processes of fibroplasia and vasculogenesis. Significantly, increased expression of biomarkers is accompanied by a decrease in the hypotensive success of trabeculectomy. Consequently, the cytokine levels determined by ELISA may be potential biomarkers for predicting low hypotensive effect of filtering surgery, and may indicate further necessity of searching effective perioperative treatment

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**O-TH-02 / P-WT-138****BIMATOPROST SUSTAINED-RELEASE IMPLANT FOR LOWERING INTRAOCULAR PRESSURE: LONG-TERM EFFICACY AND PATIENT-REPORTED OUTCOMES**

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**New Information**

The long-term efficacy data and the patient-reported outcomes resulting from this Phase 1/2, 24-month study have been presented separately at the American Glaucoma Society 2018 meeting and the European Glaucoma Society 2018 meeting, respectively.

**Purpose**

Poor adherence to topical intraocular pressure (IOP)-lowering medication is prevalent in glaucoma management.<sup>1</sup> To address nonadherence, a biodegradable bimatoprost sustained-release implant (BimSR) was developed. This report presents safety outcomes, duration of IOP-lowering effect, and patient-reported outcomes in glaucoma patients administered BimSR.

**Methods**

Phase 1/2, prospective, 24-month (mo), paired-eye trial. After washout, 75 patients received BimSR (6, 10, 15, or 20-μg dose strength) intracamerally (study eye) and topical bimatoprost 0.03% QD (bim; fellow eye). Rescue topical medication or a single repeat BimSR was permitted. Long-term IOP lowering for patients receiving the 10- and 15-μg BimSR dose strengths (n=21 each) was assessed by IOP, time to additional IOP-lowering therapy, and patients (%) without additional IOP-lowering therapy. Three questionnaires (5-point scales) were used to assess patient treatment preferences and patient experiences with prior eye drops and implant administration procedure.

**Results**

Initial treatment with BimSR 10 or 15 μg, respectively, controlled IOP up to 4 and 6 mo in 95.2% and 66.7% of patients without rescue medication/retreatment. Median time to additional IOP-lowering therapy after BimSR administration was 38–39 weeks. At 24 mo, 23.8% patients had not been rescued/retreated, and mean (SD) IOP was 16.0 (2.2) and 15.9 (2.5) mmHg with BimSR 10- and 15-μg, respectively, vs 16.4 (2.1) and 15.4 (2.4) mmHg for fellow eyes. Across all dose strengths, >30% of patients reported being bothered by some aspect of their eye drop; 56% reported missing their eye drops ≥once/mo. After first BimSR administration, >81% reported the procedure was less burdensome than expected; consistent results were reported after a second implant (>83%). At 24 mo, >80% reported they were very or extremely likely to choose the procedure again if allowed and >88% would recommend it to others. Adverse events (>48-h post administration) were similar to those with bim and consistent with the administration procedure and prostaglandin analog class effects.

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### Conclusions

Single BimSR implant showed favorable IOP-lowering efficacy for >6 mo in most patients and up to 24 mo in a subset. Most patients reported they would likely choose to use BimSR again and to recommend it to other glaucoma patients. These data support the clinical development of BimSR in ongoing phase 3 trials.

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**O-TH-04 / P-WT-212****EFFICACY OF A DEEP LEARNING SYSTEM FOR DETECTING GLAUCOMATOUS OPTIC NEUROPATHY BASED ON COLOR FUNDUS PHOTOGRAPHS**Mingguang He<sup>\*1,2</sup><sup>1</sup>Zhongshan Ophthalmic Center, Guangzhou, China, <sup>2</sup>Centre for Eye Research Australia, Melbourne, Australia**Purpose**

To assess the performance of a deep learning algorithm for detecting referable glaucomatous optic neuropathy (GON) based on color fundus photographs.

**Methods**

A deep learning system for the classification of GON has been developed for automated classification of GON on color fundus photographs. Twenty-one trained ophthalmologists were recruited to classify 48,116 fundus photographs collected from multiple hospitals in China. Referable GON was defined as vertical cup/disc ratio  $\geq 0.7$  and other typical changes of GON. The reference standard was made when  $\geq 3$  graders had achieved agreement. A separate validation dataset of 8,000 fully gradable fundus photographs was used to assess the performance of this algorithm. The area under receiver operator characteristic curve (AUC) with sensitivity and specificity was applied to evaluate the accuracy.

**Results**

In the validation dataset, this deep learning system achieved an AUC of 0.986 with sensitivity of 95.6% and specificity of 92.0%. The most common reasons for false negative grading (n=87) were GON with co-existing eye conditions (n=44, 50.6%), including pathologic or high myopia (n=37, 42.6%), diabetic retinopathy (n=4, 4.6%) and age related macular degeneration (n=3, 3.4%). The leading reason for false positive cases (n=480) was having other eye conditions (n=458, 95.4%), mainly including physiologic cupping (n=267, 55.6%). Misclassification as false positive among normal fundus was present in only 22 eyes (4.6%).

**Conclusions**

A deep learning system can detect referable GON with high sensitivity and specificity. Co-existence of high/pathologic myopia is the most common cause resulting in a false negative. Physiologic cupping and pathologic myopia were the most common reasons for false positive.

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**O-TH-09 / P-WT-257****DEVELOPMENT AND VALIDATION OF A DEEP LEARNING CLASSIFIER TO DETECT GONIOSCOPIC ANGLE CLOSURE BASED ON ANTERIOR SEGMENT OCT IMAGES**

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**Purpose**

To develop and validate a convolutional neural network (CNN) that performs automated detection of gonioscopic angle closure based on anterior segment OCT (AS-OCT) images.

**Methods**

Subjects were identified from the Chinese-American Eye Study (CHES), a population-based study of Chinese Americans in Los Angeles, CA. Each subject underwent a complete ocular exam including gonioscopy and AS-OCT imaging in each quadrant (superior, nasal, inferior, and temporal) of the anterior chamber angle (ACA). Deep learning methods were used to develop three competing multi-class classifiers for Shaffer grades 0, 1, 2, 3, and 4. Binary probabilities for open (Shaffer grades 0,1) and closed (Shaffer grades 2,3,4) angle eyes were constructed by summing probabilities over the corresponding Shaffer grades. Models were evaluated with five-fold cross validation using an 80%/20% distribution of training and validation data. The best-performing model was also evaluated using an independent test dataset. Outcome measures included area under the receiver operating characteristic curve (AUC), sensitivity, specificity, and accuracy of the binary classifier for detecting gonioscopic angle closure.

**Results**

The CHES dataset consisted of 4036 images from 791 subjects, with a balanced number of quadrants with open (N = 1943) and closed (N = 2093) angles. The classification model was developed with a cross-validation dataset of 3396 images (1632 open angle; 1764 closed angle) from 664 subjects. The remaining 640 images (311 open and 329 closed) from 127 subjects were segregated into an independent test dataset. For detecting gonioscopic angle closure, the best performing model had an AUC of 0.933 (95% confidence interval, 0.925-0.941) with a sensitivity of 91.4±1.4% and specificity of 82.3±1.5%. The predictive accuracy of the classifier for gonioscopic angle closure among eyes with Shaffer grade 0 or 1 was 98.4% and 89.1%, respectively. The predictive accuracy of the classifier for gonioscopic open angle among eyes with Shaffer grade 3 or 4 was 87.4% and 98.9%, respectively. The AUC for the independent test dataset was 0.922.

**Conclusions**

Deep learning models based on AS-OCT images can detect gonioscopic angle closure with high accuracy, especially in eyes with the highest degree of angle closure. These methods could be applied to automate clinical evaluation of the ACA and screening for patients at risk for primary angle closure glaucoma.

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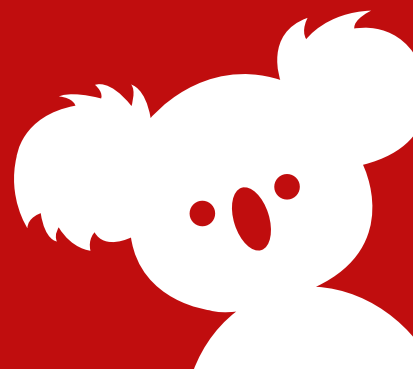
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# POSTER ABSTRACTS



# Epidemiology, Quality of Life and Health Economics

**P-WT-001**

**MEDICATION ADHERENCE BY GLAUCOMA PATIENTS ATTENDING A NIGERIAN HOSPITAL**

Kayode Ajite\*

**Purpose**

Glaucoma is a chronic disease necessitating a lifelong treatment in order to prevent the irreversible blindness occurrence. Non adherence to medical treatments by glaucoma patients can lead to resultant visual impairment, blindness, and disabilities. The aim of this study is to determine the adherence to medication glaucoma and identify factors responsible for non-adherence in patients attended to in our hospital.

**Methods**

A cross-sectional study was conducted from March 2018 to July 2018 at Ekiti state university teaching hospital, Ado Ekiti. Consecutive patients with glaucoma, aged 18 years or above, who have been on at least one topical glaucoma medication for at least six months and were attending the glaucoma clinic during the study period were included. A questionnaire was used to gather data about patients' demographics and factors affecting adherence to medical treatments. The Morisky Medication Adherence Scale was used to evaluate the adherence to glaucoma medication. Results were analyzed using SPSS version 18. Descriptive statistics, and chi-square were used.

**Results**

A total 93 (27.5%) patients were non adherent to glaucoma therapy. Non adherence was associated with finance/cost of medication ( $P = 0.03$ ), forgetfulness ( $P = 0.01$ ) and side effects of drops ( $P = 0.04$ ). Other barriers were difficulty with drop administration ( $P = 0.02$ ), older age ( $P = 0.04$ ), advanced stage of glaucoma ( $P = 0.01$ ), longer frequency of follow up ( $P = 0.00$ ). Sex ( $P = 0.53$ ), level of education ( $P = 0.09$ ), and marital status ( $P = 0.77$ ) were not statistically significantly associated with non-adherence to anti-glaucoma drug treatment.

**Conclusions**

Almost one third of the studied patients were non adherence to medication, this is an important clinical problem in the management of glaucoma. Patient education and adequate counseling may help in improving the patients' adherence to glaucoma medications.

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## P-WT-002

# FUNCTIONAL VISUAL ABILITY AND QUALITY OF LIFE IN CHILDREN WITH GLAUCOMA

Abdulrahman AlDarrab\*

### Purpose

To evaluate the effect of glaucoma and its management on the functional visual ability (FVA) and the vision related quality of life (VR QoL) in children 8 to 18 years of age.

### Methods

Functional visual ability (FVA) was assessed using the Cardiff Visual Ability Questionnaire for Children (CVAQC) and VR QoL was assessed using the Impact of Vision Impairment for Children (IVI\_C) tool.

### Results

Eighty-five children 8 to 18 years of age were interviewed King Khaled Eye Specialist Hospital (KKESH), Riyadh, Saudi Arabia. Scores for FVA and VR QoL were decreased in children with glaucoma: median of CVAQC scores, -0.68 (interquartile range [IQR], -1.27 to 0.19; range, -3.00 higher visual ability to +2.80 lower visual ability); IVI-C mean score, 55.3 (SD, 13.0; normal VR QoL, 96). Factors associated with significantly lower FVA and VR QoL included, lower best-corrected visual acuity (BCVA) ( $P < 0.0001$  for both FVA and VR QoL), bilateral glaucoma ( $P = 0.04$  for in FVA and 0.009 in VR QoL) and three or more glaucoma surgeries ( $P < 0.001$  for both FVA and VR QoL).

### Conclusions

FVA and VR QoL as perceived by children with glaucoma are reduced. Children with lower BCVA, bilateral glaucoma and those who had undergone three or more glaucoma surgeries had significantly lower FVA and VR QoL. Improving the QoL with psycho-social involvement and visual rehabilitation by the use of low vision aids among children with glaucoma should be included in the treatment plan in addition to medical and surgical treatment.

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## P-WT-003

### INFLUENCE OF PSYCHIATRIC SYMPTOMS ON UTILITY BASED QUALITY OF LIFE AMONG GLAUCOMA PATIENTS IN A WEST AFRICA TERTIARY HOSPITAL

Nnenne Ani\*

#### Purpose

Glaucoma can precipitate psychiatric disorders severe enough to reduce the quality of life.<sup>1</sup> The aim of this study is to determine the level of anxiety and depression and their influence on time trade-off utility among glaucoma patients at a tertiary hospital in West Africa.

#### Methods

This was a hospital-based cross-sectional study conducted over five months. Subjects were selected by simple random sampling and consisted of 299 glaucoma patients. Inclusion criteria was age 16 years or older with no history of coexisting ocular pathology or chronic systemic illness. Sociodemographic data was obtained through an interviewer-based structured proforma. HADS questionnaire and time trade-off utility questionnaire were also used. Ocular examination included VA, applanation tonometry, gonioscopy and slit-lamp examination with + 78D. Other tests were perimetry and refraction. Data was analysed using SPSS (Version 20), and p-value set at < 0.05.

#### Results

Two hundred and ninety-nine subjects participated in the study. There were 141 males (47%) and 158 females (53%) giving a male: female ratio of 1:1.12. The relative frequency of anxiety and depression were 37.5% and 34.1% respectively. Positive family history, previous membership of a Glaucoma Society and worsening BCVA in the better eye were predictors for anxiety. Increasing age ( $p = 0.029$ ), higher educational level ( $p = 0.001$ ) and worsening BCVA in the better eye ( $p = 0.001$ ) were predictors for depression. The mean score of TTO among study population was  $0.84 \pm 0.1417$  (95% CI 0.82-0.86). Subjects with depression, who had longer duration of glaucoma had lower TTO scores unlike their counter parts without depression ( $p = 0.001$ ) and subjects with anxiety who had positive family history of glaucoma reported lower TTO value compared to their counterparts without anxiety ( $p = 0.046$ ). Worsening BCVA in the better eye was shown to be the only predictor for lower TTO quality of life. TTO had a significant inverse relationship with anxiety ( $p = 0.040$ ) and depression ( $p = 0.001$ ).

#### Conclusions

This study shows that there is a high relative frequency of anxiety and depression among glaucoma patients, which has led to a reduced time trade-off utility quality of life among this group of persons. This underscores the need for establishment of counselling unit in the glaucoma clinic and interdisciplinary management of glaucoma patients with the Neuro- psychiatrists for the achievement of patients' overall wellbeing.

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## P-WT-004

# LIVING WITH GLAUCOMA - HOW DIFFICULT IT IS IN A SOUTH ASIAN SET UP? A QUALITATIVE STUDY OF FUNCTIONAL IMPLICATIONS IN ADVANCED GLAUCOMA

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### Purpose

The ultimate goal of glaucoma management is the preservation of patients' visual function and quality of life (QoL). The disease itself as well as the medical or surgical treatment can have an enormous impact on a patient's QoL. QoL depends on the social circumstances and context of the culture and value systems in which they live. The purpose of this study was to explore whether patients with advanced glaucoma had vision-related functioning difficulties and influence of vision problems on health-related QoL in Sri Lanka.

### Methods

Self-administered format of National Eye Institute Visual Functioning Questionnaire - 25 (VFQ-25) was given to 30 patients with advanced glaucoma. It was translated to Sinhalese and validated. Patients had their glaucoma diagnosis for at least 5 years and had a range of disease severities (median best eye Mean Deviation was -18.193 dB). A total score for each of the questions were calculated and expressed this as a percentage of the total possible score, from 0 to 100, with lower scores indicating better results.

### Results

All patients had difficulty in performing daily activities to a certain extent (range 32 % to 58%) Distant vision and outdoor activities were affected more than near activities. Difficulty in driving was not an issue for 30% patients as they were anyway not driving. 20% had given up driving due to poor eye sight. All were frustrated and were worried about losing eye sight and becoming a burden. 90 % of patients had extended family support and they were coping fairly well. In order to maintain independence some actively changed aspects of their behavior.

### Conclusions

Results from this qualitative study suggest that visual impairment significantly affects QoL and adoption of certain coping behaviours may help glaucoma patients to adapt to their condition. An awareness of coping and adaptive strategies, in addition to the usual clinical tests, provides a better insight into the impact of disease. Interestingly, QoL seems to be worsened by glaucoma only in the more advanced stages and especially when both eyes are affected. Due to good extended family support in Sri Lanka patients are coping well even with advanced disease.

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## P-WT-005

### CORRELATION OF CENTRAL CORNEAL THICKNESS(CCT) WITH RETINAL VEIN OCCLUSION (RVO) & PRIMARY GLAUCOMA AT TERTIARY HOSPITAL

Shahnaz Begum\*

#### Purpose

To compare the central corneal thickness among patients with retinal vein occlusion & healthy eyes. Also correlating central corneal thickness with retinal vein occlusion(RVO) & primary glaucoma.

#### Methods

We conducted a cross sectional study of patients seen at ophthalmology out-patients department of BIRDEM General Hospital from January 2016 to June 2017 who had branch retinal vein occlusions (BRVO) & central retinal vein occlusions (CRVO). Patients' demographics (including age, sex, and medical history and ocular history) were obtained. CCT measurements by ultrasound pachymetry were recorded for each patient and compared to controls. We also showed percentage of patients suffering from primary glaucoma among RVO patients & CCT in different varieties of glaucoma patients.

#### Results

Mean age of RVO-eye was higher than controls,  $59.7 \pm 10.3$  vs.  $46.4 \pm 5.8$  years, ( $p < 0.001$ ). Males were more prevalent (81.25%) than female in RVO- eye. In RVO- eye group, systemic diseases were more prevalent than control group. Primary glaucoma and ocular hypertension were detected in 24 eyes (27.5%) of RVO-group. Mean CCT of RVO- eyes & control group was  $525.54 \pm 35\mu\text{M}$  and  $545.6 \pm 31.2\mu\text{M}$  respectively. In primary open-angle glaucoma (POAG) group CCT was  $527.09 \pm 21.2\mu\text{M}$  and in the chronic angle-closure glaucoma (CACG) group was  $562.0 \pm 5.66\mu\text{M}$ , in ocular hypertension  $585.67 \pm 14.57$ , in the pseudo-exfoliation glaucoma (PXG) group was  $555 \pm 8.49\mu\text{M}$ , and NTG group was  $493 \pm 9.73\mu\text{M}$ . The NTG group seems to have the thinnest CCT among all glaucoma patients.

#### Conclusions

RVO- eye patients have thinner CCT than controls. Normal tension glaucoma has the thinnest CCT among all glaucoma patients. The pathophysiology of this association is unclear. It may be related to less lamina cribrosa rigidity in the thin corneal eye. Lamina cribrosa displacement may compress central retinal vein, leading to RVO. Our study also showed that systemic diseases are more among RVO patients.

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## P-WT-006

### DEMOGRAPHY & REFERRAL PATTERN OF GLAUCOMA CLINIC PATIENTS IN A TERTIARY HOSPITAL IN INDIA

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#### Purpose

A retrospective study from glaucoma clinic of a tertiary eye care hospital from India over a 16-month period. The study aimed at evaluating the sub-types of glaucoma, stage of disease and treatment protocol at the centre. A retrospective study from glaucoma clinic of a tertiary eye care hospital from India over a 16-month period. The study aimed at evaluating the sub-types of glaucoma, stage of disease and treatment protocol at the centre.

#### Methods

All subjects underwent a detailed ophthalmic examination in our glaucoma clinic as per the routine protocol including applanation tonometry, gonioscopy, ultrasound pachymetry, perimetry/pre-perimetric test and any other relevant investigation. Glaucoma was defined using modified International Society of Geographical and Epidemiological Ophthalmology criteria.

#### Results

Of the 1058 patients, males predominated at 60%. Majority of them (54%) were in the 6<sup>th</sup> decade or above, while 38% were between 20-50 years of age and 8% younger than 20 years.

Glaucoma subtypes were: angle closure glaucoma (PACG) 23%, ACG suspects 13%, open angle glaucoma (POAG) 22%, POAG suspects 15 %, secondary glaucoma 13% and primary congenital glaucoma (PCG) 2.5%. No glaucoma was seen in 11.5%.

Almost 13% presented with glaucoma blindness in one eye. Glaucoma surgery was required in 17.5% while 32% could be controlled on anti-glaucoma medications.

#### Conclusions

Primary glaucoma predominates in hospital referrals, equally distributed between closed and open angle subtypes. Advanced glaucoma was fairly common, with almost 1/4<sup>th</sup> cases requiring surgical intervention. Referral practice was robust with over-diagnosis occurring in only 12%.

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**P-WT-007**

**INCIDENCE AND MANAGEMENT OF SECONDARY GLAUCOMA FROM RETINAL DETACHMENT SURGERY IN A TERTIARY HOSPITAL IN THE PHILIPPINES**

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**Purpose**

to estimate the incidence of secondary glaucoma following surgery for rhegmatogenous retinal detachment and to determine their outcomes in terms of visual acuity and control of intraocular pressure.

**Methods**

A prospective observational cohort study was done involving patients who underwent retinal reattachment surgery at the Philippine General Hospital. The patients were followed-up for 3 months postoperatively and were monitored for development of secondary glaucoma. Descriptive analysis for done to determine success rate of management of cases in terms of visual acuity and control of intraocular pressure.

**Results**

Of the 52 patients enrolled in the study, 27% (n = 19) developed secondary glaucoma after surgery, giving a calculated incidence rate of 12.17% per month. Analysis of mean IOP trends show that elevations occur in the first day postoperatively with a sustained elevation up to the first month and returning to statistically normal levels by the third month postoperatively. The incidence of secondary glaucoma is slightly higher with a combined scleral buckling and vitrectomy (39.3%, n = 11) as compared to vitrectomy alone (31.8%, n = 7), but the difference is not statistically significant. Analysis of visual acuity trends show that mean visual acuity is worse among cases with secondary glaucoma, with a mean logMAR acuity of 1.34 at the third month postoperatively compared to 1.08 in those with no elevations in IOP. Most cases of secondary glaucoma are managed with topical and oral medications which achieves successful control of IOP in 68% of cases. Other management options include laser iridotomy, laser cyclophotocoagulation, and early removal of silicone oil tamponade.

**Conclusions**

Secondary glaucoma may complicate retinal reattachment surgery. The overall incidence rate of development of secondary glaucoma is significant to warrant monitoring in the postoperative period. Control of IOP may positively impact final visual acuity after retinal reattachment surgery. Preoperative counseling of patients undergoing retinal reattachment surgery should include glaucoma risk assessment and possibility for additional procedures to achieve acceptable IOP levels.

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## P-WT-008

### TO STUDY THE ASSOCIATION OF GLAUCOMA AND HELICOBACTER PYLORI IN SOUTH INDIAN POPULATION

Meenakshi Dhar\*

#### Purpose

To investigate the incidence of H. pylori infection amongst Glaucoma patients in South India and to find the characteristics of Glaucoma in patients positive for H.pylori.

#### Methods

This is a case-control study conducted after Institutional ethics committee approval, with informed consent from all participants. Both eyes of 50 consecutive glaucoma patients were included in Group A. Comprehensive ocular, glaucoma evaluation of the patients was done. Control group [Group B] comprised of 50 consecutive age and sex-matched normal people. Exclusion criteria: patients whose fundus and visual field evaluation was not possible. Serologic Assays Serum levels of anti-Pylori IgG antibody was done with ELISA method. Statistical analyses were performed with SPSS software.

#### Results

The seroprevalence of H. Pylori infection was significantly higher ( $P = 0.011$ ) in Glaucoma patients 36% than in the control group [14%], with a male preponderance [18:7]. There was no statistically significant difference in the average age, visual acuity, IOP and ONH between seropositive [Gl(HP+ve)] & seronegative groups [Gl(HP-ve)]. In Gl (HP+ve) patients Glaucomatous field loss [based on Hodapp's classification]—was advanced in 12 eyes, severe [ $n = 4$ ] moderate [ $n = 10$ ] & minimal [ $n = 10$ ]. Statistically significant ( $p = 0.03$ ) severe visual field loss was seen in Gl (HP+ve) eyes as compared to 12.5% in Gl (HP-ve) group. Statistically significant ( $p = 0.03$ ) decline was seen in Mean RNFL thickness in the Gl (HP+ve) group: Gl(HP-ve) group (66.2 : 74.98 microns). Combined mean of avGCL-IPL—also shows significant decline. { Gl(HP+ve): Gl (HP-ve)- 58.13: 70.28 microns.

#### Conclusions

Glaucoma patients have a significantly higher seroprevalence of H. Pylori infection with a male preponderance. Seropositive patients had significantly more advanced Visual field loss, retinal nerve fibre layer thinning and Mean of average ganglion cell layer and inner plexiform layer thinning and dry eye.

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**P-WT-009**

**NORMAL TENSION GLAUCOMA IN PATIENTS WITH MODERATE TO SEVERE OBSTRUCTIVE SLEEP APNEA**

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**Purpose**

To determine the prevalence of glaucoma in patients newly diagnosed with moderate-severe obstructive sleep apnea (OSA).

**Methods**

We conducted a prospective cross-sectional study of 100 consecutive patients newly-diagnosed with moderate-severe OSA on polysomnography (PSG) recruited from the sleep clinic at the Singapore General Hospital. They underwent a complete ophthalmologic examination and investigations including the Humphrey Visual Field (HVF) test, central corneal thickness (CCT), axial length and anterior chamber depth measurements and spectral-domain optical coherence tomography measurements of the peripapillary retinal nerve fiber layer thickness.

**Results**

Majority of patients were Chinese (79%) and male (71%), with a mean (SD) age of 50.7 (12.2) years. The prevalence of glaucoma was 8/100 (8%), all of whom were classified as normal tension glaucoma (NTG). 4/8 patients (50%) had both structural and functional damage, while the remaining 50% were pre-perimetric with structural damage only. Glaucomatous eyes had longer axial lengths (26.54 vs 24.60 mm,  $p < 0.05$ ), and worse HVF mean deviation (SD) (-4.06 (2.32) vs. -2.00 (2.99),  $p = 0.02$ ). 3/100 patients (3%) had ocular hypertension. There was no significant difference between the groups in terms of age, gender, ethnicity, body mass index, family history of glaucoma, medical comorbidities, CCT, anterior chamber depth, mean, maximal and minimal phasing intraocular pressures and PSG parameters (all  $p > 0.05$ ).

**Conclusions**

The prevalence of NTG in moderate-severe OSA is much higher compared to the general population. Patients with glaucoma had longer axial lengths and worse mean deviations on HVF testing. We suggest that a complete ophthalmologic screening for glaucoma should be performed in this group of patients.

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## P-WT-010

### VISUAL ABILITY AND QUALITY OF LIFE IN CHILDREN WITH CHILDHOOD GLAUCOMA: MOVING BEYOND CLINICAL ENCOUNTER

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#### Purpose

To evaluate the visual ability (VA) and vision-related quality of life (VRQoL) of children treated for childhood glaucoma (CG).

#### Methods

306 children (mean age, 12.3 years; SD, 2.9 years; 62% male) with primary or secondary CG (mean duration since diagnosis, 9.0 years; [SD] 4.4 years) under follow-up at a tertiary eye care centre completed the 23-item L V Prasad Functional Vision Questionnaire –II (LVP-FVQ-II) as a measure of VA and 24-item Impact of Vision Impairment- Children (IVI-C) questionnaire as a measure of VRQoL during their routine ophthalmic visit. We investigated the measurement properties of LVP-FVQ II and IVI-C questionnaire using Rasch analysis and generated interval-level estimates of VA and VRQoL respectively. The main outcome measures were VA and VRQoL (Rasch-derived scores). Multivariable linear regression analyses assessed the influence of socio-demographic and clinical variables on the VA and VRQoL of children with CG.

#### Results

Majority (81%) of the children had bilateral CG and 53% had primary CG. A little over two-thirds (68%) of the children had normal visual acuity ( $\geq 6/18$  in better eye). Mean (standard deviation, SD) follow-up was 8.98 (4.4) years and 47% of the children did not require any ant-glaucoma medication for control of intraocular pressure. Rasch analysis of the IVI-C indicated need for minor modifications following which a psychometrically robust unidimensional 18-item IVI--C emerged. By comparison, the LVP-FVQ II demonstrated acceptable psychometric properties. Visual ability was moderately reduced, with a median LVP-FVQ II score of -2.25 logits (interquartile range, [IQR], -0.69 to -4.19; range, 4.16 [lower VA] to -4.49 [higher VA]). VRQoL showed large reduction with a median IVI-C score of 0.78 logits (IQR, 2.04 to -0.09; range, -2.62 [lower VRQoL] to 3.86 [higher VRQoL]). Children with unilateral CG reported significantly better VRQoL than those with bilateral CG (mean difference = 0.53,  $p = 0.03$ ).

#### Conclusions

Regardless of the type of CG, child's age and gender, CG has a significant impact on the child's VA and VRQoL. Although the VA was similar across unilateral and bilateral CG, children with unilateral CG reported significantly better VRQoL as compared to those with bilateral CG. Ophthalmologists and parents of children with CG will need to be alert to this finding. Efforts must be made to improve the VA and VRQoL of children with CG.

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## **P-WT-011** **STEROID INDUCED GLAUCOMA AFTER KIDNEY TRANSPLANT**

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### **Purpose**

To determine the prevalence of steroid induced glaucoma and treatment characteristics in kidney transplant patients in a tertiary level multi speciality Institution.

### **Methods**

In this prospective cross-sectional study, the patients who received kidney transplant were enrolled and underwent comprehensive ophthalmological evaluation including intraocular pressure (IOP) measurement with Goldmann Applanation tonometry, visual field examination with Humphrey Field Analyzer, and gonioscopy. Cases with IOP > 21 mmHg, visual field defect, and vertical optic disc cupping 0.7 or more or asymmetry of 0.2 or more were labelled as glaucoma whereas patients with IOP > 21 mmHg with normal visual field were designated as ocular hypertension. All patients were treated with immunosuppressive drugs prednisolone, cyclosporine, tacrolimus, and mycophenolate mofetil.

### **Results**

The mean age of patients was 39 (SD:9) (range: 25-60) years. Out of 72 patients with kidney transplant 7 (9.72%) patients were diagnosed with steroid induced glaucoma and 9 (12.5%) patients had ocular hypertension. Four (5.55%) patients underwent trabeculectomy to control IOP whereas 3 (4.16%) patients were controlled on anti-glaucoma medications. Best-corrected visual acuity < 6/9 was noted in 23 (31.94%) patients in at least one eye. Other associated findings were cataract [30 (41.67%) patients], pseudophakia [8 (11.11%) patients], hypertensive retinopathy [10 (13.88%) patients], diabetic retinopathy [4 (5.55%) patients], branch retinal vein occlusion [1 (1.38% patient)] in at least one eye. The average follow-up was 30 months with interquartile range of 18-84 months.

### **Conclusions**

Kidney transplant patient must be screened for glaucoma and other associated ocular abnormality and should be on routine ophthalmological follow-up due to the possibility of steroid induced glaucoma.

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## P-WT-012

# POPULATION BASED CROSS SECTIONAL STUDY ON PREVALENCE OF PRIMARY GLAUCOMA IN THE RURAL AND URBAN POPULATION: KARAMSAD GLAUCOMA STUDY

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### Purpose

To Study the prevalence of primary open angle and primary angle Closure glaucoma at Shree Krishna hospital in the urban and rural population of Anand district in Gujarat. There have been many such studies in India for the Prevalence of glaucoma but no such study has been conducted in Western India. This study will give us the amplitude of the problem so that it can help us to make new strategies for the problem.

### Methods

The study is a descriptive study which was conducted in 'Shree Krishna Hospital Gokal nagar, Karamsad, Anand, Gujarat, which is the largest tertiary care hospital between two main cities of Gujarat i.e. Ahmedabad and Vadodara. All the patients from general eye OPD and rural OPD were included in the study. Total 11236 patients were included in the study representing rural and urban population of Anand. The patients were screened for glaucoma and comprehensive ophthalmic examination including Best corrected visual acuity, IOP, disc evaluation, perimetry and gonioscopy was performed. Patients were divided in subgroups depending upon the variables like gender, refractive error, co morbidity and angle status. The data was analysed and studied.

### Results

Overall prevalence of glaucoma is 2.12%. The prevalence of POAG was 1.78% and PACG was 0.34%. Prevalence of POAG increase with age. No relationship was found with co morbidity, gender.

Myopes have higher prevalence for POAG and hypermetropes for PACG. 3.34% had developed blindness.

### Conclusions

With this study we can conclude that the prevalence of POAG is much higher 1.62% as compared to the PACG 0.34 %. This data suggests that the prevalence is at least as much as that of the southern India studies. Prevalence is related to refractive errors but not with Diabetes, hypertension and gender.

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## **P-WT-013** **CHANGES IN INTRAOCULAR PRESSURE DURING PREGNANCY**

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### **Purpose**

To investigate, using our national data, the changes in intraocular pressure (IOP) that occur in pregnant women and thereby, to determine the possible effect of pregnancy on the diagnosis and follow-up of glaucoma.

### **Methods**

180 eyes of 90 healthy pregnant women (pregnant group) and 186 eyes of 93 healthy age-matched females (control group) were included in the study. Complete ocular examinations were performed on each eye. IOP measurements were obtained with Goldmann applanation tonometer during pregnancy (first, second and third trimesters) for pregnant cases, and in similar time intervals for control subjects. For each trimester, the mean of three Goldmann IOP readings was recorded. IOP measurements were taken and recorded for each group simultaneously. The patients with previous ocular history and who had chronic disease were excluded from the study.

### **Results**

The mean visual acuity, keratometry and refractive error of both control and pregnant groups did not change significantly during the study (all p values > 0.05). The mean trimester IOPs were measured as  $15.33 \pm 1.86$ ,  $13.82 \pm 1.17$  and  $13.02 \pm 1.98$  mmHg, respectively. A significant decrease in IOP was observed in pregnant cases during the first, second and third trimesters compared with the healthy women. The difference between control and first, control and second, and control and third trimester groups were found to be  $0.33 \pm 0.19$  mmHg, ( $p > 0.05$ ),  $1.84 \pm 0.12$  mmHg ( $p < 0.05$ ) and  $2.52 \pm 0.16$  mmHg ( $P < 0.05$ ), respectively. Discussion: IOP decreased in all trimesters  $> 0.05$ , respectively.

### **Conclusions**

IOP decreased in all trimesters of pregnancy and this decrease in IOP was observed to be significant during the second and the third trimester. The fluctuation and physiologic decrease in IOP should be considered in the monitoring of glaucoma detected during pregnancy or already existing.

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## P-WT-014

### PRIMARY OPEN-ANGLE GLAUCOMA AND INCREASED RISK OF CHRONIC KIDNEY DISEASE

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#### Purpose

To investigate the association between primary open-angle glaucoma (POAG) and the subsequent development of chronic kidney disease (CKD).

#### Methods

We included 1,025,340 beneficiaries in the 2002–2013 Korean National Health Insurance database from 2002 to 2013. To determine the effect of POAG on CKD, we applied time-varying covariate Cox regression analyses: Model 1 included only POAG as a time-varying covariate; Model 2 included Model 1 and demographic information; and Model 3 included Model 2 and comorbidity, co-medication, and Charlson comorbidity index score.

#### Results

The fixed cohort included 478,303 eligible subjects, and of these, 1,749 suffered incident POAG and 3,157 developed CKD. POAG was associated with an increased risk of CKD development (HR = 7.63; 95% confidence interval [CI], 5.89–9.87) in Model 1; HR = 3.54 [95% CI, 2.73–4.58] in Model 2; and HR = 2.90 [95% CI, 2.24–3.76] in Model 3).

#### Conclusions

POAG increased the risk of subsequent CKD in the general population, suggesting that POAG and CKD might share a common pathogenic mechanism.

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## P-WT-015

### ASSOCIATION BETWEEN ESODEVIAION AND PRIMARY OPEN-ANGLE GLAUCOMA IN KOREAN ADULTS: THE KOREA NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY

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#### Purpose

To evaluate the association between strabismus and primary open-angle glaucoma (POAG) in a representative Korean population.

#### Methods

A total of 11,114 participants 20 years of age or older in the Korea National Health and Nutrition Examination Survey (KNHANES) database for the years 2010 through 2011 were analyzed. Glaucoma diagnosis was based on the International Society of Geographical and Epidemiological Ophthalmology criteria. Ocular alignment was evaluated using the alternate prism and cover test, and clinically significant horizontal strabismus was defined as exodeviation of  $\geq 15$  prism diopters (PD) and esodeviation of  $\geq 10$  PD. The prevalences of POAG and strabismus were calculated using KNHANES sample weights. Univariate and multivariate logistic regression analyses were used to evaluate the risk factors for POAG.

#### Results

In the Korean population, the prevalence of POAG was 3.16% (95% confidence interval [CI], 2.79–3.53%) and that of clinically significant horizontal strabismus was 0.67% (95% CI, 0.46–0.87%): 0.51% (95% CI, 0.34–0.67%) for exodeviation and 0.16% (95% CI, 0.05–0.27%) for esodeviation. Interestingly, subjects with clinically significant esodeviation had a much higher prevalence of POAG (12.32%) than those without strabismus (3.19%,  $P = 0.0241$ , Rao-Scott's chi square test). After adjusting for age, intraocular pressure (IOP), and spherical equivalent, clinically significant esodeviation was identified as an independent risk factor for POAG (OR 11.73 [95% CI 3.63–37.87],  $P < 0.0001$  in right eyes, OR 6.12 [95% CI 1.50–24.97],  $P = 0.0116$  in left eyes, weighted logistic regression analysis).

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## Image

Figure 1

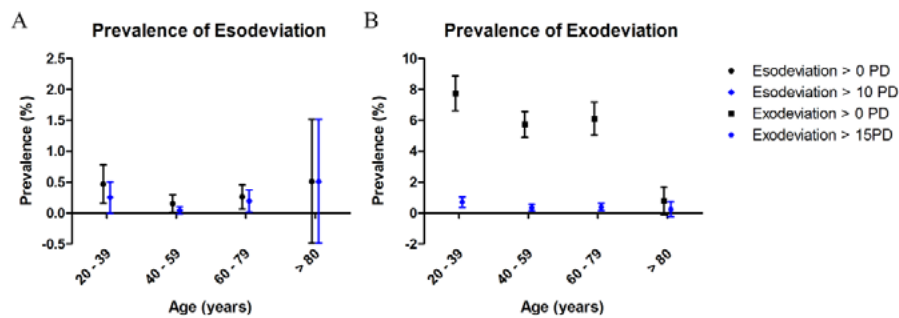


Figure 2

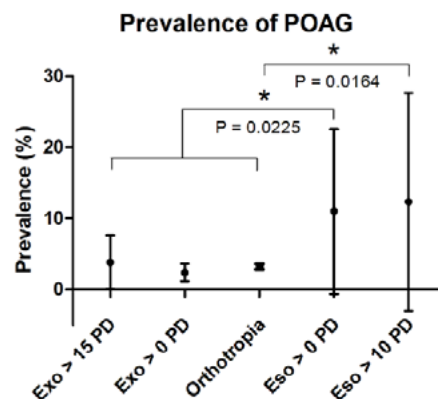
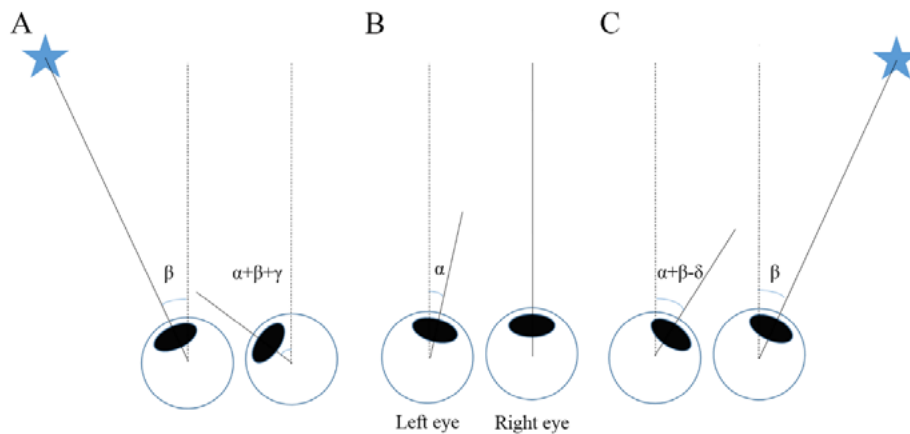


Figure 3



## Conclusions

This study found a positive association between esodeviation and POAG in a representative population. This could be the result of, at least in part, ocular-adduction-induced greater strain on the temporal optic nerve head (ONH) and peripapillary tissues, which makes the eyes with esodeviation more vulnerable to the development of POAG.

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## P-WT-016

### THE RELATIONSHIP BETWEEN EYE DISEASES AND HEARING

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#### Purpose

To investigate whether there are correlations between age-related eye diseases such as cataract, glaucoma, diabetic retinopathy, age-related macular degeneration, and hearing loss.

#### Methods

Using the database of the Korea National Health and Nutrition Examination Survey, participants 40 years of age or older who had both ophthalmologic examination and automatic hearing test were included. The hearing loss was defined as the loss of airway hearing loss over 40 decibels based on the automatic hearing test to determine the threshold of airway hearing for each frequency.

#### Results

The weighted prevalence of diabetic retinopathy was not significantly different between the hearing impaired and hearing impaired groups ( $P = 0.740$ ), but the weighted prevalence of cataract, glaucoma, wet AMD, and dry AMD was significantly different ( $P < 0.001$  for all). In the age and sex adjusted model, the odds ratio for cataracts in people with hearing loss was 1.373 (1.118 - 1.687). The odds ratios of glaucoma, diabetic retinopathy, wet age-related macular degeneration, and dry age-related macular degeneration were not significant in people with hearing loss ( $P = 0.505, 0.224, 0.731$ , and  $0.220$ , respectively). The significant factor for simultaneous hearing loss and cataract was age, which increased the risk of 6.574 times per 10 years. Significant factors for glaucoma in hearing loss were age (6.570 times per decade, 2.857 - 4.461), male (3.14 times, 1.119 - 8.829), and triglyceride (1.003 times per 1mg / dL, 1.001 - 1.005). For diabetic retinopathy, age, ex-smoker, systolic BP, BMI, and fasting blood sugar was significant factors for concurrent hearing loss. In wet AMD, increased age and systolic BP elevations, and in dry AMD, increased age and HDL decline affected concurrent presence of hearing impairment.

#### Conclusions

The prevalence of cataracts, glaucoma, wet AMD, and dry AMD in elderly patients is higher than in normal people with hearing loss. However, with age adjustment, only cataracts are associated with hearing loss. Of the factors affecting the coexistence of each eye disease and hearing loss, age was common in all eye diseases and the other factors varied.

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## P-WT-017

### BAK-FREE PROSTAGLANDINS: EFFECT ON QUALITY OF LIFE IN PRIMARY OPEN ANGLE GLAUCOMA PATIENTS

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#### Purpose

The purpose of this study was to compare QoL (quality of life) in glaucoma patients receiving BAK (benzalkonium chloride) preserved and BAK free prostaglandins.

#### Methods

A total of 110 subjects were divided into three groups; 40 receiving BAK preserved prostaglandins, 40 receiving BAK free travoprost and 30 age matched controls. All the patients were assessed by a single interviewer with orally administered Quality of Life (GQL-15) and Ocular surface disease index (OSDI) questionnaires.

#### Results

Mean GQL-15 score in BAK group was significantly higher than BAK free group ( $24.71 \pm 7.42$  versus  $17.58 \pm 3.06$ ;  $p$  value  $< 0.05$ ). There was a strong positive correlation between OSDI scores and GQL-15 scores in all the groups ( $r$  value: BAK: 0.63, BAK free: 0.23, Controls: 0.29), with higher OSDI scores (severe OSD) associated with higher GQL-15 scores (worse QoL).

#### Conclusions

BAK preserved prostaglandins lead to higher OSDI scores which correlate poorly to QoL scores as compared to BAK free prostaglandins. Our results highlight the importance of assessment of ocular surface in management of patients with glaucoma who are being prescribed BAK preserved anti glaucoma agents.

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## P-WT-018 MANAGEMENT OF GLAUCOMA PROGRESSION

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### Purpose

To determine the characteristics of the progression of glaucoma taking into account the analysis of the treatment approaches (regimens) used in patients with primary open-angle glaucoma.

### Methods

A combined analytical research and clinical multicenter cohort study was conducted in the period from 2015 to 2018 at 30 scientific and clinical bases in 6 countries (Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Uzbekistan), which included data from 155 patients with different stages of POAG. Dynamics of IOP, MD, PSD data was described by the equation of the line:  $y = kx + b$ , where  $b$  is a constant, some average level of the parameter,  $k$  is a coefficient that characterizes the slope of the line indicating a tendency to increase / decrease the parameter value for 2.5 years.

### Results

At the time of glaucoma diagnosis, 90.3% of prescriptions were represented by five main regimens. The first place is occupied by the group of beta-blockers (BB) (43.7%), followed by the prostaglandin group (PG) in second place (27.1%), the combination BB + PG takes the third place (12.1%), the fourth - BB + ICA 4.0%, monotherapy with carbonic anhydrase inhibitor (ICA) - the fifth (3.2%). All laser and surgical techniques, as well as their combinations with medical therapy, account for 5.2%, that is, surgical treatment is not used in due measure. At the beginning of the prospective part of the study, the number of treatment regimens used increased to 31, and in the final study, 40 treatment options were used, the frequency of laser and surgical techniques and their combinations with medical therapy increased to 37.2%.

Monotherapy with the use of BB leads to the maximum negative trend at 2.5 years of use of this regime (-0.4). The best trends show the appointment of PG analogues in monotherapy (-0.07) and

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their use in combination with BB (-0,14), as well as the combination of BB + ICA (-0,14).

### Conclusions

An increase in the level of IOP in the dynamic observation of the patient leads to the need for a revision of the therapy, which in turn provides an additional reduction in the ophthalmotonus (there is a change in the IOP level from 0 to -2.5), but at the same time, glaucoma progression trend from -0.18 to -0.81), which can be evidence of both the ineffectiveness of the chosen tactics at the start of treatment, and the “programmed” nature of the course of the disease.

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## P-WT-019 PRIMARY ANGLE CLOSURE DISEASE IN THE YOUNG

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### Purpose

To determine the angle characteristics among young PACD patients attending tertiary care center in Northern India.

### Methods

Prospective non-comparative case series. Patients reporting in Glaucoma Clinic of R.P Center from June 2017 to May 2018 with PACD in the age group less than 40 years were recruited for the study. Data recorded included age, gender, detailed Slit lamp biomicroscopy, Gonioscopy, Biometry and Ultrasound Biomicroscopy. Patients with prior incisional surgery or evident secondary mechanism for angle closure were excluded. Data was recorded and analysed with SPSS software.

### Results

53 eyes of 27 patients were recruited including 15 females and 12 males. Mean age was  $34.25 \pm 5.4$  years, baseline IOP  $29.85 \pm 14.65$  mmHg and CDR  $0.74 \pm 0.23$  respectively. Mean Axial length (AL), anterior chamber depth (ACD) and lens thickness (LT) were  $21.99 \pm 1.18$  mm,  $2.55 \pm 0.62$  mm,  $4.28 \pm 0.35$  mm respectively. 71.7% (38/53) eyes had “sinewave” or “double hump” configuration of plateau iris on gonioscopy. On Ultrasound biomicroscopy, 41.5% (22/53) eyes had true plateau iris, 30.2% (16/53) eyes had pseudo-plateau iris due to ciliary body cysts and the rest 28.3% (15/53) eyes had pupillary block. All eyes underwent Yag iridotomy. 22.6% (12/53) eyes required surgical intervention for IOP control and 13.2% (7/53) eyes additional laser procedure (iridoplasty/repeat iridotomy). Rest 64.2% (34/53) eyes were controlled on  $3.10 \pm 1.10$  no of medications. Amongst surgical interventions, (4/12) eyes underwent cataract surgery, (6/12) eyes trabeculectomy, (2/12) eyes combined surgery. 16.7% (2/12) eyes developed malignant glaucoma following surgical intervention. Post treatment IOP at last visit was  $15.02 \pm 6.34$  mmHg on medical therapy and  $14.48 \pm 6.34$  mmHg post surgery.

### Conclusions

The incidence of plateau iris is 71.7% in the young population. Amongst eyes with plateau iris configuration, pseudo plateau iris comprise a significant proportion (30.2%) when compared to true plateau iris (41.5%). Significant proportion of population (64.2%) are controlled with medical management alone. There is a high risk of malignant glaucoma (16.7%) in patients undergoing any surgical intervention.

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## P-WT-020 DRIVING LIMITATION IN GLAUCOMA

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### Purpose

Visual acuity (VA) and Esterman visual fields (EVF), two main visual parameters used to assess driving suitability in Australia, may fail to capture the visual and non-visual requirements for driving in glaucoma patients. The study evaluates the use of a glaucoma-specific patient-reported outcomes (PRO) instrument, the Glaucoma Driving Limitation Questionnaire (GDLQ), to determine driving suitability. We also determine if GDLQ scores worsen with glaucoma severity, and if worse GDLQ scores correlate with worse VA, EVF and perimetric mean deviation.

### Methods

Multi-centre cross-sectional study of 64 patients (mean age 67.9 (SD 14.3; range 19-89), and 37 (58% male) with primary open angle glaucoma (POAG) in Melbourne, Australia. Participants filled out the GDLQ, which comprised 15 items that assessed driving-related visual functions. Demographic data, GDLQ person measure score (PMS), VA, contrast sensitivity, Humphrey and EVF were compared among earliest, early, moderate, and advanced glaucoma patient groups (Bascom Palmer glaucoma severity score criteria for perimetric mean deviation (MD)<sup>1</sup>for the better eye). Intergroup significance was assessed using analysis of variance (ANOVA) for numerical data and chi-squared test for categorical variables. Linear and multiple regression was used to determine if there was an association between VA (better eye), EVF, perimetric MD (better eye) and GDLQ PMS. Rasch analysis was conducted to assess performance of the GDLQ.

### Results

11 cases were removed from Rasch analysis as they were either extreme cases or poorly fitting. Final Rasch results were suboptimal with a Person Separation Index of 1.69 and Item Reliability score of 0.74. GDLQ PMS were significantly worse in the advanced group compared to the earliest ( $p = 0.035$ ) and early ( $p = 0.027$ ) groups. In contrast, both VA and EVF had no statistically significant difference between groups. Linear regression revealed a statistically significant correlation between better eye MD and GDLQ PMS ( $R^2 = 0.085$ ,  $p = 0.035$ ). There was no association between VA (better eye) and EVF results with GDLQ PMS ( $R^2$  values  $< 0.01$ ,  $p$  values  $> 0.05$ ).

### Conclusions

The traditionally used VA and EVF may fail to capture the complex requirements needed to assess driving suitability. The self-reflective GDLQ, which correlates with glaucoma severity but not with VA and EVF in our study, may be a useful adjunct in driving assessment for glaucoma patients.

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## P-WT-021

### THE DEFINITION OF HIGH INTRAOCULAR PRESSURE ASSOCIATED WITH OPEN ANGLE GLAUCOMA IN THE KOREAN POPULATION

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#### Purpose

The most important risk factor for development of open angle glaucoma(OAG) has known as high intraocular pressure (IOP). Previously defined normal range was mean IOP with 2 standard deviation range that was 10 mmHg to 21 mmHg. So, the traditional criteria for the high IOP is regarded as more than 21 mmHg. However, the IOP may vary by race, gender, or many other factors. In this study, we investigated the critical point of IOP which has a high risk of the development of OAG with the data of the Korea National Health and Nutrition Examination Survey.

#### Methods

A population-based, cross-sectional survey was performed between 2010 and 2011. Data on demographics, comorbidities, and health-related behaviors were obtained, and comprehensive ophthalmic examinations were performed. IOP were divided into two subgroups (higher and lower). For each dividing, we computed a *t*-test statistic, and the corresponding P values were adjusted for multiple testing. Optimal cut-off IOP value for dividing was determined that yielded the minimum P value. Multivariate regression analysis (adjusting for age, sex, diabetes, systemic hypertension, body mass index, serum cholesterol) was used to assess the optimal cutoff value of IOP associated with the development of OAG.

#### Results

A total of 7,656 participants (Male; OAG (193): control (3,045) vs Female; OAG (166): control (4,252)) were included in the analyses. In terms of the prevalence of OAG, significant cutoff value was 19mmHg in male subjects (OR = 2.80, 95% CI: 1.27 ~ 6.16, p = 0.011) and 18mmHg in female subjects (OR = 2.68, 95% CI: 1.32 ~ 5.32, p = 0.006)

#### Conclusions

In terms of the risk of OAG, the IOP greater than 19mmHg in male and 18mmHg in female appears to be a higher IOP in the Korean population.

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## P-WT-022

### RESULTS OF THREE QUANTITATIVE VISUAL TESTS WITH PRIMARY OPEN ANGLE GLAUCOMA PATIENTS ACCORDING TO DIFFERENT LIGHTS

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#### Purpose

Glaucoma is a chronic, progressive, heterogenous optic neuropathy which leads to visual field loss, disabilities and irreversible blindness if not diagnosed and treated at the right time. Glaucoma is deeply related life of quality and vision is important factors of Life of quality. To comparing quantitative vision test such as visual acuity, contrast test and color assessment in primary open angle glaucoma patients according to 3 different light systems.

#### Methods

Cross sectional study of 20 eyes of 20 patients with POAG. Three different light systems consist of 3 band fluorescent lamp(CRI 80), general LED(CRI 75)and quantum dot LED (CRI > 95). All light had same illuminance as 230lux to exclude illuminance effect. Visual testing included best corrected visual acuity with ETDRS chart, CSV-1000E contrast test and color test with Farnsworth Munsell 100-hue test.

#### Results

Mean of patient's MD was  $-10.5 \pm 9.0$ dB. There was no significant difference in BCVA according to 3 light system( $p = 0.92$ ), There were neither significant difference in detail contrast test (A,B,C,D) according to 3 light system.( $p = 0.98$ ,  $p = 0.93$ ,  $p = 0.86$ ,  $p = 0.70$ ). Score of color test with quantum dot LED was lower than 3 band fluorescent lamp, general LED, but there was no significant difference between 3 light system(ANOVA,  $p = 0.08$ ). However score of color with quantum dot LED was significantly lower than general LED and 3 band fluorescent lamp( $p = 0.03$ ,  $0.047$ )

#### Conclusions

POAG patients did not show significant difference visual acuity score and contrast test score ,which are expressed as black and white symbol, according to different light system. However POAG patient under quantum dot LED(CRI > 95) could well distinguish color difference than with other light system. It would be color rendering index(CRI) that is a quantitative measure of ability of a light source to reveal the colors of various objects faithfully in comparison with an ideal or natural light source. Therefore high CRI light system may improve life of quality of glaucoma patients.

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## P-WT-023

### OBSTRUCTIVE SLEEP APNOEA AND OPTIC DISC PARAMETERS IN YOUNG ADULTS

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#### Purpose

Obstructive sleep apnoea (OSA) is linked to increased glaucoma risk in middle-aged and older adults.<sup>1,2,3,4</sup> Little is known about associations between OSA and glaucoma risk in young adults. We therefore explored associations between overnight polysomnography (PSG) measures of OSA and optic disc parameters in a cohort of young adults.

#### Methods

Participants of the longitudinal Western Australian Pregnancy Cohort (Raine) study underwent an ophthalmic examination that included spectral-domain optical coherence tomography (SD-OCT) imaging, and measurements of intraocular pressure (IOP), central corneal thickness (CCT), and refractive error. The primary measures of the SD-OCT imaging were neuroretinal rim (NRR) area and retinal nerve fibre layer (RNFL) thickness. An overnight PSG was conducted to assess OSA-related measures, including apnoea-hypopnoea index (AHI), respiratory disturbance index (RDI), and number of respiratory-effort arousals. Regression models were generated to explore associations between PSG and SD-OCT measures.

#### Results

A total of 806 participants (50.4% males; 19-22 years old) completed SD-OCT imaging and PSG. The median AHI was 2.3 events per hour (interquartile range [IQR]: 1.1–4.5) and median RDI was 3.3 (IQR: 1.8–6.2%). For all participants, higher RDI was associated with thinner RNFL layer at the temporal-inferior and temporal-superior segments of the optic disc ( $p = 0.02$  and  $0.01$  respectively). Additionally, increased number of respiratory-effort arousals was associated with thinner RNFL at the temporal-inferior segment ( $p = 0.013$ ). These findings remained significant after adjustments for body mass index, waist-to-hip ratio, IOP, CCT, and refractive error. There were no other significant associations between PSG and SD-OCT measures.

#### Conclusions

Our findings that preclinical glaucomatous changes to the optic disc that are secondary to measures of OSA severity may start to manifest from a young age. Long term follow-ups of this cohort will allow us to document the progression of optic disc changes in relation to PSG parameters.

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## P-WT-024

### COMPARISON OF THE CLINICAL PROFILE OF GLAUCOMA PATIENTS BETWEEN PRIVATE AND GOVERNMENT CLINICS IN THE PHILIPPINES

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#### Purpose

The purpose of this study is to compare the clinical profile of diagnosed glaucoma patients seen in 2 private and 2 government clinics in the Philippines.

#### Methods

This was a descriptive, cross-sectional, multi-center retrospective review of documented glaucoma cases diagnosed from January 2009 to December 2014 in four eye clinics in the Philippines (2 private and 2 government clinics). The clinical profile data extracted from the medical records included demographic characteristics, ophthalmological findings, diagnostic tests done and treatments performed.

#### Results

A total of 1,245 glaucoma patients were included. Ninety-one percent of subjects were Filipinos, 5% were Filipino-Chinese, and 4% from other ethnicities. The mean age was 58 years old, with a 4.5: 5.5 female to male ratio.

Government centers reported more angle closure glaucoma (37.8% government vs 27.3% private) whereas private centers reported more open angle glaucoma cases (35.5% private vs 20.3% government). Patients from government centers reported more cases of secondary glaucoma while private centers had more cases of ocular hypertension, glaucoma suspect and mixed mechanism glaucoma. Medical management was given to 1070 patients or 86% of all the subjects, A single drug was used in 245 patients (23%), while multiple drugs were used in 825 (77%). Trabeculectomy was the most common procedure accounting for 56% of all surgeries performed. Laser Iridotomy and Iridoplasty were the most frequent laser treatments accounting for more than 50% of all laser procedures.

#### Conclusions

The clinical profile of glaucoma patients seen in private and government clinics showed differences in the types of glaucoma seen, surgical or laser treatments, and choice of anti-glaucoma medications. Determining the clinical profile of a specific population is important to aid health planners in allocating resources, designing training programs to fit the needs of the population, and implementing best practices through information sharing.

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**P-WT-025**

**ASSOCIATION OF METFORMIN USE AMONG DIABETICS AND THE INCIDENCE OF POAG – RESULTS FROM THE CHENNAI EYE DISEASE INCIDENCE STUDY**

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**Purpose**

To determine the association of the use of Metformin among patients with diabetes mellitus on the six-year incidence of POAG (Primary Open-angle glaucoma)

**Methods**

Participants of the Chennai Glaucoma Study (a population-based cohort study) were examined at baseline and after a six-year interval at the Chennai Eye Disease Incidence Study. Detailed ophthalmic examination included medical and drug history, applanation tonometry, gonioscopy, pachymetry, optic disc evaluation, and automated perimetry. Cases were defined to have primary open-angle glaucoma based on the International Society of Geographical and Epidemiological Ophthalmology Classification. Subjects using Metformin as a treatment for diabetes mellitus were studied for the risk of incident POAG. Participants diagnosed to have glaucoma at baseline were excluded.

**Results**

4302 participants were included of whom 128 (3%) had incident POAG. 905 participants (21.0%) had diabetes mellitus of which 142 (15.7%) were using Metformin. Of the subjects with POAG, 92 (71.9%) were non-diabetic and 36 were diabetic (28.1%); Of the diabetics, incidence among those on Metformin was 5.6% (8 participants) and those not on metformin was 3.6% (28 participants). There was no difference in the incidence of POAG in subjects with diabetes mellitus, with and without Metformin use ( $p = 0.25$ ). Logistic regression showed no association of Metformin use with the incidence of POAG (OR 1.33, 95 CI: 0.58 to 3.04,  $p$ -value 0.49) after adjusting for age, gender and place of residence. There was no difference noted in IOP at the follow-up ( $p$ -value 0.22) with and without metformin use.

**Conclusions**

The current study did not show any beneficial effect of metformin on the incidence of POAG.

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## P-WT-026

# CHILDHOOD GLAUCOMA PROFILE USING CHILDHOOD GLAUCOMA RESEARCH NETWORK CLASSIFICATION

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## Purpose

Once Childhood glaucoma is a heterogeneous group of diseases and there was no standized classification system, Childhood Glaucoma Research Network (CGRN) proposed a new classification system. In this context, the purpose of this study was to apply the classification in a Brazilian population trying to investigate the prevalence and the characteristics of each subtype of childhood glaucoma.

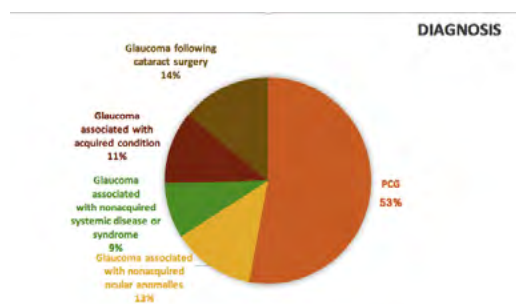
## Methods

This was a retrospective study including 412 patients with diagnosis of childhood glaucoma or glaucoma suspect. Medical records were collect from patients assisted in childhood glaucoma's clinic at the Department of Ophthalmology and Visual Sciences, Federal University of São Paulo. The initial diagnosis and new diagnosis according to CGRN classification were recorded.

## Results

All patients fit one of the seven categories of the new classification. 61% of diagnoses were changed upon reclassification. 51% of patients had primary glaucoma (juvenile open angle glaucoma and primary congenital glaucoma [PCG]); 45% had secondary glaucoma (glaucoma associated with non-acquired ocular anomalies; glaucoma associated with nonacquired systemic disease or syndrome; glaucoma associated with acquired condition; and glaucoma following cataract surgery); and 3% were glaucoma suspect. The most common diagnoses found were PCG. Mean age of the entire group was  $14.56 \pm 8.1$  years (range 0 - 44 years). 55% of all patients were male and 72% had bilateral disease. For those with unilateral disease, 53% had disease involvement in the right eye.

## Image



## Conclusions

The CGRN classification provides a useful method of classifying childhood glaucoma. A single, standardized classification system is important for diagnosis and management these patients, in addition, may improve physician communication, and future researchs.

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**P-WT-027**

**THE PREVALENCE OF GLAUCOMA AND OCULAR HYPERTENSION AMONG ADULTS IN THE CENTRAL REGION OF POLAND**

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**Purpose**

To determine the prevalence of glaucoma and ocular hypertension (OHT) and other age-related eye diseases among older adults in the city of Lodz in the central region of Poland.

**Methods**

The study design was population-based, cross-sectional study. A total of 1107 women and men of predominantly Caucasian origin were successfully enumerated and recruited for the study. All selected subjects were interviewed and underwent detailed ophthalmic examinations.

**Results**

In total, various types of glaucoma were diagnosed in 5.51% (95% CI 4.17-6.85) of subjects and 2.62% (95% CI 1.68-3.56) had ocular hypertension (OHT). Overall 8.04% (95% CI 6.44-9.64) subjects had cataract surgery in either eye. After excluding subjects with bilateral cataract surgery, the prevalence of cataract was 12.10% (95% CI 10.18-14.03). AMD was found in 4.33% (95% CI 3.14-5.54) of all subjects. Of them 3.25% (95% CI 2.21-4.30) had early AMD and 1.08% (95% CI 0.47-1.69) had late AMD. The prevalence rates of DR and myopic macular degeneration were 1.72% (95% CI 0.95-2.48) and 0.45% (95% CI 0.06-0.85) respectively. All multiple logistic regression models were only significantly associated with older age. The highest rate of visual impairment was observed among subjects with retinal diseases.

**Conclusions**

The total prevalence of glaucoma and ocular hypertension (OHT) in our study population was rather high but was similar with the findings from other studies amongst European Caucasian adults.

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## P-WT-028

### PRESCRIBING PATTERN OF TOPICAL B-BLOCKERS IN POAG PATIENTS WITH COMORBIDITIES THAT ARE CONTRAINDICATIONS FOR ITS USE-A RETROSPECTIVE STUDY FROM THE UK

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#### Purpose

To describe the prescribing pattern of topical beta-blocker (TBB) therapy in glaucoma patients with comorbidities that are contraindications for its use, especially in those with specific cardiovascular (CV) and respiratory conditions.

#### Methods

This is a non-interventional, retrospective study using data from the UK Clinical Practice Research Datalink database. Records of newly diagnosed patients with primary open-angle glaucoma (POAG) and ocular hypertension (OHT) (period 2013–2017), aged  $\geq 18$  years with a minimum follow-up of 12 months prior to the end of December 2017 were included. The endpoints included patients (n, %) with contraindicated comorbidities for TBB (primary endpoint) and had TBB as a first line treatment or had more than one prescription for TBB in the first 6 months after initiating TBB (secondary endpoints). Data were assessed by main cohort (i.e. POAG (Group [Gp] I), OHT (Gp II), POAG after OHT (Gp III) patients) and by subcohort (i.e. patients with at least 1 TBB prescription). The main cohort was stratified based on prescription (TBB, other IOP-lowering agents or no treatment).

#### Results

In total, 14,311 records were analyzed; 7,055 of these met the inclusion/exclusion criteria (Gp I, n = 4884; Gp II, n = 1979; Gp III, n = 192); 1,674 (23.7%) patients had contraindicated comorbidities (Gp I, n = 1195 (24.5%); Gp II, n = 427 (21.6%); Gp III, n = 52 (27.1%)). Among them, 1,113 (15.8%) patients had CV comorbidities (Gp I, n = 790 (16.2%); Gp II, n = 285 (14.4%); Gp III, n = 38 (19.8%)) and 678 (9.6%) patients had respiratory comorbidities (Gp I, n = 486 (10.0%); Gp II, n = 175 (8.8%); Gp III, n = 17 (8.9%)). In all, 1,067 (15.1%) patients were prescribed TBB (17.9% in Gp I, 7.4% in Gp II and 24.0% in Gp III), of whom 179 (16.8%) had CV and 37 (3.5%) had respiratory comorbidities. In 42.4% (n = 409) and 57.6% (n = 555) of subcohort patients, TBB was used as first- and second-line treatment, respectively.

#### Conclusions

In comparison with other regions<sup>1, 2</sup>, a relatively low proportion of POAG and OHT patients with comorbidities were prescribed TBB in the UK, indicating a good awareness and implementation of the National Institute for Health and Care Excellence guidelines by ophthalmologists in the UK. However, there is still a need to assess the presence of comorbidities in glaucoma patients before prescribing TBB therapy.

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## P-WT-029 UTILITY INDEX OF GLAUCOMA PATIENTS IN THAILAND

Kulawan Rojananuangnit\*

### Purpose

To evaluate both generic and eye specific quality of life regarding utility index in glaucomatous patients comparing with normal.

### Background:

Following from natural history of glaucoma disease, there is no visual symptom be detected in early stage of disease, thereafter disease is progressed to the more severe stage, which is not only directly affected vision both visual acuity and visual field but also impacted quality of life in patients. Utility index is a crucial part of outcome measurement in health economics evaluation.

### Methods

We interviewed normal and glaucomatous participants with the visual function questionnaire utility index(VFQ-UI) Thai-version, the Euro quality of life questionnaire 5 dimensions 5 levels (EQ-5D-5L) and Euro visual analogue scale(EQ-VAS).<sup>1-6</sup> Utility index from both generic and eye specific quality of life were calculated.

### Results

There were 47 normal and 127 glaucomatous participants participated in this study. Glaucoma group was included 35 early stage, 43 moderate stage and 49 severe stage participants. Severe stage group was divided into 30 normal vision, 14 blindness one eye and 5 blindness both eyes participants. Mean age of both groups were comparable ( $63.78 \pm 6.84$  vs.  $66.30 \pm 8.93$  years old,  $p = 0.062$ ). Male and female ratio was also proportional. Generic utility index score and EQ-VAS score were not statistically different between normal and glaucomatous groups, respectively (EQ-5D-5L:  $0.874 \pm 0.122$  vs.  $0.837 \pm 0.191$ ,  $p = 0.215$ , EQ-VAS:  $76.06 \pm 15.07$  vs.  $74.02 \pm 15.10$ ,  $p = 0.43$ ), in contrast with eye specific utility index, glaucomatous group was significantly lower than normal group, accordingly (VFQ-UI:  $0.833 \pm 0.147$  vs.  $0.895 \pm 0.070$ ,  $P < 0.05$ ).

We also analysed these differences within glaucoma groups as following stage; early, moderate, severe, blindness one eye and blindness both eyes groups, respectively. EQ-5D-5L were  $0.888 \pm 0.10$ ,  $0.824 \pm 0.227$ ,  $0.868 \pm 0.165$ ,  $0.763 \pm 0.249$  and  $0.6124 \pm 0.155$ ,  $P < 0.05$ . EQ-VAS were  $75.29 \pm 13.98$ ,  $74.42 \pm 15.32$ ,  $76.83 \pm 16.05$ ,  $68.57 \pm 14.99$  and  $60.00 \pm 7.07$ ,  $p = 0.112$ . VFQ-UI were  $0.887 \pm 0.095$ ,  $0.850 \pm 0.122$ ,  $0.857 \pm 0.123$ ,  $0.723 \pm 0.196$  and  $0.519 \pm 0.039$ ,  $P < 0.05$ . Both utility index were lower in visual impairment groups, especially blindness both eyes group had the lowest score.

### Conclusions

Quality of life in terms of utility index both generic and eye specific were lower in glaucomatous group comparing with normal, undoubtedly. VFQ-UI was more specific in assessing glaucomatous patients than generic EQ-5D-5L.

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## **P-WT-030** **POSNER-SCHLOSSMAN SYNDROME (GLAUCOMATOCYCLITIC CRISIS): A 5-YEAR REVIEW**

Emma Rusmayani\*

### **Purpose**

Posner-Schlossman syndrome (PSS) or glaucomatocyclitic crisis is a rare condition with self-limited unilateral recurrent episodes of elevated intraocular pressure (IOP) and mild anterior chamber inflammation in which diagnosis can be challenging. We reviewed our 5-year experience with PSS to give a brief picture of the natural characteristic of the disease.

### **Methods**

We investigated 56 eyes from 52 patients (24 males and 28 females; both eyes for 2 males and 2 females) diagnosed with PSS during the years 2012-2017 in the Jakarta Eye Center Menteng and Kedoya. Data were collected on age, gender, visual acuity, episode of attacks, drugs regimen, IOP during attacks and after surgery or treatment in the latest follow up.

### **Results**

The mean age of the 52 patients was 48.13 years old (range, 18–82 years). The mean intraocular pressure (IOP) of initial record for all 56 eyes was 37.63 mmHg (ranged from 10-65 mmHg). The mean visual acuity during attacks was 0.87 LogMAR and mean episode of attacks was 2.41 times, with 41% of the cases were their first time onset. Medical treatment was efficacious for 39 patients (69.62 %). Eight patients(14.82 %) underwent a surgical treatment and all had normal IOP afterwards.

### **Conclusions**

PSS was found more in middle-aged patients. PSS tends to be the typical self-limiting and response well to medical treatment. However, the episodic and recurrent nature of PSS should be a concern. Therefore, patients with PSS must have regular evaluation of visual acuity, visual fields and IOP.

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## P-WT-031

### TO STUDY CLINICAL AND GENETIC PROFILE OF PATIENTS WITH JUVENILE ONSET NORMAL TENSION OPEN ANGLE GLAUCOMA (JNTG)

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#### Purpose

To study clinical and genetic profile of patients with juvenile onset normal tension open angle glaucoma (JNTG).

#### Methods

In this cross sectional, case control study 25 unrelated POAG patients in the age group of 10-40 years with no records of IOP > 21 mm of Hg and with the presence of glaucomatous optic neuropathy were evaluated. Their clinical profile was compared with 30 JOAG patients with high IOP(JHTG). The following were recorded: Age of diagnosis, highest baseline IOP, Diurnal Variations in IOP, Pachymetry, Disc photography, Visual field, OCT and Goniophotography. Family history of glaucoma, use of any drugs and an evaluation of their systemic status was conducted. An MRI brain with orbits was performed to rule out non Glaucomatous causes of optic neuropathy. The TBK1 gene duplications were analysed using the Taqman assay in 20 JNTG patients whose DNA was available for evaluation and compared with 20 controls and 20 JHTG patients.

#### Results

The mean age of JNTG patients was 31.8The mean age of JNTG patients was  $31.8 \pm 4$  years. In 25% JNTG patients there was a positive family history of glaucoma. None of the patients had systemic diseases except 1 patient with migraine. None of the patients had any lesions in the Brain as the cause of the glaucomatous optic neuropathy. The average Mean deviation among JNTG patients was  $-6 \pm 2.2$  dB while that among the JHTG was  $-13.6 \pm 3.4$  dB ( $P < 0.01$ ). The average disc area of JNTG patients was  $2.96 \pm 0.6$  mm<sup>2</sup> compared to  $2.34 \pm 0.8$  mm<sup>2</sup> among the JHTG ( $p = 0.02$ ). Duplication of the *TBK1* gene was found in 1 JNTG patient (5%).

#### Conclusions

Juvenile NTG patients have a less severe disease than Juvenile HTG patients. Juvenile normal tension glaucoma is a distinct entity that needs categorisation in the present classification of Glaucoma.

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## P-WT-032

# THE GLAUCOMA AUSTRALIA EDUCATIONAL IMPACT STUDY: AN RCT EVALUATING GLAUCOMA EDUCATION AND PATIENT KNOWLEDGE, ANXIETY AND TREATMENT SATISFACTION

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### Purpose

To measure the impact of patient-centred glaucoma-related education on knowledge, anxiety and treatment satisfaction.

### Methods

A multicentre Australia-wide randomised clinical trial involving 101 newly-diagnosed glaucoma patients randomised 1:1 to intervention or control groups.

Those randomised to the Glaucoma Australia educational intervention received telephone-based counselling followed by mail out, in addition to usual care and information from their treating ophthalmologist. The control group received only usual care and information from their treating ophthalmologist. Surveys were administered at baseline and 4-weeks following intervention.

The Auckland Glaucoma Knowledge Questionnaire (AGKQ) measured glaucoma related knowledge. The Hospital Anxiety and Depression Scale (HADS) and Eye Drop Satisfaction Questionnaire (EDSQ) measured anxiety and patient treatment satisfaction, respectively.

### Results

Mean age was  $64.7 \pm 11.1$  years and 52 (51.5%) were male. There was no noticeable increase in knowledge levels in the control group (mean difference: 0.04 logits,  $P = 0.7$ ), compared with 0.49 logits ( $P = 0.02$ ) increase in knowledge levels in the intervention group. Between group comparison showed a non-significant increase in knowledge (0.45 logits,  $P = 0.07$ ) comparing intervention participants with controls. Intervention participants experienced a statistically significant decrease in anxiety compared to controls ( $-0.60$  logits,  $P = 0.02$ ). No between-group difference was found in EDSQ scores.

### Conclusions

Patient-centred glaucoma-related education and support services may improve knowledge and can reduce anxiety for newly diagnosed glaucoma patients. All glaucoma patients should be adequately counselled about the nature of the disease and its management.

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## P-WT-033

### SHARED MEDICAL APPOINTMENTS IN GLAUCOMA CARE PROVISION AT A TERTIARY CARE EYE HOSPITAL - A RANDOMIZED TRIAL

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#### Purpose

The primary objective of this study was to examine how Shared Medical Appointments (SMA) affects the level of patient's knowledge, satisfaction and compliance to medications in glaucoma care provision.

#### Methods

A prospective randomized trial involved 820 patients with primary glaucoma on treatment for one year. 164 groups of five patients were randomly assigned to either the SMA or one-on-one (control) arm. While one patient in the SMA group was being examined and treated, the other 4 in the group got to listen to them. Those in the one-on-one arm engaged with the doctor while the other 4 patients waited outside the consultation suite. During the appointment, patients in both conditions experienced an eye examination, received recommendations from the physician and had the opportunity to ask questions. After examination, patients received a survey which included questions assessing their level of knowledge about glaucoma and their satisfaction level with their appointments. During follow-ups total number of patients in a group ranged between 2 and 7.

#### Results

410 patients were randomized into the one-on-one arm while 410 were recruited into the SMA arm. An average SMA took 2.65 minutes per patient while an average one-on-one appointment took 2.8 minutes per patient ( $P < 0.05$ ). Patients randomized in the SMA group were 1.2% more satisfied with their appointment experience than patients who received a one-on-one appointment ( $P < 0.05$ ). In addition, glaucoma knowledge scores were 6% higher amongst patients randomized to the SMA group as compared to patients attending one-on-one ( $P < 0.05$ ). The compliance probability of the patients to the prescribed medicines is 1.22% higher amongst patients randomized to the SMA group compared to the one-on-one patients ( $P < 0.2$ ).

#### Conclusions

The results support the use of SMA in glaucoma management since it has a potential for increasing the satisfaction, knowledge level and compliance of patients. We believe, this will improve the follow up rates, indirectly reducing the burden of glaucoma blindness.

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## **P-WT-034** **FACTORS ASSOCIATED WITH GLAUCOMATOUS BLINDNESS**

Phornrak Sriphon\*

### **Purpose**

To determine the prevalence, demographic and clinical characteristics of blindness in glaucoma patients.

### **Methods**

Retrospective medical record review of 506 glaucoma patients who were seen between January 2011 and December 2016 at Out patient department of ophthalmology, Chaiyaphum Hospital. Glaucomatous blindness was determined by best corrected visual acuity (BCVA) or visual field (VF) and another cause of blindness were excluded. Descriptive statistics were used for analysis.

### **Results**

There were 506 glaucoma patients included in this study. The prevalence of glaucomatous blindness was 35.57% (95% CI 31.51 - 39.86). There were 153 patients with unilateral blindness, and high frequency of blindness at present was 57%. The prevalence of blindness varied in various types of glaucoma by secondary glaucoma, angle closure glaucoma and open angle glaucoma were 45.2% (95% CI 29.5 - 60.5), 40.2% (95% CI 21.8 - 48.5) and 32.4% (95% CI 27.3 - 37.5) respectively. Sex, age, initial IOP, diabetes, high blood pressure, duration of treatment, and type of treatment were not too different in a prevalence of glaucomatous blindness.

### **Conclusions**

Glaucoma is a major problem in the health sector and is a silent threat to vision because of the prevalence of glaucomatous blindness still high. More than half of patients in this study were blinded at first time before treatment. Therefore, screening for glaucoma patients at policy level may play a role in reducing the prevalence of visual loss. Angle closure glaucoma and secondary glaucoma which had a high prevalence of blindness should be monitored closely.

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## P-WT-035

### REVISITING BIOMETRIC RISK FACTORS FOR PHACOMORPHIC GLAUCOMA

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#### Purpose

Cataract and glaucoma are leading causes of visual impairment in Asia.1 Cataract in India is the most important cause of preventable blindness accounting to 63.7percent2 . Phacomorphic glaucoma remains one of the most significant cause of irreversible loss of vision, especially in the rural population.

#### Methods

This is a case series of 10 randomly selected cases of phacomorphic glaucoma seen in a single week phakic in both eyes, with symptoms suggestive of phacomorphic glaucoma, intra ocular pressure more than 21 mm in the presence of intumescent/mature hypermature cataract.

All patients underwent a complete slit lamp examination,iop measurement,axial length measurement lens thickness(LT) and anterior chamber depth(ACD) measurements of both eyes The lens position (LP )and relative lens position(RLP) were calculated.

#### Results

The mean age of the patients included in the study was  $61.64 \pm 3.88$  years, among them 8 (72.7%) were females 3 (27.3%) were males. The majority 7 (63.6%) of the patients had mature cataract, intumescent cataract was found among 3 (27.3%) patients and one patient had hypermature cataract. The angle in the contralateral eye was occludable in (8) 72.7% of cases and open in 3(27.3%)cases.

Comparing IL(ipsilateral) and CL(contralateral) parameters among the paired eyes of patients, it was found that mean IOP IL was  $38.91 \pm 12.00$  which was significantly more ( $P < 0.001$ ) than IOP – CL which had the mean value  $19.45 \pm 6.82$ . The highest negative correlation was seen between IOP diff (IL-CL) and AXL diff (IL-CL) though it was statistically insignificant too ( $r = -0.523$ ,  $p = 0.099$ ). The other parameters did not differ significantly the mean values of which were ACD IL was ( $2.18 \pm 0.40$ ) which was less than ACD – CL ( $2.42 \pm 0.9$ ), The mean LT IL. CL were  $4.74 \pm 4.49$   $4.49 \pm 0.37$ .resectively. Mean LP IL was  $4.55 \pm 0.33$  which was less than LP – CL which had the value  $4.66 \pm 0.93$ , Mean RLP IL was  $2.0 \pm 0.02$  which was less than RLP – CL which had the value  $2.10 \pm 0.04$ .

#### Conclusions

Relatively small differences in biometric parameters can increase risk for developing phacomorphic glaucoma.

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## P-WT-036

### CLINICAL PROFILE AND TREATMENT OUTCOMES OF PATIENTS WITH NEOVASCULAR GLAUCOMA IN A TERTIARY HOSPITAL

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#### Purpose

Neovascular glaucoma (NVG) is an aggressive secondary glaucoma that necessitates more than just medical glaucoma therapy and needs close collaboration with the retina service. Thus, we would like to determine the clinical profile and outcomes of treatment among patients with neovascular glaucoma in a tertiary hospital.

#### Methods

Medical records of patients with NVG seen at the Department of Health Eye Center (DOHEC), East Avenue Medical Center between January 2000 and August 2018 were reviewed. Demographic and clinical characteristics were described and for those with more than a month of follow-up, management was also described. Pertinent outcomes included the visual acuity (VA) and intraocular pressure (IOP).

#### Results

There were 166 NVG patients (181 eyes) with a mean age of  $55.53 \pm 13.80$ . Majority of the patients were male 110/181 (67%). Diabetic retinopathy was seen in 81/181 (45%) eyes and central retinal vein occlusion was seen in 48/181 (27%) eyes. Baseline VA of hand movement was observed in 67/181 (36.8%) eyes and no light perception was observed in 49/181 (26.9%) eyes. Only 64/181 (35%) eyes had at least one month of follow up (mean follow up time of 73 wk) with procedures done (injection, glaucoma surgery, laser). 36/64 (56%) of eyes underwent intravitreal injection with bevacizumab (IVB), 26/64 (41%) of eyes underwent trabeculectomy with mitomycin C, 48/64 (75%) of eyes underwent panretinal photocoagulation (PRP) and 38/64 (59%) of eyes underwent diode laser cyclophotocoagulation. The average number of procedures done was 1 (1-3). For eyes that underwent procedures, IOP decreased from baseline of  $46.5 \pm \text{SD mmHg}$  to  $22.5 \pm \text{SD}$  ( $p = 0.011$ ). When comparing the number of procedures done on eyes and outcomes, the initial and final VA and IOP of those with no procedure done were both worse than those with 1 procedure (diode only, trabeculectomy only, IVB only), 2 procedures (combination of IVB with diode or IVB with trabeculectomy), and 3 procedures (combination of IVB, trabeculectomy with MMC and PRP, and diode, IVB and PRP done), ( $P < 0.0001$ ).

#### Conclusions

Patients seen in our tertiary center usually presented with advanced NVG. Most of the patients had diabetic retinopathy and central retinal vein occlusion. Combination procedures led to better IOP control however a great percentage of eyes still lost vision.

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## P-WT-037

### IS MYOPIA AS A RISK FACTOR FOR PRIMARY OPEN-ANGLE GLAUCOMA?

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#### Purpose

To investigate the relationship between myopia and various indicators of primary open-angle glaucoma (POAG).

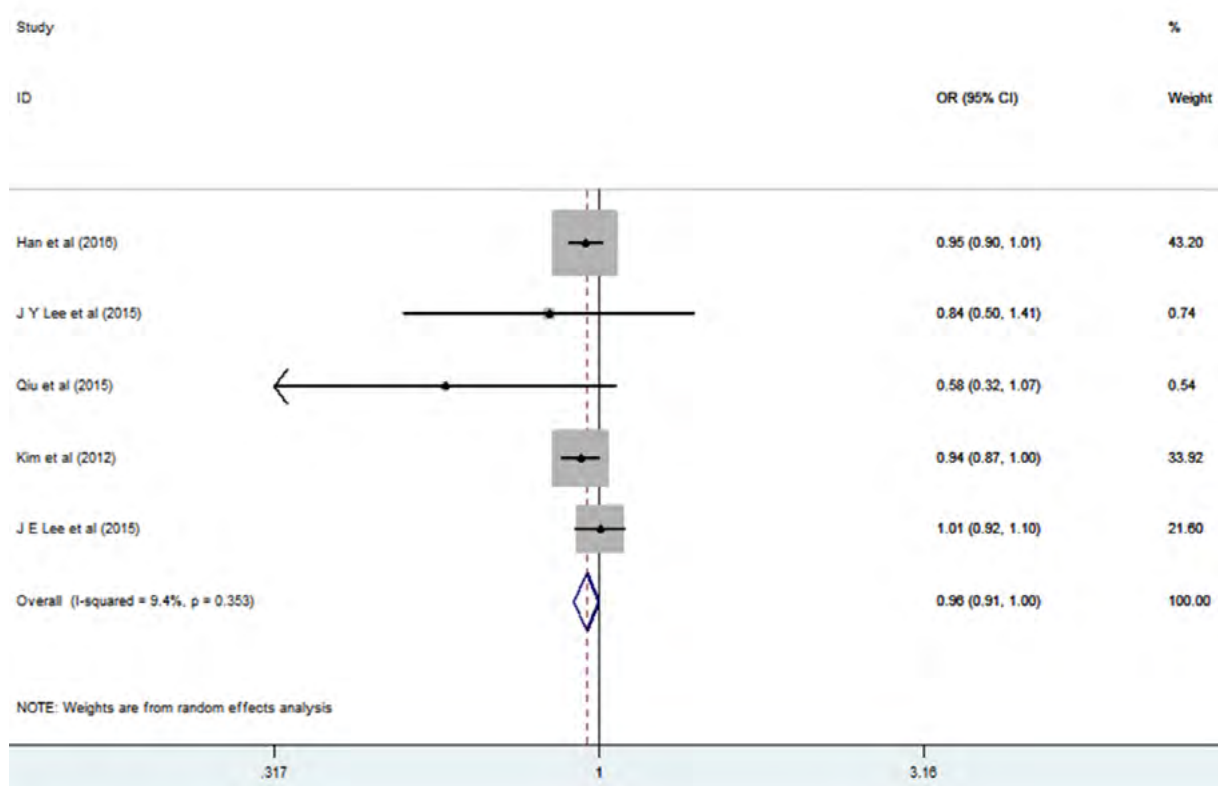
#### Methods

Published and unpublished articles were identified from PubMed and Embase databases until July 2018, and reference lists of articles were searched. According to international standards, high myopia was defined as a refractive error greater than -6 D. For studies with no odds ratios (ORs) concerning the progression of myopia and glaucoma, we checked the raw data and calculated the ORs; then, the ORs were pooled using a random effects model.

#### Results

In the classification of 'High myopia (>-6 D) and POAG', data from 6 population-based cross-sectional studies were included in the main analyses and the pooled OR was 3.661 (95% CI, 2.752 - 4.870). There was no statistically significant heterogeneity among the 5 cross-sectional studies ( $I^2 = 0.0\%$ ;  $P = 0.985$ ). And in the classification of 'Myopia and the progress of POAG', data from 7 retrospective cohort studies were included in the main analyses and the pooled OR was 1.004 (95% CI, 0.903 - 1.117). The heterogeneity was considerable among studies ( $I^2 = 78.9\%$ ;  $P < 0.001$ ) and after omitting studies that contributed significantly to the heterogeneity, the pooled ORs were 0.956 (95% CI, 0.914 - 0.999).

#### Image



## Conclusions

High myopia (>-6 D) may be a risk factor associated with POAG. However, our study suggests that myopia may cannot be considered a risk factor for the progress of POAG. The mechanism of this result needs further study.

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## P-WT-038

### FACTORS ASSOCIATED WITH DRIVING SELF-REGULATION AT NIGHT IN SUBJECTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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#### Purpose

The aim of our study is to investigate the association between glaucoma severity, glaucomatous visual field defect pattern and driving self-regulation at night in subjects with primary open-angle glaucoma (POAG).

#### Methods

The study was approved by the Ethics Committee of the Keio University School of Medicine (#2010293). All study subjects gave informed, written consent prior to being enrolled. This was an observational study. Japanese patients between 40 and 85 years of age were screened for eligibility. All study participants answered the following questionnaire in Japanese at baseline ophthalmic examination. "Do you avoid driving at night?" A binocular integrated visual field was calculated for each patient by merging a patient's monocular visual fields, using the 'best sensitivity' method. The integrated visual field mean total deviation was calculated as the mean of 52 total deviation values across the visual field. The integrated visual field was also divided into six regions, and the average of the total deviation values in each of these six areas was calculated. The relationship between the driving behavior of avoid driving at night and eleven variables was analyzed using generalized linear model using the binomial function. An optimal linear mixed model was selected from 2<sup>12</sup> patterns of combination of nine variables using the second-order bias-corrected Akaike information criterion index.

#### Results

Two hundred and forty-seven patients with POAG were analyzed in this study. Age of the POAG patients was 63.7 ± 10.6 [40 to 84] (average ± standard deviation [range]). Among 247 patients, 172 (70%) were male, and 75 (30%) were female. Mean TD value was -1.7 ± 3.6 [-19.9 to 3.2] dB. In the optimal model for the behavior of avoid driving at night, age, gender, mean total deviation values in the superior right area, and distance driven per week were selected.

#### Conclusions

Older age, female gender, worse mean total deviation in the superior right visual field, and distance driven per week were associated with driving avoidance at night in subjects with POAG.

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**P-WT-039**

**ASSOCIATION OF ALCOHOL CONSUMPTION AND IOP IN MEN AND WOMEN: THE 5TH KOREA NATIONAL HEALTH AND NUTRITIONAL EXAMINATION SURVEY 2010-2012**

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**Purpose**

To assess the relationship between daily alcohol consumption and intraocular pressure (IOP) in Korean men and women.

**Methods**

We explored the effect of daily alcohol intake on high IOP in 7,532 adults who participated in the 2010-2012 Korean National Health and Nutritional Examination Survey (KNHANES). Multiple logistic regression analysis was used to assess the relationship between average daily alcohol consumption and an IOP of  $\geq 18$ mmHg after adjusting for age, body mass index, hypertension, diabetes mellitus, and smoking in each sex group.

**Results**

When adjusted for related factors, the odds of high IOP was 2.57 times (95% confidence interval, 1.239 to 5.314) higher in men with a daily heavy alcohol intake than men with a heavy alcohol intake < 1 per month. However, increased odds of high IOP with daily alcohol consumption were not found among women.

**Conclusions**

After adjusting for age and other confounders, there was a significant relationship between daily alcohol consumption and high IOP in men, whereas the relationship was not significant in women.

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## P-WT-040

### FACTORS ASSOCIATED WITH DRIVING SELF-REGULATION IN RAIN IN SUBJECTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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#### Purpose

The aim of our study is to investigate the association between glaucoma severity, glaucomatous visual field defect pattern and driving self-regulation in rain in subjects with primary open-angle glaucoma (POAG).

#### Methods

The study was approved by the Ethics Committee of the Keio University School of Medicine (#2010293). All study subjects gave informed, written consent prior to being enrolled. This was an observational study. Japanese patients between 40 and 85 years of age were screened for eligibility. All study participants answered the following questionnaire in Japanese at baseline ophthalmic examination. "Do you avoid driving in rain?" A binocular integrated visual field was calculated for each patient by merging a patient's monocular visual fields, using the 'best sensitivity' method. The integrated visual field mean total deviation was calculated as the mean of 52 total deviation values across the visual field. The integrated visual field was also divided into six regions, and the average of the total deviation values in each of these six areas was calculated. The relationship between the driving behavior of avoid driving in rain and eleven variables was analyzed using generalized linear model using the binomial function. An optimal linear mixed model was selected from 2<sup>12</sup> patterns of combination of nine variables using the second-order bias-corrected Akaike information criterion index.

#### Results

Two hundred and forty-seven patients with POAG were analyzed in this study. Age of the POAG patients was 63.7 ± 10.6 [40 to 84] (average ± standard deviation [range]). Among 247 patients, 172 (70%) were male, and 75 (30%) were female. Mean total deviation value was -1.7 ± 3.6 [-19.9 to 3.2] dB. In the optimal model for the behavior of avoid driving in rain, age, mean total deviation in the superior right visual field and distance driven per week were selected (p values < 0.05 for all variables).

#### Conclusions

Older age, worse visual field in the superior right visual field, and distance driven per week were associated with driving avoidance in rain in subjects with POAG.

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# Genetics, Genomics and Biomarkers

## P-WT-041

# THE CORRELATION BETWEEN GLAUCOMA POLYGENIC RISK SCORE AND IOP MEASURED BY ICARE® HOME TONOMETRY WITHIN AND OUTSIDE OF OFFICE HOURS

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### Purpose

We have recently described a glaucoma polygenic risk score (PRS) which is associated with intraocular pressure (IOP) and could help in glaucoma prediction. In this study we aim to investigate the correlation between IOP as measured by Icare® HOME tonometry, worsening glaucoma, and the PRS.

### Methods

137 participants with glaucoma were invited from within a 5-year prospective study of glaucoma progression (PROGRESSA) to perform home tonometry. Patients were instructed on the use of the Icare® HOME tonometry device. Patients were asked to measure their eye pressure four times per day for 2 to 4 consecutive days including early morning, midday, afternoon and late evening time points. A glaucoma PRS was developed by characterizing glaucoma endophenotypes on 67,040 UK Biobank (UKBB), and previously published data, and combining data on IOP, vertical cup to disc ratio (VCDR) and glaucoma, using multi-trait analysis of GWAS (MTAG). Glaucoma progression was assessed using optical coherence tomography (Zeiss Cirrus™ HD-OCT) of the peripapillary retinal nerve fibre layer (pRNFL).

### Results

There was a correlation between structural loss of retinal nerve fibre layer structure and maximum recorded IOP during the Icare® HOME measurement period ( $p = 0.045$ ). In addition, maximum recorded IOP and mean IOP values were correlated with worsening VCDR with  $p$ -value of 0.028 and 0.021, respectively. There was a trend towards association between the GPRS and the maximum recorded IOP difference between inside office hours (8AM to 6PM) and outside office hours (6PM to 8AM) ( $p = 0.070$ ).

### Conclusions

A significant association was found between the maximum recorded IOP and glaucoma progression as determined by RNFL loss and increased VCDR. The possible association of the glaucoma polygenic risk score with IOP fluctuation between in and out of office hours raises the possibility that a genetic test could provide useful information about IOP fluctuation beyond what is currently achievable with twice yearly snapshot measurement of IOP.

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## P-WT-042

### AQUEOUS HUMOR METABOLOMICS IS ABLE TO DISCRIMINATE GLAUCOMA PATIENTS

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#### Purpose

There is a need for early biomarkers to effectively help detecting glaucoma. Up to half of the patients have not been diagnosed<sup>1</sup>. Moreover, the only effective treatment up to date is lowering intra-ocular pressure, targeting just one of the known risk factors. Additional biomarkers could aid the diagnosis of glaucoma and potentially lead to new targeted therapies.

Metabolomics, the study of metabolites in biofluids or tissues, can be used to understand the organism's phenotype because metabolites are the end-products of genome-wide or proteome-wide interactions. In previous studies, several metabolic biomarkers were found in blood for differentiating glaucoma from cataract patients<sup>2</sup>. In this work we compared the metabolic profile of aqueous humor (AH) from cataract and glaucoma patients (primary open-angle glaucoma, POAG, as well as normal-tension glaucoma, NTG) using *ex vivo* nuclear magnetic resonance (NMR) spectroscopy.

#### Methods

AH samples were collected from 90 patients (30 patients per diagnostic group) at the beginning of surgery, after a period of night fasting. Diabetic patients were excluded. <sup>1</sup>H NMR spectra of AH samples were acquired using an Avance 400 MHz NMR spectrometer (Bruker Biospin, Rheinstetten, Germany). The AH spectra were further analysed with Matlab (MathWorks, version R2017b) following standard chemometrics methodologies.

#### Results

Several regions within AH NMR spectra were identified as statistically significant for differentiating between glaucoma and cataract patients (see figure below). SVM classification of NMR spectrum within region [0.5-4.2] ppm reached 96% accuracy in separating glaucoma from cataract patients. Age, gender and main systemic diseases revealed to not significantly alter the AH metabolic profile and thus, variations within these parameters did not influence the conclusions of our analysis.

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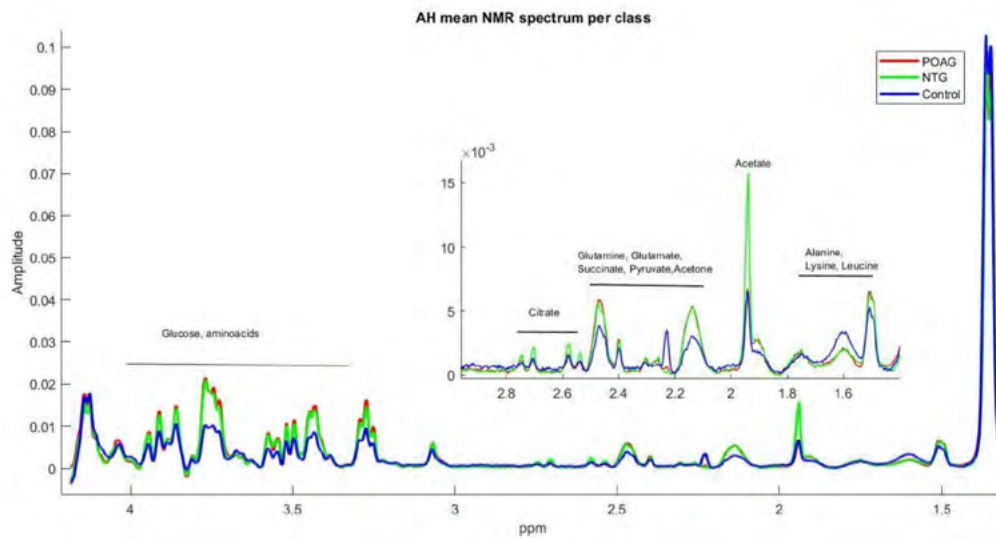
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## Conclusions

Metabolomics might help better understand the pathophysiology behind glaucoma and help clinicians perform an early diagnosis. These findings may represent a leap forward towards a more personalized approach for glaucoma patients.

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## P-WT-043

### GLAUCOMA SCREENING IN FAMILY MEMBERS OF GLAUCOMA PATIENTS IN EASTERN REGION OF NEPAL

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#### Purpose

To determine the prevalence of glaucoma in first degree relatives of Primary open angle glaucoma (POAG) and Primary angle closure glaucoma (PACG) patients during routine eye examination in the hospital.

#### Methods

In this prospective observational hospital based study, we determine the prevalence of glaucoma in first degree relatives of the patient diagnosed as glaucoma, attending the outpatient department at Ramlal Golchha Eye Hospital.

#### Results

We invited 227 individuals, first degree relatives of 72 persons diagnosed as POAG/PACG, out of which 143 attended our hospital screening for glaucoma. Sixty one percent of the attendees were males and thirty nine were females. A total of 23 persons were identified as having glaucoma of which 9 persons were aged more than 60 years, 7 persons were aged 40-60 years, 4 of them were aged 20-40 years, 3 were aged 10-21 years.

#### Conclusions

Prevalence of glaucoma in first degree relatives is higher than rest of the general population. Screening of glaucoma in first degree helps in earlier detection and treatment of glaucoma. Awareness of screening in first degree relatives may also play a major role in early detection of glaucoma. It also reduces needless blindness due to glaucoma.

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## P-WT-044

# IS WEAK CORNEAL BIOMECHANICS A BIOMARKER FOR GLAUCOMA IN EYES WITH PSEUDOEXFOLIATION

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### Purpose

Corvis ST captures images during corneal deformation with an air puff jet. The purpose of this study was to determine if corneal biomechanics can be used to predict which eyes with pseudoexfoliation deposits will develop glaucoma by studying the differences in intraocular pressure (IOP) and biomechanical properties of these eyes using Corvis ST.

### Methods

This was a prospective, cross-sectional study of 116 treatment-naïve eyes which underwent Corvis ST, Goldmann applanation tonometry and axial length measurements. These included 44 normal eyes, 25 eyes with primary open angle glaucoma (POAG), 37 eyes with pseudoexfoliation syndrome without glaucoma (PXF) and 10 eyes with pseudoexfoliative glaucoma (PXG). The marker studied for corneal biomechanics was deformation amplitude (DA), which is the maximum amplitude measured from the start of deformation to the highest concavity of the corneal apex. The means of the groups were compared using ANOVA statistics.

### Results

Although the mean IOP measured on Corvis ST was significantly higher in the PXG group, the corneal compensated IOP (IOPcc) was similar between all the groups ( $p > 0.2$ ). There was no difference in the axial length between the groups suggesting that the eyes were matched for axial myopia. There was a significant difference between the mean central corneal thickness of POAG eyes ( $510.76 \pm 36.35\mu$ ) and PXF eyes ( $532.19 \pm 41.56\mu$ ,  $p = 0.026$ ). The mean DA ( $\pm$  SD) was  $1.14 \pm 0.14$  mm in normals,  $1.05 \pm 0.11$  mm in POAG,  $1.11 \pm 0.10$  mm in PXF and  $0.99 \pm 0.12$  mm in PXG. After adjusting for IOPcc and central corneal thickness, DA was significantly lower ( $P < 0.01$ ) in glaucomatous eyes (POAG and PXG) as compared to normal eyes. Additionally, the DA was lower in PXG when compared to PXF eyes ( $p = 0.012$ ).

### Conclusions

As previously described, the present study showed that POAG eyes are biomechanically weaker than normal eyes. In addition, eyes with PXG were biomechanically weaker than PXF eyes after adjusting for the difference in IOP. Therefore, in eyes with pseudoexfoliation deposits, stronger biomechanics may be protective against developing glaucoma.

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**P-WT-045**

**DE NOVO MYRF MUTATIONS AS CANDIDATES FOR NANOPHTHALMOS THROUGH ANALYSES OF TRIO-BASED WHOLE GENOME SEQUENCING**

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**Purpose**

Nanophthalmos is a congenital disorder characterized commonly by a short axial length (AL), severe hyperopia and angle closure glaucoma. Mutations that have been identified through Mendelian genetic analysis can only explain a fraction of nanophthalmos cases. Here, we investigated de novo mutations (DNMs) in nanophthalmos.

**Methods**

This is the first trio-based whole genome sequencing study for nanophthalmos, which reveals the potential role of DNMs. A total of 15 trios (15 nanophthalmos probands and their unaffected parents) from Zhongshan Ophthalmic Center, China were recruited and analyzed.

**Results**

We identified 2 DNMs of MYRF, c.789delC (p.S264fs) and c.789dupC (p.S264fs), in 2 probands among 15 trios respectively, which were validated by Sanger sequencing. These loss-of-function (frameshift) DNMs resulted in premature stop codons and protein structure damage in both probands. Among the gene co-expression and genetic interaction networks of MYRF, certain genes related to nanophthalmos, microphthalmia, anophthalmia and coloboma (MAC), high hyperopia, angle-closure glaucoma, and AL are shared.

**Conclusions**

In summary, we report, for the first time, two novel frameshift DNMs in MYRF gene that suggest probably a mechanism, unknown so far, responsible for the development of nanophthalmos.

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## P-WT-046

### CLINICAL AND MOLECULAR CHARACTERIZATION OF JUVENILE NORMAL TENSION GLAUCOMA

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#### Purpose

To study clinical and genetic profile of patients with juvenile normal tension open angle glaucoma.

#### Methods

A cross sectional, single center study with 25 JOAG patients in the age group of 10-40years with no records of IOP > 21mmHg and with the presence of glaucomatous optic neuropathy was carried out. The following were recorded: age of diagnosis, highest baseline IOP, diurnal variations in IOP, CCT, disc cupping. Visual field defects and gonioscopy. Family history of glaucoma, history of any long standing headache or migraine and any episode of transient blackout were also elicited. An MRI brain with orbits was also done to look for any other cause of optic neuropathy. The TBK gene was analysed using the Taqman Assay in 20 patients whose DNA was available for evaluation.

#### Results

The mean age of patients was  $31.8 \pm 4$  years. In 25% patients there was a positive family history. None had any systemic issue except 1 patient with history of migraine. Four (16.67%) patients were high myopes with Myopia > 6 dioptres. The average untreated baseline IOP was in the range 16.83-17.27mmHg with average central corneal thickness being  $541.6 \pm 34\mu$ . None of the patients had any lesions in the Brain as the cause of the optic neuropathy. Mutations in the TBK gene were present in 3 out of 20 patients.

#### Conclusions

Juvenile normal tension glaucoma is a distinct entity that needs categorisation in the present classification of Glaucoma.

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## P-WT-047

### OCULAR BIOMETRY AND GENOMIC ASSOCIATION IN PRIMARY ANGLE CLOSURE DISEASE- A DESCRIPTIVE STUDY

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#### Purpose

To study the ocular biometric parameters in PACD patients and to compare them with normal control subjects and to identify role of genetic polymorphisms in PCMTD1 and COL11A1 genes in a South Indian population in PACD pathogenesis.

#### Methods

Total 200 eyes of 100 PACD patients and 200 eyes of 100 control subjects were included in the study. PACD patients were further divided into subgroups PACS, PAC and PACG based on ISGEO classification system. After relevant clinical history, thorough ophthalmic examination was done including gonioscopy, dilated fundus evaluation and perimetry. This was followed by optical biometry, ultrasonographic A-scan, manual keratometry and pachymetry. Biometric parameters included axial length (AXL), anterior chamber depth (ACD), lens thickness (LT), relative lens position (RLP), lens axial length factor (LAF), mean keratometry (K) and central corneal thickness (CCT). 5 ml of venous blood sample was taken from each participant which was later used for genotyping.

#### Results

The mean age for PACD patients was  $58.23 \pm 10.48$  years and for control group was  $59.35 \pm 10.9$  years and the difference was not significant (p value 0.460). Mean AXL, ACD, LT, RLP, LAF, K and CCT using optical method were  $22.47 \pm 1.08$  mm,  $2.65 \pm 0.57$  mm,  $4.28 \pm 0.47$  mm,  $2.13 \pm 0.19$  mm,  $1.91 \pm 0.26$  mm,  $45.03 \pm 1.66$  D and  $514.05 \pm 34.62$   $\mu$  respectively. Mean AXL, ACD, LT, RLP and LAF using ultrasound method were  $22.45 \pm 1.07$  mm,  $2.66 \pm 0.56$  mm,  $4.25 \pm 0.43$  mm,  $2.13 \pm 0.18$  mm and  $1.90 \pm 0.25$  mm respectively. Similarly, K and CCT using manual keratometer and Pachymeter were  $44.98 \pm 1.60$  D and  $513.69 \pm 38.40$   $\mu$  respectively. Mean difference was statistically significant for AXL, LT, LAF and K with  $p < 0.05$  whereas ACD, RLP and CCT yielded no significant association. In our study allelic frequency for *PCMTD1*, NM\_001286783.1:c.215C>T was 95.75% and 4.25% for C and T respectively. For *COL11A1*, NM\_080629.2:c.2386C>G we found allelic frequency for C and G as 96% and 4% respectively.

#### Conclusions

Ocular biometric parameters do vary significantly in PACD patients when compared to normal control subjects. PACD patients were having smaller eyeballs with short AXL, shallow ACD, thicker lenses with steeper corneas. Genotyping of *PCMTD1*, NM\_001286783.1:c.215C>T and *COL11A1*, NM\_080629.2:c.2386C>G polymorphism yielded no significant association with PACD in the Indian population.

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## P-WT-048

### EFFECTIVENESS OF TREATMENT FOR GLAUCOMA IN STURGE-WEBER SYNDROME: EXPERIENCE FROM A TERTIARY REFERRAL PAEDIATRIC HOSPITAL

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#### Purpose

To describe the incidence of secondary glaucoma treatment outcomes in Sturge-Weber Syndrome (SWS) in children presenting to a tertiary Paediatric Ophthalmology Department at The Children's Hospital at Westmead (CHW).

#### Methods

A retrospective study of patients with SWS referred to the Department of Ophthalmology at CHW between 2003 to 2016 with at least 2 years follow up were identified and information was collected from the clinical notes of all subjects.

#### Results

29 patients with SWS 16 (55%) male were evaluated for glaucoma. The mean age at presentation was 33.8 months with an average follow up of 69.5 months. 16 (55%) were diagnosed with glaucoma at a mean age of 44 months. 12 were unilateral (75%) and 4 (25%) had bilateral disease giving a total of 20 eyes affected with glaucoma. Port wine stains (PWS) were ipsilateral to the glaucoma-affected eye in 19 (95%) eyes. Average intraocular pressure (IOP) on initial assessment in glaucomatous eyes was 23.8mmHg compared to 14.9mmHg in all eyes of patients with SWS. Choroidal vascular malformations were present in 8 (50%) of the glaucoma-affected eyes.

19 surgical procedures were performed including 7 trabeculotomies, 8 trabeculectomies and 4 Baerveldt tube shunt surgeries.

Seven trabeculotomies were performed in 4 patients with 3 eyes requiring repeat procedures. 1 eye met the criteria for successful treatment and two eyes achieved qualified success. The average number of pre-operative anti-glaucoma drops for each patient was 2.5 decreasing to 0.4 post-operatively. There were four eyes with failed trabeculotomy.

Eight trabeculectomies were performed in 5 patients. Five trabeculectomies met the criteria for success and one failure. The other two cases were followed at different hospitals. Patients who had failed repeat trabeculotomies proceeded to Baerveldt tube insertion. In these 4 patients 1 achieved success and three patients achieved qualified success with an overall reduction in anti-glaucoma medications from 2.25 pre-operatively to 0.75 post-operatively.

#### Conclusions

Glaucoma affects a significant proportion of patients with SWS and is associated with the presence of an ipsilateral PWS in most cases. In our study, Trabeculectomy was the most efficacious procedure for controlling IOP and reducing the burden of ongoing treatment in SWS associated glaucoma.

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## P-WT-049

### ENDOTHELIN-1 AND ENDOTHELIN RECEPTOR-A IN BULGARIAN POPULATION WITH PRIMARY OPEN-ANGLE GLAUCOMA - PROGNOSTIC IMPORTANCE

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#### Purpose

To explore the plasma levels of endothelin-1 (ET-1) and endothelin receptor-A (ETR-A) in primary open-angle glaucoma (POAG) patients. As possible early glaucoma biomarkers we investigate their prognostic and diagnostic abilities.

#### Methods

The total number of participants (75) were divided into three groups: controls (25), early glaucoma stage (22), and advanced glaucoma (28). The enzyme-linked immunosorbent assay test was used to determine the plasma concentrations. Statistical techniques used in the current study were comparative, ROC, correlation, and regression analysis.

#### Results

We found significance in ET-1 between controls (4.88 pg/mL) and glaucoma patients but lack of statistical significance in glaucoma severity (early POAG: 6.33 pg/mL and advanced POAG: 6.34 pg/mL). ET-A mean values showed significance between the three groups (controls: 1209.28 pg/mL, early POAG: 673.44 pg/mL, and advanced POAG: 992.28 pg/mL). Two mathematical models were developed concerning the two perimetric indices (MD/PSD) and ETR-A in early glaucoma group. ETR-A showed high diagnostic accuracy and also significant diagnostic ability for advanced glaucoma. The risk for early glaucoma changes increases 1.243 times for each year added to the age. Every pg/mL increasing of ET-1 plasma concentration rise the risk for early glaucoma changes with 2.124 times and every pg/mL increasing of ETR-A decreases the risk for early glaucoma changes with 1%.

#### Conclusions

The current study demonstrates that plasma ET-1 and ETR-A could be two more good diagnostic parameters for early POAG changes. In that moment, however, the laboratory testing is exotic and not routine method, basically because of its price. We think that the use of quick, inexpensive and routine test will be available, so that not only early glaucoma changes will be detected, but also the prevention of arising at risk groups. Further, a new approach to glaucoma management needs to be considered - topical endothelin receptor antagonists.

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## P-WT-050

### ANALYSIS OF C-REACTIVE PROTEIN SINGLE NUCLEOTIDE POLYMORPHISMS IN KOREAN PATIENTS WITH EXFOLIATION SYNDROME

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#### Purpose

To evaluate the association of C-reactive protein (CRP) single nucleotide polymorphisms (SNPs) in Korean individuals with exfoliation syndrome (XFS) and to investigate those SNPs' correlations with XFS phenotypes.

#### Methods

A total of 101 Korean XFS patients and 154 control subjects were included in this study. Five CRP SNPs, namely rs1205, rs1130864, rs1800947, rs1417938 and rs2794521, were genotyped using the TaqMan® allelic discrimination assay. A case-control association study on the allelic and genotypic frequencies of each SNP was performed, and the phenotypic features of XFS were compared in terms of those SNPs.

#### Results

Of the five CRP SNPs selected for the study, none showed any significant allele or genotypic frequency differences between the XFS patients and control subjects. Also, a subgroup analysis revealed that none of the four SNPs of CRP were associated with other relevant XFS phenotypes, including bilateral involvement of XFS or the development of glaucoma.

#### Conclusions

Even though increased serum CRP level have been suggested as markers of inflammation and peripheral endothelial dysfunction in XFS, our data suggest that for Korean subjects, variants in CRP genes have negligible effects on the development of XFS.

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**P-WT-051**

**ANALYSIS OF SYSTEMIC RENIN AND ANGIOTENSIN II LEVELS IN NORMAL-TENSION GLAUCOMA**

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Na Young Lee\*

**Purpose**

To investigate the roles of vascular dysregulation and instability in normal-tension glaucoma (NTG), we determined the serum levels of renin and angiotensin II.

**Methods**

Thirteen patients with NTG and age-matched 24 healthy controls were enrolled in this study. Blood samples from all subjects were assayed for renin and angiotensin II.

**Results**

There were no significant differences in age, gender, visual acuity, intraocular pressure, refractive power, systemic and diastolic pressure between the NTG and control groups. The systemic levels of renin were significantly higher in the NTG group than in the control group ( $p = 0.037$ ). However, the angiotensin II levels were not significantly different between the NTG and control groups ( $p = 0.281$ ).

**Conclusions**

After excluding patients with cardiovascular diseases, serum renin levels were elevated in patients with NTG. The angiotensin II levels were not significantly different in NTG. Increased renin levels suggest that ischemia/inflammation may play a role in the pathogenesis of NTG.

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## P-WT-052

### GENETIC VARIANTS ASSOCIATED WITH PROGRESSION OF VISUAL FIELD DEFECT IN PRIMARY OPEN-ANGLE GLAUCOMA

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#### Purpose

Genetic variants associated with primary open-angle glaucoma (POAG) can be classified into two types.<sup>1</sup> One is a genetic variant associated with intraocular pressure (IOP) elevation (IOP-related genetic variant), while the other is a genetic variant associated with a vulnerability of optic nerve independent of IOP (non-IOP-related genetic variant). This study was conducted to investigate the association between the additive effects of IOP-related or non-IOP-related genetic variants and visual field progression in POAG.

#### Methods

Eleven variants identified as IOP-related genetic variants, including rs1052990 (near gene: *CAV2*), rs11656696 (*GAS7*), rs59072263 (*GLCCI1/ICA1*), rs2472493 (*ABCA1*), rs58073046 (*ARHGEF12*), rs2286885 (*FAM125B*), rs6445055 (*FNDC3B*), rs8176743 (*ABO*), rs747782 (*PTPRJ*), rs4619890 (*AFAP1*), and rs2745572 (*FOXC1*), and 9 variants considered as non-IOP-related genetic variants, including rs3213787 (*SRBD1*), rs735860 (*ELOVL5*), rs1063192 (*CDKN2B*), rs1900004 (*ATOH7*), rs10483727 (*SIX6*), rs11969985 (*GMD5*), rs3785176 (*PMM2*), rs1192415 (*TGFB3*), and rs35934224 (*TXNRD2*), were genotyped for 284 POAG patients and 246 control subjects. The total number of risk alleles of 11 IOP-related or 9 non-IOP-related genetic variants was calculated for each participant as an unweighted genetic risk score (GRS). A logistic regression model was used to estimate the risk (odds ratio) of glaucoma for each risk allele of genetic variants, and the sum of the logarithmically converted odds ratios of 11 IOP-related or 9 non-IOP-related genetic variants was used as a weighted GRS. The mean deviation (MD) of Humphrey Visual Field Analyzer 30-2 in the worse eye was divided by the age at the time of visual field test, and was used as an indicator of glaucomatous visual field progression (MD change: dB/year). The association between the GRS and MD change was evaluated.

#### Results

There were significant relationships between the unweighted (Beta = -0.14, P = 0.023) or weighted (Beta = -0.15, P = 0.012) GRS of IOP-related genetic variants and the MD change by multiple linear regression analysis. As the GRS of IOP-related genetic variants increased, the rate of MD change became faster.

#### Conclusions

Additive effect of IOP-related, not non-IOP-related, genetic variants was associated with MD change, which indicates that IOP-related genetic variants (IOP elevation) rather than non-IOP-related genetic

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variants (vulnerability of optic nerve) may play an important role for the progression of visual field defect in POAG.

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## P-WT-053

### PROFILING METALLOPROTEINASE RELATED GENES USING MICE HYPERTENSION/ISCHEMIA MODEL REVEALS THE CANDIDATES IN EARLY STAGE RETINAL DENATURATION

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#### Purpose

The stress on retina, for example ocular hypertension and ischemia, can trigger denaturation of retina causing glaucoma. In order to explore ischemia/hypertension-sensitive genes, we focused on metalloproteinase family and tissue inhibitor of metalloproteinase which play important roles in retinal homeostasis. In this study, we profiled the genes using alternative mice model to explore the sensitive genes which can be predictor of the retinal denaturation in early stage.

#### Methods

Ischemia model or hypertension model was prepared by applying stress to the left eye of C57BL/6J mice; the optic nerve was ligated for ischemia model, and hyaluronic acid solution was injected into the vitreous body for hypertension model. The right eye was not treated in both models. Four hours or eight hours after the treatment, RNA was extracted from the each side of retina, and cDNA was synthesized respectively. qPCR was performed in 16 genes: *Adam9*, *Adam15*, *Adam17*, *Adamts3*, *Adamts9*, *Adamts10*, *Adamts13*, *Adamts17*, *Adamts18*, *Mmp2*, *Mmp9*, *Mmp14*, *Mmp15*, *Mmp16*, *Mmp17* and *Timp3*. Expression levels of the genes were analyzed in the stressed left retina relative to non-treated right retina by  $\Delta\Delta C_t$  method.

#### Results

In the ischemia model, the relative expression levels of *Adam17* and *Adamts18* were under 65% in eight hours condition. ( $P < 0.01$ ). The relative level of *Adam9* was decreased from 84% to 76% depending the ligation time ( $P < 0.01$ ). While the level of *Timp3* was decreased to less than 75% in four hours condition ( $P < 0.05$ ), the level was increased to three times in eight hours condition ( $P < 0.01$ ). In eight hours condition of hypertension model, the relative levels were suppressed to 55% in *Adam17* ( $P < 0.01$ ) and to 66% *Adamts18* ( $P < 0.05$ ) respectively. In addition, eight hours hypertension upregulated levels of *Adamts9* and *Mmp2*, a double and 1.3 times respectively ( $P < 0.01$ ).

#### Conclusions

The significant decrease of *Adam9* in 4 hours ligation suggested that *Adam9* has a potential to become a predictor of retinal denaturation in very early stage. The downregulation of *Adamts18* might be useful to predict denaturation of retina in early stage in both ischemia and hypertension condition. Also, specific up-regulation of *Timp3* in 8 hours ligation, which is alternative ischemia model, implies that *Timp3* has a potential to be a maker of ischemia condition.

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## P-WT-054

### INTERLEUKIN-8 PROFILE IN AQUEOUS HUMOUR OF PATIENTS ACROSS PRIMARY ANGLE CLOSURE DISEASE SPECTRUM

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#### Purpose

To investigate the concentration of interleukin-8 (IL-8) in the aqueous humour of patients across primary angle closure disease spectrum.

#### Methods

Aqueous humour samples were obtained during elective phacoemulsification or combined phacoemulsification and trabeculectomy surgeries from 15 cataract (as controls) and 46 angle closure subjects (including 16 primary angle closure suspects (PACS), 16 PAC and 14 PACG). The concentration of IL-8 in the aqueous humour were measured using AYOXXA's LUNARIS™ Human 11-plex Ophthalmology panel. Kruskal-Wallis test was used to determine the mean difference in IL-8 concentrations between the groups.

#### Results

Interleukin-8 was detected in 95.1% (58 out of 61) of samples. The concentration of IL-8 was significantly different between the groups ( $p = 0.02$ ) being highest in the PACG group ( $9.00 \pm 7.42$  pg/ml), followed by PAC ( $6.74 \pm 8.06$  pg/ml) and PACS ( $3.37 \pm 2.19$  pg/ml). The concentration of IL-8 was  $3.83 \pm 2.18$  pg/ml in controls. There was a significant positive correlation between IL-8 aqueous concentration and presenting intraocular pressure (IOP, correlation coefficient  $[r]=0.34$ ,  $p = 0.01$ ), and with the magnitude of peripheral anterior synechiae (PAS,  $r = 0.31$ ,  $p = 0.03$ ). No significant correlation was noted with age or vertical cup-to-disc ratio.

#### Conclusions

Aqueous concentration of the inflammatory cytokine IL-8 was elevated in PACG and significantly correlated with presenting IOP and PAS suggesting that inflammation may play a role in the development of PAC/PACG or progression from PACS, the earliest stage of the disease spectrum.

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## P-WT-056

### THE HERITABILITY OF ANTERIOR CHAMBER DEPTH IN HANDAN EYE STUDY

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#### Purpose

To study the heritability of anterior chamber depth(ACD) in the Handan Eye Study in China.

#### Methods

Individuals aged  $\geq 30$  years who participated in the Handan Eye Study(HES) were eligible for inclusion in this study. Anterior chamber depth was determined by A-scan ultrasonography and anterior segment optical coherence tomography (ASOCT). Data from right eyes of selected individuals was used in analysis. Heritability was estimated using two distinct Methods parent-offspring regression and best-fitting model.

#### Results

916 subjects from 292 pedigrees were selected for analysis. The familial correlation coefficient estimates were 0.17 ( $P < 0.01$ ) in first degree relatives and 0.57( $P < 0.05$ ) in second degree relatives. The heritability estimates for ACD measured by A-scan was  $h^2 = 0.12$  and  $h^2 = 0.27$  for ASOCT measurements. CCT had an estimated heritability 0.618 using parent-offspring regression and a heritability 0.788 using the ACE model.

#### Conclusions

This study confirms that the anterior chamber depth is a heritable ocular phenotype in human. These results provide an important basis for studying the molecular genetics and understanding the mechanism of ACD inheritance.

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## P-WT-057

### ANGIOPOIETIN RECEPTOR TEK-ASSOCIATED PRIMARY CONGENITAL GLAUCOMA: FIVE NOVEL GENE VARIANTS WITH PHENOTYPE EXPANSION

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#### Purpose

Recently, we discovered heterozygous loss-of-function mutations in the tunica interna endothelial cell kinase gene, *TEK*- attributable for 5% of primary congenital glaucoma (PCG). *TEK* is highly expressed in the endothelium of Schlemm's canal (SC)- a lymphatic/vascular hybrid vessel.

We sought to discover additional *TEK* mutations in a global cohort of PCG families.

#### Methods

DNA samples were whole exome sequenced in > 200 PCG families without mutations in known PCG-causing genes *CYP1B1*, *LTBP2*, *FOXC1*, *MYOC*, *ANGPT1* and *ANGPT2*. SNP and Variation Suite software v8.4 was used. Exonic and splice site regions variants were selected. Variants with a global allele frequency > 0.0001 in the Exome Variant Server, 1000 Genomes Project, or Exome Aggregation Consortium databases were excluded.

For missense variants, evolutionary conservation of affected amino acid residues were assessed using GERP++, and PhyloP. *In silico* pathogenicity predictions were generated using SIFT, Polyphen-2, MutationTaster, LRT, MutationAssessor, FATHMM, MetaSVM, LR and CADD.

Crystal structure and FoldX prediction programs determined the SNP effect on protein stability. Sanger sequencing verified co-segregation in extended pedigrees.

To determine whether the variant *TEK* proteins reduced activation of *TEK* signaling, heterologous expression vectors for WT and variant *TEK* proteins were generated in cell culture models. *In vitro* assays were performed to examine expression, intracellular trafficking, and signaling function. Intracellular and secreted *TEK* protein abundance, and distribution was determined by western blot and immunocytochemistry.

#### Results

Five additional families with novel/rare *TEK* variants were noted. There were 4 missense mutations: G136V, A841V, V188G, and G1035R; and a loss-of-function nonsense mutation Y904X. Functional analysis in a combined *in silico* and *in vitro* approach showed loss of function in patient alleles, supporting a causative role in disease.

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A large (12 participants) 4-generation family (A841V) showed co-segregation of Perthes diseases and/or ovarian cysts (females) in most affecteds. The enucleated eye of the 11-year-old proband histologically demonstrated absence of SC within a non-surgical cross section of the anterior chamber angle.

### Conclusions

We present 5 PCG families harboring novel *TEK* mutations, and novel human eye pathology of an affected family member demonstrating SC absence. We also describe a unique constellation of extra-ocular vascular phenotypes in one TEK family.

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# IOP Physiology and Pathophysiology

## P-WT-058

### SHORT-TERM INTRAOCULAR PRESSURE ELEVATION AFTER PHACOEMULSIFICATION SURGERY

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#### Purpose

To evaluate the patients who have an acute intraocular pressure (IOP) elevation after phacoemulsification surgery.

#### Methods

In this retrospective case series, charts of consecutive patients who had early IOP elevation within 2 weeks after phacoemulsification surgery were reviewed. All patients had preoperative IOP of less than 21 mmHg with or without medications. The patients who had undergone previous incisional glaucoma surgery and patients with angle closure glaucoma were excluded. We reviewed demographic information, intraoperative course, and postoperative outcomes.

#### Results

149 eyes of 149 patients were included in the study. The mean age of the patients was  $66,3 \pm 9,7$  years; the mean preoperative IOP was  $15,2 \pm 2,6$  mmHg. The mean postoperative IOP was  $27,7 \pm 8,5$  mmHg at 1st day. The mean of first elevated IOP measurement was 31mmHg (range 24-56). The mean IOP spike time was  $1,73 \pm 1,68$  days. IOP decrease was detected on average  $9,4 \pm 8,4$  days with a mean of  $2,1 \pm 1,0$  antiglaucoma medications. The follow-up time was  $3,6 \pm 2,6$  months; the mean IOP was  $14,9 \pm 3,7$  mmHg with 1,1 medications at last visit. Only one glaucomatous eye required glaucoma surgery.

*There were diabetes in 57; glaucoma in 26, high myopia in 7 and pseudoexfoliation in 31 patients. In 10 eyes, posterior capsule rupture (PCR) developed intraoperatively. In patients with glaucoma, pseudoexfoliation, diabetes or PCR, the IOP regulation time was significantly longer. Axial length, age and gender had no correlation with the above parameters. Preoperative IOP value was positively correlated with IOP at 1st day and negatively with IOP spike time.*

#### Conclusions

Intraocular pressure elevation after phacoemulsification usually can be controlled by medication. Presence of diabetes, preexisting glaucoma, pseudoexfoliation and intraoperative PCR cause longer IOP regulation time.

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## P-WT-059

### RECURRENT OPTIC DISC HEMORRHAGE AND ITS EFFECT ON VISUAL FIELD PROGRESSION IN GLAUCOMA

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#### Purpose

To investigate the association between visual field progression and disc hemorrhage recurrence frequency and locations.

#### Methods

82 patients with bilateral glaucoma, or unilateral glaucoma and a fellow glaucoma suspect eye were enrolled. Subjects received 3 monthly non-mydriatic optic disc photography and 6 monthly standard automated perimetry. The disc was partitioned into 8 sectors. Disc hemorrhage count over 5 years was recorded for each sector. Global visual field progression was calculated using linear regression on the mean of all sensitivity values at each time point. Sectoral progression was calculated by performing linear regression on the sensitivity at each locus over time, then selecting the value with largest and second largest significant ( $p < 0.05$ ) negative slope within that sector. The association between disc hemorrhage and visual field progression rate globally and within a sector was calculated using linear mixed modelling.

#### Results

151 eyes from 77 patients completed the study with an average of 20 disc photos taken per eye. The majority of eyes (74%) had primary open angle glaucoma. With global visual field analysis, eyes with hemorrhage in 2 different sectors of the disc had worse progression rate than eyes with hemorrhage in 1 sector ( $P = 0.0119$ ) and eyes with no hemorrhage ( $P = 0.0006$ ). Regarding maximal sectoral loss, sectors with 1 hemorrhage and 2-8 hemorrhages progressed at a similar rate ( $P = 0.5924$ ), sectors with 9 or more hemorrhages progressed faster than all other groups ( $P < 0.0001$ ). With multivariate analysis using various glaucoma clinical parameters as explanatory variables, disc hemorrhage count and baseline visual field sensitivity were the only parameters significantly associated with visual field progression ( $P < 0.0001$ ).

#### Conclusions

Sectors with 9 or more haemorrhages (45% of visits) over 5 years have significantly worse visual field progression than sectors with single or low number of recurrent hemorrhages. In addition, disc hemorrhages occurring at different locations in the same eye was strongly associated with greater global visual field progression.

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## P-WT-060

# POPULATION VARIABILITY OF BIOMECHANICAL PROPERTIES OF THE CORNEA AND THE SCLERA IN HEALTHY SUBJECTS

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### Purpose

Intraocular pressure measurement depends on the biomechanics of the cornea and the sclera. Ocular Response Analyzer allows *in vivo* study of biomechanical properties of the eye and simultaneously obtain values of the goldmann-correlated and corneal-compensated IOP.

The aim of the study was to define physiological ranges of corneal hysteresis, corneal resistance factor, and corneal elasticity coefficient in normal population.

### Methods

We examined 4410 eyes of 2205 healthy subjects from 18 to 89 years old (mean age was  $59.7 \pm 14.4$ ) with the Ocular Response Analyzer (ORA). Two standard parameters of biomechanical properties of the cornea have been measured with ORA: corneal hysteresis (CH) and corneal resistance factor (CRF). Calculation of the corneal elasticity coefficient (Ke) is done by an original patented method (RF patent № 2361504) by analyzing cornea deceleration dynamics at the moment of indentation. Central corneal thickness (CCT) was measured by ultrasound pachymetry.

### Results

Variability of central corneal thickness was significant, ranging from 448 to 685 mkm for all patients. The mean value was  $563 \pm 37$  mkm. There was also no significant dependency of CCT on age discovered, however the parameter indicated overall decrease in the age groups. Intraocular pressure was normal in all cases, mean value of corneal-compensated IOP was  $17,0 \pm 2,8$  mmHg, this parameter was necessary for standardization of the biomechanical properties.

The analysis of distribution of CH and CRF revealed nearly equal range of values, however, the first one is more variable (*Figure 1*). Age-related changes in biomechanical properties were manifested in the decrease of CRF and CH with age. Moreover, the corneal elasticity coefficient decreased for each age range. There was not gender difference in biomechanical properties of the eye.

The obtained results allowed us to propose a scale of the norm of biomechanical parameters of the cornea for clinical use of Ocular Response Analyzer. In extreme value ranges, there is a high probability of a tonometric error in the application of the Goldmann tonometer.

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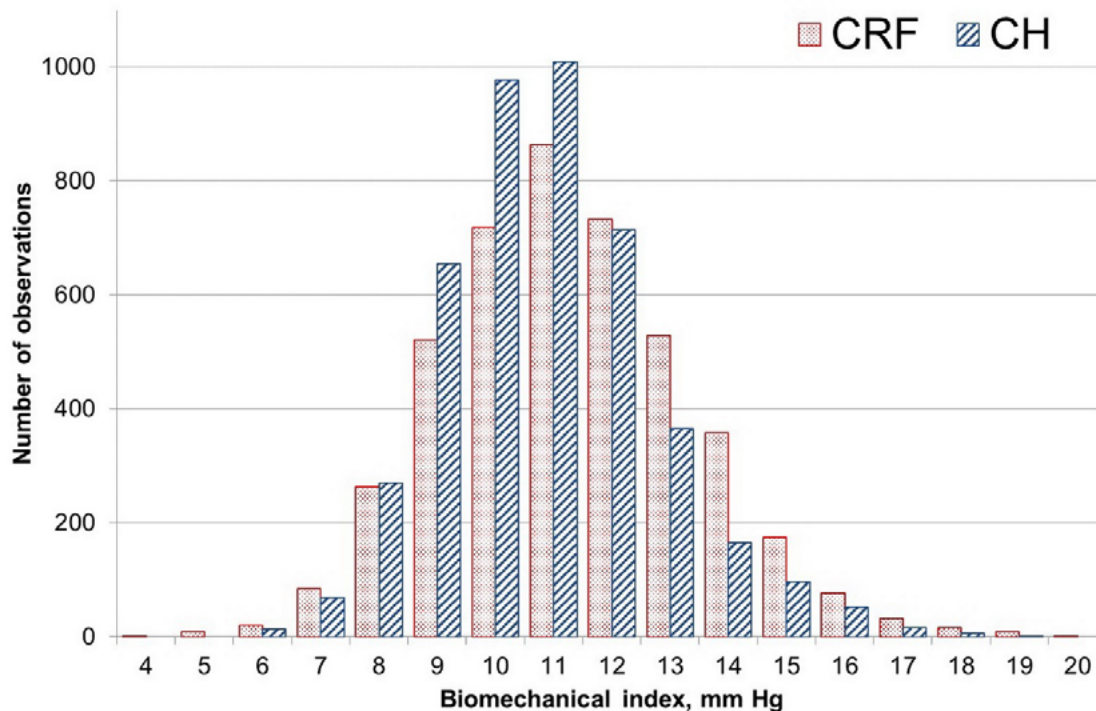
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## Conclusions

Values measured with the Ocular Response Analyzer in healthy subjects have normal distribution with a wide range.

The scale of evaluation for corneal resistance factor, corneal hysteresis and the elasticity coefficient based on the statistical analysis of big group of patients is proposed for clinical practice.

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## P-WT-061

# EXCIMER LASER TRABECULOSTOMY (ELT) A LASER BASED MIGS PROCEDURE ENABLES SAFE & CONSISTENT 12 YEAR INTRAOCULAR PRESSURE-LOWERING EFFICACY

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### Purpose

To evaluate the long-term, 12 year, IOP-lowering efficacy and safety of ELT (Excimer Laser Trabeculostomy) Alone and ELT+Phacoemulsification in patients with OAG (open-angle glaucoma) or OHT (ocular hypertension), and in patients with co-existing OAG or OHT and surgical cataract.

### Methods

19 patients were followed for 12 years. 12/44 eyes with OAG or OHT underwent *ab interno* ELT Alone (fiberoptic, 308nm), creating durable channels through TM & SC inner wall. 7/37 eyes with OAG or OHT and surgical cataract underwent ELT+Phaco. Patients were followed at 1 day, 1 month, 3 months, 6 months, 1 year, and every year thereafter for 12 years from initial treatment. The primary outcome measures are mean change in IOP (without washout) and number of glaucoma medications from baseline. Secondary outcome measures are change in visual acuity (BCVA), surgical complications, and adverse events (AE).

### Results

At 12 years, the mean IOP in ELT Alone was reduced by 22.7% from a pre-op IOP of  $22.9 \pm 5.4$  to  $16.8 \pm 4.6$ mmHg, (p-value IOP < 0.001). In the ELT+Phaco group, the mean IOP was reduced by 45.6% from a pre-op IOP of  $25.0 \pm 5.8$  to  $13.6 \pm 4.1$ mmHg (p-value IOP < 0.001). The number of glaucoma medications at 12 years for the ELT Alone group changed from  $1.9 \pm 0.8$  to  $1.5 \pm 1.4$  meds (p = 0.47). For ELT+Phaco meds changed from  $1.4 \pm 0.8$  to  $2.4 \pm 0.6$  meds (p = 0.99).

### Conclusions

ELT Alone and ELT+Phaco, MIGS procedures without implants, are clinically safe and effective, and enable long-term, consistent and significant reductions in IOP in patients with OAG or OHT. 12-year post-ELT IOP reduction with no implants was equivalent to 1- & 5-year IOP-lowering data following combined phacoemulsification with iStent implants. At 12 years, glaucoma medication requirements were decreased from pre-op in the ELT Alone group but increased in the ELT+Phaco group. There were no reported AE's. This study presents the longest post-MIGS procedure data which validates the concept of MIGS procedures and especially MIGS without implants for long-term IOP lowering.

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## P-WT-062

### DYNAMIC CHANGES IN IRIS PARAMETERS UNDER PHYSIOLOGICAL CONDITIONS AMONG PATIENTS AT RISK OF ANGLE CLOSURE

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#### Purpose

To evaluate changes in anterior chamber (AC) morphology induced by physiological changes between light and dark in eyes of patients with PAC (Primary Angle Closure), PACS (Primary Angle Closure Suspects) and control subjects without eye pathology and to identify risk factors associated with primary angle closure using swept source anterior segment optical coherence tomography (SS-OCT) measurements of the iris.

#### Methods

Longitudinal prospective study involving 39 PAC/PACS Caucasian subjects and 19 subjects without eye pathology in a control group. Participants underwent gonioscopy and SS-OCT (Tomey Corporation, Nagoya, Japan). Customized software (Tomey Corporation, Nagoya, Japan) was used to measure anterior chamber parameters.

#### Results

The increase in pupil diameter from light to dark was associated with iris volume decrease in all eyes in this study with stronger correlation in control eyes ( $R^2 = 0.645$ ) than in PACS eyes ( $R^2 = 0.363$ ) and PAC eyes ( $R^2 = 0.189$ ). Iris curvature change from light to dark was most pronounced in PACS eyes ( $D0.034\text{mm}$ ,  $P < 0.01$ ) compared to either control and PAC eyes. In PACS eyes, pupil diameter change from light to dark conditions showed stronger correlation with increase in iridotrabecular contact increase ( $R^2 = 0.455$ ) compared to PAC eyes ( $R^2 = 0.06$ ).

#### Conclusions

Proportional decrease of iris volume associated with pupil diameter increase during physiological dilatation is diminished in PACS eyes, compared to controls. Increased iris curvature was more pronounced in PACS eyes under physiological conditions and increase in pupil diameter showed the strongest association with increase in iridotrabecular contact in PACS eyes. This study demonstrates a relationship between iris curvature, pupil diameter change and iridotrabecular contact, in physiological conditions, in eyes of Caucasian patients with occludable angles which could be used to predict those most at risk of acute or chronic angle closure.

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## P-WT-063

# PREFERRED SLEEPING POSITION AND ASYMMETRIC GLAUCOMA: IS THERE A RELATIONSHIP?

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### Purpose

To determine the association between the preferred sleeping position and asymmetric visual field loss in glaucoma patients.

### Methods

This cross sectional, comparative study was over 18 months in Ophthalmology setup in accordance with the relevant declaration of Helsinki specifications. Three hundred consenting individuals, with recently diagnosed Primary open angle glaucoma(POAG) - High Tension Glaucoma(HTG) and Normal Tension glaucoma(NTG); aged 40 -70 years who were able to speak and comprehend native language and/or English and/or Hindi fluently were enrolled in the study and prospectively evaluated. All subjects were interviewed face-to-face and demographic information obtained. The subjects underwent a comprehensive ophthalmic examination and glaucoma examination.

A questionnaire on the preferred sleeping position was administered to each subject. The following questions were asked: 1) Do you have a preferred lying position when you are sleeping? a)YES, b)NO; 2) If your answer to 'Question1' is a)YES, which body position do you prefer?- right decubitus/left decubitus/both or supine/prone.

The association between the preferred sleeping position and asymmetric visual field(VF) loss in the glaucoma patients was analysed. Asymmetric VF loss defined as a difference in mean deviation of at least 2dB between the eyes.Chi-square test, independent *t*-test and paired *t*-test used for statistical analysis.

### Results

A total of 300 POAG subjects were included (184 men, 116 women; mean age  $62.3 \pm 12.5$  years; range 42-70 years). There were 240 HTG and 60 NTG patients. 112 patients preferred lateral decubitus. Out of these, 43.75% patients preferred worse eye dependent position. In all three groups, the number of patients preferring the worse eye dependent lateral decubitus was significantly larger than those preferring the better eye dependent lateral decubitus.195 patients had asymmetric visual field loss (157 HTG, 38 NTG). There was no significant difference in the preferred sleeping position between the HTG and NTG group with asymmetric VF loss( $p = 0.85$ ).

### Conclusions

Sleep position habitually preferred by glaucoma patients may be associated with greater visual field loss. No similar published Indian study known to the author. In Indian scenerio, ophthalmologists and glaucoma specialists are not in the habit of obtaining a sleep related history. As clinicians, we can guide our patients to control glaucoma to some extent possibly by simple life style changes as altering sleep positions.

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**P-WT-064**

**INFLUENCE OF DIFFERENT PHYSIOLOGICAL PARAMETERS ON INTRAOCULAR PRESSURE DURING PHYSICAL ACTIVITY – EARLY RESULTS FROM A PILOT STUDY WITH THE EYEMATE™**

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**Purpose**

Accurate measurements of intraocular pressure by clinically available methods is typically limited to static situations in standard body positions. The aim of this pilot study was to employ a novel telemetric intraocular pressure sensor (EYEMATE™, Implants for Health Ltd, Hannover, Germany) for recording IOP during different body positions and physical activities.

**Methods**

Patients previously implanted with the EYEMATE were fitted with an external antenna to allow for telemetric recording of IOP during several experiments, including automatic measurements at 5 minute intervals for 24 hours, quasi-continuous measurements during bicycle ergometry, different body positions and at different breathing exercises.

**Results**

IOP could be recorded reliably during all settings. Measurements showed IOP to be highly dynamic with diurnal variations > 20 mmHg in several. Most patients showed a marked decrease in IOP at night as well as correlation with blood pressure and heart rate. High intrathoracic pressure during forced expiration lead to reproducible increases in IOP by up to 15 mmHg, whereas low intrathoracic pressure during forced inspiration decreased IOP by up to 8 mmHg.

**Conclusions**

The implantable pressure sensor allows for reliable non-contact, continuous measurement of IOP during normal physical activities. This will enable detailed investigations of the effect of various physiological parameters on IOP with high temporal resolution and few technical limitations, and may lead to better understanding of dynamic IOP regulation in glaucoma.

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## P-WT-065

### MACHINE LEARNING TO DETECT INTRAOCULAR PRESSURE PEAK AT 6AM FROM A MORNING MINICURVE IN SUSPECTED AND GLAUCOMA PATIENTS

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#### Purpose

To use a machine learning technique to predict intraocular pressure (IOP) peak at 6am (IOP > 21 mmHg) from a morning minicurve with IOP measurements at 8am, 9am and 11am in suspects (SG) and primary open-angle glaucoma (POAG) patients.

#### Methods

Patients with SG and POAG had the IOP measured with the Perkins tonometer at 6am in the supine position and in darkness before standing up. The eye with the highest IOP at 6am was selected from each patient. Two new variables were defined for morning curves: slope at 8am and concavity (Fig. 1 A). As predictors of IOP peak at 6am, the IOP values at 8am were obtained with the Perkins tonometer after each patient rested for 60 min in supine position, in darkness, and at 9am and 11am in sitting position, with the Goldmann tonometer. Visual field MD, central corneal thickness, age and gender were also taken. A classification tree method (CART) was used to predict the IOP peak at 6am, after randomization of the sample in training (n = 60) and validation (n = 38) groups.

#### Results

Ninety-eight eyes of 98 patients were included. The values of IOP at 8am, 9am and 11am, as well as the inclination and concavity values of the minicurve were significantly different ( $P \leq 0.001$ ) in the subgroups with and without IOP peak at 6am. Other variables did not present significant differences. Three groups of patients were stratified in relation to the IOP peak risk at 6am by the CART method: low risk (0 of 22 / 0%), intermediate risk (7 of 27 / 26%) and high risk (42 of 49 / 86%). The variables that showed the greatest predictive power for IOP peak at 6am were the IOP at 8am and the concavity of the morning curve (Fig. 1B). Doing the 24-hour IOP curve in only 27% of the patients (intermediate risk group) would result in sensitivity of 100%, specificity of 86% and accuracy of 93% for prediction of IOP at 6am.

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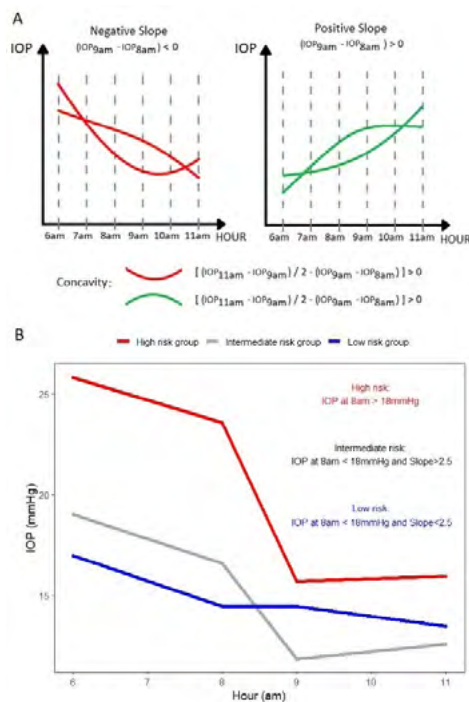
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## Conclusions

IOP peak at 6am could be predicted with high accuracy by the CART method using IOP measurements at 8am, 9am and 11am. The greatest advantage of the classification tree method is that it is easy to interpret.

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## P-WT-066

### EVALUATION OF CORNEAL HYSTERESIS IN EARLY GLAUCOMA PATIENTS - A NEW TOOL FOR DETECTION OF THE DISEASE

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#### Purpose

The aim of the research was to evaluate the correlation between intraocular pressure (IOP) measured with Goldmann applanation tonometry (GAT) to central corneal thickness (CCT) adjusted IOP obtained with Ocular Response Analyzer tonometer (ORA) and to establish whether there is a correlation between IOP, corneal hysteresis (CH) and OCT RNFL results.

#### Methods

The study included 25 subjects in control group and 46 early glaucoma patients. All measurements were performed in glaucoma outpatient clinic of Wroclaw University Hospital: intraocular pressure with GAT and ORA, CCT and OCT RNFL thickness. Control group included subjects with no ophthalmic history. Early glaucoma patients group included early primary open angle subjects treated pharmacologically with no history of either laser nor surgical treatment of glaucoma. The inclusion criteria were assessed based on ophthalmic assessment of optic nerve disc and perimetry (MD > -6dB).

#### Results

Early glaucoma group revealed significant positive correlation between ORA IOP and GAT IOP. The correlation between ORA IOP and CH was revealed to be significantly negative. There was strong positive correlation between ORA IOP and GAT IOP results in control group.

#### Conclusions

CH in patients with early stage glaucoma, as confirmed by OCT RNFL thickness, is significantly lower compared with control group. CH is an important parameter that can be useful for early glaucoma diagnosis. IOP measured with ORA tonometer correlates with GAT IOP results. ORA tonometry could act as a new, noninvasive method of intraocular pressure and corneal hysteresis measurement alternative to GAT. Due to correlation between CH values and glaucomatous damage, ORA can be useful for diagnosis of glaucoma at its early stage.

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## P-WT-067

# PROLONGED UNSUPERVISED USE OF STEROID EYE DROPS LEADING TO BILATERAL GLAUCOMA AND CATARACT: A CASE REPORT

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### Purpose

To report a rare case of bilateral cataract and glaucoma in an 18 year old male, secondary to prolonged and unsupervised use of steroid eye drops.

### Methods

Case report.

### Results

An 18 year old male presented with irritable eye complains since 3 years and decrease in vision since 1 year.

His BCVA was 6/36 and 6/24 in right and left eye. There was evidence of giant papillae in upper tarsal conjunctiva with limbal hypertrophy. Pupillary reaction was ill sustained in both eyes. Slit lamp examination revealed posterior subcapsular cataract, right eye more than left. Intraocular pressure was 40 mmHg and 38 mmHg in right and left eye with bilaterally open angles. Dilated funduscopy revealed bilateral cupping of 0.7

On further enquiry the patient gave history of using antibiotic-steroid eye drops (Dexamethasone 0.1%) twice daily, in both eyes, since 3 years, which were prescribed to him by a general practitioner for his ocular complains. As the duration of therapy and side effects were not specified by the doctor, the patient kept obtaining the eye drops on repeat prescription basis and used them indiscriminately without any ophthalmic checkup.

A diagnosis of steroid eye drops induced bilateral cataract and secondary open angle glaucoma was made.

Patient was advised to discontinue the eye drops and started on 4% sodium cromoglycate eye drops twice daily along with systemic antihistaminics for his allergic keratoconjunctivitis. IOP lowering measures were taken in the form of oral Acetazolamide 250 mg twice daily for three days and was maintained on Brimonidine 0.2%+Timolol 0.5% combination eye drops. He was reviewed till target IOP was achieved and signs of allergic conjunctivitis regressed.

4 months later, he underwent cataract extraction in the form of clear corneal phacoemulsification with intraocular lens implantation in right eye followed by left. Postoperatively, he was put on a tapering dose of Loteprednol 0.5% eye drops with careful IOP monitoring and funduscopy at each follow up visit. There was no evidence of progression in the cupping and his BCVA was 6/12 in both eyes.

Humphrey field analysis test revealed bilateral superior paracentral scotomas.

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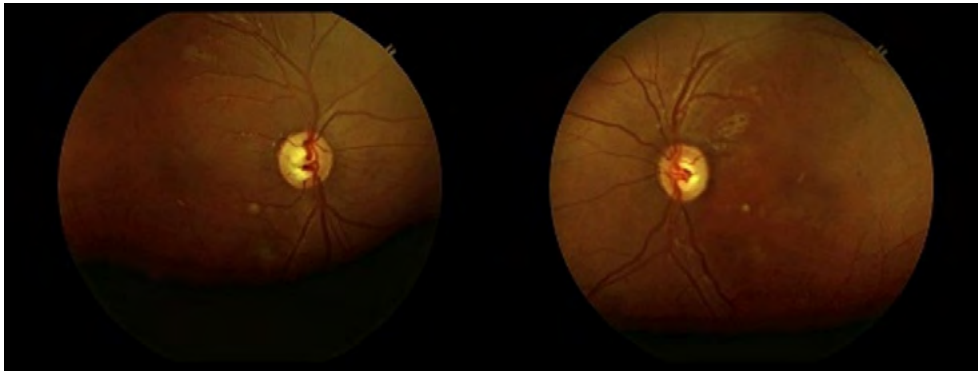
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## Conclusions

Glaucoma is more commonly caused by local steroids prescribed as eye drops or periocular ointments than with systemic preparations and warrants IOP measurement regularly.

Cataracts are more common with systemic steroids.

Unbridled prescription of steroid eye drops by general practitioners, without IOP monitoring, should be discouraged.

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## P-WT-068

### INTRAOCULAR PRESSURE PROFILE AND VISUAL ACUITY IN FELLOW EYE AFTER OPEN GLOBE INJURY

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#### Purpose

In an attempt to manage the traumatized eye, an unusual high IOP in the fellow eye could be overlooked. The aim of the study was to assess the intraocular pressure (IOP) profile and visual acuity (VA) in the fellow eye after open globe injury.

#### Methods

This was a prospective, observational study which included 18 consecutive patients presenting with open globe injury to a tertiary care centre between January 2012 to February 2017. The main outcome measures were IOP, VA and management of the fellow eye.

#### Results

Male preponderance (n = 12, 66.7%) and injury to the left eye (n = 11, 61.1%) was observed. Mean age was  $29.2 \pm 12$  years. Steep rise in the IOP ( $32 \pm 8.7$  mmHg; 26 – 44 mmHg) was recorded in 8 out of the 18 (44.4%) fellow eyes and were started on topical anti-glaucoma medication ( $\geq 3$  medications). The initial VA ranged from 0.25 – 0.50 (logMAR chart). Ocular examination revealed quiet anterior and posterior segment, with no symptoms. Gonioscopy findings were normal. Pupils were fixed and dilated in two eyes. A significant improvement in the IOP ( $19.5 \pm 2.9$  mmHg) within 8 weeks was observed after initiating anti-glaucoma medications. An improvement in VA was observed in all eyes (0.50-1.00). Inadvertent use of topical steroids in the fellow eye was observed in 2 out of 8 patients (25%). Anti-glaucoma medication was stopped in 6 (75%) cases within 6 months. At 18 months follow up 2 (25%) patients continued to require at least one medication. There was no visual-field defect recorded in any of the 8 eyes.

#### Conclusions

In open globe injury the intra-ocular pressure of the fellow eye is raised in a significant number of patients. Timely recognition and management of the fellow eye is important to ensure inadvertent loss of vision in the fellow eye.

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## **P-WT-069**

### **CASE REPORT OF A RARE ACUTE ANGLE CLOSURE ATTACK SECONDARY TO SILICONE OIL PUPILLARY BLOCK IN A VITRECTOMIZED APHAKIC EYE**

Miguel Luiz Guillermo\*

#### **Purpose**

This report describes acute angle closure from silicone oil in a vitrectomized eye without the presence of a physiologic or artificial lens to act as barrier to anterior to migration.

#### **Methods**

A 45 year old male suffered blunt trauma to his right eye 4 months before consult. Within a week, the patient experienced increasing cloudy vision and was diagnosed with traumatic cataract and inferior rhegmatogenous retinal detachment. Intraocular pressure was normal. Intracapsular cataract extraction and pars plana vitrectomy with silicone oil was performed.

One week before consultation at our institution the patient began experiencing increased right ocular pain. BCVA was hand movement (HM) at 3 feet. A 3 mm non-reactive pupil and shallow anterior chamber with peripheral iridocorneal touch was present. Dumbell extension of silicone oil through the pupil was observed causing pupillary block and forward displacement of the iris. Intraocular pressure was 34 mmHg. The optic nerve appeared undamaged with an intact neuroretinal rim and CDR of 0.4. Gonioscopy revealed 360 degree closed angles that still opened with indentation.

IOP was controlled with timolol BID and acetazolamide tablets (250 mg/tab) TID. Topical tropicamide 0.5% and phenylephrine HCl 0.5% was also given every QID to dilate his pupil. The patient was also instructed to assume a head prone position.

#### **Results**

The following day, the patient's pupil had dilated to 6mm with anterior chamber deepening and relief of angle closure. Prolapsed silicone oil had returned to the vitreous cavity. Intraocular pressure was 6 mmHg. 1% pilocarpine was given TID to constrict the pupil and trap the oil posteriorly. A laser iridotomy was performed at the 7:00 iris sector. Final gonioscopy revealed open hyperpigmented angles with 360 degree visible ciliary body bands. Medications were discontinued giving a final IOP of 10 mmHg. The patient was then scheduled for transscleral suturing of an intraocular lens, repeat PPV and exchange with heavy silicone oil.

#### **Conclusions**

In the absence of an intraocular barrier the natural tendency of low molecular weight silicone oil is to migrate anteriorly in supine position. Pupillary block can occur eliciting acute angle closure. However, simply dilating the pupil and placing the patient in prone position often returns the oil to the vitreous cavity breaking the acute angle closure attack.

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## P-WT-070

### ASSOCIATION OF BLEB MORPHOLOGY PARAMETER USING BLEB GRADING SOFTWARE AND INTRA OCULAR PRESSURE

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#### Purpose

To evaluate the relationship of bleb parameter to IOP using digital clinical grading scale software.

#### Methods

This is a cross sectional analytic studi. Inclusion criteria: patients underwent primary trabeculectomy or phacotrabeculectomy of > 1 mo, age > 18 ys, IOP were taken by 2 ophthalmologists using Goldmann aplanation tonometry. A digital clinical grading scale software is created in collaboration with Magister Program of Biomedical Engineering, School of Electrical and Informatics Engineering, Bandung Technology Institute. A photograh of the bleb were taken by 2 ophthalmologists, using 5 megapixel camera with resolution of 1296 x 972 that mounted in the Zeiss-SL 130 slitlamp, then soft data of photograph were analyzed using bleb evaluation software within specific parameter using modification of Indiana Bleb Appearance Grading Scale. The scaling interval are Height 0-3, Extent 0-3, vascularity 0-4. The association between each and all parameter (height, extent and vascularization) with intraocular pressure were analized using multivariate analysis (multiple linier regression).

#### Results

There were 55 eyes of 50 patients, median of age 62 (20-78 ys). Median of IOP 17 (10-44 mmHg), 22 patients underwent trabeculectomy, 13 trabeculectomy with MMC and 20 phacotrabeculectomy. About 61,8 % evaluation done 1-3 months after surgery, 21,8% between 3-6 months and 16,4% 6 months after surgery. Multivariate analysis using multiple linier regression showed association between height of the bleb and IOP, with final model  $IOP = 21.398 - 2.196 * \text{Height}$ . This is mean that every 1 value increase of bleb height, the IOP will decrease by 2.196 mmHg. There was no association between extent and vascularization of the bleb with IOP.

#### Conclusions

In bleb morphology evaluation using digital software, there was association between height of the bleb and IOP but there were no association between extent and vascularization with IOP. The improvement of this software need to be done to evaluate allgorithm for extent and vascularization parameter.

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## P-WT-071

### PERIPAPILLARY AND MACULAR CHOROIDAL AREA IN PATIENTS WITH NORMAL-TENSION GLAUCOMA

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#### Purpose

Some studies investigated the choroidal thickness found no differences between normal and glaucoma patients,<sup>1,2</sup> while other studies demonstrated there was a significantly thinner choroidal thickness in glaucoma versus control eyes.<sup>3,4</sup> The purpose of this study was to evaluate normal and normal-tension glaucoma (NTG) eyes for differences in peripapillary and macular choroidal area measurements.

#### Methods

This cross-sectional comparative study enrolled 52 normal subjects and 35 NTG patients. Peripapillary and macular choroidal images were recorded by enhanced depth imaging optical coherence tomography (EDI-OCT), with conversion of the luminal and interstitial areas to binary images performed using the Niblack method.

#### Results

While there was a significant difference between normal subjects and NTG patients for the peripapillary choroidal area ( $1,853,672 \pm 626,501 \mu\text{m}^2$  vs.  $1,606,448 \pm 418,214 \mu\text{m}^2$ ,  $P = 0.047$ ), there were no significant differences between the normal subjects and NTG patients observed for the macular choroidal area ( $345,365 \pm 119,248 \mu\text{m}^2$  vs.  $316,442 \pm 85,732 \mu\text{m}^2$ ,  $P = 0.23$ ). In the NTG patients, multivariate regression analysis demonstrated a correlation between the macular choroidal area and the axial length ( $\beta = -0.345$ ,  $P = 0.04$ ). Furthermore, there was also a significant correlation between the peripapillary choroidal area and the age of the NTG patients ( $\beta = -0.469$ ,  $P = 0.004$ ). In addition, there was no relationship between the glaucoma severity and the peripapillary and macular choroidal areas in the NTG patients.

#### Conclusions

While there were decreases in the peripapillary choroidal area in NTG patients, these changes were not influenced by the glaucoma severity. Moreover, a significant decrease was not observed in the macular choroidal area.

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## P-WT-072

# RELATIONSHIP BETWEEN A SENSING CONTACT LENS OUTPUT AND VF GLAUCOMA PROGRESSION IN OAG: A PRACTICAL TOOL TO ILLUSTRATE THE LIKELIHOOD OF PROGRESSION

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### Purpose

Data from 445 open angle glaucoma patients (OAG) was used to demonstrate the association between the profile of a sensing contact lens and retrospective rate of visual field (VF) progression, deriving in a progression report (PR) to illustrate the potential likelihood of experiencing fast ( $< -1\text{dB/y}$  mean deviation (MD) change) from slow VF glaucomatous progression. The objective of this study is to validate the PR as a tool for evaluation of VF progression.

### Methods

22 OAG patients were analysed. 24-hour ocular dimensional profile recorded with SENSIMED Triggerfish (TF; Sensimed, Lausanne, Switzerland) more than 1 year before the current evaluation were used to generate a PR. The likelihood of VF glaucoma progression was estimated based on clinical parameters collected before the TF session: Assessor 1 (last year resident) and Assessor 2 (2nd year fellow), blindly scaled a progression bar identical to the one provided in the PR. Agreement between assessors and between each assessor and PR results were evaluated. Actual glaucoma progression or lack thereof was assessed for each patient based on subjective clinical evaluation of the VF and compared to PR results using unpaired *t*-tests.

### Results

Patient mean age was  $64 \pm 10$  years, 60% were female. Correlations were fair between the 2 assessors ( $r = 0.42$ ), good between assessor 1 and PR ( $r = 0.54$ ) and poor between assessor 2 and PR ( $r = 0.02$ ). Removing the results of a patient who was source of a big disagreement between assessors, the correlations improved, though assessor 2 and PR correlated only fairly. Clinical evaluation of progression was assessed for 19 out of 22 patients due to missing VFs. Progression was observed for 7 patients, 12 did not progress. Comparison with PR results showed a statistical difference ( $p = 0.001$ ) between PR mean scores for progression and non-progression.

### Conclusions

PR could provide as good information as a glaucoma fellow to predict VF progression for patients with limited follow-up data. TF recording being related to the eye's biomechanical properties and the ocular tissues' response to pressure variations, it offers new information that complements the conventional structural and functional exams. With a single MD value, history of glaucoma medication, laser and surgery PR extracted from TF is as good as a highly trained ophthalmologist using all available structural and functional information for prediction of fast or slow progression.

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## P-WT-073

### TWENTY-FOUR-HOUR INTRAOCULAR PRESSURE LOWERING EFFECTS OF LATANOPROST EXAMINED BY ICARE HOME SELF-TONOMETER

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#### Purpose

Icare HOME (Icare HOME, Icare Finland, Helsinki, Finland) is a hand-held tonometer that can be used by patients at home without topical anesthesia. This device can be used to evaluate the diurnal fluctuations of the intraocular pressure (IOP) and to assess the 24-hour effect of anti-glaucoma medications. The purpose of this study was to determine the effects of latanoprost on the IOP over a 24 h period.

#### Methods

Fifteen healthy subjects (mean age 37.6 years) were studied. Topical latanoprost 0.005% ophthalmic solution was applied at 10:00 h on one eye (right or left randomly), and the IOP was measured every hour from 9:00 (baseline) to 22:00 h after the application and from 6:00 to 10:00 h on the following day (19 total measurements). The IOP was measured with the Icare HOME by the subjects (IOPself) for the 19 times, and it was simultaneously measured each time by the ophthalmologist with the same IcareHOME device (IOPo). These IOPs were compared statistically.

#### Results

The baseline IOP of the latanoprost-treated eye was  $16.1 \pm 3.6$  mmHg by the patients and  $14.4 \pm 4.3$  mmHg by the ophthalmologist. The baseline IOP of the untreated eye was  $15.6 \pm 4.5$  mmHg (IOPself) and  $13.8 \pm 4.1$  mmHg (IOPo). The maximum decrease and time of the IOP-lowering effects (latanoprost-treated eye - untreated eye) was -2.5 mmHg at 17:00 h (IOPself) and -2.4 mmHg at 18:00 h (IOPo). The IOP was significantly lower than the baseline IOP from 13:00 to 10:00 h on the following day. The IOPs measured with the Icare HOME by patients tended to be higher than IOP measured by ophthalmologist by an average 1.4 mmHg ( $P < 0.05$ ).

#### Conclusions

The results indicate that latanoprost can significantly lower the IOP for 24 h in normal eyes. In addition, the results indicate that the IOP can be monitored reliably with the IcareHOME device by inexperienced individuals.

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## **P-WT-074**

### **COMPARISON OF INTRAOCULAR PRESSURE MEASUREMENTS WITH THE GOLDMAN APPLANATION TONOMETRE AND PERKINS TONOMETRE**

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**Anya Kalu\***

#### **Purpose**

To compare intraocular pressure measurements with the Goldman Applanation Tonometre with that of Perkins Tonometre.

#### **Methods**

Two hundred eyes of one hundred patients who were  $\geq 18$  years, who consented, were recruited for the study. There were 50 females and 50 males. Each patient had ocular examinations  $\geq 24$  hours before the intraocular pressure measurement were done. The ocular examination included a visual acuity test, examination of the anterior segment and dilated Fundoscopy. Each patient had intraocular pressure measurement first by the Perkins tonometre with the patient in the upright sitting position, then by the Goldman's applanation tonometre with the patient seated against the slit lamp, after a 20 minutes interval.

Data was obtained using a questionnaire containing biodata, sociodemographic characteristics, Ophthalmic history and examinations, blood pressure, weight and height. Data were entered and analysed using statistical package for social sciences (SPSS) version 20.0 (SPSS Inc, Chicago, IL, USA). The significance level for association between variables was  $P < 0.05$ .

#### **Results**

Two hundred eyes of 100 patients were studied, while values of the right eyes (100) were analysed. The mean intraocular pressure measurement by the Goldman applanation tonometre was 16.36mmHg, while that for Perkins was 16.56mmHg. Analysis of the findings using linear regression analysis showed a coefficient of determination ( $r^2$ ) = 0.976 which is close to 1. This implies that intraocular pressures measured with Perkins tonometre correlates 97.6% of times, with the intraocular pressure measured by Goldman's tonometre.

#### **Conclusions**

There was no significant difference in the intraocular pressures when measured with either the Goldman applanation or Perkins tonometre.

Perkins tonometre could be a good alternative to Goldman applanation tonometre in intraocular pressure measurement especially in patients who cannot comfortably sit upright or when intraocular pressure is needed to be checked in the supine position.

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## P-WT-075

### CHANGE IN INTRAOCULAR PRESSURE AFTER GLENN OR FONTAN PROCEDURE IN PATIENTS WITH SINGLE VENTRICLE

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#### Purpose

Single ventricle (SV) refers to a cardiac malformation characterized by the existence of only one functional ventricle, and patients with SV require bidirectional Glenn shunt (Glenn procedure), followed by total cavopulmonary connection (Fontan procedure). It is known that central venous pressure (CVP) significantly increases after these procedures. Intraocular pressure (IOP) increases when changing from sitting to supine position because of CVP fluctuation. Thus, we studied the influence of CVP in IOP before and after these surgeries for SV patients.

#### Methods

This study examined a prospective, nonrandomized case series. Fourteen patients had SV and underwent Glenn (N = 8) or Fontan (N = 6) procedures. We measured IOP under general anesthesia using Icare® PRO (ICARE FINLAND OY) before and after the procedures. CVP was also monitored at the same time. The study, conforming to the Declaration of Helsinki, was approved by the Institutional Review Board of Hokkaido University Hospital (No.015-0157).

#### Results

The mean age ( $\pm$  SD) was  $12.3 \pm 10.4$  month-old (range 1 to 30). Twenty-eight eyes of 14 patients were enrolled. The mean CVP ( $\pm$  SD) was  $7.7 \pm 2.4$  mmHg before the surgery and  $12.4 \pm 2.1$  mmHg after the surgery. The mean IOP ( $\pm$  SD) was  $9.6 \pm 2.6$  mmHg before the surgery and  $14.1 \pm 4.1$  mmHg after the surgery. Both CVP and IOP were significantly higher after the surgeries than before. There was no statistically significant correlation between CVP change and IOP change.

#### Conclusions

Glenn procedure and Fontan procedure in patients with SV increased both CVP and IOP. There was no correlation in those fluctuations, suggesting CVP was not directly linked to IOP.

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## P-WT-076

### MEAN AMPLITUDE OF INTRAOCULAR PRESSURE EXCURSIONS, A NEW ASSESSMENT PARAMETERS FOR 24-HOUR IOP FLUCTUATIONS IN UNTREATED POAG PATIENTS

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#### Purpose

To investigate a new parameter, mean amplitude of intraocular pressure excursions (MAPE), and to compare its efficacy on assessing 24-hour intraocular pressure fluctuations with other ocular parameters.

#### Methods

A cross-sectional study of 24-hour IOP monitoring and visual deficit data collected from patients treated at the Eye and Ear Nose and Throat Hospital of Fudan University in Shanghai, China. Only the right eye was evaluated in each of the 79 healthy people and 164 untreated patients with primary open angle glaucoma (POAG). Each participant underwent 24-hour IOP monitoring by measuring IOP every 2 hours. Comprehensive ophthalmologic examinations, including a visual field test, were also performed. Association between visual field deficits and IOP fluctuation parameters were investigated via partial least squares (PLS) regression. Diagnostic performance was evaluated with area under the receiver operating characteristic curves (ROC). IOP fluctuation was expressed as MAPE calculation by 1 standard deviation.

#### Results

Compared with 79 eyes of healthy volunteers, the MAPE values in 164 eyes of matched POAG patients were higher ( $4.16 \pm 1.90$  versus  $2.45 \pm 0.89$ ) with a statistical significance of  $P < 0.01$ . In PLS regression, MAPE remained the highest score of variable importance in projection, and its standard regression coefficient was 0.533 which was larger than the other variables, including mean IOP, Standard deviation of IOP, Max difference and area under circadian IOP curve. Diagnostic performance analysis showed ROC of MAPE for glaucoma detection was 0.822 (95% confidence interval, 0.768-0.868) ( $P < 0.001$ ).

#### Conclusions

MAPE was higher in POAG patients and was significantly associated with glaucoma severity. Thus, it might be a more effective parameter to characterize clinically relevant IOP fluctuations during 24-hour IOP monitoring.

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## P-WT-077

# THE RISK OF OCULAR HYPERTENSION IN CHILDREN TREATED WITH SYSTEMIC STEROID

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### Purpose

Ocular hypertension is a well-known side effect of treatment with steroids. Data concerning the intraocular pressure response to systemic treatment with steroid, however, are limited especially for children. This study aimed to investigate the risk and clinical significance of steroid-induced intraocular hypertension in children treated with systemic steroid.

### Methods

Prospective cohort study of children treated with high dose systemic steroid (prednisolone-equivalent > 0.5 mg/kg/day for more than 2 weeks). Exclusion criteria were known eye disease and previous treatment with systemic steroid. IOP was measured by an Icare rebound tonometer. An intraocular hypertensive steroid response was defined as a net increase in IOP > 6 mmHg from baseline and peak IOP > 21 mmHg in either eye. Patients with peak IOP > 30 mmHg and a net increase in IOP > 15 mmHg were considered as high responders. Systemic steroid dose was calculated as the prednisolone-equivalent. For statistical analysis the right eye was used.

### Results

17 children aged 5-17 years were prospectively included in the study. The indications for treatment with systemic steroid were acute lymphoblastic leukemia (11), renal diseases (2) and systemic inflammatory diseases (4).

The treatment period varied from 38 to 238 days and follow-up varied from 75 to 359 days. 4 to 11 IOP measurements were performed in both eyes in each child during follow-up.

8 children (47%) showed a steroid-induced hypertensive response. 2 children (12%) were high responders with peak IOP 28 and 44 mmHg and net IOP changes 11 and 23 mmHg.

Median time to peak IOP in steroid responders was 34 days (22 to 147 days) and median steroid dose at peak IOP was 1.5 mg/kg (0.04 to 2.5 mg/kg). Net IOP increase was weakly associated with accumulated steroid dose at peak IOP ( $r^2 = 0.5$ ,  $p = 0.05$ ), whereas no association was found with steroid dose at peak IOP and time to peak pressure. No significant difference in age was found between steroid responders and non-responders.

### Conclusions

Treatment of children with high dose systemic steroid is associated with a hypertensive intraocular pressure response in approximately 50%. Although the hypertensive response in most cases seems to be modest and hardly clinically significant, this study confirms the risk of severe intraocular hypertension in 10-15%. IOP screening of children in prolonged treatment with high-dose systemic steroid is therefore mandatory.

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**P-WT-078**

**SHORT-TERM EFFECTS AND SAFETY OF AN ACUTE INCREASE OF INTRAOCULAR PRESSURE AFTER INTRAVITREAL BEVACIZUMAB INJECTION ON CORNEAL ENDOTHELIAL CELLS**

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**Purpose**

The purpose of this study is to evaluate short-term effects and safety of an acute increase of intraocular pressure (IOP) after single-dose intravitreal bevacizumab injection on corneal endothelial cells and central corneal thickness.

**Methods**

Forty-two patients who underwent intravitreal injection of 2.5 mg/0.1 ml bevacizumab because of central serous chorioretinopathy or diabetic macular edema were included in this study. The changes of IOP, corneal endothelial cells, and corneal thickness at baseline, 2 min, 5 min, and 30 min after injection were analyzed prospectively with a specular microscope.

**Results**

In all patients, the mean IOPs at baseline, 2 min, 5 min, and 30 min after injection were  $11.48 \pm 2.22$  mmHg,  $49.71 \pm 10.73$  mmHg,  $37.64 \pm 11.68$  mmHg, and  $14.88 \pm 4.77$  mmHg, respectively. These changes were significant ( $p < 0.01$ ). In only one eye, IOP did not decrease to  $\leq 30$  mmHg even at 30 min after injection. According to changes in IOP with time, the coefficient of variation of the corneal endothelium significantly increased ( $p = 0.03$ ), but cell density, hexagonality of the corneal endothelium, and central corneal thickness did not change ( $p = 0.79, 0.21$ , and  $0.08$ , prospectively). One week after injection, there was no sign of inflammation or any other complications in all 42 eyes.

**Conclusions**

After intravitreal injection, IOP rapidly increases, then decreases to the normal range in most eyes 30 min after injection and it is tolerable to corneal endothelium.

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## P-WT-079

### POSITION OF CENTRAL RETINAL VASCULAR TRUNK IN UNILATERAL NORMAL-TENSION GLAUCOMA: A COMPARISON OF THE LAMINA CRIBROSA SHIFT

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#### Purpose

To investigate whether the position of the central retinal vascular trunk, as a surrogate of lamina cribrosa (LC) shift, was associated with the presence of glaucoma in unilateral normal-tension glaucoma (NTG) patients.

#### Methods

The position of the vascular trunk was measured as the deviation from the center of the Bruch's membrane opening (BMO), as delineated by OCT imaging. The shift index was calculated as the distance of the vascular trunk from the BMO center relative to that of the BMO margin. The angular deviation of vascular trunk was measured with the horizontal nasal midline as 0° and the superior location as a positive value. The shift index and angular deviation were compared between glaucoma and fellow control eyes within individuals. The angular location of the midpoint of the retinal nerve fiber layer (RNFL) defect was measured from the BMO center.

#### Results

NTG eyes had higher baseline intraocular pressure (IOP;  $14.2 \pm 2.5$  mmHg vs.  $13.8 \pm 2.3$  mmHg,  $P = 0.006$ ), a larger  $\beta$ -zone PPA area ( $0.96 \pm 0.59$  mm<sup>2</sup> vs.  $0.85 \pm 0.61$  mm<sup>2</sup>,  $P = 0.019$ ), and a larger shift index ( $0.57 \pm 0.27$  vs.  $0.39 \pm 0.23$ ,  $P < 0.001$ ). In a generalized linear mixed-effects model, larger shift index was the only risk factor of NTG diagnosis (OR = 10.824,  $P = 0.001$ ). Angular deviation showed a correlation with angular location of RNFL defect ( $r = -0.444$ ,  $P < 0.001$ ). A generalized estimating equation regression model revealed that the shift index was larger in the NTG eyes than in the control eyes for all ranges of axial length, while it was the smallest for the axial length of 23.4 mm (all  $P < 0.001$ ). In 21 eyes (11%), the vascular trunk was deviated temporally, which deviation was associated with short axial length ( $P = 0.008$ ).

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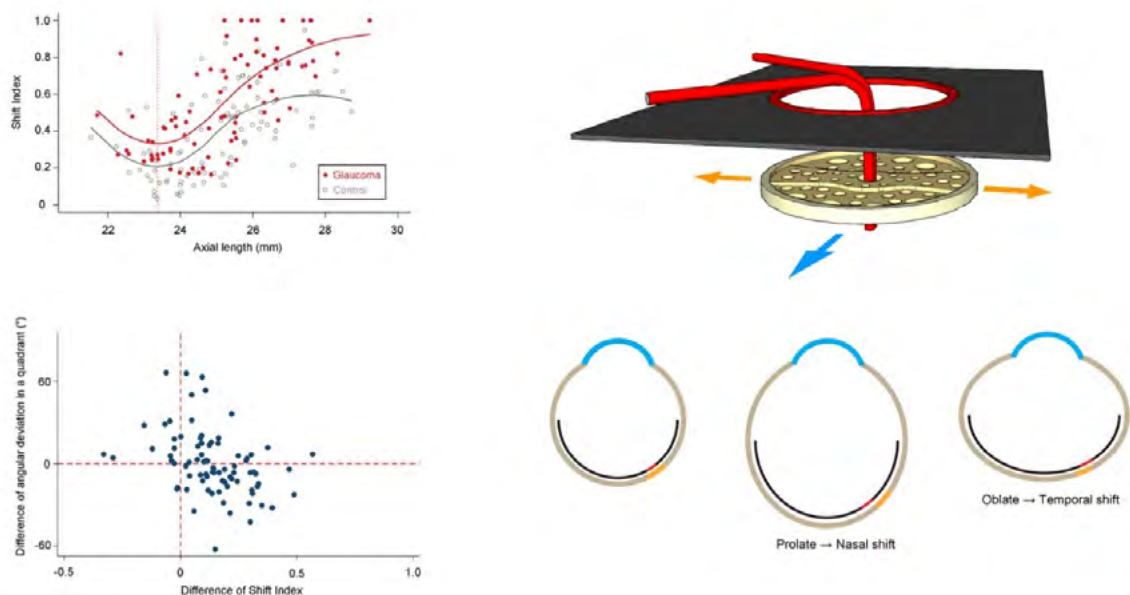
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## Conclusions

LC shift was larger in the unilateral NTG eyes for all ranges of axial length. LC shift can increase vulnerability to glaucomatous damage.

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## P-WT-080

### THE EFFECT OF AGEING ON THE RECOVERY OF RETINAL GANGLION CELL FUNCTION FOLLOWING INTRAOCULAR PRESSURE ELEVATION IN MICE

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#### Purpose

To investigate the effect of ageing on the capacity of the eye to cope with acute intraocular pressure (IOP) elevation in mice.

#### Methods

IOP was elevated to 50 mmHg for 30 minutes in anaesthetised (ketamine/xylazine) 3- and 12-month old (3mo and 12mo) C57Bl/6 mice by infusing Hanks' Balance Salt Solution through a glass micro-pipette (~50 micrometer tip) inserted into the anterior chamber of one eye. The contralateral eye served as an untreated control. Retinal function was assessed using electroretinogram to provide an index of the health of the major cell classes in the eye. Responses were collected one week prior to and at 3 (n = 13 3mo, n = 11 12mo), 7 (n = 13 3mo, n = 10 12mo), 14 (n = 10 3mo, n = 8 12mo) or 28 (n = 10 3mo, n = 11 12mo) days after IOP elevation. Responses in the high IOP eye was expressed relative (%) to their contralateral control eye (mean  $\pm$  SEM). As ganglion cell responses are influenced by input from the outer retina (photoreceptors and bipolar cells), we express ganglion cell recovery as the % difference between relative ganglion cell (output cells) and photoreceptor (input cells) function. The effect of age on ganglion cell recovery at the various recovery time points was analysed using two-way ANOVA.

#### Results

In 3-month old eyes, 3 days after IOP elevation, ganglion cell function was  $-37.3 \pm 7.0\%$  worse than expected from the photoreceptor input. By 7 days after IOP elevation, ganglion cell responses were similar to photoreceptor responses ( $-5.7 \pm 7.2\%$ ) and remained so at 14 ( $-9.7 \pm 6.0\%$ ) and 28 days ( $15.6 \pm 16.4\%$ ) of recovery. In contrast, 12-month old eyes showed slower recovery. Ganglion cell responses in 12-month old eyes were worse than expected from photoreceptor responses at 3 days ( $-58.1 \pm 6.1\%$ ), 7 ( $-34.8 \pm 10.5\%$ ) and 14 days ( $-23.0 \pm 7.8\%$ ) post-IOP elevation. Only at 28 days had ganglion cell responses returned to levels comparable with photoreceptor responses in 12-month old eyes ( $5.4 \pm 11.9\%$ ). Two-way ANOVA confirmed a significant age effect in recovery ( $p < 0.05$ ).

#### Conclusions

Retinal ganglion cell function is more affected by acute IOP elevation than photoreceptor responses. Ageing slows down the recovery of retinal ganglion cells.

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**P-WT-081**

**THE EFFECT OF ULTRASOUND CYCLOPLASTY (UCP) USING HIGH INTENSITY FOCUSED ULTRASOUND (HIFU) ON AQUEOUS HUMOUR DYNAMICS: A 1 YEAR FOLLOW UP**

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**Purpose**

Ultrasound cycloplasty (UCP) utilises High Intensity Focused Ultrasound (HiFU) to treat glaucoma. This prospective study explores the effect of HiFU on aqueous humour dynamics in glaucomatous eyes.

**Methods**

All patients with primary open angle glaucoma (POAG) with uncontrolled intraocular pressure (IOP) despite treatment were recruited from the glaucoma clinic and offered UCP as treatment. Peribulbar anaesthesia was used for all cases and postoperative treatment involved four weeks of topical corticosteroids. A washout of glaucoma medications was performed prior to the baseline and the 12 month postoperative aqueous dynamic measurement visits.

*Inclusion Criteria:* Patients > 18 years of age with uncontrolled POAG.

*Exclusion Criteria:* Other forms of glaucoma, systemic beta blocker use, a history of allergy to fluorescein and previous intraocular surgery not including SLT/ALT.

*Outcome measures:* IOP (Goldmann tonometry), Outflow facility (Schiotz tonography), Aqueous flow rate (fluorophotometry), and Uveoscleral outflow (calculated using Goldmann's equation).

**Results**

32 patients were recruited onto the study with 16 completing 12 month follow up. IOP reduction of 20.9% was achieved ( $p = 0.005$ ) with a 15.7% reduction in aqueous flow rate ( $p = 0.05$ ). There was no significant difference in the outflow facility or calculated uveoscleral outflow.

**Conclusions**

Aqueous humour dynamics and intraocular pressure are significantly affected following successful treatment with HiFU in patients with glaucoma. A reduction in aqueous outflow corresponds with a significant reduction in IOP up to 12 months post-operatively. This is in keeping with similar results at 3 months postoperatively and shows a sustained effect of HiFU.

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## P-WT-082

### EFFECT OF INTRAOCULAR PRESSURE ELEVATION ON THE TRILAMINAR RETINAL VESSEL NETWORK IN MOUSE EYES

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#### Purpose

Inner retinal blood flow is autoregulated to compensate for changes in intraocular pressure (IOP) elevation. Previous studies have focused on the superficial vessels but not the deeper layers of the inner retina. Here, we investigate if the superficial, intermediate and deep retinal vascular plexus show different responses to acute IOP elevation.

#### Methods

Adult C57BL6/J mice (4–5 months old, n = 10) underwent anterior chamber cannulation in one randomly selected eye with a fine (50 µm) glass pipette connected to a height-adjustable saline reservoir under general anaesthesia (80:10 mg/kg ketamine:xylazine). IOP was raised from 10 to 100 mmHg in steps of 10 mmHg (3 min/step). For recovery, IOP was returned back to 10 mmHg. At each IOP level, retinal structure and vasculature were assayed using optical coherence tomography angiography (OCTA, Spectralis OCT2) at a 20°x10° field one-disc diameter superior to the optic nerve margin. En face images of detectable vessels in the superficial vascular complex (SVC), intermediate capillary plexus (ICP) and deep capillary plexus (DCP) were extracted according to automated segmentation of structural OCT data. The large superficial vessels were masked using FIJI software in all layers to avoid project artefacts. The resultant image comprising of vessels that were 2<sup>nd</sup> order or smaller were analysed for vessel area (Angiotool), with changes expressed as a % relative to baseline. One-way ANOVA was used to assess change in layer thicknesses with IOP elevation, and two-way ANOVA was used to compare change in vessel layers with IOP levels.

#### Results

Elevation of IOP produced a decrease in % vessel area in the SVC, ICP and DCP (P < 0.05). The deeper layers, but not the SVC, showed a trend towards increased vessel area with IOP elevation from 10 to 20 mmHg, however this was not significant. With higher levels of IOP elevation (>50 mmHg) SVC vessel area was less affected compared with ICP and DCP (P < 0.05). Both ICP and DCP were similarly affected by IOP elevation (p = 0.59). There was also a reduction in the thicknesses of the retinal nerve fibre layer (93.05%, P < 0.05), inner and outer plexiform layers (88.95%, 95.28%, P < 0.05, respectively) but not in the ganglion cell (p = 0.61), inner (p = 0.74) and outer nuclear layers (p = 0.36). All layers returned to baseline levels during recovery.

#### Conclusions

The data suggests that the superficial vessel complex is more resistant to IOP elevation compared with the intermediate and deeper capillary plexus in the mouse retina.

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## P-WT-083

### MEASURING 24H INTRAOCULAR PRESSURE FLUCTUATIONS WITH A NEW SENSING CONTACT LENS DEVICE

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#### Purpose

This feasibility study investigated the ability of a new sensing contact lens to measure IOP in healthy subjects and glaucoma patients.

#### Methods

A new sensing contact lens (SCL, Sensimed AG, Lausanne, Switzerland), which measures IOP through a pressure sensor embedded in a contact lens, was placed on subjects' eyes for a 24-hour recording session. During the session, each subject underwent IOP provocative tests including postural changes and water drinking test. IOP was measured in the fellow eye at specific time points as well as during the provocative tests, by Goldmann applanation tonometry (GAT), dynamic contour tonometry (DCT) and pneumatonometry (PT). The recordings continued in ambulatory conditions, after the provocative tests.

To evaluate absolute IOP measurement reliability, SCL values obtained immediately after placement were compared with tonometry values acquired on the same eye, prior to SCL placement. The ability to measure IOP fluctuations was assessed by comparing SCL IOP variation to tonometry IOP variation in the fellow eye during provocative tests.

#### Results

Eight subjects (4 healthy subjects and 4 washed-out glaucoma patients) were included in the analysis. Mean age was  $52.9 \pm 17.2$  years and 62.5% of the subjects were females. 75% of the subjects showed an IOP difference within  $\pm 5$  mmHg as compared to GAT on the same eye, (mean ( $\pm$ SD) =  $-2.75 \pm 3.52$  mmHg). When comparing to DCT, 87.5% of the subjects showed an IOP difference within  $\pm 5$  mmHg ( $0.18 \pm 4.95$  mmHg). And, 87.5% of subjects showed an IOP difference within  $\pm 5$  mmHg ( $2.03 \pm 4.43$  mmHg) when comparing to PT.

For all 8 subjects, differences in IOP fluctuation were within  $\pm 5$  mmHg for at least 80% of the points when SCL on one eye was compared to DCT and PT on the fellow eye (Figure 1a and b).

#### Conclusions

The agreement between SCL IOP and tonometry in the same eye is comparable to literature results for routinely used tonometry devices<sup>1,2</sup>. IOP variations measured by SCL and DCT or PT on fellow eyes demonstrated excellent agreement. SCL is capable of measuring IOP continuously for 24h, collecting a large number of IOP points including during patient activities and sleeping period.

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## P-WT-084

### EFFECT OF TOPICAL ANESTHESIA ON MEASUREMENTS OBTAINED WITH OCULAR RESPONSE ANALYZER: A RANDOMIZED CONTROLLED TRIAL

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#### Purpose

To evaluate if topical anesthesia can reduce variability of consecutive measurements obtained with the Ocular Response Analyzer (ORA).

#### Methods

Eligibility criteria included age  $\geq 18$  years, a diagnosis of open angle glaucoma suspect or open angle glaucoma, visual acuity 20/60 or better in both eyes. Exclusion criteria included previous glaucoma or corneal surgery, corneal scarring, keratectasia and contact lens users.

The study was conducted over a 20-30 minute session for each patient. A web-based interface was used to randomize one eye to receive 1 drop of 0.5% proparacaine while the fellow eye was used as control. Three consecutive ORA measurements (Reichert Inc., Depew, NY) were obtained for the right and then the left eye. A questionnaire to evaluate comfort during the exam, applanation tonometry and pachymetry measurements were obtained after ORA. All measurements were obtained by an observer blind to treatment allocation.

The main outcome was Intraclass Correlation Coefficients (ICCs) for Corneal Hysteresis (CH) and corneal compensated intraocular pressure (IOPcc) obtained with ORA for intervention vs control eyes.

Retrospective data from our clinic was used to estimate that a sample size of 67 patients were required to demonstrate an improvement in the ICC for CH from 0.7 to 0.85 with 80% power and an alpha of 0.05.

#### Results

We recruited 69 patients of which 68 completed the study. The ICC for CH was significantly lower for intervention eyes (0.46 vs 0.69,  $p = 0.001$ ). ICC for IOPcc was also significantly lower for intervention eyes (0.68 vs 0.84,  $P < 0.001$ ).

#### Conclusions

The use of topical anesthesia does not reduce variability of consecutive measurements obtained with ORA. CH and IOPcc, the 2 most widely used ORA parameters in the evaluation glaucoma patients, had significantly higher variability when obtained with anesthesia. Our results do not support a modification of the current protocol that obtains ORA without previous application of topical anesthesia.

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**P-WT-085**

**EFFECT OF UPPER EYELID ELEVATION ON INTRAOCULAR PRESSURE MEASUREMENT OBTAINED USING REBOUND TONOMETERS AND THE GOLDMANN APPLANATION TONOMETER**

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**Purpose**

Recently, intraocular pressure (IOP) measurement using the rebound tonometer Icare® PRO with manual eyelid manipulation (eyelids are manually opened and the eyeball is compressed by hand) resulting in the overestimation of IOP has been reported. Conversely, while using a rebound tonometer, IOP can usually be measured simply by elevating the upper eyelid. The aim of this study was to investigate whether upper eyelid elevation (UEE) affects IOP measurements obtained using three different rebound tonometers (Icare® TA01i, Icare® PRO, and Icare® ic100) and the Goldmann applanation tonometer (GAT).

**Methods**

In total, 101 participants were included (56 primary open-angle glaucoma patients and 45 healthy subjects); one eye of each participant was used for measurements. IOP measurements were performed with or without UEE. Each measurement was performed twice, and the order of the four tonometers was random.

**Results**

For Icare® TA01i, Icare® PRO, Icare® ic100, and GAT, the IOP values without UEE were  $12.1 \pm 2.9$ ,  $13.3 \pm 2.7$ ,  $11.7 \pm 2.9$ , and  $16.0 \pm 3.2$  mmHg, respectively, whereas those for values with UEE were  $12.3 \pm 3.0$ ,  $13.3 \pm 2.8$ ,  $11.7 \pm 2.9$ , and  $16.0 \pm 3.3$  mmHg, respectively. Notably, no significant differences were found between the IOP values of the measurements performed without and with UEE (all  $P > 0.1$  by paired *t*-test). In a sub-analysis of glaucoma patients, for GAT, the IOP value with UEE was significantly higher than that without UEE by  $0.2 \pm 0.6$  mmHg (range: -1 to 2.5 mmHg;  $P = 0.01$ ).

**Conclusions**

Our results indicate that simple UEE at IOP measurement has little effect on IOP measurements obtained using recent rebound tonometers and GAT.

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**P-WT-086**

**INFLUENCE OF BLOOD PRESSURE AND OTHER FACTORS ON 24-HOUR CONTACT LENS SENSOR MEASUREMENTS IN PATIENTS WITH UNTREATED GLAUCOMA**

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**Purpose**

Influence of blood pressure and other factors on 24-hour contact lens sensor measurements in patients with untreated glaucoma.

**Methods**

To investigate influence of blood pressure (BP) and other factors on 24-hour contact lens sensor (CLS; Triggerfish®, Sensimed) measurements in untreated glaucomatous eyes.

**Participants and Methods**

Forty-seven patients with primary open angle glaucoma who had received no intraocular pressure (IOP)-lowering treatment for at least 4 weeks were enrolled [mean age,  $51.0 \pm 11.0$  (mean  $\pm$  standard deviation) years; Humphrey 24-2 mean deviation (MD),  $-6.0 \pm 3.5$  dB]. On Day 1, IOP was measured with Goldmann applanation tonometry every 3 hours from 9 am to 12 pm in one eye. In the same eye, 24-hour CLS measurements reflecting the corneal shape changes induced by IOP fluctuation was started at 8 am on day 2. Ambulatory BP was measured simultaneously. BP measurement interval was every 30 minutes except for night period (every hour, from 8 pm to 6 am). The influence of BP and other factors on the range, average, maximum, and minimum CLS values (mV eq) was examined with step-wise multiple regression analysis with mean arterial pressure (MAP), age, MD of Humphrey 24-2, central corneal thickness (CCT), corneal curvature, axial length, and IOP on day 1 as independent variables.

**Results**

Mean IOP on day 1 was  $14.0 \pm 2.5$  mmHg. Average MAP had significant association with average CLS values during 24 hours (beta coefficient, 0.30;  $p = 0.04$ ). The IOP range on day 1, age, corneal curvature, and average MAP had significant association with maximum CLS values during 24 hours (beta, 0.41, -0.58, -0.41, 0.29;  $p = 0.002$ ;  $<0.001$ , 0.005, 0.02, respectively). Mean and range of IOP on day 1 were significantly associated with the average CLS values during the waking hours (beta, -0.35, 0.48;  $p = 0.04$ , 0.005, respectively). CCT was significantly associated with the range and maximum CLS values during the waking hours (beta, -0.35, -0.38;  $p = 0.02$ , 0.008, respectively). Average MAP, age, and corneal curvature had significant association with the average, maximum, and minimum CLS values during the sleeping hours (Average CLS values: beta, 0.43, -0.61, -0.49;  $p = 0.002$ ,  $<0.001$ , 0.001, respectively; Maximum CLS values: beta, 0.39, -0.59, -0.46;  $p = 0.005$ ,  $<0.001$ , 0.003, respectively; Minimum CLS values: beta, 0.47, -0.49, -0.36;  $p = 0.001$ , 0.002, 0.02, respectively).

**Conclusions**

In addition to the IOP level, MAP, age, and corneal parameters have significant influence on 24-hour CLS values.

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## P-WT-087

### CORRELATION BETWEEN BLOOD PRESSURE (BP), INTRAOCULAR PRESSURE (IOP) AND INTRACRANIAL PRESSURE (ICP) – A PILOT STUDY

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#### Purpose

To simultaneously and non-invasively measure intraocular pressure (IOP), intracranial pressure (ICP) and blood pressure (BP) in glaucoma patients previously provided with an implantable intraocular sensor, while inducing controlled orthostatic pressure variations with the use of a tilt table.

#### Methods

Four patients previously implanted with an intraocular pressure sensor were placed on a tilt table, in order to measure IOP, ICP changes and BP in different body positions. IOP was continuously monitored by a telemetric intraocular sensor with the help of an external antenna. Changes in ICP were estimated based on phase-angle shifts in otoacoustic emissions, recorded with a commercially available audiometry device. Heart rate (HR) and blood pressure (BP) were measured with a digital arm sphygmomanometer. The patient was tilted in four different positions according to the following protocol: upright (90°) for 2 minutes; reclined (45°) for 2 minutes; supine (0°) for 10 minutes; head down (-10°) for 2 minutes; supine (0°) for 2 minutes; reclined (45°) for 2 minutes; and upright (90°) for 2 minutes.

#### Results

Moving from upright to head down position lead to an average increase in IOP of 1.4 mmHg (supine) and 3.0 mmHg (head down), respectively. IOP remained stable during the extended supine position and returned to baseline IOP upon moving back to the upright position. ICP also showed an increase in supine and head down positions. In three patients ICP remained stable during extended supine position, while in one other patient it significantly dropped again within 2-3 minutes after reaching supine position. BP and HR slightly dropped during the 10 minutes in supine position in all patients.

#### Conclusions

These preliminary data show with high temporal resolution the dependence of IOP, ICP and BP on variations in body position. IOP and ICP increased with the tilt in all patients, but there appear to be differences in ICP regulation between patients in supine position. While these findings need to be confirmed in a larger patient population, differential ICP regulation may impact the pressure gradient across the lamina cribrosa, which may have implications for the development and progression of glaucoma.

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**P-WT-088**

**CENTRAL RETINAL VENOUS PRESSURE IN ASYMMETRIC PRIMARY OPEN ANGLE GLAUCOMA (POAG)**

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**Purpose**

Elevated central retinal venous pressure (CRVP) leads to reduced ocular perfusion pressures which might be responsible for further progression in glaucoma. Aim of the present study was to evaluate whether an elevated CRVP is associated with visual field damage in asymmetric glaucoma.

**Methods**

21 patients suffering from POAG were included. Asymmetric glaucoma damage was defined as a difference of > 5 dB mean deviation (MD) in Humphrey 30-2 visual fields comparing both eyes of one patient. CRVP was measured by Ophthalmodynamometry. Elevated CRVP was defined as > 5mmHg higher compared to IOP. Furthermore intraocular pressure (IOP) and retinal nerve fibre layer thickness (Spectralis OCT, Heidelberg Engineering) were evaluated. For statistical analysis the Mann-Whitney-U test and the Spearman Correlation was applied.

**Results**

The mean visual field defect was 5,03 dB in less affected eyes and respectively 16,91 dB in more affected eyes ( $p < 0.001$ ). IOP showed no significant differences between more or less affected eyes (12,83 mmHg/12,57 mmHg). CRVP showed also no significant differences between eyes suffering from early or advanced visual field damage (20,54 mmHg/19,83 mmHg). Elevated CRVP was, however, significantly correlated with structural damage. Retinal nerve fiber layer thickness was found to be significantly less in eyes with elevated CRVP (66,52  $\mu$ m/81,31  $\mu$ m/  $p = 0,049$ ).

**Conclusions**

The results of the present study show that elevated CRVP is not necessarily correlated with functional glaucoma damage (visual field). Structural damage, however, might be a reason for a elevated CRVP and therefore the cause of reduced perfusion pressures in some POAG patients.

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**P-WT-089**

**LONG-TERM INTRAOCULAR PRESSURE FLUCTUATION AS A RISK FACTOR FOR VISUAL FIELD PROGRESSION – RESULTS FROM THE SINGAPORE 5-FLUOROURACIL STUDY**

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**Purpose**

To study the effect of long-term intraocular pressure (IOP) fluctuation on visual field (VF) progression 8 years post-trabeculectomy.

**Methods**

Retrospective analysis of post-trabeculectomy data from the Singapore 5-Fluorouracil (5-FU) Study. VFs were analysed using Progressor software (Medisoft, Ltd, Leeds, United Kingdom). Outcome measures were mean VF slope per year, number of progressing points and mean slope for progressing points per year. Multivariate linear regression analyses were performed, adjusting for age, gender, ethnicity, glaucoma type, use of intra-operative 5-FU, diabetes mellitus, hypertension, pre-trabeculectomy VF mean deviation, and post-trabeculectomy mean IOP and IOP fluctuation.

**Results**

127 (52.3%) of the 243 original study subjects completed 8 years follow-up with  $\geq 5$  reliable visual fields and  $\geq 8$  6-monthly IOP measurements. The mean age was  $61.8 \pm 9.6$  years. Majority were male (64.6%) and Chinese (80.3%). 68 (51.2%) eyes had open-angle glaucoma and 59 (46.5%) had angle-closure glaucoma. 66 (52.0%) eyes received intra-operative 5-FU while 61 (48.0%) eyes received placebo. Post-operatively, the mean IOP was  $14.2 \pm 2.8$  mmHg and mean IOP fluctuation was  $2.53 \pm 1.20$  mmHg. Higher IOP fluctuation was associated with greater slope for field ( $B = -0.068$ ;  $p = 0.016$ ), number of progressing points ( $B = 0.309$ ;  $p = 0.017$ ), as well as VF progression defined by  $\geq 1$  progressing point ( $B = 0.473$ ;  $p = 0.023$ ) and  $\geq 3$  adjacent progressing points in the same hemifield ( $B = 0.426$ ;  $p = 0.039$ ). Age was associated with greater number of progressing points ( $B = 0.051$ ;  $p = 0.007$ ). There was no significant effect of 5-FU compared to placebo for all outcome measures.

**Conclusions**

In post-trabeculectomy Asian eyes with well-controlled IOP, higher long-term IOP fluctuation is associated with greater VF progression.

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## P-WT-090

### EFFECT OF GENERAL ANESTHESIA ON INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING OPHTHALMIC SURGERY

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#### Purpose

To measure the change in IOP after inducing general anesthesia in patients undergoing ophthalmic surgery.

#### Methods

Prospective non-randomized study conducted between January 2017 and August 2017 at LV Prasad eye institute. Subjects undergoing ophthalmic surgery under general anesthesia were enrolled in the study. The inhalational anesthetics were used for anesthesia. In children, Sevoflurane (8% for 30-60 seconds) along with Nitrous oxide (50%) and Oxygen (50%) was used for induction; in older children and adults, Propofol (2.0 mg/kg) or Sevoflurane 2% along with Nitrous oxide (50%) and Oxygen (50%) were used as inducing agents while maintenance was with Sevoflurane (2%) along with Nitrous oxide (50%) and Oxygen (50%) in all subjects. Muscle relaxants used were atracurium 0.5 mg/kg for induction and 0.1mg/kg/30 min for maintenance. The anesthesia was maintained at level 3 plane 2. The IOP of non-surgical eye was recorded at three time points as described: 5 min before induction using topical 0.5% proparacaine eye drops (T1), 5 min after endotracheal intubation (T2) and at the end of surgery (T3). In a subset of patients IOP after induction but before intubation was recorded (Textra). The IOP was recorded using ICare PRO followed by Perkin's tonometer. The heart rate and blood pressure were also recorded at three time points.

#### Results

We included 49 eyes of 49 subjects aged 5-70 years. Mean IOP by Perkin's tonometer at T1 was  $18.01 \pm 4.83$  mmHg (range:10-30 mmHg), at T2 was  $13.36 \pm 3.94$  mmHg and at T3 was  $12.4 \pm 4.29$  mmHg. The IOP at Textra was  $12 \pm 3.19$  mmHg. There was significant drop in IOP of 4.65 mmHg between T1 and T2 with Perkins ( $p = 0.00$ ). There was difference of 5.61 mmHg between T1 and T3 ( $p = 0.00$ ), the difference in IOP was not significantly different between T2 and T3 (0.96 mmHg,  $p = 0.28$ ). The drop in IOP between T1 and Textra was greater than T1 and T2 (although not significantly different,  $p = 0.46$ ). IOP measured by ICare PRO tonometer also showed similar drop in IOP at T2 and T3, however was higher than Perkins IOP by 0.5 mmHg.

#### Conclusions

The IOP measured by Perkins and ICare PRO under general anesthesia were significantly lower at all time points under inhalational anesthesia. Clinical decisions in children should be taken based on true IOP which is likely to be 4-5 mmHg higher than that measured under general anesthesia using inhalational anesthetics.

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## P-WT-091

# INTRAOCULAR PRESSURE ELEVATION AFTER PHACOEMULSIFICATION AND ITS PREVENTION IN EYES WITH GLAUCOMA OR EXFOLIATION SYNDROME

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### Purpose

To investigate the frequency of early postoperative intraocular pressure (IOP) elevation after phacoemulsification in patients with normal tension glaucoma (NTG) and exfoliation syndrome and to confirm the prophylactic effect of oral acetazolamide against IOP elevation.

### Methods

Sixty-six patients with normal eyes, 67 with medically well-controlled NTG, or 67 with exfoliation syndrome scheduled for routine cataract extraction and intraocular lens implantation were evaluated. Patients were divided into 2 groups by preoperative oral acetazolamide administration. The IOP was measured preoperatively, and first postoperative 3 hours and 1 day. A postoperative IOP spike was defined as IOP greater than 25mmHg.

### Results

Mean preoperative IOP was  $12.64 \pm 2.99$ ,  $12.31 \pm 2.91$ ,  $13.28 \pm 3.63$  mmHg in normal, NTG, and exfoliation groups, respectively. Preoperative IOP did not differ significantly among groups ( $p = 0.215$ ). IOP spike at 3 hours occurred in 4 eyes (6.06%) in normal group, 15 eyes (22.4%) in NTG group, 8 eyes (11.9%) in exfoliation group. IOP spike at 1 day occurred in 4 (5.97%) NTG and 5 (7.46%) exfoliation patients. The incidence was significantly higher in the NTG and exfoliation groups ( $p = 0.020$ ,  $p = 0.023$ ). Preoperative acetazolamide administration significantly reduced the frequency of IOP spike at 3 hours in all groups ( $P < 0.034$ ).

### Conclusions

A significant proportion of patients with NTG and exfoliation syndrome had an IOP spike shortly after cataract surgery. Administration of preoperative oral acetazolamide significantly reduced the IOP spike in these eyes.

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## **P-WT-092**

# **THE VARIABILITY OF INTRAOCULAR PRESSURE BETWEEN BOTH EYES ACCORDING TO THE TYPE OF TONOMETER IN PATIENTS WITH UNILATERAL TEARING**

Bo Ram Seol\*

### **Purpose**

To investigate the difference of intraocular pressure (IOP) between both eyes in patients with unilateral tearing.

### **Methods**

In this study, we reviewed the medical charts of patients who complained of different degrees of bilateral tearing. The tear meniscus height (TMH), IOP measured with non-contact tonometer, and Goldmann applanation tonometer were evaluated. The difference of IOP between both eyes measured by the non-contact tonometer and the Goldmann applanation tonometer were analyzed. We evaluated the relationship between the variability on bilateral difference in IOP according to the type of. In addition, we investigated whether variability of IOP according to the type of tonometer is correlated with TMH.

### **Results**

A total of 29 patients were enrolled. The mean difference of IOP between both eyes was  $-0.28 \pm 2.14$  mmHg when measured with non-contact tonometer and  $0.72 \pm 2.11$  mmHg with Goldmann applanation tonometer. The patients with higher bilateral difference in TMH showed more variability on bilateral difference in IOP according to the type of tonometer ( $P = 0.005$ ,  $r = 0.626$ , Spearman's correlation analysis). In addition, the eyes with higher TMH showed the more variable IOP according to the type of tonometer ( $P = 0.026$ ,  $r = 0.372$ , Spearman's correlation analysis).

### **Conclusions**

When the TMH is higher, the difference of IOP between both eyes is measured differently according to the type of tonometer. In addition, the eyes with higher TMH have more variable IOP according to the type of tonometer.

### **References**

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## P-WT-093

### POSTURAL CHANGE IN INTRAOCULAR PRESSURE IS MORE STRONGLY ASSOCIATED WITH WAIST HIP RATIO THAN BODY MASS INDEX

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#### Purpose

While greater body mass index (BMI) is associated with increased intraocular pressure (IOP) in both the seated and supine positions, BMI has no significant effect on the magnitude of postural IOP changes (Geloneck, 2015). To our knowledge the relation of postural IOP change to waist-hip ratio (WHR) has not previously been reported. The purpose of this study is to investigate the influence of adiposity as measured by BMI and WHR on postural change in IOP in glaucomatous (G) and non-glaucomatous (NG) subjects.

#### Methods

Eligible subjects were at least 40 yrs old with a BMI either  $\leq 30$  (low BMI) or  $\geq 35$  (high BMI). All G subjects had primary open-angle glaucoma and were being treated with topical or laser therapy. Blood pressure, weight, height, waist and hip measurements were performed. Tonometry was performed using a tonopen 5 minutes after assuming each body position. IOP was first measured in the seated position, and then in the supine, right lateral decubitus (RLD) and left lateral decubitus (LLD) positions in randomized order. We analyzed mean postural IOP change of each eye from seated to each of the 3 recumbent positions ( $3 \times 2 = 6$  total IOP changes) by BMI (high vs low) and WHR (above vs below median).

#### Results

19 NG and 14 G subjects were recruited (see Table). Among NG subjects, 9 were low BMI and 10 were high BMI. Among G subjects 7 were low BMI and 7 were high BMI. The median WHR for the entire cohort was 0.920. There were no statistically significant differences between the low and high BMI NG groups in mean postural IOP change from seated to any of the recumbent positions (see Figure). All 6 of the mean postural IOP changes were larger in the high WHR NG group compared with low WHR NG group and achieved statistical significance in the supine position OS ( $p = 0.030$ ) and the LLD position OS ( $p = 0.013$ ). When G subjects are sorted by BMI, mean postural IOP change achieved statistical significance in the supine position OS ( $p = 0.006$ ). The high WHR G group experienced a mean postural IOP change that was greater than or equal to low WHR G group in every instance, but in no case did the difference achieve statistical significance.

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## Image

**Demographics by Glaucoma Status and BMI**

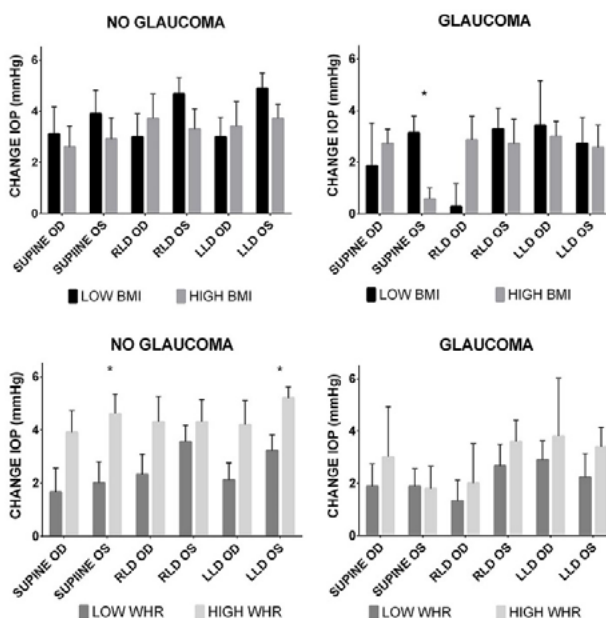
		≤ 30 BMI	≥ 35 BMI
<b>No Glaucoma</b>			
	N	9	10
	BMI	27.11 ± 1.97	39.63 ± 7.57
	WHR	0.92 ± 0.12	0.95 ± 0.09
	Male	6 (67%)	4 (40%)
	BP	120/78	131/86
<b>Glaucoma</b>			
	N	7	7
	BMI	24.85 ± 2.85	37.15 ± 3.93
	WHR	0.88 ± 0.07	0.96 ± 0.06
	Male	3 (43%)	5 (71%)
	BP	137/88	140/82

Mean ± SD; BMI: Body mass index; WHR: Waist-hip ratio; BP: Mean blood pressure

**Demographics by Glaucoma Status and WHR**

		≤ 0.92 WHR	> 0.92 WHR
<b>No Glaucoma</b>			
	N	9	10
	BMI	31.63 ± 7.05	35.57 ± 9.54
	WHR	0.85 ± 0.05	1.01 ± 0.08
	Male	4 (44%)	6 (60%)
	BP	123/82	129/82
<b>Glaucoma</b>			
	N	9	5
	BMI	30.67 ± 8.01	31.59 ± 6.22
	WHR	0.88 ± 0.05	1.00 ± 0.04
	Male	5 (56%)	3 (60%)
	BP	134/83	145/88

Mean ± SD; BMI: Body mass index; WHR: Waist-hip ratio; BP: Mean blood pressure



## Conclusions

High WHR was associated with larger mean postural IOP change compared with low WHR in both normal and glaucomatous subjects. There was no relationship between mean postural IOP change and BMI.

## References

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## P-WT-094

# THE EFFECTS OF EYE MOVEMENTS ON INTRAOCULAR PRESSURE IN GLAUCOMA PATIENTS WITH A NOVEL INTRAOCULAR PRESSURE SENSOR

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### Purpose

To quantify the effect of gaze direction and squeezing on changes in intraocular pressure ('IOP') in glaucoma patients equipped with an IOP sensor.

### Methods

Four patients implanted with a novel IOP sensor (EYEMATE™), that allows for quasi-continuous tele-metric monitoring of IOP, were seated in front of a Harms wall at a distance of 2.5 meters in a standard chin rest with the center of the wall (primary position) at eye height. They were directed to fixate at 24 positions on the Harms wall for 12 seconds each. Between each position, the patients returned their gaze to the primary position for 12 seconds as baseline measurement. The experiment was repeated 3 times. IOP was measured every 100 milliseconds using an external antenna fixed around the study eye. Also, IOP was recorded in 3 patients while squeezing their eyes shut repeatedly. Analysis was based on either mean or peak IOP compared to mean baseline IOP, averaged over repetitions.

### Results

Change in gaze direction generally provoked an initial spike in IOP (up to 10 mmHg), followed by a slow return to baseline (up to 5 mmHg). Changes in IOP strongly depended on gaze direction with the highest increases occurring during upward gazes. The 25° upward gaze induced an average peak IOP change of 2.7 mmHg compared to baseline, whereas the 25° downward gaze induced an IOP change of -0.5 mmHg. Nasal gaze positions induced a peak IOP change of 1.3 mmHg in contrast to temporal positions, in which the IOP change was 2.1 mmHg. Squeezing showed a similar graph pattern with a peak IOP change of  $35 \pm 4.3$  mmHg and a tendency to undershoot after opening the eye, before returning to baseline.

### Conclusions

Our preliminary data is in line with previous literature that observed a dependence of IOP on vertical gaze direction by means of Goldmann applanation tonometry.<sup>1</sup> This study is novel as the recorded data has a much higher temporal resolution than previously possible. In addition, Goldmann measurements are affected by repeated contact of the tonometer probe against the cornea. IOP recordings performed by the Eyemate™-sensor do not have these measurement errors. We have also found an asymmetry between nasal and temporal gaze direction that was not previously reported. These findings should be taken into consideration during standard Goldmann applanation tonometry.

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**P-WT-096**

**A STUDY ON THE ASSOCIATION BETWEEN SINGLE CRANIAL NERVE PALSIES AND THE INTRAOCULAR PRESSURE OF THE AFFECTED AND UNAFFECTED EYES**

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**Purpose**

The role of elevated intraocular pressure (IOP) in the incidence and progression of glaucoma is well known. However, the exact mechanisms of IOP regulation are still unclear. Circadian variations in IOP are associated with human circadian rhythms, which are under the control of the autonomic nervous system. Therefore, the question arises which afferent and efferent pathways are involved in the regulation of IOP. The aim of this study is to investigate if isolated cranial nerve (CN) palsies of the third, fourth and sixth nerves as well as traumatic or compressive optic neuropathy are associated with an IOP difference between the affected and the unaffected eye.

**Methods**

This was a retrospective study including patients diagnosed with a third, fourth, sixth nerve palsy or who had an optic nerve meningioma or a traumatic optic neuropathy at a tertiary center. We included only patients with a unilateral single palsy. Other inclusion criteria were existing IOP measurements, best-corrected visual acuity, slit-lamp anterior segment and fundus examination, and orthoptic status in both eyes. Patients with a history of strabismus or orbital disease were excluded from the study.

**Results**

Two hundred and forty-four patients were included. A third nerve, fourth nerve or sixth nerve palsy were present in 97 (40%), 65 (27%) and 40 (16%) patients, respectively. An optic nerve meningioma was present in 29 (12%) patients and 13 (5%) patients had a traumatic optic neuropathy. Mean IOP of the affected eyes was  $14.1 \pm 2.8$  mmHg ( $\pm$  standard deviation) which was statistically significantly different from the mean IOP of the unaffected eyes  $14.4 \pm 2.7$  mmHg ( $P < 0.001$ ). Oneway analysis of variance showed no statistically significant differences of the mean IOP among patients with different palsies ( $p = 0.54$ ).

**Conclusions**

Although our study demonstrated a statistically significant difference of the mean IOP between the affected and the unaffected eyes, this difference was clinically not significant. We were not able to find evidence for the involvement of any of the studied CNs in the long-term regulation of IOP.

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## P-WT-097

# INFLUENCE OF CARDIOVASCULAR SYSTEM ON 24 HOUR OCULAR VOLUME CHANGES, MEASURED WITH CONTACT LENS SENSOR IN HEALTHY AND POAG SUBJECTS

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## Purpose

To investigate the influence of cardiovascular system (CVS), on ocular volume change biorhythms in healthy and primary open angle glaucoma (POAG) populations.

## Methods

Time synchronized, 24 hours, continuous recordings of ocular volume changes and CVS functional parameters (blood pressure, heart rate, cardiac output, blood oxygen saturation) measurements, were performed with a contact lens sensor-based device (CLS, Sensimed Triggerfish®, Sensimed AG, Switzerland) and cuff-less CVS holter system (CVS, Somnotouch® NIBP, Somnomedics GmbH, Germany). Interactions between CVS and CLS data were evaluated by comparing corresponding medians of CVS parameters to medians of CLS data acquired every minute. Correlations during wake and sleep time periods were then calculated using test.corr with a p-value > 0.05 for correlations rejection.

## Results

16 subjects (8 healthy and 8 washed-out POAG) were included in the analysis. Mean age was 62±12 years, 10 females. In the wake period, 2 healthy subjects showed fair positive correlations between CLS and CVS, while no correlations was detected for the other subjects. In the same period, 4 POAG patients showed fair to good negative correlations between CLS and CVS data, while other 4 patients showed no correlations. During the sleep time, 2 healthy subjects exhibited fair to good positive correlations between CLS and CVS data. In the same period, fair to strong negative correlations were detected for all 8 POAG. Only one patient showed a fair positive correlations between CLS and one of the CVS parameters (Table 1).

## Image

**Table 1: Correlations between CLS and CVS data**

CO- cardiac output, SAP- systolic arterial pressure, DAP- diastolic arterial pressure, HR- heart rate, SpO2- blood oxygen saturation.

ID	AWAKE					SLEEP				
	CO	SAP	DAP	HR		CO	SAP	DAP	HR	SpO2
NORM1	0	0	0	0		0	0	0	0	0
NORM2	0,39	0,37	0,32	0,3		0	0	0	0	0
NORM3	0	0	0	0		0	0	0	0	0
NORM4	0	0	0	0		0	0	0	0	0
NORM5	0	0,42	0,42	0		0,43	0,59	0,54	0,41	0
NORM6	0	0	0	0		0	0	0	0	0
NORM7	0	0	0	0		0	0	0	0	0
NORM8	0	0	0	0		0	0,55	0,43	0	0
POAG1	0	-0,25	-0,33	0		-0,52	0	-0,29	-0,69	-0,35
POAG2	0	0	0	0		-0,35	-0,34	-0,26	-0,29	-0,24
POAG3	0	0	0	0		-0,52	-0,53	-0,49	0	-0,42
POAG4	-0,49	0	0	-0,51		-0,79	-0,81	-0,82	-0,8	-0,34
POAG5	-0,51	-0,28	-0,25	-0,39		-0,44	-0,66	-0,82	-0,44	0
POAG6	0	-0,35	0	0		-0,3	-0,33	0	0	0,35
POAG7	0	0	0	0		-0,66	-0,68	-0,66	-0,74	0
POAG8	0	0	0	0		-0,64	-0,74	-0,61	-0,5	0

### Conclusions

Observed correlations between CLS and CVS data, are positive for healthy subjects and overall negative for POAG patients. Influence of CVS on ocular volume changes biorhythms measured with CLS seems to be disease dependent. This data brings new insights into the pathogenesis of glaucomatous neuropathy and may indicate a new potential diagnostic tool.

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## P-WT-098

### ANGLE RECESSION GLAUCOMA – LOOKING FOR THE POINT OF NO RETURN

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#### Purpose

To assess the extent of angle recession and its relevance to IOP levels in case series of 7 consecutive traumatic patients and available therapeutic options. To define beyond what size of the affected area the IOP can not be controlled with medications alone.

#### Methods

An on-going prospective interventional study on seven eyes of 7 consecutive patients - 4 males and 3 females, aged 48- 69 (mean age 57.4 y.) seen – earliest on day 1 up to 2 weeks after the trauma. Anterior chamber angles were evaluated using slit-lamp photography (Eyesuite™, Haag-Streit AG).

Trabeculectomy surgery was performed using ‘Moorfields Safer Surgery System’.

Literature search of the PubMed and Cochrane databases was performed.

#### Results

Four of the patients presented with hyphema and in all 7 cases the IOP in the affected eyes was elevated compared to the fellow eye. The measurements ranged from 24 up to 42 mmHg and were closely related to time period after the trauma, quantity of blood in the anterior chamber and extent of the angle recession ( clock hours ). The fellow eyes showed no pathology. In 5 out of 7 eyes we succeeded to lower the IOP below 21mmHg using medications. In two eyes despite the therapy the pressure remained unsatisfactory and after three months of follow up they were offered trabeculectomy. Both surgeries achieved significant reduction of IOP and these patients were left off any anti-glaucoma medication. On the 6-th month visit all seven eyes maintain good vision and their IOP is well controlled.

#### Conclusions

The outcome from a blunt head trauma could be secondary angle recession glaucoma. At the time of presentation we could speculate about the prognosis using few checkpoints such as density or size of the hyphaema / coagulum, affected part of the trabecular meshwork and features of the chamber angle.

In our prospective study the main predictor for final IOP turns to be the size of clock hours destructed trabecular meshwork with tendency of half circumference or more to necessitate surgery.

There aren't yet any established reliable predictors for the final IOP and whether an eye will end up off any antiglaucoma medication, medication alone or surgery +/- medication.

A bigger study with similar design will let us know what is to be expected from these injured eyes in long term even in the very beginning at the time of presentation.

#### References

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**P-WT-099**

**CLINICAL CHARACTERIZATION OF REFRACTORY VIRUS-RELATED INFLAMMATION INSIDE AQUEOUS OUTFLOW PATHWAYS IN IMMUNOCOMPETENT CHINESE PATIENTS**

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**Purpose**

Refractory cases of “Posner-Schlossman Syndrome” are very common in immunocompetent Chinese patients. In our current study, we propose that this entity with specific clinical features is primarily due to refractory virus infection inside aqueous outflow pathways. Timely recognition and appropriate treatment prevent serious complications.

**Methods**

This is a retrospective study. We collect 2 groups of refractory Posner-Schlossman Syndrome case-series during two periods in Zhongshan Ophthalmic Center. A clinical diagnosis of refractory virus-related inflammation inside aqueous outflow pathways is proposed in patients within the second group after an in-depth analysis of cases from the first group who respond poorly to traditional treatments. Systemic anti-virus treatment is prescribed in cases from the second group after a consensus is reached.

**Results**

This is a retrospective study. We collect 2 groups of refractory Posner-Schlossman Syndrome case-series during two periods in Zhongshan Ophthalmic Center. A clinical diagnosis of refractory virus-related inflammation inside aqueous outflow pathways is proposed in patients within the second group after an in-depth analysis of cases from the first group who respond poorly to traditional treatments. Systemic anti-virus treatment is prescribed in cases from the second group after a consensus is reached.

**Conclusions**

In refractory PSS patients, we must meticulously look for specific clinical features indicating the presence of refractory virus-related inflammation inside aqueous outflow pathways. Timely recognition and systemic anti-virus treatment at a relatively early disease stage is imperative to avoid serious complications.

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## P-WT-100

### ASSESSMENT OF ANXIETY AND DEPRESSION IN YOUNG CHINESE PATIENTS WITH EARLY-STAGE PRIMARY OPEN ANGLE GLAUCOMA

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#### Purpose

To evaluate the hypothesis that psychological distress (depression and anxiety) might play an important, if not etiological role at the initial stage of young primary open angle glaucoma (POAG) in China.

#### Methods

In this cross-sectional study, we enrolled 21 early-stage POAG patients, 26 glaucoma suspects, and 38 healthy controls (all aged 20 to 40 years old Han Chinese) at Zhongshan Ophthalmic Center, China. Direct PCR sequencing of myocilin (MYOC), the only gene known to cause juvenile-onset POAG (JOAG), was performed in POAG patients. All the participants completed the Self-rating Anxiety Scale (SAS) and Self-rating Depression Scale (SDS). Peripapillary retinal nerve fiber layer (pRNFL) and macular ganglion cell complex (mGCC) measurements were assessed among early-stage POAG patients and glaucoma suspects. Data was analyzed with SPSS.

#### Results

The mean age of early-stage POAG patients was  $30.43 \pm 4.52$  years. Only one non-pathogenic polymorphism, Arg76Lys, was present in 2/21 patients. The mean IOP in POAG patients was  $16.99 \pm 3.73$  mmHg, and 70% of them were classified as normal tension glaucoma. The SAS and SDS scores in early-stage POAG patients were significantly higher than those in glaucoma suspects ( $P = 0.010$ ;  $P = 0.001$ ) and healthy controls ( $P = 0.014$ ;  $P = 0.005$ ), respectively, adjusting for age, sex, body mass index (BMI), and educational level. Moreover, SAS and SDS scores were negatively correlated with pRNFL and mGCC thicknesses, after controlling for demographic characteristics and intracocular pressure.

#### Conclusions

This is the first study to show that psychological factors have a strong association with POAG in young early-stage glaucoma patients. Excluding the hereditary factor and severely elevated IOP as the causes, the association at a relatively early disease stage in a younger population suggests a possible psychological etiology, considering the neurodegenerative nature of POAG. This hypothesis, however, needs further validation with large-scale longitudinal cohort study and investigation on molecular mechanisms.

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# Laboratory Sciences

## P-WT-101

### EXPLORING THE ROLE OF ENDOCANABINOIDS IN PRIMARY ADULT GLAUCOMA

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#### Purpose

To evaluate the levels of endocannabinoids such as anandamide (AEA) and 2 arachidonoylglycerol (2-AG), in the aqueous and plasma samples of patients with primary adult glaucoma as compared to healthy controls.

#### Methods

A prospective, observational clinical study including 20 primary angle closure glaucoma (PACG) and 16 control/cataract patients. All patients underwent a detailed ophthalmic examination. The inclusion criteria were patients with age  $\geq 40$  years. PACG was defined as 'occludable' angle with peripheral anterior synechiae extending over at least  $180^\circ$  on indentation/manipulative gonioscopy); with IOP  $> 21$  mmHg on three different occasions (applanation tonometry) with characteristic optic nerve head and visual field changes suggestive of glaucomatous optic neuropathy, control group had patients undergoing cataract surgery with no other ocular pathology. Exclusion criteria are any patient with media opacities other than cataract, any other ocular pathology, history of an attack of acute angle closure or secondary glaucoma, priorsurgery, and uncooperative or unreliable patients. Patients with systemic illness were also excluded.

Sample collection from glaucoma & control patients.

0.1cc of aqueous humor was collected in 1ml syringe and placed in microcentrifuge tubes with coding. Also, 2 ml blood in EDTA vial was collected for the isolation of plasma for the analysis. Samples were coded and stored at  $-86^\circ\text{C}$  until analysis by LC-MS/MS at high precision Bio-analytical Facility at Ocular Pharmacology of Dr.RPCentre.

Method of Sample extraction and analysis of endocannabinoids.

The quantitative analysis of endocannabinoids from biological matrices was done by utilizing appropriate chromatographic separation and estimation was done using highly sensitive spectroscopic method.

#### Results

The mean age in the PACG group was  $52.2 \pm 15.1$  yrs and Control group was  $54.67 \pm 19.54$  yrs. The endocannabinoids were in undetectable levels in the aqueous. In plasma, PACG group – Anandamide level was  $3.76 \pm 1.08$  ng/ml and 2-AG was  $5.37 \pm 2.59$  ng/ml whereas in the Control group - Anandamide level was  $4.83 \pm 2.80$  ng/ml and 2-AG was  $6.78 \pm 4.25$  ng/ml. The cortisol levels in PACG group in aqueous was  $5.37 \pm 2.59$  ng/ml and in plasma was  $71.55 \pm 44.99$  whereas in Control group  $0.531 \pm 0.459$  ng/ml and  $84.06 \pm 52.16$  ng/ml respectively.

#### Conclusions

The endocannabinoid levels in the PACG group was lower than the Control group. The cortisol levels in PACG group was higher than that of the Control group.

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## P-WT-102

### THE INHIBITORY EFFECTS OF AG-100 ON TGF-BETA STIMULATED HUMAN TENON FIBROBLASTS

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#### Purpose

Trabeculectomy is the most popular procedure of glaucoma surgeries, which creates an artificial route from anterior chamber to sub-conjunctival region (bleb). The successful rate of trabeculectomy is highly related to the fibrosis of bleb which is modulated by human tenon fibroblasts (HTFs). To decrease the scar formation at the bleb region is beneficial to trabeculectomy. AG-100 is a novel compound provided by Allgenesis Biotherapeutics Inc., Taipei, Taiwan, which had been found to inhibit cell proliferation in lung fibroblasts. This study focused on the anti-fibrotic effects of AG-100 in TGF-beta stimulated HTFs.

#### Methods

WST-1 assay was conducted for examining the effect of AG-100 on cell proliferation. Western blot analysis was carried out to determine the effect of AG-100 on the expression of  $\alpha$ -SMA, a maker of myofibroblast transdifferentiation. Transwell migration assay was established to evaluate the effect of AG-100 on cell migration. Collagen gel contraction assay was performed for determining the effect of AG-100 on tissue contraction.

#### Results

HTFs co-cultured with TGF-beta increased cells proliferation significantly, which could be reversed by AG-100 at concentrations starting from 3  $\mu$ M. HTFs co-cultured with TGF-beta had significantly increased  $\alpha$ -SMA expression, which could be reversed by AG-100 at 500 nM and 1  $\mu$ M. HTFs treated with TGF-beta had significantly induced cell migration, which was reversed by AG-100 at both 300 nM and 1  $\mu$ M. The contraction of the collagen gel was induced by TGF- beta, which was counteracted by the presence of AG-100 at the concentrations of 3  $\mu$ M and 10  $\mu$ M.

#### Conclusions

TGF-beta is considered as the major growth factor that affects the fibrosis of bleb. We noted AG-100 could inhibit the TGF-beta related responses in HTFs including cell proliferation, myofibroblast transdifferentiation, cell migration, and tissue contraction. With the anti-fibrotic activity in the bleb region, AG-100 has potential to become an adjunctive agent to improve the successful rate of trabeculectomy.

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## P-WT-103

### IOP CHANGE AFTER TRIAMCINOLONE ACETONIDE (TA) SUBCONJUNCTIVAL INJECTION IN C57BL/6J MOUSE EYES

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#### Purpose

To investigate IOP changes after triamcinolone acetonide (TA) subconjunctival injection in C57BL/6J mouse eyes.

#### Methods

Male mice of C57BL/6J at 6 or 8 weeks of age were used in this study. IOP was measured with a Tono-Lab rebound tonometer (Tiolat, Vantaa, Finland) every week. Each IOP recorded was the average of 6 measurements from the same eye. IOP measurement was performed between 15 and 17 PM, to minimize the influence of diurnal variation. 26-gauge (0.26×12mm) scarlet needles (Tochigi Seiko, Tochigi, Japan) with 1cc syringe were used for subconjunctival injection. All injections were performed under intraperitoneal anesthesia with ketamine/xylazine mix and topical anesthesia with 0.5% proparacaine. TwentyµL of TA (40 mg/mL) was injected subconjunctivally to the right eyes while the left eyes served as a control. 2 groups below were administered.

Group A: 2 injections at weeks 0 and 1 on 8-week-old mice.

Group B: 2 injections at weeks 0 and 1 on 6-week-old mice.

The IOP changes were evaluated statistically.

#### Results

Group A: IOP was  $18.9 \pm 3.8$ mmHg at week 6 and  $15.6 \pm 1.8$ mmHg at week 8 in TA-treated eyes; compared to  $19.0 \pm 2.2$ mmHg at week 6 and  $16.1 \pm 0.9$ mmHg at week 8 in control eyes. No difference statistically was noted ( $n = 17$ ).

Group B: IOP was  $21.5 \pm 5.6$ mmHg at week 6 and  $22.1 \pm 6.5$ mmHg at week 8 in TA-treated eyes; compared to  $17.7 \pm 3.8$ mmHg at week 6 and  $17.9 \pm 4.1$ mmHg at week 8 in control eyes. The IOP of TA-treated eyes was significantly higher than that in control ones, respectively ( $n = 19$ , mean±standard deviation,  $P < 0.05$ , paired  $t$ -test).

#### Conclusions

2 TA injections for 2 consecutive weeks induced IOP elevation in 6-week-old mice at week 6 and the elevation continued to the end of week 8; however, the same injections did not induce statistically IOP difference in 8-week-old mice.

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## P-WT-104

### METABOLOMICS OF THE AQUEOUS HUMOR IN PATIENTS WITH PRIMARY CONGENITAL GLAUCOMA

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#### Purpose

Primary congenital glaucoma (PCG) is an autosomal recessive eye disorder, accounting for 0.01-0.04% of blindness around the world. Unfortunately, the molecular characteristics regarding the pathogenic mechanisms of the disease remain poorly understood.

#### Methods

Here we for the first time employed gas chromatography coupled to time-of-flight mass spectrometer (GC/TOF MS) to comprehensively reveal metabolic characteristics for PCG.

#### Results

Firstly, 363 metabolites were detected in 50 aqueous humor (AH) samples from 30 patients with PCG, 10 patients with congenital cataract (CC) and 10 patients with aged-related cataract (ARC). Secondly, a total of 290 metabolites were found in other 15 patients with PCG and 10 patients with primary open angle glaucoma (POAG). Further analysis suggested patients with PCG had a significantly distinct metabolomics profile. Three amino acid associated metabolites including glycine, urea, and phenylalanine, were identified to be significantly different ( $p \leq 0.05$ ) in relation to PCG. And meanwhile, three glaucoma-associated single nucleotide polymorphisms (SNPs) such as rs7114303, rs9364602, and rs2165241 were determined to be related to these three metabolites. The results here indicated certain amino acid associated metabolites and their metabolisms as key regulatory elements and metabolic pathways in the pathogenesis of PCG.

#### Conclusions

Collectively, this work not only extended our understanding on molecular characteristics of PCG, but presented glycine as a potential biomarker for earlier diagnosis and may provide new therapeutic strategies for the disease.

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## P-WT-105

### THE DESCMET'S MEMBRANE IN PRIMARY CONGENITAL GLAUCOMA

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#### Purpose

The pathophysiology of Primary congenital glaucoma (PCG) is still evolving.

The study was conducted to describe Descemet's membrane (DM) and Pre Descemet's layer (PDL) morphology in eyes with PCG *in vivo* using High definition Anterior segment OCT (ASOCT) and on histopathology and to observe any relationship with anterior chamber angle dysgenesis.

#### Methods

In this comparative observational case control series conducted at a tertiary care referral hospital, consecutive PCG patients, previously operated and old enough to undergo an ASOCT examination were recruited along with healthy subjects as controls. Corneal scans on ASOCT were evaluated for DM morphology and anterior chamber angle was examined on the 'Sclera module'. The DM thickness was measured under high magnification using the calliper tool of the ASOCT. The DM and anterior chamber angle of affected eyes were compared with fellow eyes (among the unilateral PCG eyes) and with controls. Corneal tissues (7) of PCG eyes who had undergone keratoplasty and enucleated eyes of retinoblastoma (7; controls) were evaluated on formalin fixed paraffin embedded sections stained on Hematoxylin & Eosin as well as collagen I and IV immunostaining. The main outcome measures were DM and PDL characteristics on ASOCT and histopathology; relationship with anterior chamber angle dysgenesis, if any.

#### Results

**On ASOCT**, DM among PCG patients showed significant thickening ( $30.88 \pm 10.63 \mu\text{m}$ ) in comparison to fellow eyes ( $14.46 \pm 3.37 \mu\text{m}$ ) as well as controls ( $11.55 \pm 1.04 \mu\text{m}$ ); ( $P < 0.001$ ; ANOVA). On histopathology, thickening of both DM (mean:  $258.26 \pm 63.43 \mu\text{m}$  vs controls  $28.96 \pm 5.13 \mu\text{m}$ ;  $p 0.002$ ) and PDL (mean:  $13.52 \pm 5.17 \mu\text{m}$  PCG vs  $4.60 \pm 2.48 \mu\text{m}$  in controls;  $p 0.007$ ) was seen with intense positive collagen immuno-staining to collagen I (PDL) and Collagen IV (DM and PDL). On ASOCT, a double membrane sign (hyper-reflective DM and PDL) was visible in all affected PCG eyes (22 eyes of 15 patients) compared to fellow (8) and normal eyes (10); merging with abnormal membrane over trabecular meshwork.

#### Conclusions

Abnormal thickening of DM and PDL in concurrence with goniodysgenesis in PCG has not been reported so far. These changes might be related to primarily anomalous DM and could have long term consequences on corneal viability.

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## P-WT-106

### EFFECTS OF RANIBIZUMAB ON PTEN, AKT1 AND THBS1 PROTEINS ON HUMAN TENON'S FIBROBLASTS IN VITRO

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#### Purpose

Modulating wound healing, mediated by fibroblast migration and proliferation within the Tenon's capsule, has become the focus in determining successful trabeculectomy. Anti-vascular endothelial growth factors such as Ranibizumab have been garnering use as an intraoperative anti-fibrotic agent, however its mechanism of action is poorly understood. Gene studies have shown expressions of thrombospondin 1 (THBS1) and phosphatase and tensin homolog (PTEN) in human Tenon's fibroblasts to be significantly reduced, with a non-significant downregulation of expression of serine-threonine protein kinase 1 (AKT1) by Ranibizumab. This study aims to evaluate THBS1, PTEN and AKT1 protein expressions in human Tenon's fibroblasts (HTF) treated with Ranibizumab.

#### Methods

HTFs treated with 1ml of Ranibizumab in serum free culture media at a concentration of 0.5mg/ml were incubated for 48 hours. Levels of THBS1, PTEN and AKT1 protein expressions were determined with enzyme-linked immunosorbent assay (ELISA).

#### Results

THBS1, AKT1 and PTEN protein expressions were significantly downregulated by Ranibizumab.

#### Conclusions

Thrombospondin 1 (THBS1), phosphatase and tensin homolog (PTEN) and serine-threonine protein kinase 1 (AKT1)'s combined gene and protein downregulation may be the mechanism responsible for anti-fibrotic Ranibizumab activity in trabeculectomy, however further studies are needed to clarify its clinical significance. Understanding effects of Ranibizumab in regulating Tenon's fibroblast activity will open a new window in its role as a potent and safer anti-scarring agent in trabeculectomy.

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## P-WT-108

### SPATIOTEMPORAL CHANGES AND PROTECTIVE EFFECTS OF PACAP IN RETINAL GANGLION CELLS AFTER OPTIC NERVE CRUSH

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#### Purpose

Pituitary adenylate cyclase-activating polypeptide (PACAP) has been demonstrated to play a vital role in retinal ganglion cells (RGCs) apoptosis in various retinal injury animal models. The aim of this study was to analyze the spatiotemporal expression changes of PACAP and its receptors in the retina after optic nerve crush (ONC) and explore the effect of intravitreal injection of PACAP on RGCs apoptosis in a ONC model.

#### Methods

Eyes of Sprague-Dawley rats were enucleated at 1, 3, 5, 7 and 14 days after ONC. Changes of protein and mRNA level of PACAP and its receptors, PAC1R, VPAC1R and VPAC2R in the retina after ONC were examined by western blot and real-time PCR. Immunofluorescence double staining were performed to verify the distribution of PACAP and its receptors. Fluorogold retrograde labeling was performed to detect survival RGCs after PACAP treatment (1 nM to 200 nM). Immunofluorescence double staining and TUNEL assay were used to observe the effect of PACAP on RGC apoptosis.

#### Results

The expression of PACAP and PAC1R increased from Day 1 after ONC, and peaked at Day 5 ( $P < 0.05$ ,  $P < 0.01$ ,  $P < 0.001$ ). Moreover, PACAP and PAC1R located mainly in ganglion cell layer (GCL; PACA positive cells,  $P < 0.05$ ; PAC1R positive cells,  $P < 0.01$ ). In PACAP-treated group, the number of RGCs was significantly increased compared with the vehicle-treated group ( $P < 0.001$ ). Both TUNEL (+) cells and the fluorescence intensity of cleaved-caspase 3 in PACAP-treated group were decreased distinctly compared with the vehicle-treated group ( $P < 0.01$ ). The expression of Bcl-2 and phosphorylated CREB in retina increased after PACAP treatment ( $P < 0.01$ ).

#### Conclusions

Collectively, we first detected that the expression of PACAP and PAC1R were remarkably increased after ONC, and mainly expressed in GCL. PACAP treatment can promote CREB phosphorylation, up-regulate the expression of Bcl-2, inhibit caspase-3-mediated RGC apoptosis and increase the survival rate of RGCs. These results suggest that PACAP plays an important role in RGC apoptosis after ONC and provide a theoretical basis for the treatment of glaucoma.

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## P-WT-109

### MESENCHYMAL STEM CELLS ARE DIFFERENTIATING TO RETINAL GANGLION-LIKE CELLS IN RAT POLYSTYRENE MICROSPHERES INDUCED GLAUCOMA MODEL

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#### Purpose

The aim of this study was to evaluate the differentiation ability of intravitreal injection of rat bone marrow derived mesenchymal stem cells (rBM-MSCs) to retinal ganglion-like cells in a polystyrene microsphere induced rat ocular hypertension (OHT) model which establishes sustained and moderate elevation of intraocular pressure in rodents.<sup>1,2</sup>

#### Methods

An OHT rat model was generated via intracameral injection of 7 microliter polystyrene microspheres into the anterior chamber. rBM-MSCs labeled with green fluorescence protein were transplanted intravitreally before or after OHT induction depending on the groups. At the end of the fourth week, flat-mount retinal dissection was done and labeling against Brn3a, CD90, GFAP, Rhodopsin, CD11b, Vimentin<sup>3</sup> and localization of GFP positive rBM-MSCs was used to evaluate by means of immunofluorescence staining and to count differentiated retinal cells by flow cytometry. A total of 56 eyes of 34 male Wistar albino rats were investigated. The rat eyes were divided into 5 groups including control group (no injections), only intravitreal rBM-MSCs injected group, OHT induced and (two weeks later) intravitreal sham injected group, OHT induced and (two weeks later) intravitreal rBM-MSCs injected group and OHT induced and (same day) intravitreal rBM-MSCs injected group.

#### Results

Flow cytometry results revealed that CD90<sup>+</sup>Brn3a<sup>+</sup> cells significantly increased in glaucoma induced and rBM-MSC injected groups compared to control, sham operated and only rBM-MSC injected group. ( $P < 0,01$ ). Immunofluorescence microscopy revealed differentiation of the GFP labeled stem cells to various retinal cells including ganglion-like cells. rBM-MSCs were observable in ganglion cell, inner and outer nuclear retinal layers in rBM-MSCs injected eyes.

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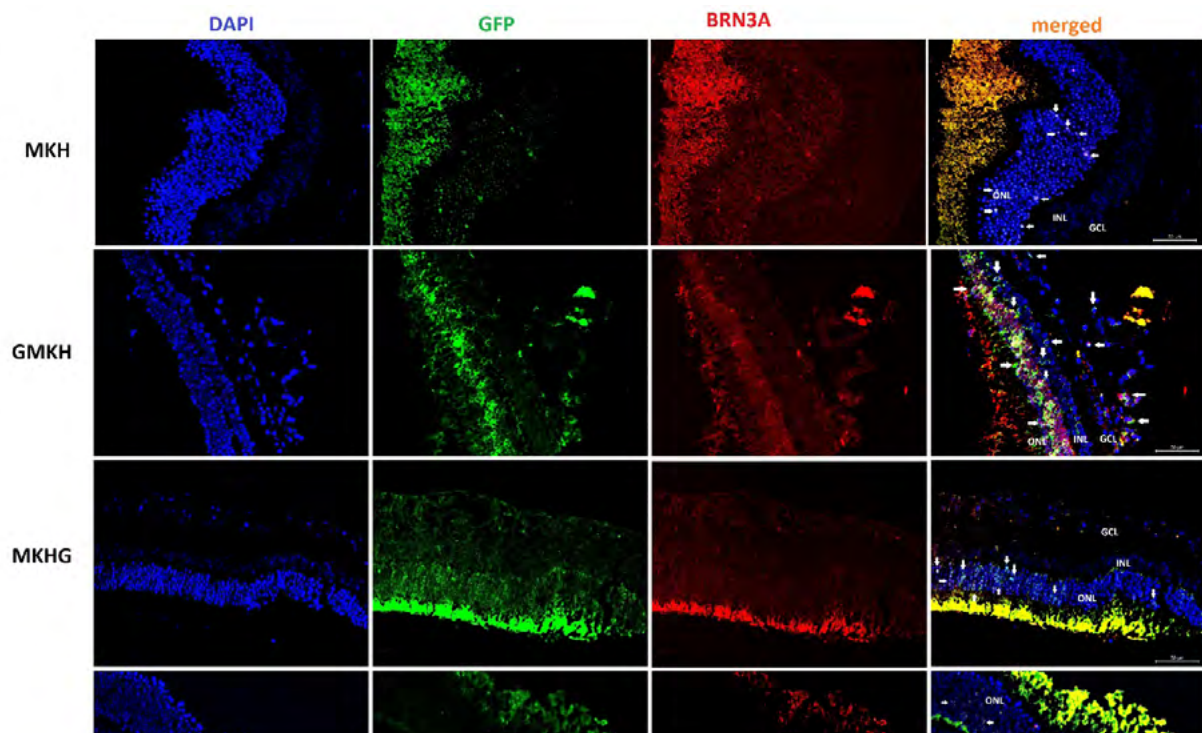
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## Conclusions

In conclusion, we demonstrated that intravitreally transplanted rBM-MSCs differentiated to ganglion like cells in an experimental glaucoma model in rats similar to the previous reports.<sup>4,5</sup> It is possible to say that MSCs are promising hope as neuroregenerating therapies and this could be a preferred approach in the future treatment of glaucoma. More advanced studies must be carried out to investigate the longterm effects of intravitreal stem cell applications, determine understand the possibility of an increased integration rate and neuroprotective effect and determine the side effects of MSC transplantation.

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## P-WT-110

### PROTECTIVE EFFECTS OF TAMOXIFEN AGAINST PRESSURE-INDUCED INJURY IN A RAT EX VIVO GLAUCOMA MODEL

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#### Purpose

Acute exposure to elevated hydrostatic pressure can cause apoptosis and axonal impairment of retinal ganglion cells (RGC) via down-regulation of glutamate transporter (GLAST) and glutamine synthetase (GS). Therefore, it is considered that agents that effectively enhance GLAST and GS expression may serve as potential therapeutics against pressure-induced injury. In this study, we found that tamoxifen (TX), a selective estrogen modulator, provided potent neuroprotection to retinal ganglion cells (RGCs) in an *ex vivo* acute glaucoma model.

#### Methods

*Ex vivo* eyecup preparations were exposed to pressure elevation (10 and 75 mmHg) for 24 hours using a closed chamber system. We examined the neuroprotective effects of TX in hyperbaric conditions using light microscopy, immunohistochemistry, and immunoblotting.

#### Results

In this rat *ex vivo* acute glaucoma model, we found that TX provided potent neuroprotection to RGCs in spite of previous reports linking TX to retinal toxicity. Real-time RT-PCR and Western blot analyses revealed a significant decrease of GLAST and GS expression after pressure elevation, whereas TX inhibited the reduction of GLAST and GS expression, resulting in protection against the pressure-induced changes.

#### Conclusions

These prominent neuroprotective effects warrant the consideration of TX as a potential therapeutic modality in pressure-induced RGC impairment characterized by altered glutamate homeostasis.

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## P-WT-111

# CYTOPROTECTIVE EFFECT OF PLANT-DERIVED ANGIOGENIN FUSION PROTEIN ON TRABECULAR MESHWORK DAMAGE INDUCED BY BENZALKONIUM CHLORIDE

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## Purpose

Benzalkonium chloride (BAK) is a common eye drop preservative for glaucoma treatment, but exhibits dose-dependent toxicity. Therefore, the cytoprotective effect and mechanism of angiogenin (ANG) on trabecular meshwork (TM) damage induced by BAK was evaluated. In addition, we developed a plant-derived ANG fusion protein and evaluated its protective effects on TM structure and function.

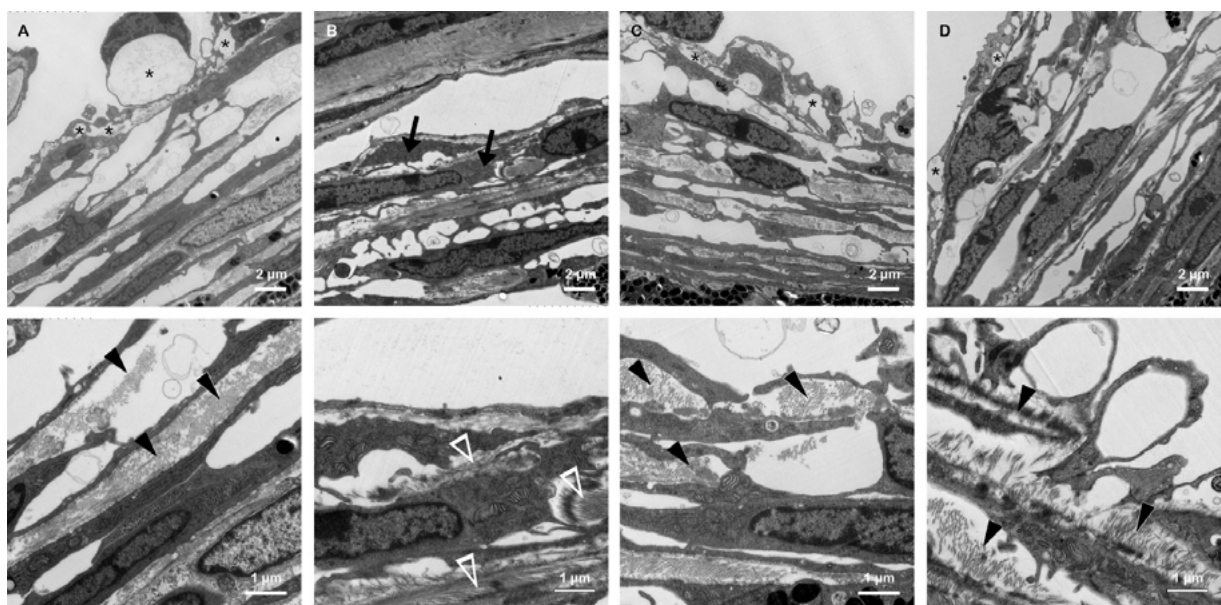
## Methods

Plant-derived ANG (ANG-FcK) was synthesized by the fusion of the Fc region of immunoglobulin G and KDEL to conventional recombinant human ANG (Rh-ANG) and was purified from transgenic tobacco plants. BAK was used to establish a mouse model for degenerative changes in TM, and the protective effects of ANG-FcK and Rh-ANG were evaluated. Intraocular pressure (IOP) was measured for 4 weeks and ultrastructural changes, deposition of fluorescent microbeads, and type I collagen and  $\alpha$ -SMA expression were analyzed after mice were euthanized. Primary human TM cells were cultured and expression patterns of fibrosis-related markers were evaluated.

## Results

Structural and functional degeneration of TM were induced by the instillation of 0.1% BAK in mice, and co-treatment with ANG preserved TM outflow function, measured by IOP and a microbead tracer. ANG prevented phenotypic and ultrastructure changes. ANG-FcK had a higher molecular weight (44 kDa) than that of Rh-ANG (15 kDa), but a similar cytoprotective effect in the mouse model of BAK-induced TM degeneration and in human TM cells.

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### Conclusions

The cytoprotective effect of ANG on TM resulted from a reduction in ultrastructural changes and retained outflow function. Additionally, plant-derived ANG-FcK is a promising glaucoma treatment.

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## P-WT-112

### IMPACT OF INTRAOCULAR PRESSURE REDUCTION ON NEURODEGENERATION IN DIABETIC RAT RETINA

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#### Purpose

To investigate the effects of lowering intraocular pressure (IOP) on retinal ganglion cell (RGC) loss and ischemia or inflammation in diabetic retina.

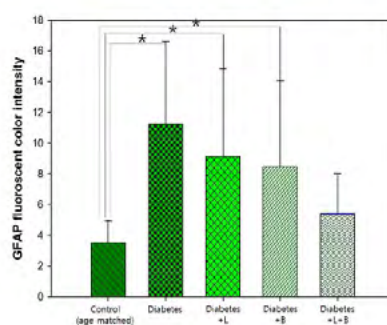
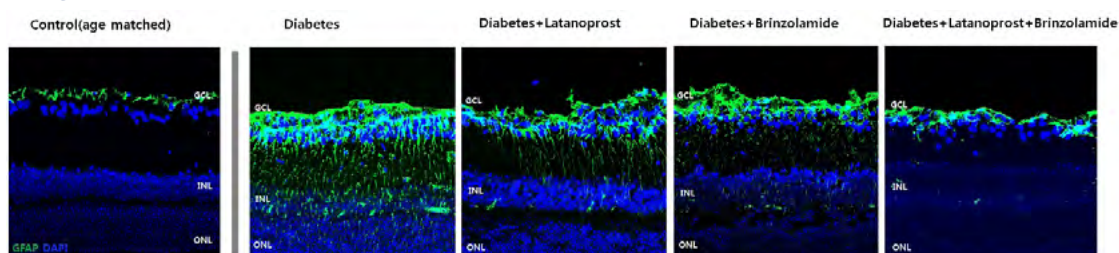
#### Methods

Diabetes was induced by a single intraperitoneal injection of 60 mg/kg of streptozotocin (STZ). Diabetic rats were randomly assigned to received topical latanoprost or brinzolamide or normal saline for 8 weeks. Age-matched control rats were treated with normal saline eye drops.

#### Results

Diabetic rats showed slightly increased IOP compared to age-matched control rats ( $P < 0.05$ ). Combined treatment of anti-glaucoma eyedrops decreased IOP in diabetic rats ( $P < 0.05$ ) at 3, 7, 8 weeks after STZ injection. Standard deviation of IOP was increased by diabetes ( $P < 0.05$ ), but not in the diabetic eyes treated with brinzolamide or combined treatment. Apoptosis of cells in the ganglion cell layer by diabetes was decreased by combined treatment of brinzolamide and latanoprost ( $P < 0.05$ ). Increased glial fibrillary acidic protein (GFAP) induced by diabetes was decreased only by combined treatment of brinzolamide and latanoprost ( $P < 0.05$ ). Increased expression of vascular endothelial growth factor (VEGF) in diabetic rats was attenuated by treatment of brinzolamide or combined treatment of latanoprost and brinzolamide ( $P < 0.05$ ). Intracellular adhesion molecule -1 (ICAM-1) was increased in diabetic rats than age-matched control rats, but not in latanoprost or brinzolamide or combined treatment group.

#### Image



### Conclusions

IOP-lowering medical treatment relieved ischemia and inflammation aggravated by diabetes in STZ-injected rats. Improvement of perfusion pressure by IOP reduction may be helpful in neuroprotection in diabetic retina.

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## P-WT-113

### OPTIC NERVE REGENERATION FOLLOWING GLAUCOMATOUS INJURY IN AGED MICE

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#### Purpose

Current treatments for glaucoma aim to slow progression of the disease but a significant proportion of those affected continue to progress to blindness despite access to the best treatments available<sup>1</sup>. No treatments are available to restore vision that has been lost. There is therefore an unmet clinical need to try to develop strategies to regenerate the optic nerve and regain function.

Inducible PTEN deletion (PTEN KO) has been shown to facilitate optic nerve regeneration in a model of traumatic optic neuropathy<sup>2</sup>. Here we assessed whether PTEN KO can also promote axon regeneration following glaucomatous injury. We also explored the effect of PTEN KO on anterograde axonal transport.

#### Methods

12 month old Balb/cJ wild type (WT) and conditional PTEN KO mice (PTEN<sup>flx/flx</sup>) were injected intravitreally with AAV2-Cre-GFP or AAV2-GFP three weeks prior to induction of ocular hypertension (OHT) by intracameral injection of cross-linking hydrogel (mixture of vinylsulfonated hyaluronic acid and thiolated hyaluronic acid dissolved in PBS). IOP was measured at multiple timepoints post-injury. Cholera toxin B (CTB) was administered intravitreally 1 week post-injury with tissue collection 24 hours post CTB injection. Optic nerve anterograde axonal transport was quantified by measuring CTB intensity at 100 um intervals. GAP43 immunohistochemistry was used to identify growth cones in retinal ganglion cell axons as a marker of regeneration.

#### Results

There was a significant improvement in axonal transport in PTEN KO mice following OHT compared to WT (P < 0.0001). Axonal transport returned to baseline levels in the induced retinal PTEN knockout mice. B tubulin positive cells in the ganglion cell layer were not significantly reduced at 1 week post injury (WT p = 0.26; PTEN KO p = 0.73). PTEN KO was validated by a significant upregulation of the downstream marker of the mTOR pathway phospho-S6 in retinal ganglion cells compared to wild type (p = 0.007). Positive GAP43 immunohistochemistry was only observed in the optic nerve axons of PTEN KO mice following injury. GAP43 was not observed in axons in the absence of injury.

#### Conclusions

Axonal injury following OHT occurs prior to any observed cell loss. PTEN KO can promote anterograde optic nerve axonal transport and stimulate regeneration following glaucomatous injury. Work is ongoing in the lab to explore the effects of regeneration on retinal function and fine tune regeneration strategies to reduce the risk of oncogenesis.

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## P-WT-115

# LOCAL DELIVERY AND SUSTAINED-RELEASE OF NITRIC OXIDE DONOR LOADED IN MESOPOROUS SILICA PARTICLES FOR EFFICIENT TREATMENT OF OCULAR HYPERTENSION

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### Purpose

To develop a novel nitric oxide (NO) donor delivery system based on mesoporous silica nanoparticles (MSNs) to delivery sodium nitroprusside (SNP) to the target tissues (trabecular meshwork and Schlemm's canal endothelium) and for sustained IOP reduction.

### Methods

The uniform MSNs were synthesized and SNP encapsulated into MSNs (SNP@MSNs). Cytotoxicity was tested by CCK-8 assay. Cell monolayer permeability was evaluated by measuring transendothelial electrical resistance. SNP@MSN was topically applied to caveolin 1 knockout mice which have spontaneous ocular hypertension. NO concentration and sGC expression was measured.

### Results

MSNs are spherical (average diameter of ~50 nm) with parallel-aligned pore channels and a rather narrow pore size of 2.7 nm in the walls. SNP@MSNs (up to 0.5 mg/mL) had no cytotoxicity; it can be uptaken by AAP cells and significantly reduced TEER of cell monolayer. MSNs passed through the cornea and locally delivered SNP to the conventional outflow tissue (TM and SC) and sustainably released NO to activate the downstream signaling pathway which successfully achieved more mean IOP reduction (22%) and longer duration of 48 h with 1/40 of 1/40 of the dose of SNP solution.

### Conclusions

A highly efficient SNP@MSNs delivery system has been developed successfully as a topical eye drop for sustained IOP reduction.

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## P-WT-116

### BIO-MODULATION OF PRIMARY HUMAN TENON'S CAPSULE FIBROBLASTS USING A NOVEL APPLICATION OF COATED MAGNESIUM

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#### Purpose

The purpose of this study was to evaluate the biocompatibility and antiproliferative potential of different coated magnesium alloys as a novel drainage device material in glaucoma surgery.

#### Methods

The pure magnesium was cut into disks of 14.5 mm diameter and 1 mm thickness, coated with Hydroxyapatite, Dicalcium phosphate dihydrate and DCPD-Stearic acid, respectively. The primary HTCFS were seeded on DCPD, DCPD+SA, and HA disks in 24-well culture plates for Day 2 to Day 7. The glass was used as control. The MTT and LDH assay was used to determine cellular metabolic activity and cytotoxicity during the logarithmic phase of HTCFS, respectively. The BrdU assay was used to evaluate cell proliferation. Western blot was used to assess the expression of alpha-smooth muscle actin (alpha-SMA).

#### Results

The trend of cellular metabolic activity of different coated magnesium alloys gradually decline during the logarithmic phase of HTCFS, and each type of coated magnesium alloy significant decrease metabolic activity of HTCFS to compare with control ( $p = 0.00$ ). The trend of cytotoxicity of different coated magnesium alloys slightly increase during the logarithmic phase of HTCFS, and the group of DCPD+SA is no significant different which compare with control ( $p = 0.932$ ). Significant inhibition of proliferation was observed for group of DCPD+SA ( $p = 0.47$ ). The expression of  $\alpha$ -SMA was decreased in the cells which seed on coated magnesium alloy disks.

#### Conclusions

Cellular activity of HTCFS will be modulated by direct exposure to coated magnesium metal. The coating of DCPD+SA could significantly inhibit fibroblasts proliferation and its cytotoxic profile was the same as glass. In comparison to titanium, coated magnesium alloy attenuates HTCFS proliferation. Coated magnesium alloys reduce the expression of alpha-SMA.

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## P-WT-117

### MICRORNA PROFILING IN GLAUCOMA EYES WITH VARYING DEGREES OF OPTIC NEUROPATHY

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#### Purpose

To explore the miRNA profile and its putative role in glaucomatous optic neuropathy using next-generation sequencing.

#### Methods

Aqueous humor (AH) samples were collected from 19 primary open-angle glaucoma (POAG) eyes and 17 cataract eyes before surgery. Next-generation sequencing was performed for RNA samples extracted from 18 AH samples, and the bioinformatics approach was applied for samples with adequate clean data output. The other 18 samples were used for quantitative PCR (qPCR) validation of sequencing results.

#### Results

In total, 12 (six POAG and six cataract controls) samples with sufficient clean data output after sequencing were used for further data analysis. Four hundred sixty-six and 480 mature miRNAs were detected in the POAG and cataract control groups respectively. Among them, 164 miRNAs were detected in all POAG samples, and 96 miRNAs were detected in all cataract control samples. Furthermore, 88 miRNAs were identified as differently expressed between POAG and cataract control eyes. In addition, 16 miRNAs were differently expressed between POAG eyes with severe visual field damage and eyes with moderate visual field damage. This differential expression was predicted to regulate thiamine metabolism, purine metabolism, and transcriptional misregulation. Relative expression patterns of hsa-miR-184, -486-5p, and -93-5p were confirmed by qPCR.

#### Conclusions

This study comprehensively demonstrated the miRNA expression profile in aqueous humor of POAG eyes, especially the differential expression of miRNA in eyes with varying degrees of visual field damage, which, together with the underlying miRNA related pathways, indicate new targets for the pathogenesis and progression of POAG.

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## P-WT-118

### CONJUCTIVAL HISTOPATHOLOGY OF EYES ON LONG TERM ANTIGLAUCOMA MEDICATIONS

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#### Purpose

To compare the conjunctival histopathology in patients on prostaglandin analogues to those on other antiglaucoma medications.

#### Methods

The study was done in a tertiary eye care centre in South India. Cases undergoing Glaucoma triple procedure from Jan 2016 to June 2016, on Antiglaucoma medications for a minimum of 3 months who consented to the study were included. Exclusion criteria - Ocular or systemic inflammatory diseases, steroid medications, history of eye surgeries, secondary glaucomas.

A 2mm x 2mm superior bulbar conjunctival biopsy was taken from the edge of the conjunctival flap during surgery with minimal crush damage and sent for histopathology preserved in formalin. Specimens were from the same conjunctival region to reduce regional differences in cellularity. All specimens were taken before antimetabolite application. A masked observer, after processing and staining, evaluated for number of goblet cells, intraepithelial and subepithelial lymphocytes, mast cells and plasma cells under light microscope. Average of 3 high power fields was taken. The numbers of goblet cells and lymphocytes were counted in epithelial layer and the numbers of lymphocytes, plasma cells and mast cells were counted in subepithelial layer and substantia propria. Cells were counted only when nuclear and cytoplasmic morphology made clear identification of cell type possible.

#### Results

Histopathology of 22 specimens were available. Though there was no statistical significance, the numbers of goblet and plasma cells were more in the PG analogue group while the number of mast cells were more in the non-PG analogue group suggestive of more subclinical inflammation and fibrosis in non PG analogue group.

#### Conclusions

We found increase in goblet cells in the PG analogue group and increase in mast cells in the non PG analogue group though there was no statistical significance. This was similar to studies in European populations (1,2) where latanoprost was compared exclusively to timolol. Non PG analogues possibly induced a drop in goblet cells and crystallization pattern. Surgical success was similar in the 2 groups.

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## P-WT-119

### NEUROPROTECTIVE EFFECT OF BRAZILIAN GREEN PROPOLIS ON RETINAL GANGLION CELLS IN ISCHEMIC MOUSE RETINA

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#### Purpose

This study investigated whether Brazilian green propolis (BGP) can increase the viability of retinal ganglion cells (RGCs) in ischemic mouse retina, and examined the possible mechanisms underlying this neuroprotection.

#### Methods

C57BL/6J mice were subjected to constant elevation of intraocular pressure for 60 minutes to establish retinal ischemia-reperfusion injury. Mice then received saline or BGP (200 mg/kg) intraperitoneally once daily until sacrifice. Histone acetylation, hypoxia-inducing factor (HIF)-1 $\alpha$  and glial fibrillary acidic protein (GFAP) expression was assessed at 1, 3, and 7 days after injury. The expression of p53, Bax and Bcl-2 was also analyzed at 3 days after injury. The neuroprotective effect of BGP treatment on RGC survival was evaluated using Brn3a immunohistochemical staining.

#### Results

The expression of HIF-1 $\alpha$  and GFAP was upregulated and histone acetylation decreased in saline-treated ischemic retinas within 7 days. BGP treatment effectively attenuated the elevated expression of HIF-1 $\alpha$ , GFAP, p53 and Bax. The expression of Bcl-2 and Histone acetylation increased by BGP treatment, resulting in a significant difference between BGP-treated and saline-treated retinas. Immunohistochemical staining for Brn3a also revealed that BGP treatment protected against RGC loss in ischemic retina.

#### Conclusions

Our study suggests that BGP has a neuroprotective effect on RGCs through the downregulation of HIF-1 $\alpha$ , GFAP, p53 and Bax, and increase of Bcl-2 and histone acetylation in ischemic mouse retina. These findings suggest that BGP is a potential neuroprotective agent against RGC loss under oxidative stress.

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## P-WT-120

### EFFICACY AND TOLERABILITY OF A NEW THERMOSTABLE FORMULATION OF LATANOPROST IN NANOPARTICLES

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<sup>3</sup>Ophthalmology, Hospital Santa Lucía, <sup>4</sup>Ophthalmology, Hospital Durand, CIUDAD DE BUENOS AIRES, Argentina

#### Purpose

Benzalkonium chloride (BAK) has known toxic effects on the ocular surface on long-term use. A new latanoprost 0.005% BAK-free nanoemulsion (LNe) was engineered as a new alternative to deliver latanoprost to the cornea. The lipophilic properties of the new formulation and the size of the oil nanodroplets become important for absorption and bioavailability, leaving relatively no free molecules to induce ocular surface toxicity. Furthermore, nanoemulsions have been found to restore the tear film and exert protective effects on the ocular surface, resulting in improvements in hyperemia, irritation and dry eye. We hypothesized that this formulation has the same intraocular pressure (IOP)-lowering efficacy and is better tolerated than the BAK-containing latanoprost solution (LSc).

#### Methods

Adult patients with primary open-angle glaucoma under treatment with LSc for  $\geq 6$  months (baseline), switched to LNe once daily. As primary outcome, IOP-lowering efficacy was evaluated after 4, 8 and 12 weeks of treatment with LNe. Non inferiority was defined as a mean difference (95% CI) from baseline  $< 1.5$  mmHg at every timepoint after switching. As secondary outcome, ocular surface damage was determined using Ocular Surface Disease Index (OSDI) score, Break-up time (BUT), conjunctival hyperemia and corneal staining at baseline and after 4, 8 and 12 weeks of treatment with LNe.

#### Results

A total of 103 patients (198 eyes) concluded the study. Six patients discontinued because of ocular itching, increased tearing, blurred vision, strange body sensation, dry eye or allergic eye reactions. No serious treatment-related adverse effects were reported. No patient had IOP  $> 20$  mmHg. Every 95% CI of mean IOP after switching to LNe were within the 1.5 mmHg non-inferiority margin from baseline IOP (13.13-16.13 mmHg): 13.65-14.35, 13.38-14.07, 13.33-13.98 mmHg (4, 8 and 12 weeks). After 12 weeks of treatment with LNe, OSDI score decreased from 25.39 to 13.88,  $P < 0.05$ ; BUT increased from 7.47 to 9.22 seconds,  $P < 0.05$ ; and eyes with conjunctival hyperemia and corneal staining decreased by 27.7% and 19.2%.

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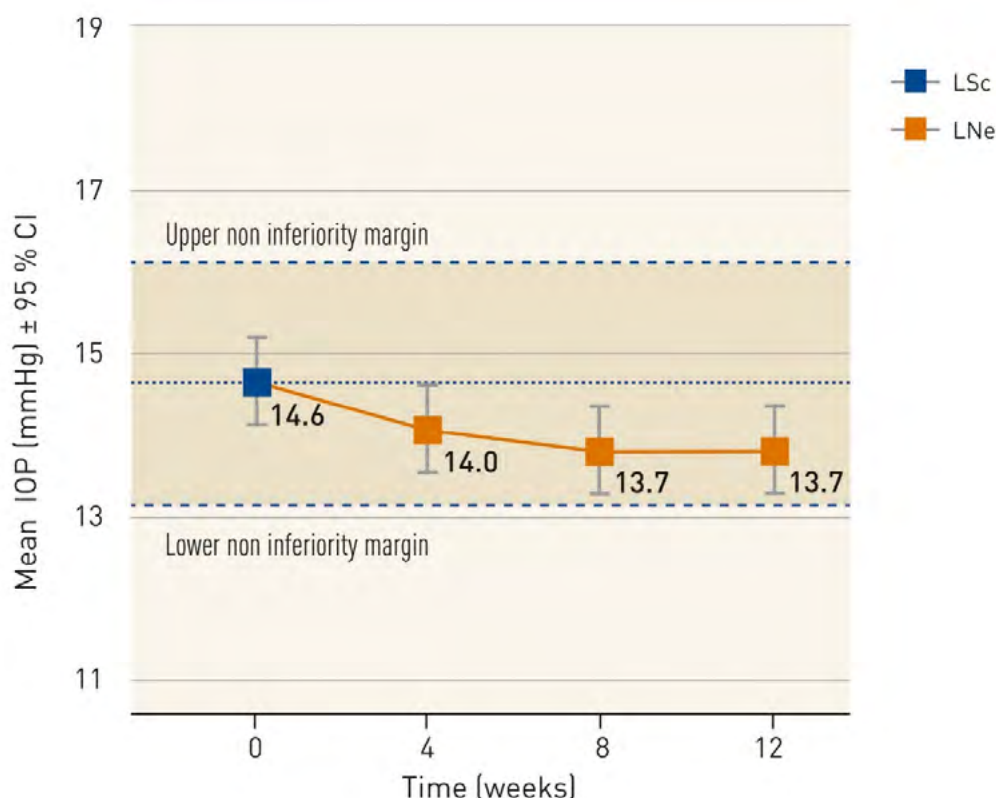
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## Conclusions

The new formulation of latanoprost in nanoemulsion showed the same IOP-lowering efficacy as the conventional formulation with significant improvements of ocular surface parameters, adding the advantage of being stored at up to 30°C for 24 months.

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## P-WT-121

### OUTCOMES OF IN-VITRO CONVERSION OF FLOW RESTRICTIVE GLAUCOMA DRAINAGE DEVICE TO NON-RESTRICTIVE DRAINAGE IMPLANT

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#### Purpose

To investigate the method of conversion of flow restrictive implant (Ahmed Glaucoma Valve, AGV) to a non-flow restrictive device by destroying the functionality of the valve leaflets.

#### Methods

The newly opened FP7 AGV implants and the Aurolab aqueous drainage implants (AADI) were connected to a 27 gauge cannula, open manometer, digital manometer and an automated infusion pump and were placed inside a saline bath. Data logging was done using a digital manometer at 4Hz using computerized data logging software. As soon as the AGV's flow characterisation reached the steady phase, their valve functionality was destroyed by disrupting the valve leaflets, using a specially designed blade and forceps and the flow characteristics recorded. This was compared to the flow characteristics of the AADI.

#### Results

A total of 5 AGV's and two AADI were tested. The average priming pressures were 648 (min 635, max 660) mmHg for the AGV's. There was initial resistance to flow 503 mmHg (min:460, max:545) even with AADI which lasted for  $2.36 \pm 1.6$  hrs, the pressures recorded in transient phase were 8 and 5 mmHg which dropped to 1 mmHg in both the implants. The mean  $\pm$  standard deviation steady phase operating pressures for the AGV's were  $10.4 \pm 2.1$  (min 7, max 13) mmHg. The AGV's after losing their valve functionality, the pressure of the AGV dropped to 1mmHg in 2 devices and 0 mmHg in 3 devices. The time taken for this pressure drop was  $10.2 \pm 3.0$  min (min 7, max 15) minutes.

#### Conclusions

It was possible to convert the flow restrictive AGV into a non-flow restrictive device by destroying the functionality of the AGV. The pressure of the AGV's obtained after destroying its functionality was similar to AADI.

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## P-WT-122

# INHIBITION OF TGF-BETA PATHWAY REVERSES EPITHELIAL-TO-MESENCHYMAL TRANSITION IN TRABECULAR MESHWORK CELLS

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### Purpose

Trabecular meshwork (TM)-Schlemm's canal pathway plays a central role in regulating intraocular pressure (IOP). TM cells cover over TM fibers composing of several extracellular matrices (ECM). Their contractibility contributes to spaces of TM fibers, which is essential for the control of IOP. Another cause of the IOP elevation is the accumulation of ECM at TM, that increases the resistance of aqueous humor outflow. Previously, we reported that the integrin-associated ECM led to induction of epithelial-to-mesenchymal transition (EMT)-like phenomenon in monkey TM cell. This may explain the pathology of primary open-angle glaucoma, the decrease of TM cells and increase of  $\alpha$ -smooth muscle actin ( $\alpha$ -SMA) positive cells in TM. In this study, we hypothesized that mesenchymal-to-epithelial transition occurred in mesenchymal TM cells and examined the effects of a TGF- $\beta$  pathway inhibitor on EMT reversal.

### Methods

Primary TM cells were isolated from cynomolgus monkey eyes. TM cells were seeded on the collagen-coated dish and incubated for three days. After confirmation of EMT by checking cell shape, we added a TGF- $\beta$  receptor inhibitor (SB431542) into the media and incubated them for more two days. Subsequently, cells were subjected to Western blot and immunofluorescence analysis.

### Results

Immunofluorescence analysis showed that actin stress fibers were enhanced in mesenchymal TM cells on collagen (as shown in previous our study). By adding a TGF- $\beta$  inhibitor, actin fibers showed epithelial-like bundles and one of adherence junction proteins,  $\beta$ -catenin localized at cell-cell border continuously. In addition, a TGF- $\beta$  receptor inhibitor reduced the expression of mesenchymal markers (fibronectin and  $\alpha$ -SMA) and decreased the level of phosphorylation of Smad2 in mesenchymal TM cells.

### Conclusions

Blocking of TGF- $\beta$  signaling pathway was indicated to induce EMT reversal in TM cells. Because TM cells regulate homeostasis of aqueous humor outflow, it may be a new strategy for the regulation of IOP to reverse EMT in mesenchymal TM cells.

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## P-WT-123

### DISTRIBUTION OF INTER-ENDOTHELIAL JUNCTION AND VASCULAR MURAL CELLS MAY ACCOUNT FOR HIGHER VASCULAR PERMEABILITY IN PORCINE IRIS PUPILLARY REGION

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#### Purpose

Exudation in the anterior chamber is commonly observed around pupil in clinic. We hypothesize that high permeability exists in iridal pupil region. and vascular mural cells also contribute to the blood-aqueous barrier.

#### Methods

Twenty-one freshly enucleated porcine eyes were divided into two groups. 12 eyes were applied for permeability test and perfused through temporal long posterior ciliary artery (LPCA) at 200μm/min with FITC-albumin 0min (2eyes), 2min (5eyes) and 8min (5eyes); the other 9 eyes were used for perfusion labelling with VE-cadherin, claudin-5 and αSMA. Iris was cryosectioned for confocal microscopy followed by further HE and Van Gieson staining for eyes of permeability test. Iris sectors were flat-mounted for all experimented eyes. Images were taken under the same laser intensity, and signal intensities were compared among eyes as well as iris vascular segments by three observers.

#### Results

Porcine iris vasculature is permeable to albumin since 2min after perfusion though lower and slower than ciliary process. Iris vascular permeability is different among regions. Pupillary region, especially at the superficial and deep capillary network, showed stronger FITC signal than ciliary region. Correspondingly, these areas of iris pupillary region were occupied by microvasculature which showed weak, uneven and discontinuous claudin-5 labelling. Meanwhile, vessels in these areas were only partially covered by scarce αSMA positive vascular mural cells.

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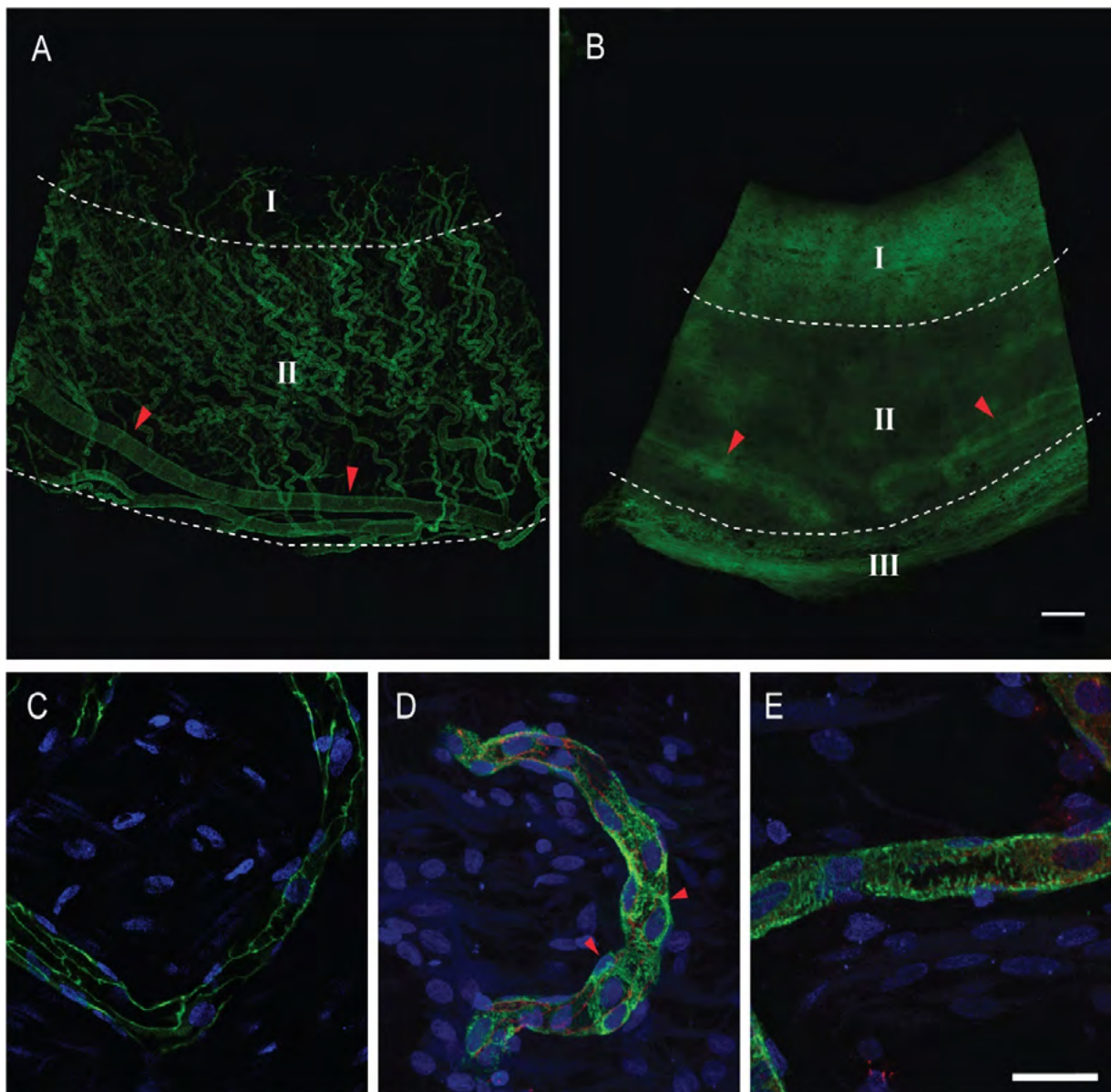
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## Conclusions

Iris pupillary region is more permeable to albumin than iris ciliary region, which may due to the distribution pattern of inter-endothelial tight junction proteins and contractive vascular mural cells. Further quantitative study will be needed to confirm whether the volume change of iris is remarkably obvious in this region than others.

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## P-WT-124

### CRITICAL DURATION FOR REVERSIBILITY OF RETINAL GANGLION CELL INJURY IN A MOUSE CIRCUMLIMBAL SUTURE MODEL

Da Zhao<sup>1</sup>, Vickie Wong<sup>1</sup>, Zheng He<sup>1</sup>, Christine Nguyen<sup>1</sup>, Jeremiah Lim<sup>1</sup>, Algis Vingrys<sup>1</sup>, Bang Bui<sup>1</sup>

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#### Purpose

To determine the duration of chronic IOP elevation needed to produce irreversible retinal ganglion cell injury in mice.

#### Methods

IOP elevation (~+10 mmHg) was induced in anaesthetized (isoflurane) adult male C57BL6/J mice (3 months old) by attaching a circumlimbal suture around one randomly chosen eye (contralateral untreated control eye). After 8 (n = 27) and 12 weeks (n = 23) of IOP elevation animals underwent *in vivo* assessment to quantify retinal function with electroretinography (ERG) and structure using optic coherence tomography (Spectralis OCT). Eyes were harvested for immunohistochemistry (RNA binding protein with multiple splicing) to quantify ganglion cells. In two other groups, the suture was after 8 and 12 weeks (n = 26 and 28) of IOP elevation, to return IOP back to baseline. Endpoint assessment and tissue collection was conducted 4 weeks later, at 12 and 16 weeks respectively. Data (mean ± SEM) were compared using *t*-test (control vs. treatment) and one-way ANOVA (within groups).

#### Results

After 8 and 12 weeks of chronic IOP elevation, RGC function declined to 75 ± 8% and 78 ± 7% of control eyes, respectively. Suture removal at week 8 facilitated full recovery of RGC function (97% ± 7%, P = 0.9 vs. baseline) 4 weeks later. However, when the suture was removed at week 12 (79% ± 9%, P < 0.05) there was no recovery of function. Regardless of whether the suture was cut at week 8 or 12, there was no recovery in RNFL thickness (~11-15% thinner in all groups) and ganglion cell count (~10-15% loss in all groups). However IOP lowering prevent further RNFL thinning and cell loss.

#### Conclusions

This mouse circumlimbal suture enables chronic moderate levels of IOP elevation and allows IOP normalization by suture removal. In this model, retinal ganglion cell dysfunction remains irreversible after 8 weeks of IOP elevation, but not after 12 weeks. In contrast to the reversibility of ganglion cell function at week 8, RNFL thinning and ganglion cell loss were irreversible.

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# Medical Treatment and Non-Incisional Surgery

## P-WT-125

### ULTRASOUND CYCLOPLASTY IN SURGICAL NAÏVE OPEN-ANGLE GLAUCOMA PATIENTS. INTERIM 18 MONTH RESULTS OF A PROSPECTIVE MULTICENTER CLINICAL TRIAL

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<sup>1</sup>University of Tel-Aviv, Tel Aviv, Israel, <sup>2</sup>University of Pisa, Pisa, Italy, <sup>3</sup>Katholieke Universiteit Leuven, Leuven, Belgium

#### Purpose

The aim of this prospective study is to evaluate the efficacy and safety of the Ultrasound Cyclo Plasty (UCP) procedure using High Intensity Focused Ultrasound (HIFU) in surgically naïve open-angle glaucoma patients.

#### Methods

Prospective non-comparative clinical study conducted in four university hospitals. Sixty-six eyes with primary open-angle glaucoma, intraocular pressure (IOP) > 21 mmHg and with no history of filtering surgery were treated with therapy probe comprising 6 piezoelectric transducers, consecutively activated during 8 seconds each. Complete ophthalmic examinations were performed before the procedure, and at 1 day, 1, 3, 6, 12, 18 and 24 months after. Primary outcomes were surgical success (defined as IOP reduction from baseline  $\geq 20\%$  and IOP > 5 mmHg without adding medications compared to baseline), and vision-threatening complications. Secondary outcomes were the presence of complications, and the reduction of the number of medication used.

#### Results

IOP was significantly reduced after one procedure ( $P < 0.05$ ), from a mean preoperative value of  $24.3 \pm 2.9$  mmHg ( $n = 2.3$  hypotensive medications) to a mean value of  $16.6 \pm 4.1$  mmHg ( $n = 2.4$  hypotensive medications) at last follow-up visit (mean IOP reduction of 31%). Surgical success was achieved in 65% of eyes. Notwithstanding side effects such as transient anterior chamber inflammation, refractive error changes, transient hypotony (in 3 patients, one of which had choroidal detachment) and macular edema (1 case), no major intra or post-operative complications (phthisis or induced cataract) were observed.

#### Conclusions

UCP procedure is an effective and well-tolerated method to reduce intraocular pressure in patients with open-angle glaucoma without previous filtering surgery.

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## P-WT-126

### INITIAL OUTCOMES OF MYCROPULSE TRANSSCLERAL CYCLOPHOTOAGULATION IN PATIENTS WITH GLAUCOMA AND PENETRATING KERATOPLASTY OR BOSTON KERATOPROSTHESIS

Natalia Agudelo\*

#### Purpose

To evaluate the efficacy and safety of mycropulse transscleral cyclophotocoagulation in reduce the intraocular pressure in patients with glaucoma and penetrating keratoplasty (KP) or botson keratoprosthesis (BK).

#### Methods

We retrospectively reviewed records from patients with uncontrolled secondary glaucoma due to PK and BK despite maximal tolerated medical therapy who recieved mycropulse transscleral cyclophotocoagulation 360 seconds in 360 degrees. we evaluated intraocular pressure (IOP), glaucoma medication, best corrected visual acuity (BCVA) preoperatively and during follow-up.

#### Results

a total of 19 eyes from 19 patients received the surgical intervention. 16 eyes with KP and 3 with BK. Mean follow-up was 6 months. Mean preoperative IOP was  $19.9 \pm 6.0$  and postoperatively were  $15.1 \pm 4.9$ ,  $13.9 \pm 5.1$ ,  $13.2 \pm 3.2$  at 1, 3, and 6 months respectively. an IOP reduction of 33.6% was achieved at 6 months ( $P < 0.05$ ). mean BCVA decreased 1 line 6 months after the surgery. glaucoma medication fell significantly from  $3.6 \pm 1.4$  to  $1.75 \pm 1.25$ . postoperatively there was a 49% decrease in glaucoma medication usage. Overall 25% of the patients did not require glaucoma medications at 6 months. there was no visual significant complications.

#### Conclusions

Mycropulse transscleral cyclophotocoagulation is effective and safe in reducing IOP and number of glaucoma medications with stable BCVA in patients with glaucoma and KP and BK.

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## P-WT-127

# IOP-LOWERING EFFICACY AND LONG-TERM SAFETY PROFILE OF OMIDENEPAG ISOPROPYL 0.002%, A SELECTIVE EP2 AGONIST, IN OAG AND OHT

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<sup>1</sup>Ophthalmology, University of Tokyo, Bunkyo-ku, Tokyo, Japan, <sup>2</sup>Santen Inc., Emeryville, CA, United States, <sup>3</sup>Santen Pharmaceutical Co., Ltd., Osaka, Japan

### Purpose

The Phase 3, randomized, controlled, investigator-masked AYAME study (NCT02623738) compared the intraocular pressure (IOP)-lowering effects of omdenepag isopropyl (OMDI), a selective, non-prostaglandin, EP2 agonist, vs latanoprost in patients with primary open-angle glaucoma (POAG) or ocular hypertension (OHT). The Phase 3, open-label RENG study (NCT02822729) further evaluated the long-term safety and efficacy of OMDI in patients with open-angle glaucoma (OAG) or OHT.

### Methods

AYAME: eligible patients (baseline IOP 22–34 mmHg after a 1–4-week washout) were randomized 1:1 to OMDI 0.002% or latanoprost 0.005% QD for 4 weeks. IOP was measured at 9:00, 13:00, and 17:00 at Weeks 1, 2, and 4. The primary endpoint was change from baseline in mean diurnal IOP at Week 4 (non-inferiority margin, 1.5 mmHg). RENG: eligible patients (baseline IOP  $\geq 16$ – $<22$  mmHg in Group 1 and  $\geq 22$ – $<34$  mmHg in Group 2) received OMDI 0.002% QD for 12 months. IOP was measured at 9:00, 13:00, and 17:00 at Weeks 2, 4, 8, 12, 26, 40, and 52.

### Results

In AYAME, the mean $\pm$ SD diurnal IOP change from baseline to Week 4 was  $-5.96 \pm 2.45$  mmHg for OMDI (n = 94) and  $-6.45 \pm 2.01$  mmHg for latanoprost (n = 95). The mean between-group difference was 0.63 mmHg (95% CI 0.01, 1.26), indicating non-inferiority. The most frequently reported ocular adverse drug reactions (ADRs; OMDI vs latanoprost) were conjunctival hyperemia (24.5% vs 10.4%), corneal thickening (11.7% vs 1.0%), and punctate keratitis (0% vs 5.2%). There were no serious adverse events (AEs). In RENG, the mean $\pm$ SD diurnal IOP reduction at Week 52 was  $-3.7 \pm 2.1$  mmHg in Group 1 and  $-5.6 \pm 2.7$  mmHg in Group 2; reductions were sustained throughout the study. Four serious AEs were reported; these were considered unrelated to OMDI. The most frequently reported ADR was conjunctival hyperemia (16.5%), followed by macular edema (ME) including cystoid ME (CME) (10.6%). All ME/CME cases were mild or moderate, occurred in pseudophakic eyes, and responded to standard-of-care treatment and OMDI discontinuation. There were no reports of increased pigmentation of the iris or eyelid, eyelash changes, or deepening upper eyelid sulcus.

### Conclusions

In AYAME, OMDI 0.002% was shown to be non-inferior to latanoprost 0.005% in reducing IOP in patients with POAG or OHT. In RENG, during a 52-week period, OMDI was reasonably well tolerated and achieved significant and stable IOP reductions in patients with OAG, including normal-tension glaucoma, or OHT.

Sponsored by Santen.

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## P-WT-128

# DEVELOPMENT OF NANOEMULSIONS TO IMPROVE THE OCULAR BIOAVAILABILITY AND PATIENT COMPLIANCE IN GLAUCOMA TREATMENT USING TIMOLOL MALEATE

Divya Ajmeera\*, Sarangapani Manda<sup>1</sup>, Susmitha Kolluri<sup>1</sup>, Krishnaveni J<sup>1</sup>

<sup>1</sup>Kakatiya University, Warangal, India

### Purpose

Medical or non-surgical treatment for glaucomas involves topical eye-drop instillation of aqueous products. Various features of the ocular physiology, anatomy, and biochemistry made the ocular environment impervious to foreign substances, thus creating unique challenges for delivering drugs to eyes. In addition, the poor drug bioavailability and short residence time in tears result in several daily administrations to accomplish the preferred therapeutic effects, dropping the patient compliance.

In order to enhance the effectiveness of the drug, our study was aimed to develop a nanoemulsion for topical administration that would increase the contact time of the drug on the surface of eye and drug penetration into the deeper layers of the ocular tissues. This may then enhance the bioavailability, lower systemic absorption, and lessen the need for frequent administration leading to improved patient compliance.

### Methods

Systems consisting of different oils, surfactants, and cosurfactants were prepared and their pseudo-ternary-phase diagrams were constructed by the water titration method. These compositions were used to develop Timolol maleate nanoemulsions. *In vitro* drug release studies and *Ex vivo*, corneal permeation studies were conducted using bovine cornea. The best formulation was optimized using 3<sup>2</sup> factorial designs and this will be further subjected to rabbit eye irritation test, and Therapeutic efficacy studies to know the fate of the formulation *in vivo*.

### Results

Developed nanoemulsions showed satisfactory physicochemical properties when evaluated for their viscosity, Droplet size, pH, Refractive index, Surface tension, Osmolality, and surface morphology. *In vitro* drug release studies revealed sustained release patterns. We found improved corneal permeation of drug by *Ex vivo* studies compared to simple drug solution.

### Conclusions

Based on the results obtained, we can strongly suggest nanoemulsion formulations as potential delivery vehicles for ophthalmic delivery.

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## P-WT-129

# EFFECTS OF INTRAVITREAL DEXAMETHASONE ON INTRAOCULAR PRESSURE IN TREATMENT OF MACULAR EDEMA SECONDARY TO NON-INFECTIOUS UVEITIS

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### Purpose

To report effects of dexamethasone 0.7 mg sustained-release intra vitreal implant (Ozurdex®; Allergan, Inc, Irvine, CA) on intraocular pressure (IOP) in patients with macular edema secondary to non-infectious uveitis.

### Methods

A retrospective chart review of 41 eyes of 34 (12 male and 22 female) consecutive patients treated with a Ozurdex® for non-infectious uveitis was performed. IOP was assessed before and at the 1 week, 1, 3, 6 months and last follow up visit after injection. Ocular hypertension (OHT) was defined as a IOP measurement of > 21 mmHg.

### Results

The mean age of the patients was  $46.0 \pm 19.59$  (range; 15 to 79) years and post-injection mean follow-up time was  $11.7 \pm 7.6$  (range; 1 to 24) months. Sixteen patients received more than 1 injections (mean injection number;  $2.3 \pm 1.4$ ). The baseline mean IOP increased from  $13.9 \pm 3.2$  mmHg to  $16.2 \pm 6.6$  mmHg,  $16.8 \pm 7.0$  mmHg,  $14.6 \pm 6.0$  mmHg,  $14.2 \pm 3.7$  and  $15.2 \pm 4.8$  mmHg at 1st week, 1, 3, 6 months and final visit, respectively. Increment of IOP was statistically significant at 1st week, 1st months and at the last visit ( $p = 0.002$ ;  $p = 0.002$  and  $p = 0.019$ , paired *t*-test, respectively). There was negative correlation between age and 1st month IOP ( $r = -0.377$ ,  $p = 0.001$  by Pearson's correlation analysis). The last visit IOP was positively correlated with number of injection, baseline IOP, and 1st week IOP ( $r = 0.401$ ,  $p = 0.001$ ;  $r = 0.374$ ,  $p = 0.002$ ;  $r = 0.293$ ,  $p = 0.015$ ; respectively by Pearson's correlation analysis). OHT developed in 16 eyes (39%). In 13 eyes (31.7%) IOP was controlled with hypotensive drug, when in 3 eyes (7.3%) invasive surgery for glaucoma was required (1 trabeculectomy and 2 non-penetrating glaucoma surgery).

### Conclusions

Dexamethasone intravitreal implant induced OHT (39%). Most cases of OHT can be controlled medically, and small proportion (7.3%) required glaucoma surgery. Risk factors included multiple injection, younger age and higher baseline IOP.

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## P-WT-130

### CARDIOVASCULAR EFFECTS AND SAFETY OF MANNITOL IN TREATING RAISED INTRAOCULAR PRESSURE

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#### Purpose

To evaluate the cardiovascular effects and safety of mannitol use in treating raised intraocular pressure (IOP).

#### Methods

Retrospective chart review of 50 patients presenting to the Royal Victorian Eye & Ear Hospital Emergency Department and requiring intravenous mannitol infusion for raised IOP. Primary outcomes include blood pressure and heart rate before, during and after mannitol infusion. Secondary outcomes include side-effects and the requirement of a 'code blue' for medical emergency.

#### Results

The mean age of patients was 53 years, mean presenting IOP was 54mmHg and mean post-mannitol IOP was 32mmHg. Mannitol caused a significant increase in systolic blood pressure during infusion which returned to baseline after cessation. The mean increase in systolic blood pressure during 100g mannitol infusion was 12.17mmHg ( $P < 0.05$ , 95% CI 8.15-16.20mmHg). Linear regression showed that age ( $P < 0.05$ ), past medical history of hypertension ( $P < 0.01$ ) and use of blood pressure medications ( $P < 0.01$ ) were predictors for increased systolic blood pressure with mannitol infusion. Gender, mannitol dose (adjusted for g/kg) and baseline systolic blood pressure did not significantly affect the systolic blood pressure change with mannitol. There was no significant difference in diastolic blood pressure ( $p = 0.46$ ), mean arterial pressure ( $p = 0.11$ ) and heart rate ( $p = 0.06$ ) during mannitol infusion. Common side effects included nausea/vomiting (12%), headache (6%) and dry mouth/thirst (2%). No patient had pulmonary congestion or fluid/electrolyte imbalance. There were no Code Blue calls.

#### Conclusions

Intravenous mannitol infusion increases systolic blood pressure which returns to baseline after cessation. Common side-effects include nausea/vomiting, headache and dry mouth/thirst. The change in blood pressure is significantly influenced by age, a past medical history of hypertension and use of blood pressure medications. Close monitoring of these patients may be warranted during mannitol infusion.

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## P-WT-131

### ULTRASOUND CILIARY PLASTY IN GLAUCOMA TREATMENT – MEDIUM-TERM FOLLOW-UP

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#### Purpose

Currently, the only effective and proven method of glaucoma therapy is to reduce intraocular pressure. Cyclodestruction methods are used to achieve this effect by limiting the production of aqueous humor mainly in severe forms of glaucoma. Using ultrasound as a more precise energy focus on target tissue can contribute to improving the safety and efficacy of ciliary body surgery techniques used to date.

The aim of the study was to demonstrate the technique and to evaluate the efficacy and safety of Ultrasound Ciliary Plasty (UCP) procedure in glaucoma patients.

#### Methods

Thirty three patients with primary and secondary refractory glaucoma were enrolled to ultrasound ciliary plasty procedure. Complete ophthalmic examinations were performed before the procedure, at 1 day, 1 week, 1, 3, 6 and 12 months after. Until today in our clinic we performed 62 UCP procedures, remaining patients are in the follow-up period shorter than 12 months.

#### Results

Among thirty three patients under 12 months observation intraocular pressure was reduced from mean preoperative value of  $22,6 \pm 4,6$  mmHg (n – average number of hypotensive medications = 3,9) to a mean value of  $16,3 \pm 3,1$  mmHg (n = 2,0) at last follow-up (mean IOP reduction of 27,9%). Pupil irregularity were observed in nine patients (27%) after procedure. No other major intraoperative or postoperative complications occurred.

#### Conclusions

UCP seems to be an effective and well-tolerated method to reduce intraocular pressure in patients with refractory glaucoma. Long-term observation on larger group is needed to confirm efficacy of this procedure.

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## P-WT-132

### ASSESSMENT OF ANTERIOR SEGMENT OF THE EYE AFTER ULTRASOUND CILIARY PLASTY IN GLAUCOMA TREATMENT

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#### Purpose

The aim of a study is to evaluate corneal morphology and topography in eyes after transscleral Ultrasound Ciliary Plasty. How corneal keratometry, thickness and elevation is changing after UCP procedure.

#### Methods

Twenty seven patients with primary and secondary refractory glaucoma were enrolled to ultrasound ciliary plasty procedure. Complete ophthalmic examinations with measurements of corneal parameters were performed before the procedure, at 1 day, 1 week, 1,3 and 6 months after. Analyzed corneal parameters obtained with Oculus Pentacam, SS OCT CASIA 2 included: anterior and posterior corneal astigmatism; flat and steep corneal power (Ks, Kf), cylinder axis, peripheral anterior and posterior elevation (μm) central and minimal corneal thickness.

#### Results

Preliminary results reveal that there is significant difference in corneal astigmatism right after UCP procedure. However during time, later then 1 month, that parameter return to initial values – no significant difference. K readings, peripheral anterior and posterior elevation (μm), central corneal thickness and minimal corneal thickness remain unchanged - no significant difference.

#### Conclusions

UCP seems to have influence on corneal topography right after procedure, however during time all parameters return to initial values. The procedure is safe and well-tolerated to reduce intraocular pressure in patients with refractory glaucoma. Long-term observation with larger group of patients is needed to confirm this results.

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## P-WT-133

### REAL-WORLD EFFICACY OF SELECTIVE LASER TRABECULOPLASTY IN THE UK AND FACTORS PREDICTING SUCCESS

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#### Purpose

Selective laser trabeculoplasty (SLT) is an increasingly common glaucoma management option, both as first-line treatment in newly-diagnosed patients and as an adjunct to topical treatment.<sup>1,2</sup> In this retrospective observational study we aimed to determine the real-world effectiveness of SLT in the United Kingdom (UK) and to identify baseline factors that predict treatment success.

#### Methods

We used de-identified electronic medical records (Medisoft® Ophthalmology database) from adult patients (≥18 years) undergoing a first (index) SLT between October 2011 and March 2017 at 5 UK ophthalmology teaching centres. For study inclusion, patients were required to have a baseline (≤6 months pre-index SLT) IOP assessment, ≥2 post-SLT IOP assessments, and ≥ 3 months of follow-up. Kaplan-Meier survival analysis was conducted, with SLT failure defined as the occurrence of any further glaucoma procedure (including repeat SLT) after the index SLT or any of the following at 2 consecutive visits: IOP > 21 mmHg, IOP reduction < 20% from baseline, or an increase in number of glaucoma medications. Multivariable Cox regression was used to examine patient- and centre-related factors predictive of treatment success.

#### Results

In total, 831 SLT-treated eyes of 831 patients were included in the analysis; 524 (63.1%) eyes were recorded as receiving topical medication at the time of index SLT. Mean pre-SLT IOP was 22 mmHg. The estimated probability of treatment success was 70%, 45% and 27% at 6, 12 and 24 months, respectively. Higher baseline (pre-SLT) IOP was strongly and significantly associated with treatment success (hazard ratio 0.95, 95% CI 0.94–0.97;  $P < 0.001$ ): every 1 mmHg increase in baseline IOP was associated with a 5% reduction in risk of treatment failure.

#### Conclusions

In this real-world setting, the majority of patients initially responded to SLT, but almost three-quarters failed treatment within 2 years post-SLT, according to the study criteria. Based on these analyses, SLT is more likely to be effective in patients with IOP > 21mmHg at the time of procedure, which is consistent with reports in literature that higher pre-treatment IOP may predict success<sup>3</sup>.

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**P-WT-134**

**NOVEL MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION: INITIAL RESULTS IN GLAUCOMA**

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**Purpose**

To investigate and evaluate the clinical efficacy and safety profile of micropulse transscleral cyclophotocoagulation (MP-TSCPC) in patients with glaucoma.

**Methods**

Prospective case series of 54 consecutive uncontrolled glaucoma patients who underwent MP-TSCPC at the Linko Chang Gung Memorial Hospital and who had at least 3 months of follow-up. Patients underwent MP-TSCPC using the IRIDEX Cyclo G6 laser with settings of 2000mW of 810 nm infrared diode laser with a duty cycle of 31.3%, which translated to 0.5 milliseconds of “on time” and 1.1 milliseconds of “off time”. The mean intraocular pressure (IOP) and percent of its reduction before and after treatment were measured. Complications after MP-TSCPC were also recorded.

**Results**

A total of 56 eyes were treated with MP-TSCPC in this study. The mean IOP before MP-TSCPC was  $34.1 \pm 11.6$  mmHg. The mean IOP after MP-TSCPC was  $17.2 \pm 7.9$  mmHg. The IOP was reduced by an average of 48.4% at the last follow-up. Five patients may required further laser or surgical intervention for adequate IOP control. Complications included hypotony, IOP spike, hyphema, transient inflammation, and vision loss.

**Conclusions**

MP-TSCPC is effective at lowering IOP and decreasing the need for ocular antihypertensive medications. Eyes with limited visual potential or at high risk for incisional glaucoma surgery can successfully be treated with MP-TSCPC as a reasonable and effective alternative to traditional TSCPC. Long-term follow-up and further studies are necessary.

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## P-WT-135

### SAFETY AND EFFICACY OF ULTRASOUND CYCLO PLASTY IN INDIAN EYES WITH REFRACTORY GLAUCOMA

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#### Purpose

To evaluate the safety and efficacy of Ultrasound Cyclo Plasty (UCP) in Indian eyes with refractory glaucoma and nil potential vision with 2 different treatment protocols.

Group 1: Ultrasound duration = 6 seconds/transducer, 2 times consecutively.

Group 2: Ultrasound duration = 8 seconds/transducer, 2 times consecutively.

#### Methods

Prospective interventional study of 16 patients who underwent UCP using High Intensity Focused Ultrasound (HIFU) with EyeOP1 device (Eye Tech Care, Rillieux-La-Pape, France). The inclusion criteria were end-stage primary and secondary glaucoma patients with no vision and IOP > 21mmHg with medication or after conventional glaucoma surgery. Patients with prior cyclodestructive procedures or implants were excluded. All patients underwent Slit-lamp examination and photography, Applanation tonometry, anterior segment OCT and macular OCT pre-operatively and post-operatively at 1 day, 1 week, months 1, 2, 3, 6 and 12. Primary outcome was the percentage reduction in IOP compared to baseline at each post-operative visit. Secondary outcome was the mean change in IOP and mean change in number of Anti-Glaucoma Medications (AGM) compared to baseline. Incidence of device and procedure related adverse events were noted at each visit. Primary and secondary outcomes were compared between the two groups.

#### Results

16 eyes of 16 patients underwent the procedure as two groups of 8 each. The percentage and mean IOP reduction from baseline was statistically significant at all post-operative visits : day 1 (24%; 10.4 ± 2.2;  $P < 0.001$ ), month-1 (41%; 17.4 ± 3.2;  $P < 0.001$ ), month-3 (31%; 12.8 ± 2.9;  $P < 0.001$ ), month-6 (34%; 12.8 ± 3.4;  $p = 0.002$ ) and month-12 (26%; 13.2 ± 3.4;  $p = 0.004$ ). There was no significant difference in the outcomes between the two groups and in the number of AGM before and after the procedure. Only 1 patient complained of pain during procedure due to insufficient local anaesthesia. No major post-operative complication (hypotony, phthisis, scleral perforation) was observed except for transient anterior uveitis in one patient.

Ultrasound Cyclo Plasty is a safe non-invasive procedure with good efficacy in refractory glaucoma patients. There is no significant difference in the efficacy with relation to the duration of ultrasound.

#### Conclusions

Ultrasound Cyclo Plasty is a safe non-invasive procedure with good efficacy in refractory glaucoma patients. There is no significant difference in the efficacy with relation to the duration of ultrasound.

#### References

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## P-WT-136

### LONG TERM EFFECT OF PROSTAGLANDIN ANALOGUES ON CENTRAL CORNEAL THICKNESS

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#### Purpose

To evaluate the effects of prostaglandin analogues on central corneal thickness (CCT) in patients with normal tension glaucoma(NTG).

#### Methods

We retrospectively reviewed 124 eyes of 63 patients with NTG who were receiving prostaglandin analogues therapy. Patients were included who are treated with 0.005% latanoprost (34 eyes of 18 patients), 0.0015% tafluprost (32 eyes of 16 patients), 0.01 % bimatoprost (12 eyes of 6 patients), or 0.004% travoprost (46 eyes of 23 patients) monotherapy. IOP and CCT assessments were performed at baseline and 1, 2, 3, 4 and 5 years after the initiation of the treatment.

#### Results

The reduction of CCT was confirmed by divided into each subgroup. In 0.005% latanoprost group, the mean CCT was statistically significantly decreased at 1 year and 2 years, but not at 3 years. In 0.0015% tafluprost group, the mean CCT was statistically significantly decreased only at 3 years. In 0.01% bimatoprost, there was a tendency to decrease over time, but statistically insignificant. In 0.004% travoprost group, the mean CCT was significantly decreased at all years. Only 0.005% latanoprost (23 eyes of 13 patients) and 0.004% travoprost (19 eyes of 10 patients) groups were observed for up to 5 years. In 0.005% latanoprost group, the mean CCT was statistically significantly decreased at 2, 4 and 5 year. In 0.004% travoprost group, the mean CCT was significantly decreased at all years except 2 year.

#### Conclusions

Topical therapy with prostaglandin analogues appears to cause a significant decrease in CCT, but there is a difference in each subgroup. The result of up to 3 years, the greatest decrease occurred in 0.004% travoprost group and the least was 0.005% latanoprost group. Only a significantly and steady decrease were confirmed in 0.005% latanoprost and 0.004% travoprost group. However because of the different aspects of the process up to the fifth years, long-term follow up studies including more numbers are more needed.

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## P-WT-137

### USE OF MAXIMUM MEDICAL THERAPY IN PRIMARY OPEN ANGLE GLAUCOMA: A RETROSPECTIVE, ELECTRONIC MEDICAL RECORDS-BASED STUDY FROM THE UK

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#### Purpose

To investigate the use of maximum medical therapy (MMT) and the risk of undergoing incisional surgery (IS) in MMT-treated patients with primary open angle glaucoma (POAG).

#### Methods

This observational study used the de-identified Electronic Medical Records from six ophthalmology clinics in the UK. Patients with POAG (aged  $\geq 18$  years at diagnosis) with at least one record of MMT prescription (concomitant use of  $\geq 3$  classes of anti-glaucoma agents [prostaglandin analog (PGA),  $\beta$ -blockers (BB), carbonic anhydrase inhibitor (CAI) and  $\alpha$ -agonists (AA)] for  $\geq 30$  days) between June 2006–December 2017 were included. The time to first IS from MMT initiation, influence of demographics and clinical characteristics on the first IS, and pre-and post-index treatment (pharmacological & surgical) sequences until last follow-up were analyzed.

#### Results

From 68,831 records, 4,077 patients (6,535 eyes) met the inclusion criteria (Cohort 1: MMT only,  $n = 5,305$ ; Cohort 2: MMT+non-incisional surgery (NIS),  $n = 1,018$ ; Cohort 3: MMT+IS+NIS,  $n = 81$ ; Cohort 4: MMT+IS,  $n = 131$  eyes). Of the 212 eyes that underwent IS, the median time (range) from MMT initiation to first IS was 504 days (d) (33–3,513 d). Across all four cohorts, age  $< 65$  years at MMT (hazard ratio [HR]=3.06;  $P < 0.0001$ ), pre-MMT NIS (HR = 3.15,  $P < 0.0001$ ) and treatment with four MMT agents (HR = 2.34,  $P = 0.000$ ) were associated with an increased risk of IS, whereas an index of multiple deprivation (IMD) decile  $\leq 2$  (HR = 0.46,  $P = 0.003$ ), intraocular pressure  $< 21$  mmHg (HR = 0.29,  $P < 0.0001$ ), and visual field 0 dB  $> MD > -6$  dB (HR = 0.31,  $P = 0.001$ ) at MMT prescription were associated with a reduced risk of IS. The most common treatment in Cohort 1 was the MMT combination of CAI/BB/PGA in 31.33% of eyes. In Cohort 4, CAI/BB/PGA $\rightarrow$ filtration surgery was the most common treatment sequence (14.50% of eyes).

#### Conclusions

These real-world data from the UK provide valuable insights into the complex treatment in clinical practice and risk factors in POAG patients receiving MMT. Furthermore, they demonstrate that MMT is being used in the management of glaucoma and prolonging the time to surgery for some patients.

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## P-WT-139

### THE USE OF PATTERN SCANNING LASER TRABECULOPLASTY TO DECREASE INTRAOCULAR PRESSURE IN FILIPINO PATIENTS: L SHORT TERM RESULTS

Bienvenido Velecina Jr., Joseph Manuel Cruz<sup>1</sup>

<sup>1</sup>Quirino Memorial Medical Center, Quezon City, Philippines

#### Purpose

A relatively new glaucoma laser application called Pattern Scanning Laser Trabeculoplasty (PSLT), its use and its efficacy in decreasing intraocular pressure in Filipino patients is described.

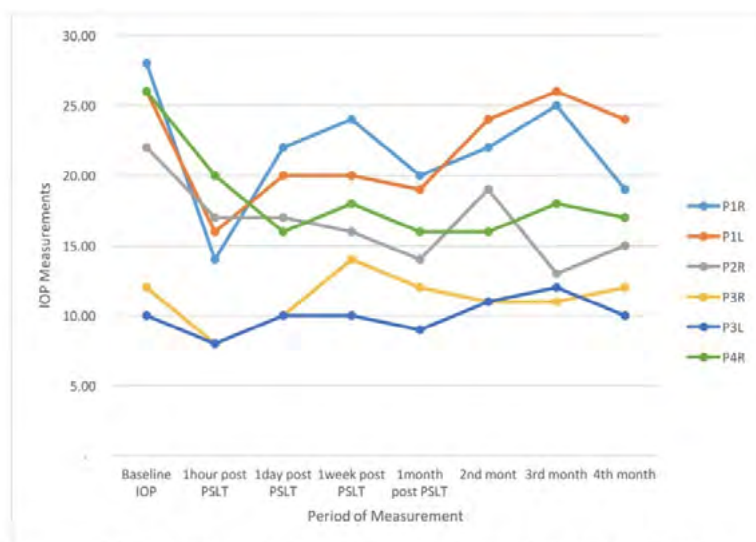
#### Methods

This is a prospective case series based on 6 eyes of 4 patients who received PSLT treatment in the Eye Center of Quirino Memorial Medical Center. The six eyes were diagnosed with either Primary Open Angle Glaucoma, Ocular Hypertension or Pseudoexfoliative syndrome. PSLT was delivered using a 577nm laser with 100um spots and a 5ms exposure placed in a patterned fashion on 360 degrees of the trabecular meshwork.

#### Results

These are the results up to the 4<sup>th</sup> month of the study. PSLT was able to significantly decrease the mean IOP by more than 20% from baseline 4 months from treatment (p value 0.03). Individually, 3 out of the six eyes exhibited more than 20% IOP decrease from baseline 4 months post-PSLT. A monthly evaluation of mean IOP decrease from baseline showed a loss of significant IOP reduction by the 3<sup>rd</sup> month which was regained the following month.

#### Image



**Figure 1.0** The changes in the intraocular pressure from the baseline up to 4 months post-PSLT. Y-axis the IOP in mmHg. (P1R- patient 1, right eye. P1L- patient 1, left eye. P2R- patient 2, right eye. P3R- patient 3, right eye. P3L- patient 3, left eye. P4R- patient 4, right eye)

#### Conclusions

PSLT exhibited an overall downward trend in the mean IOP from the 6 eyes four months post-PSLT. However, caution should be made in interpreting these results due to the low sample size. A gradual loss of significant IOP lowering, within three months in this case, should be a consideration in monitoring these patients. Further results which would include a longer follow-up will be reported in the

near future.

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## P-WT-140

### SAFETY AND EFFECTIVENESS OF SELECTIVE LASER TRABECULOPLASTY WITH A PULSE ENERGY OF 0.8–1.2 MJ VERSUS 0.8–1.4 MJ: A PROSPECTIVE OBSERVATIONAL STUDY

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#### Purpose

The purpose of this study was to compare the safety and short-term effectiveness of selective laser trabeculoplasty (SLT) with a pulse energy of 0.8–1.2 mJ versus 0.8–1.4 mJ in the treatment of patients with glaucoma or ocular hypertension.

#### Methods

This prospective observational study included 468 eyes of 269 patients treated with SLT between 1 July 2016 and 31 December 2017. SLT treatment employed an arc measure of 360°, 160 non-overlapping pulses, and pulse energy of 0.8–1.2 mJ prior to 1 July 2017 or 0.8–1.4 mJ subsequently, delivered over two sessions.

Safety was assessed by analysing the incidence and magnitude of transient intraocular pressure (IOP) elevation 1 hour post SLT. Effectiveness was assessed by comparing outcomes at 6-week review to baseline measurements. Success was defined as  $\geq 20\%$  IOP reduction without further laser or surgical intervention, or, a decrease in the number of anti-glaucoma medications, from baseline.

#### Results

No statistical differences in incidence and magnitude of transient IOP elevation 1 hour post SLT were observed. Similarly, mean absolute IOP reduction (5.88 vs 5.13 mmHg,  $p = 0.087$ ), mean percentage IOP reduction (24.6% vs 24.2%,  $p = 0.83$ ), and success rate (73.2% vs 75.3%,  $p = 0.60$ ) at 6 weeks post SLT did not differ between 0.8–1.2 mJ and 0.8–1.4 mJ groups. Elevated baseline IOP ( $OR = 1.12$ ,  $p < 0.001$ ) and advancing age ( $OR = 1.02$ ,  $p = 0.044$ ) were associated with SLT success. History of previous SLT was associated with SLT failure ( $OR = 0.376$ ,  $p = 0.018$ ).

#### Conclusions

SLT with a pulse energy of 0.8–1.4 mJ is as safe as SLT with a pulse energy of 0.8–1.2 mJ, but no more effective in the short term. This study is the first to assess whether extending pulse energy range improves the effectiveness of SLT.

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## P-WT-141

### PREDICTORS OF SUCCESS IN SELECTIVE LASER TRABECULOPLASTY: THE LAUSANNE SLT REGISTRY (LASER)

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#### Purpose

Selective laser trabeculoplasty (SLT) is a safe and effective treatment option for patients with ocular hypertension (OHT) and primary open angle glaucoma (POAG). There is, however, a paucity of evidence on indications and predictors of success. Published studies are generally limited by a small sample size and their outcomes are often contradictory. The purpose of this study was to analyze data from a large registry to determine predictive factors of SLT in patients with OHT and OAG.

#### Methods

Retrospective monocentric study of patients having had SLT treatment (Ellex Inc., Adelaide, Australia) between 2015 and 2017, with a follow-up duration of least a one year. Patients were retrieved from the LASER (Lausanne SLT Registry) database. Exclusion criteria included age < 40 years and glaucoma types other than OAG. All SLT interventions were performed by the same surgeon. IOP and number of medications was recorded at 45 minutes, 1 week, 2 and 6 months, 1, 2 and 3 years. Age, ethnicity, diagnosis, central corneal thickness, retinal nerve fiber layer thickness, standard automated visual field, energy and number of SLT impacts were all recorded among other parameters to determine which could predict SLT outcome.

#### Results

A total of 189 eyes (of 136 patients) fulfilled the inclusion criteria (61% female). The mean age was  $67.9 \pm 11$  years. In all, 89 eyes (47%) had POAG, 70 (37%) had OHT, 21 (11%) had PEX, and 9 (5%) had other types of glaucoma. Average baseline IOP was  $18.7 \pm 4.64$  mmHg and average IOP reduction was  $3.25 \pm 4.18$  mmHg (17.37%) and  $3.16 \pm 3.89$  mmHg (16.89%) at years 1 and 2, respectively. The ratio of IOP reduction from baseline to 2 months was found to be a strong predictive factor of the outcome of SLT, both positive (OR 5.4,  $p = 0.026$ ) when decreased and negative (OR 0.1,  $p = 0.0003$ ) when increased, while baseline level of IOP was not predictive (OR 1.4,  $p = 0.346$ ). Low (<50 mJ) or a high (>75 mJ) amounts of total laser energy were found to be negative (OR 0.4,  $p = 0.008$ ) and positive (OR 3.9,  $p = 0.006$ ) predictors, respectively, for success at 2 years, and seemed to be more linked to the intensity of the energy than the number of impacts.

#### Conclusions

IOP reduction at 2 months after SLT was strongly correlated with SLT success up to 2 years while high baseline IOP was not found to be a predictive factor of success. This study is another step towards attempting to effectively predict SLT efficiency.

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## **P-WT-142** **RHO-KINASE INHIBITORS, WHAT DO OPHTHALMOLOGISTS THINK?**

Jayson Koppinger\*

### **Purpose**

The purpose of this study is investigate the perceptions regarding a novel class of glaucoma medications. There had been no new classes approved in the US over the last 20 years, until the FDA approved a Rho-kinase inhibitor (ROCK-I). In preparation, this project conducts a survey of comprehensive and glaucoma specialists regarding their perceptions and knowledge.

### **Methods**

Survey questions assessing participant demographics, knowledge of ROCK-I, and perception of current topical therapeutics were sent to local ophthalmologists. Prospective participants were identified with publicly available information or was known to the author. Participants were sent an email and/or fax with the link to the online survey.

### **Results**

The survey had a response rate of 28% (53/192), with 62% male, and 38% Female. The respondents indicated they were: Comprehensive 60%, Glaucoma 26%, and Other 13%.

73% did not consider themselves knowledgeable about ROCK-I. However nearly all respondents (95%) identified the most common side effect of hyperemia. A majority identified the correct primary MOA of ROCK-I (71%), the use as an adjunctive medication (70%), and once daily dosing (68%). Only 24% of respondents were able to name a ROCK-I and identify the best use.

When prescribing, respondents favored scientific evidence, personal clinical experience, and safety profile. 93% of respondents thought currently available adjunctives were effective. All providers welcomed another topical IOP reducing medication as an adjunctive therapy, although less strongly agreed to the addition of a 1<sup>st</sup> line therapy. 57% of respondents considered themselves early adopters (<1 year), with the highest proportion being those in practice for 20+ years.

### **Conclusions**

All providers saw patients with OHTN or POAG, and despite ¾ of respondents not feeling knowledgeable about the new class, most did well. Respondents were pleased with the efficacy, but would welcome new adjunctives, highlighting the difficulty of treating these patients. Most valued the efficacy, safety profile, and cost as compared to regional patterns, emphasizing the importance practitioners place on patient centered care. The youngest practicing physicians were least likely to consider themselves early adopters, suggesting perhaps more cautious practice out of residency. Finally, glaucoma specialists were more likely to be early adopters and knowledgeable, which one could expect from a sub-specialist.

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## P-WT-143

### CLINICAL OUTCOME OF MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION IN INDIAN GLAUCOMA PATIENTS: PILOT STUDY

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#### Purpose

to evaluate the safety and efficacy of Micropulse Transscleral Cyclophotocoagulation in glaucoma in Indian patients.

#### Methods

50 eyes of 48 patients with glaucoma on maximal medical treatment were included in this prospective interventional case series.

The cases included both primary and secondary glaucomas : neovascular glaucoma(n = 15),status post trabeculectomy(n = 9),Pseudophakic glaucoma(n = 2),status post retinal detachment surgery(n = 6),advanced primary open angle glaucoma(n = 11),advanced angle closure glaucoma (n = 4),traumatic glaucoma (n = 2)Juvenile glaucoma (n = 1),Absolute glaucoma (n = 2).

After a detailed evaluation,all patients underwent a single session of the laser preset to recommended treatment guidelines. Power—2000mW of 810nm infrared diode laser set on micropulse delivery mode with duty cycle 31.33 %using the Micropulse probe applied in a continuous circumferential motion at the limbus at for 160s. Patients were put on topical steroids in tapering dose for 2 weeks in addition to their ocular antihypertensive medication.

Best corrected vision,anterior segment reaction,Intraocular pressure and fundus examination was evaluated at baseline,1 day,1 week,2 weeks,and every month for3 months..Medications were decreased in a stepwise fashion based on achieving target intraocular pressure.

#### Results

At baseline, patients were on an average of 3.45 topical glaucoma medications with an average IOP of 36.8mmHg. At Day1 IOP was reduced by 41%, at Day 7 by 49%, at 1 month by 41%, at 2 nd month by 39% and decreased 37% from baseline at 3 months after the procedure.

Average medication use decreased from 3.5 to 3.1 from baseline to final post op visit. deterioration in visual acuity of > 2 lines of vision in 2 patients,hypotony in 3 patients and moderate uveitis resolving with topical steroids in 3 patients.

#### Conclusions

Micropulse Transscleral Cyclophotocoagulation is an effective and safe procedure to reduce intraocular pressure and reduce the number of ocular antihypertensive medications.

It can be considered as a low risk alternative to incisional surgery in patients with high ocular and systemic risk and limited visual potential for rapid and sustained intraocular pressure control.

This study represents short term data and further studies can provide long term outcomes and utility of this novel tool.

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## P-WT-144

### THE STUDY OF NEURONAL MARKERS IN RETINOPROTECTION OF PRIMARY OPEN-ANGLE GLAUCOMA

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#### Purpose

To study the results of retinoprotective therapy on patients with primary open-angle glaucoma (POAG) based on the determination of specific biochemical neurotrophic and neurodegeneration markers.

#### Methods

A lacrimal fluid (LF) was analyzed in 23 patients (46 eyes) with POAG in second (16 patients) and third (7 patients) stages, and control group (CG) of 12 healthy individuals. Treatment included local anti-glaucoma medications and Retinalamin<sup>®</sup> injection 5mg daily for 10 days. The quantity of BDNF and NSE was determined.

#### Results

The BDNF of CG in LF was  $0.83 \pm 0.06$  ng/ml, the NSE- $0.51 \pm 0.06$  ng/ml. In patients with POAG, the indices were higher with BDNF- $1.39 \pm 0.85$ , NSE- $4.31 \pm 2.02$  ng/ml ( $P < 0.05$ ). After treatment with Retinalamin<sup>®</sup>, the content of BDNF was  $1.02 \pm 0.53$  ng/ml ( $p > 0.05$ ), while the NSE decreased to  $1.69 \pm 0.73$  ng/ml ( $P < 0.05$ ). Significant increase of the BDNF with II ( $1.37 \pm 0.41$  ng/ml,  $P < 0.05$ ) and III ( $1.52 \pm 1.39$  ng/ml,  $P < 0.05$ ) stages of POAG. The NSE marker was high in both stages ( $4.16 \pm 2.44$  and  $5.78 \pm 2.80$  ng/ml,  $P < 0.05$ ), which is an indication of degeneration of RGC. After treatment levels of BDNF were reduced to the values of the CG: stage II -  $0.95 \pm 0.49$  ng/ml and stage III -  $1.18 \pm 0.72$  ng/ml ( $p > 0.05$ ). After neuroprotective Retinalamin<sup>®</sup> therapy the level of NSE in patients with stage II decreased to the values of the CG ( $0.43 \pm 0.04$  ng/ml), while in stage III - it remained high ( $1.71 \pm 0.44$  ng/ml).

#### Conclusions

With POAG there is a compensatory increase of the BDNF level and a pathological increase in NSE in the LF. The change in the content of neuromarkers is determined depending on the stage of POAG. After treating patients with stage II of POAG using Retinalamin<sup>®</sup>, a decrease in initially high concentrations of BDNF and NSE in the LF to the values of the control group was noted. Patients with III stage shown high NSE values throughout the treatment.

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## P-WT-145

### A PROSPECTIVE ANALYSIS OF PENTACAM PARAMETERS PRE AND POST YAG PI IN PACS EYES

Alokesh Ganguly\*

#### Purpose

This was a prospective analysis to find out the pentacam parameter changes in pre and post PI in cases of PACS.

#### Methods

Routine patients presenting at the OPD were screened by the glaucoma specialist with GAT and the 4 mirror gonioscope under standard conditions. Those with PACS (defined as nonvisibility of the filtering trabecular meshwork for 180° or more in the absence of PAS with normal intraocular pressure) were advised YAG PI. Those patients who agreed to undergo treatment were first subjected to PENTACAM scan. Post YAG PI 7 days follow up they were checked for RR, IOP, PATENCY of YAG PI and then subjected to a post PI pentacam scan. The data from 67 such consecutive patients were then analysed.

#### Results

134 eyes of 67 patients were analysed. Pre and post PI IOP analysed by the paired t test showed two-tailed  $P=0.0107$  to be statistically significant. ACdepth(mm) compared in pre and post PI in RE was statistically significant the two-tailed  $P$  value 0.0409, however in LE it was not statistically significant. Pre and post PI AC Volume in mm<sup>3</sup> RE and LE were extremely statistically significant with the The two-tailed  $P$  value less than 0.0001. The internal depth pre and post PI in both the RE( two-tailed  $P$  value 0.8993) and LE( two-tailed  $P$  value equals 0.4433) were not statistically significant.

#### Conclusions

Amongst all the parameters of the pentacam analysed between the pre PI and post PI eyes with primary angle closure suspects only the change in anterior chamber volume in mm<sup>3</sup> was extremely significant statistically. This can serve as the best parameter to quantitatively analyse the efficacy of the procedure by pentacam in treated patient groups and also be helpful for post procedure audit of laser procedures done in glaucoma departments.

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## P-WT-146

### BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED-DOSE COMBINATION AS AN ADJUNCTIVE THERAPY TO A PGA IN PATIENTS WITH OAG OR OHT: SUBGROUP ANALYSIS

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#### Purpose

To determine the effect of To determine the effect of baseline (BL) characteristics on the additive intraocular pressure (IOP)-lowering effect of twice-daily brinzolamide 1%/brimonidine 0.2% fixed-dose combination (BBFC) in patients (pts) with open-angle glaucoma or ocular hypertension insufficiently controlled with prostaglandin analog (PGA) monotherapy.

#### Methods

Patients previously on PGA monotherapy, with a mean IOP of  $\geq 19$  and  $< 32$  mmHg were randomized to receive BBFC+PGA (n = 96) or vehicle+PGA (n = 92) for 6 weeks (W). Mean change and mean % change in IOP from BL at W6 were assessed in subgroups based on BL PGA sub-type (Bimatoprost, Latanoprost and Travoprost), IOP category (mmHg; 19–26 and 27–32), age (years [y]; 18–64 and  $\geq 65$ ), sex and race.

#### Results

At W6, mean change in diurnal IOP from BL was greater with BBFC+PGA vs vehicle+PGA ( $P < 0.001$ , primary endpoint met). Mean diurnal IOP (mmHg) in BBFC+PGA and vehicle+PGA arms was similar at BL regardless of the type of PGA (Bimatoprost: 22.9 vs 22.5 [n = 32 vs 30]; Latanoprost: 21.8 vs 22.3 [n = 38 vs 37]; Travoprost: 24.0 vs 24.2 [n = 25 vs 25]). At W6, mean change in diurnal IOP (mmHg) from BL was greater with BBFC+PGA vs vehicle+PGA (Bimatoprost -5.7 vs -3.4; Latanoprost -5.7 vs -1.5; Travoprost -5.2 vs -1.6). The corresponding mean % changes were -25.0% vs -14.9%; -26.2% vs -6.8% and -22.1% vs -7.2%, respectively. At W6, BBFC+PGA showed a greater mean change in diurnal IOP (mmHg) from BL than vehicle+PGA in both 19–26 mmHg (BBFC+PGA [n = 81]: -5.6; vehicle+PGA [n = 81]: -2.3) and 27–32 mmHg categories (BBFC+PGA [n = 5]: -5.2; vehicle+PGA [n = 7]: -0.1). The corresponding % changes were -25.1% vs -10.3% and -17.9% vs -0.5%. From BL to W6, mean change in diurnal IOP (mmHg) for BBFC+PGA vs vehicle+PGA was -6.1 (n = 34) vs -2.2 (n = 30) in 18–64 y pts and -5.3 (n = 52) vs -2.1 (n = 58) in pts  $\geq 65$  y. The corresponding % changes were -27.5% vs -9.8% and -22.9% vs -9.3%. Mean change in diurnal IOP (mmHg) from BL at W6 was higher with BBFC+PGA vs vehicle+PGA in males (n = 36 vs 46): -6.0 vs -2.6 and females (n = 50 vs 42): -5.3 vs -1.7. Across all races at W6, BBFC+PGA had higher IOP reductions compared to vehicle+PGA.

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### Conclusions

Consistent with the results of the full study cohort, BBFC+PGA showed a greater reduction in diurnal IOP vs vehicle+PGA, irrespective of type of PGA, age and gender.

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## P-WT-147

### TREATMENT OUTCOMES OF MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION IN REFRACTORY GLAUCOMA PATIENTS IN A TERTIARY GOVERNMENT HOSPITAL

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#### Purpose

The aim of this study is to determine if there is a difference in the average intraocular pressure (IOP) of refractory glaucoma cases who received Micropulse Transscleral Cyclophotocoagulation in six months.

#### Methods

This study is a retrospective, case series done in a tertiary government hospital. Intraocular pressures of 17 eyes of 14 patients with different refractory glaucoma cases with failed medical or surgical interventions were recorded after undergoing Micropulse Transscleral Cyclophotocoagulation. Intraocular pressures in time periods (Day 1, Week 1, Month 1, Month 2, Month 3, Month 6) were recorded and compared to baseline IOPs. Successful outcome measurements will be an IOP from 6 mmHg to 21 mmHg, or atleast a 30% decrease.

#### Results

The Micropulse Transscleral Cyclophotocoagulation was able to decrease the IOPs from a baseline mean of 40.3 to 18.3 mmHg by the 6<sup>th</sup> month. 11 out of 17 eyes (64.7%) were able to be within 6-21 mmHg or achieved an IOP reduction of less than 30% after 6 months. 2 eyes still had an IOP of more than 21 mmHg and did not achieve an IOP decrease of less than 30%. 4 other eyes had insufficient data. Significant differences between average IOPs as early as 1 week were already evident and were maintained until the sixth month. Medications were noted to be the same, prior and after the procedure after 6 months.

#### Conclusions

Micropulse Transscleral Cyclophotocoagulation is a decent conventional intervention for refractory glaucoma cases. It has attained success rates of lowering intraocular pressures in our study, achieving significant decrease from baseline to 6 months post procedure with minimal adverse effects. This gives ophthalmologists an additional IOP lowering option for intervening refractory glaucoma patients.

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**P-WT-148**

**CLINICAL OUTCOMES OF TRANSSCLERAL DIODE LASER CYCLOPHOTOCOAGULATION IN PEDIATRIC GLAUCOMA PATIENTS**

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**Purpose**

To evaluate the results of transscleral diode laser cyclophotocoagulation in pediatric glaucoma patients.

**Methods**

Medical records of the pediatric patients who underwent transscleral diode laser cyclophotocoagulation between January 2006 and January 2016 were reviewed retrospectively. Eyes with follow-up shorter than 6 months were excluded.

**Results**

Fifty-three eyes of 44 patients (28 boys, 16 girls) were included in the study. Mean age was 89.8 months (range, 4-204 months). Mean follow-up time was 38.9 months (range 6-120 months). Most of the eyes had aphakic and congenital glaucoma (45.3% and 37.7%, respectively). Before laser treatment, mean IOP was 29.5 mmHg (range, 23-55 mmHg). It was found as 17.5 mmHg (range, 5-35 mmHg) at last follow-up visit. Decrease in IOP level was statistically significant. The cumulative probability of success was found as 85.8% at first year and 62.9% at 5 years' follow-up visit. As a postoperative complication fibrinoid anterior chamber reaction was developed in 3 eyes and persistent epithelial defect was developed in 2 eyes.

**Conclusions**

Transscleral diode laser cyclophotocoagulation is found to be an effective and safe procedure in pediatric eyes.

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## P-WT-149

### LONG-TERM RESULT OF INTRAOCULAR PRESSURE REDUCTION EFFICACY OF PATTERN LASER TRABECULOPLASTY IN REFRACTORY GLAUCOMA PATIENTS

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#### Purpose

To assess the long-term result of the effectiveness of Pattern Laser Trabeculoplasty (PLT) in patients with refractory glaucoma.

#### Methods

A total 31 eyes of 24 patients with refractory glaucoma were enrolled in this study. Refractory glaucoma was defined as uncontrolled intraocular pressure (IOP) of more than 21 mmHg despite maximal anti-glaucoma medication from various causes in this study. The patients were divided into 3 groups by pigmentation of trabecular meshwork (TM) using gonioscopy: Group 1 was nearly invisible TM pigmentation (grade 0), Group 2 was low TM pigmentation grade (grade 1 and 2) and Group 3 was high TM pigmentation grade (grade 3 and 4). All patients were evaluated after PLT at 1 week, 1 month, 3 months, 6 months, 12 months and 18 months using slit lamp, gonioscopic examination and Goldmann applanation tonometry.

#### Results

The mean ( $\pm$  standard deviation) IOP in patients with refractory glaucoma was  $27.15 \pm 7.74$  mmHg before treatment. After PLT, the IOPs were  $18.35 \pm 5.02$  mmHg,  $19.18 \pm 2.48$  mmHg,  $18.08 \pm 3.03$  mmHg,  $17.29 \pm 3.34$  mmHg,  $16.39 \pm 2.53$  mmHg and  $17.06 \pm 3.29$  mmHg at 1 week, 1 month, 3 months, 6 months, 12 months and 18 months respectively. There was statistically significant decreased IOP from 1 week after PLT, and the pressure remains stable over 18 months. PLT has more effect on the patients who have the thicker trabecular meshwork pigmentation line ( $P < 0.05$ ) but less effective on the patients which whom the dexamethasone (OZURDEX<sup>®</sup>) was implanted.

#### Conclusions

PLT provides a possibility to decrease the number of anti-glaucomatic medications in refractory glaucoma patients. PLT can be considered as an auxiliary therapy for refractory glaucoma patients who cannot be controlled by maximal medical therapy prior to imminent surgical treatment.

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## P-WT-150

### COMPARISON OF MEIBOMIAN GLAND DYSFUNCTION IN PATIENTS USING PRESERVATIVE-CONTAINING OR PRESERVATIVE-FREE FORMULATION OF PROSTAGLANDIN ANALOGUES

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#### Purpose

To compare the ocular surface disease, especially meibomian gland dysfunction (MGD) between preservative-containing (PC) and preservative-free (PF) prostaglandin analogues (PGA) formulations in patients with open-angle glaucoma (OAG).

#### Methods

In this prospective, parallel, non-masked, randomized study, we enrolled treatment-naïve patients with OAG. Patients were randomly assigned to PC or PF PGA once daily for 12 months. All patients underwent intraocular pressure (IOP) by Goldmann applanation tonometer, ocular surface and meibomian gland assessment including ocular surface disease index (OSDI) questionnaire, tear film break-up time (TBUT), Schirmer's test, ocular surface staining (OSS) by Oxford scale, meibum score and meiboscore, lid margin abnormality score. Follow-up visits were scheduled at months 1, 3, 6, and 12.

#### Results

A total 80 patients were randomized [42 to PC group (24 to latanoprost, 18 to tafluprost); 38 to PF group (20 to latanoprost, 18 to tafluprost)]. There was no difference between age, sex ratio, baseline IOP, or type of PGAs between the two group. During follow-up period, there was no significant difference in IOP, OSDI, ocular surface parameters, and meibomian gland parameters between the two groups at months 3, 6, or 9. However, in 12 months, PC group showed lower OSDI score (PC:  $14.52 \pm 4.52$  vs PF:  $10.2 \pm 3.79$ ;  $p < 0.010$ ), shorter TBUT (PC:  $4.17 \pm 1.58$  vs PF:  $6.71 \pm 1.258$ ;  $p < 0.014$ ), higher OSS score (PC:  $1.34 \pm 0.47$  vs PF:  $1.10 \pm 0.29$ ;  $p < 0.032$ ) and lower meiboscore (PC:  $36.27 \pm 4.29$  % vs PF:  $29.79 \pm 3.14$  %;  $p < 0.001$ ) than PF group.

#### Conclusions

PC formulation induce more ocular discomfort, unstable tear film, poor ocular surface, and severe meibomian gland loss than PF formulation. Therefore, MGD should be assessed carefully before starting PGA and PF formulation may be recommended to patients with MGD.

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## P-WT-151

### COMPARISON OF OUTCOME PREDICTORS FOR MICROPULSE LASER TRABECULOPLASTY AND SELECTIVE LASER TRABECULOPLASTY

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#### Purpose

To identify and compare predictive factors of outcome for MicroPulse Laser Trabeculoplasty (MLT) and Selective Laser Trabeculoplasty (SLT).

#### Methods

50 MLT-treated eyes and 49 SLT-treated eyes of open-angle glaucoma patients with 2 months follow-up were included. Success was defined as definite or qualified. Definite success satisfied either  $\geq 20\%$  IOP reduction without addition of glaucoma medications or medication reduction while maintaining final IOP  $\leq 18$  mmHg. Qualified success satisfied  $\geq 20\%$  IOP reduction or medication reduction. Postoperative IOP elevation  $> 5$ mmHg (spikes) and adverse events were also collected.

#### Results

MLT had a higher success rate (24% definite, 78% qualified) than SLT (14.3% definite, 59.2% qualified), although this was not statistically significant ( $p = 0.330$  definite,  $p = 0.067$  qualified). Older age was associated with definite success for MLT ( $p = 0.002$ ) but not SLT ( $p = 0.663$ ). MLT had similar mean IOP lowering regardless of baseline IOP ( $p = 0.367$ ), but SLT patients with baseline IOP  $> 18$  mmHg experienced significantly greater mean IOP lowering compared to those with baseline IOP  $\leq 18$  mmHg ( $p = 0.002$ ). Glaucoma severity (MLT  $p = 0.092$ , SLT  $p = 0.268$ ), trabecular meshwork pigmentation (PTM) (MLT  $p = 0.723$ , SLT  $p = 0.161$ ), and number of laser shots (MLT  $p = 0.340$ , SLT  $p = 0.510$ ) did not have significant associations with either definition of success. No eyes had IOP spikes or complications requiring treatment.

#### Conclusions

MLT resulted in greater IOP and medication reduction than SLT. MLT was more successful in older patients than SLT and equally effective regardless of baseline IOP, unlike SLT. Glaucoma severity, PTM, or total number of laser shots were not associated with outcomes of either laser trabeculoplasties.

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## P-WT-152

### A REVIEW OF THE CURRENT STATUS OF SIMULTANEOUS TOPICAL AND SYSTEMIC BETA BLOCKER PRESCRIPTION

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#### Purpose

Topical beta-blockers are prescribed by ophthalmologists for treatment of glaucoma and systemic beta-blockers are used for various cardiovascular diseases. However, co-administration may lead to interactions and unexpected outcomes. An audit of the situation is necessary to quantify the issue and for planning of further action.

#### Methods

Patients who were prescribed topical and systemic beta-blockers simultaneously during the one-year period between 1/1/2017 to 31/12/2017 were identified using CDARS(local data searching system). The clinical notes within the ePR system(local clinical record system) of every identified patients were reviewed. Demographic data including age and sex, type of topical and systemic beta-blockers used, underlying cardiovascular diagnosis, respiratory diagnosis, together of adverse outcomes in terms of bradycardia, heart failure, respiratory distress and syncope-like episodes were documented.

#### Results

A total of 2967 patients were prescribed with topical beta-blockers in 2017, out of which 623 patients were on systemic beta-blockers simultaneously. 90 patients have underlying arrhythmia, 28 patients have pre-existing diagnosis of heart failure and 11 patients have underlying peripheral vascular diseases. 4 patients have underlying obstructive airway disease. There were 16 cases of documented bradycardia, 23 cases of heart failure exacerbation and 30 cases of syncope-like episodes within 2017.

#### Conclusions

Only a minority of patients on topical beta-blockers were on systemic beta blockers and mostly well tolerated. Adverse outcomes were uncommon. However this still carry significance as (1) the expected efficacy of topical treatment may be undermined (2) systemic absorption of topical treatment may cause side effects and (3) economic implication of wasted treatment and admission episodes generated. However, it would be difficult to establish the causal relationship. In addition no single parameter will help to predict which patient will be more susceptible. To further increase the level of safety constant awareness, interdisciplinary collaboration and computer crosschecking system may be helpful.

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## P-WT-153

### EFFICACY AND SAFETY OF MICROPULSE LASER TRABECULOPLASTY FOR PRIMARY OPEN ANGLE GLAUCOMA

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#### Purpose

To evaluate the efficiency and safety of MLT (Micropulse Laser Trabeculoplasty) for primary open angle glaucoma (POAG) patients.

#### Methods

POAG patients were enrolled from June 2016 to November 2017. General information, best corrected visual acuity, intraocular pressure (IOP), and glaucoma medication were recorded. IOP at different follow-up and glaucoma medication before and after treatment were compared.

#### Results

72 eyes of 72 patients were enrolled. IOP was  $20.6 \pm 5.9$  mmHg before MLT and  $20.8 \pm 6.8$  mmHg at 2 hours after MLT. The IOP of 1 day, 1 week, 4 weeks, 12 weeks and 24 weeks was  $17.9 \pm 4.4$  mmHg,  $18.0 \pm 4.3$  mmHg,  $17.5 \pm 3.4$  mmHg,  $17.0 \pm 2.7$  mmHg and  $16.5 \pm 2.9$  mmHg respectively. The IOP before and after MLT demonstrated a statistically significant difference by the ANOVA analysis ( $F = 5.797$ ,  $P < 0.001$ ). LSD- $t$  test showed there was no statistically significant difference between pre-MLT IOP with 2 hours after MLT ( $P = 0.207$ ). The statistically significant difference was confirmed between the pre-MLT IOP with 1 day, 1 week, 4 weeks, 12 weeks and 24 weeks after MLT ( $P = 0.006$ ,  $0.009$ ,  $0.001$ ,  $<0.001$ ,  $<0.001$ , respectively). A Kaplan-Meier life-table analysis showed an success rate of 54.2% at 24 weeks follow-up. Multivariate logistic regression analysis showed older age (OR = 1.142; 95% CI 1.014-1.286;  $P = 0.029$ ) and higher pre-MLT IOP (OR = 2.957; 95% CI 1.247-7.013;  $P = 0.014$ ) were significant predictors for MLT.

#### Conclusions

MLT was effective and safe for POAG patients. No patients experienced IOP spike after MLT. The IOP six months after treatment decreased significantly with less glaucoma medication.

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## P-WT-154

### COMBINED SUBCONJUNCTIVAL INJECTION OF DEXAMETHASONE FOR THE MANAGEMENT OF ACUTE PRIMARY ANGLE CLOSURE

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#### Purpose

To investigate whether the combined subconjunctival injection of dexamethasone can alleviate the inflammation in acute primary angle closure (APAC)-affected eyes and accelerate the decrease in intraocular pressure (IOP).

#### Methods

Forty-two patients with APAC eyes were recruited for a randomized controlled trial. These patients were separated into two groups: the injection group (21 patients) and the control group (21 patients). The injection group was subjected to a subconjunctival injection with 2.5 mg dexamethasone disodium phosphate. Other drug treatments were the same with the control group. The follow-up was at 0, 3, 6, 12, and 24 hours after injection. Observations were focused on the IOP, visual acuity, corneal edema, anterior chamber cells, anterior chamber flare, and conjunctival erythema among others.

#### Results

The IOP was significantly decreased in both groups after treatment, and the mean IOP at each follow-up was lower than the baseline. However, 24 hours after the subconjunctival injection with 2.5 mg dexamethasone, the IOP of the injection group was significantly lower compared to the control group ( $P = 0.017$ ). Kaplan-Meier survival curve analysis showed that the total success rate of the injection group and the control group were 79.7% and 54.9% at 24 hours after treatment ( $P = 0.027$ ), respectively. For the comparison of anterior chamber inflammation, the severity of conjunctival erythema, ciliary flush, and pain in the injection group was also lower than that in the control group at 24 hours after treatment ( $P = 0.012$ ,  $P = 0.048$ , and  $P = 0.013$ , respectively). No statistical significance was found between the two groups regarding the anterior chamber cells, anterior chamber flare, and photophobia.

#### Conclusions

The combined subconjunctival injection of dexamethasone for the management of APAC eyes can significantly accelerate the relief of high IOP, and therefore, improve the success rate of treatment. The obtained results in this study provide important and meaningful evidence to guide anti-inflammatory treatment for people suffering from APAC eyes.

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## P-WT-155

### BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED COMBINATION ADJUNCTIVE TO TRAVOPROST 0.004%/TIMOLOL 0.5% FIXED COMBINATION: EFFECT OF MMT ON IOP LOWERING AND OPP

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#### Purpose

To determine the effect of twice-daily brinzolamide 1%/brimonidine 0.2% fixed-dose combination (BBFC) on intraocular pressure (IOP) levels and ocular perfusion pressure (OPP) when used as an adjunct to once-daily travoprost 0.004%/timolol 0.5% fixed-dose combination (TTFC) in patients with open-angle glaucoma (OAG) and ocular hypertension (maximal medical therapy).

#### Methods

In this Phase IV, double-masked, multicentre study (NCT02730871), patients previously on TTFC for  $\geq 28$  days with a mean IOP  $\geq 19$  mmHg to  $\leq 28$  mmHg were randomized (1:1) to receive BBFC (n = 67) or vehicle (n = 67) for 6 weeks. Exploratory endpoints included the percentage of patients achieving target IOPs (i.e.  $\leq 12$ ,  $\leq 13$ ,  $\leq 14$ , ...  $\leq 25$  mmHg) at Week 6 and differences between treatments in OPP from baseline (BL) at Week 6 (diurnal and individual time points [09:00 h and 11:00 h]). These endpoints were analysed descriptively.

#### Results

The mean age of patients was 65.7 years, 54.5% were female, and 75.4% were diagnosed with primary OAG. Mean IOP at BL was 21.6 mmHg and 21.8 mmHg in the BBFC+TTFC and vehicle+TTFC groups, respectively. A notably higher proportion of patients in the BBFC+TTFC group compared with the vehicle+TTFC group achieved a target IOP of  $\leq 18$  mmHg at Week 6 (62.7% vs 35.8%). The proportion of patients achieving an IOP of  $\leq 13$ ,  $\leq 14$ ,  $\leq 15$ ,  $\leq 16$ ,  $\leq 17$ ,  $\leq 19$ ,  $\leq 20$ , and  $\leq 21$  mmHg was also higher with BBFC+TTFC than with vehicle+TTFC (10.4% vs 7.5%, 19.4% vs 9.0%, 28.4% vs 13.4%, 40.3% vs 19.4%, 50.7% vs 25.4%, 71.6% vs 44.8%, 79.1% vs 58.2%, 88.1% vs 73.1%). An IOP of  $\leq 12$  mmHg was achieved by 3% of patients in both treatment groups. The OPP at BL was similar between the two groups (BBFC+TTFC 49.9 mmHg; vehicle+TTFC 50.0 mmHg). The mean change from BL at Week 6 in OPP was 2.6 mmHg with BBFC+TTFC and 2.1 mmHg with vehicle+TTFC. The mean change and mean percentage change from BL at Week 6 in OPP at 11:00 h and 09:00 h was similar between the two groups (11:00 h: BBFC+TTFC 1.9 mmHg (4.4%), vehicle+TTFC 1.3 mmHg (3.2%); 09:00 h: BBFC+TTFC 2.6 mmHg (5.5%), vehicle+TTFC 1.9 mmHg (4.2%).

#### Conclusions

A higher proportion of patients on maximal medical therapy with BBFC+TTFC achieved a target IOP reduction (range  $\leq 13$  mmHg to  $\leq 18$  mmHg) after 6 weeks compared with those on TTFC alone. BBFC+TTFC had no adverse impact on OPP. BBFC may be a suitable adjunctive therapy for patients on TTFC requiring further IOP lowering.

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## P-WT-156

### COMPARATIVE RESULTS OF AB INTERNO CANALOPLASTY VS TRABECULECTOMY IN OPEN ANGLE GLAUCOMA

Juan Carlos Izquierdo\*

#### Purpose

To compare the efficacy and safety of AB interno Canaloplasty (ABiC) versus Trabeculectomy in the reduction of intraocular pressure (IOP) and glaucoma medications in patients with Primary open angle glaucoma (POAG).

#### Methods

Patients with prior diagnosis of uncontrolled POAG or PEX despite maximal tolerated medical therapy who received the surgical intervention studied were included; the study groups were divided according to the intervention: 42 eyes underwent trabeculectomy (Group I) or phacotrabeculectomy (Group III), and 76 eyes underwent ABiC (Group II) or phacoABiC (Group IV). Outcome measures included IOP, glaucoma medication, visual acuity, complications and postoperative interventions.

#### Results

This study included 118 eyes of 88 patients. Baseline IOP $\pm$ SD was 20.13  $\pm$  4.52 mmHg in Group I and 15.96  $\pm$  5.09 mmHg in Group II (P = 0.033) and at 9 months were 13.63  $\pm$  1.85 mmHg and 13.67  $\pm$  5.03 mmHg respectively (P = 0.818). The mean preoperative IOP $\pm$ SD was 18.20  $\pm$  5.93 mmHg in Group III and 16.90  $\pm$  8.33 mmHg in Group IV (P = 0.363), which decreased to 12.20  $\pm$  2.59 mmHg and 10.33  $\pm$  0.58 mmHg respectively (P = 0.321) at 9 months follow up. Glaucoma medication decreased was not clinically significant comparing the groups I and II, III and IV. Complete success Complete success defined as IOP  $\leq$  14 at 9 months without glaucoma medications was 50% in Group I, 33.3% in Group II (P = 0.02), 80% in Group III and 100% in Group IV (P = 0.03). When the target IOP was change to 16, 18 and 21 mmhg the percentage was similar in all the groups. Qualified success with target IOP  $\leq$  14 mmHg were 62.5%, 66.7% (p = 0.45), 80%, 100% (p = 0.03) respectively. Visual acuity remains stable in stand-alone procedures and increase with out differences between the groups in combined procedures. Complications were higher in trabeculectomy groups.

#### Conclusions

As stand-alone procedure trabeculectomy is more effective in decreasing IOP from baseline, achieving higher percentage in complete success with IOP target of 14 mmhg, in combined procedures both phacoABiC and phacotrabeculectomy are comparable in decreasing IOP, PhacoABiC achieved higher percentage in complete success with IOP target of 14 mmhg.

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## P-WT-157

# COMPARISON OF DIFFERENT COMBINATIONS OF MAXIMUM MEDICAL THERAPY FOR LOWERING INTRAOCULAR PRESSURE IN PRIMARY OPEN ANGLE GLAUCOMA

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### Purpose

To compare the efficacy and safety of two combinations of maximum medical therapy for lowering intraocular pressure (IOP) in primary open angle glaucoma (POAG).

### Methods

This study was a retrospective consecutive case series study including 84 eyes in 84 subjects with POAG treated with maximum medical therapy for lowering IOP. Enrolled patients were divided into 2 groups: the triple maximum medical therapy (TMT) group, comprising POAG patients who were treated with tafluprost, brimonidine, and the fixed drug combination (FDC) brinzolamide/timolol; and the double maximum medical therapy (DMT) group, comprising POAG patients who were treated with the FDCs tafluprost/timolol and brinzolamide/brimonidine. We compared the demographics, baseline IOP, IOP reduction rate, and adverse drug reactions (ADRs) between the 2 groups.

### Results

While the mean IOP reduction rate after 12 months was higher in the TMT group than in the DMT group, at 52.7% and 50.4%, respectively, the difference was not significant (p-value = 0.615). In the TMT group, the rate of proceeding to laser or surgical therapy was 22.2% (DMT group = 37.8%). In the TMT group, the time duration between beginning maximum medical therapy and proceeding to the laser or surgical therapy was  $10.7 \pm 1.3$  months (DMT group =  $10.3 \pm 1.5$  months). No serious ADRs were reported in either group. However, The incidence rate of conjunctival hyperemia and dry eye was statistically significant lower in the DMT group than in the TMT group.

### Conclusions

DMT is safe and effective for lowering IOP in POAG patients. DMT is noninferior to TMT in POAG patients.

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## P-WT-158

### FACTORS AFFECTING INTRAOCULAR PRESSURE CHANGE AFTER LASER IRIDOTOMY IN FELLOW EYE WITH ACUTE ANGLE CLOSURE GLAUCOMA

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#### Purpose

To investigate the factors affecting IOP change after prophylactic laser iridotomy (LI) in the fellow eye with acute angle closure glaucoma.

#### Methods

Forty subjects with acute angle closure glaucoma, who had undergone prophylactic LI in the fellow eye were enrolled in this study. Subjects with more than 180 degrees peripheral anterior synechiae at the gonioscopic examination were excluded. IOP was measured before and 1 week after LI. Twenty eyes with IOP reduction of 20% or more (Group A) and twenty eyes with IOP reduction of less than 20% (Group B) were scanned by swept-source optical coherence tomography. The anterior segment parameters were measured and compared.

#### Results

The mean age, the best corrected visual acuity and the baseline IOP were not significantly different between the two groups ( $p > 0.05$ ). The IOP after LI was significantly different between the two groups (Group A,  $11.3 \pm 2.1$  mmHg; Group B,  $13.6 \pm 2.0$  mmHg;  $p = 0.020$ ). There was a significant difference in IOP change rate between the two groups (Group A,  $30.26 \pm 11.57\%$ ; Group B,  $8.29 \pm 6.14\%$ ;  $P < 0.001$ ). The values of anterior chamber depth (ACD), lens vault, nasal trabecular iris angle (TIA) 500, temporal TIA 750, and anterior chamber volume showed significant differences between two groups ( $P < 0.05$ ). In multiple regression analysis, only ACD was significantly associated with IOP change rate ( $p = 0.014$ ).

#### Conclusions

The ACD is associated with the change of IOP after prophylactic LI in the fellow eye with acute angle closure glaucoma. This should be taken into account when considering the timing and effects of the prophylactic LI.

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## P-WT-159

### EFFECT OF BRINZOLAMIDE 1%/BRIMONIDINE 0.2% BID FIXED-DOSE COMBINATION AS AN ADJUNCTIVE THERAPY TO A PGA ON OPP IN PATIENTS WITH OAG OR OHT

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#### Purpose

To determine the effect of twice-daily brinzolamide 1%/brimonidine 0.2% fixed-dose combination (BBFC) as an adjunct to a prostaglandin analog (PGA) on ocular perfusion pressure (OPP), in patients with open-angle glaucoma (OAG) or ocular hypertension (OHT) insufficiently controlled with PGA monotherapy. Low OPP is associated with increased prevalence of OAG1.

#### Methods

In this Phase IV, double-masked, randomized clinical study (NCT02419508), adult patients with OAG or OHT on PGA monotherapy for  $\geq 28$  days, with a mean IOP of  $\geq 19$  and  $< 32$  mmHg were randomized to receive BBFC+PGA (n = 96) or vehicle+PGA (n = 92) for 6 weeks. Exploratory endpoints included the mean ocular perfusion pressure (OPP, defined as  $2/3 \times [\text{diastolic blood pressure} + 1/3 [\text{systolic blood pressure} - \text{diastolic blood pressure}] - \text{IOP}]$ ) at Week 6 and the mean change from baseline in OPP at Week 6 (diurnal and individual time points).

#### Results

The mean age of the patients was 67.2 years, 52.4% were female and 81.3% were diagnosed with primary OAG. At baseline, the mean (standard deviation, SD) OPP in the BBFC+PGA (n = 95) and the vehicle+PGA (n = 92) groups was similar (48.2 [6.52] mmHg vs 49.4 [6.72] mmHg). The mean [SD] change in the diurnal OPP from baseline at Week 6 with BBFC+PGA was higher compared with vehicle+PGA (2.4 [4.30] mmHg vs 0.6 [3.74] mmHg). At baseline, the mean (SD) OPP in BBFC+PGA and vehicle+PGA groups was similar at 09:00 h and 11:00 h (09:00 h: 48.4 [6.53] mmHg vs 49.5 [7.07] mmHg; 11:00 h: 48.4 [7.00] mmHg vs 49.5 [6.86] mmHg). At Week 6, the mean (SD) OPP at 09:00 h was 51.0 (7.32) mmHg with BBFC+PGA and 50.2 (7.72) mmHg with vehicle+PGA, corresponding to a higher mean (SD) change in OPP from baseline with BBFC+PGA than with vehicle+PGA (2.5 [5.22] mmHg vs 0.6 [4.40] mmHg). Similarly at Week 6, the mean [SD] OPP at 11:00 h was comparable in both groups (BBFC+PGA, 49.9 [7.84] mmHg; vehicle+PGA, 49.5 [7.79] mmHg) and the mean [SD] change in OPP from baseline at 11:00 h was higher with BBFC+PGA than with vehicle+PGA (1.4 [4.76] vs -0.2 [4.52]).

#### Conclusions

BBFC+PGA had no adverse impact on OPP and resulted in numerically higher pressures vs vehicle+PGA. BBFC may be a suitable adjunctive therapy for patients on PGA requiring further IOP lowering without compromising the OPP.

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## P-WT-160

### OUTCOMES OF SELECTIVE LASER TRABECULOPLASTY FOR POST VITREORETINAL SURGERY SECONDARY GLAUCOMA

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#### Purpose

To prospectively evaluate the efficacy of selective laser trabeculoplasty (SLT) in patients of post vitreoretinal surgery (VR) secondary glaucoma after silicon oil removal (SOR).

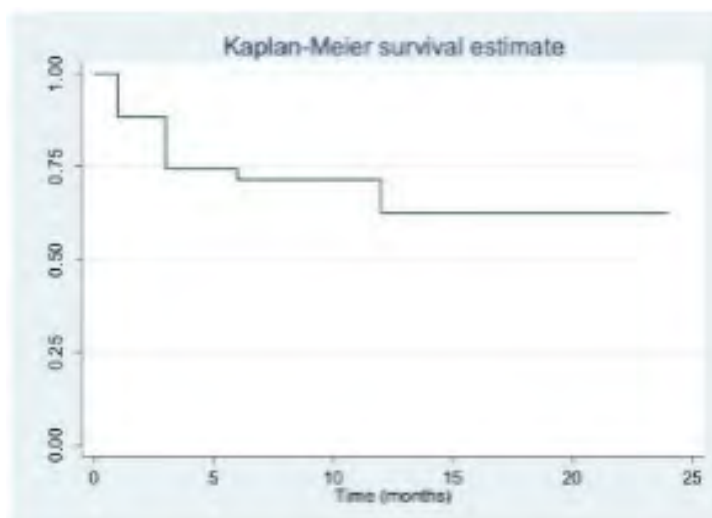
#### Methods

Patients diagnosed with post SOR secondary glaucoma with uncontrolled IOP on topical or systemic anti glaucoma therapy were offered a trial of 360 degree SLT, whenever possible. The patients were followed up prospectively over 1, 3, 6, 12, 24 months post laser to evaluate the efficacy of SLT. Success was defined as an IOP reduction > 20% at 6 months or an IOP < 21 mmHg at 6 months. Factors such as age, pre laser IOP, number of prelaser anti-glaucoma medications, duration between VR surgery and the SLT were studied for their effect on outcome.

#### Results

The mean age of the patients was  $36.5 \pm 14.8$  years. Out of 42 eyes of 42 patients pre-SLT, all eyes were on maximal topical anti glaucoma medications and 16 patients were on systemic acetazolamide also. The mean pre laser IOP was  $28.4 \pm 8.2$  mmHg and post-SLT at 6 months, it was  $18.7 \pm 7.3$  mmHg. Cumulative success probability (Kaplan Meier, Fig 1) was 66.6% at 6 months and 58.3% at 24 months. None of the factors such as age, prelaser IOP, number of medications or duration between VR surgery and the SLT were found to be determinants of failure on univariate analysis.

#### Image



#### Conclusions

Two third eyes with secondary glaucoma following vitreoretinal surgery with silicone oil benefitted from SLT and more than half could maintain IOP control upto 2 years. Hence SLT should be considered a viable option in such eyes with poor control on medical therapy.

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## P-WT-161

### INHIBITORS OF RENIN-ANGIOTENSIN SYSTEM AS POTENTIAL TREATMENT OF STEROID INDUCED TRABECULAR MESHWORK REMODELING: IN VITRO STUDY

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#### Purpose

Systemic or topical corticosteroid treatment is commonly associated with increased intraocular pressure due to accumulation of extracellular matrix (ECM) in trabecular meshwork. Renin angiotensin system (RAS) inhibitors are well known to attenuate ECM deposition in cardiovascular and other systems, however their effects on TM remodelling are not investigated yet. The aim of the study was to evaluate dose and time-dependent effects of RAS inhibitors on production and degradation of ECM in dexamethasone (DEXA) pretreated human trabecular meshwork (HTM) cells.

#### Methods

HTM cells were pretreated with DEXA 1E-7 M for 14 days, when were divided into 9 groups. Group 1 was continuously cultured with DEXA 1E-7 M, and the rest of the groups were co-treated with DEXA 1E-7M and enalaprilat dehydrate or losartan potassium in concentrations of 1E-4, 1E-5, 1E-6, and 1E-7 M for both drugs. HTM cells cultured in Dulbecco's modified Eagle's medium (DMEM) only were used as a control. All groups were incubated for another 7 or 14 days. Immunocytochemistry, western blot and ELISA were performed to measure fibronectin (FN),  $\alpha$ -smooth muscle actin ( $\alpha$ -SMA), MMP-2 and 9, TIMP-1 and 2.

#### Results

DEXA significantly increased production of FN,  $\alpha$ -SMA and both TIMP-1 and 2 by day 14 of pretreatment while significantly reduced production of both types of MMPs. Following cotreatment of HTM cells with either enalaprilat or losartan abolished the effects of DEXA on ECM deposition by decreasing production of FN and  $\alpha$ -SMA at all tested concentrations in both time points with the maximum reduction 3.44 and 4.05 folds for FN and 6.31 and 3.86 folds for  $\alpha$ -SMA in enalaprilat and losartan treated groups, respectively ( $P < 0.001$ ). MMP-2 and 9 levels showed significant increase by 3.73 and 2.84 folds in enalaprilat and by 3.51 and 3.40 folds in losartan co-treated groups, while both TIMP-1 and 2 levels were significantly reduced by 1.80 folds and 1.63 folds in enalaprilat-treated group and by 2.09 folds and 2.11 folds in losartan-treated group. No significant differences were found between all tested doses of both drugs. The time dependent effect for 7 and 14 days of treatment was also not detected for most of the tested parameters.

#### Conclusions

RAS inhibitors significantly decrease ECM deposition in dexamethasone pretreated HTM cells which was likely contributed by modulating of production of MMPs and TIMPs. Both groups of RAS inhibitors are potentially attractive in the treatment of steroid-induced glaucoma.

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## P-WT-162

### LONG-TERM EFFECTS OF TOPICAL BRIMONIDINE TARTRATE 0.2% ON OCULAR SURFACE PARAMETERS IN A TERTIARY EYE CARE HOSPITAL IN BANGLADESH

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#### Purpose

Ocular surface disease (OSD) is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance and tears film instability with potential damage to the ocular surface. The purpose of this study was to evaluate the changes of the ocular surface parameters in patients using topical brimonidine tartrate 0.2%.

#### Methods

This was a prospective study in which glaucoma subjects from a single academic center (Ispahani Islamia Eye Institute and Hospital, Bangladesh) using topical brimonidine tartrate 0.2% for more than one year were prospectively recruited. They underwent ophthalmological examination which comprised: Ocular Surface Disease Index (OSDI) questionnaire, tear film break up time (TFBUT), ocular surface staining with fluorescein, Schirmer test with anesthesia, and the presence of Meibomian gland dysfunction. Additionally, the following risk factors were evaluated: age, sex, number and type of other antiglaucomatous topical medications, time of usage and ocular surgery history.

#### Results

Overall 313 patients from glaucoma clinic were recruited, the 202 (64.54%) patients were found to have scored in the OSD test. The distribution was mild (n = 100, 31.95 %), moderate (n = 54, 17.25 %) or severe (n = 48, 15.34 %) OSD symptoms. The mean age was  $67.85 \pm 13.26$  years (range, 21-90). Blepharoconjunctivitis was detected in 72.3% of patients using topical brimonidine 0.2% for more than one year. 54.55% patients had abnormal TFBUT (<5 seconds) and 15.88% patients had an abnormal Schirmer test (<5 mm).

#### Conclusions

Blepharoconjunctivitis is a clinical problem often overlooked in patients who using topical brimonidine 0.2% and recognition of the condition and appropriate treatment can improve patient symptoms. The findings obtained from this study also suggest that the drug itself may be responsible for the deterioration of the ocular surface parameters.

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## P-WT-163

# THE EFFECTIVENESS OF INTRAOCULAR PRESSURE REDUCTION AND SUPPRESSION OF VISUAL FIELD LOSS PROGRESSION ON EARLY GLAUCOMA

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### Purpose

To investigate the effectiveness of suppression of visual field loss progression as intraocular pressure (IOP) is reduced in cases of early glaucoma treated with latanoprost monotherapy.

### Methods

The subjects were 60 cases/60 eyes (primary open-angle glaucoma (POAG) : normal-tension glaucoma (NTG) 8:52, male: female 50:10, mean age  $53.1 \pm 11.3$  years, average mean deviation (MD) value  $-1.70 \pm 1.80$  dB, mean observation period  $5.1 \pm 1.6$  years) with broadly defined POAG. The subjects underwent the highly reliable Humphrey visual field test (30-2 SITA-Standard) a minimum of five times while undergoing long-term latanoprost monotherapy. MD slope was used to assess the degree of visual field loss progression. The amount of shift in the slope was calculated after the fifth measurement.

Percentage of IOP decline was organized into the following categories: 1. Under 20%, 2. 20% to under 30%, and 3. Over 30%. MD slope shift was assumed to indicate event onset when it exceeded  $\geq -0.3$ dB/y,  $\geq -0.5$ dB/y, and  $\geq -0.7$ dB/y respectively, and it was compared to the survival curve for each percentage decline in IOP.

### Results

Mean time until event onset in the under 20% group was  $4.55 \pm 0.39$  (y),  $4.78 \pm 0.38$  (y), and  $5.35 \pm 0.37$  (y) for MD slope shifts of  $-0.3$ dB/y,  $-0.5$ dB/y, and  $-0.7$ dB/y respectively. In the 20% to under 30% group the values were  $6.03 \pm 0.55$  (y),  $6.61 \pm 0.46$  (y), and  $6.90 \pm 0.40$  (y) respectively. In the Over 30% group the values were  $8.10 \pm 0.55$  (y),  $8.65 \pm 0.45$  (y), and  $9.21 \pm 0.29$  (y) respectively.

### Conclusions

The results of this study suggest that improvement in the rate of IOP decline may suppress visual field loss progression in cases of extremely early glaucoma.

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## P-WT-164

# A RANDOMIZED CONTROLLED TRIAL COMPARING THE EFFICACY AND SAFETY BETWEEN PATTERN LASER TRABECULOPLASTY AND SELECTIVE LASER TRABECULOPLASTY

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### Purpose

To compare intra-ocular pressure (IOP) lowering efficacy and safety between SLT and PLT in patients with ocular hypertension and glaucoma.

### Methods

132 eyes from 132 OHT or POAG patients were randomly selected to receive either SLT or PLT (11 OHT and 55 POAG received SLT; 11 OHT and 55 POAG received PLT) from 5 Mar 15 – 29 Dec 2016. Recruited patients were either newly diagnosed and untreated individuals or patients who underwent a 4-week wash out period prior to baseline investigation. Patients were followed up at baseline, post-laser day 1, week 1, month 1, month 3, month 6, month 9 and month 12 for IOP and routine checkup. Diurnal IOP, RNFL imaging and visual field test were performed at baseline, month 6 and month 12 visit. There were no significant differences in age, spherical equivalent, visual field MD, and IOP between the treatment arms at the baseline visits (Table 1) ( $p \geq 0.516$ , independent  $t$ -test). Average RNFL thickness was higher in SLT group compared with PLT group (SLT: 80.9 $\mu$ m, PLT: 76.1  $\mu$ m,  $p = 0.027$ ). The diurnal mean GAT and DCT IOP measurements at the baseline were 21.4  $\pm$  4.6 mmHg and 25.6  $\pm$  4.8 mmHg, respectively, for patients randomized to SLT, and 21.1  $\pm$  4.2 mmHg and 25.1  $\pm$  4.7 mmHg, respectively, for patients randomized to PLT ( $p = 0.670$  and 0.516 respectively).

### Results

7 and 7 eyes from SLT group and 10 and 6 eyes PLT group attain complete success (IOP reduction > 20%) measured by GAT and DCT respectively. There were no significant difference in the proportion of patients achieve complete success between SLT and PLT groups, when IOP was measured by GAT ( $P = 0.499$ ) and DCT ( $P = 1.000$ ). 8 and 7 patients from SLT group resumed IOP lowering medication after month 6 and moth 12 follow up, respectively; 11 and 7 patients from PLT group resumed IOP lowering medication after month 6 and moth 12 follow up, respectively. After excluding these eyes, a comparison of mean GAT IOP from post laser to month 12 follow up between SLT group and PLT group was shown (Figure1). There was no significant difference in GAT IOP between SLT group and PLT group measured in post laser, week 1, month 1, month 3, month 6, month 9, month 12 follow up (table 2).

Higher baseline GAT/DCT IOP measurements and OPA ( $p \leq 0.000$ ) were significantly associated with a greater GAT/DCT IOP reduction from the baseline.

### Conclusions

1) PLT is as effective and safe as SLT in lowing IOP in OHT and POAG patients; 2) Higher baseline GAT/DCT IOP measurements and OPA were associated with greater GAT/DCT IOP reduction from baseline.

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## P-WT-165

### A COMPARISON OF EFFICACY AND SAFETY BETWEEN PATTERN SCANNING LASER TRABECULOPLASTY AND SELECTIVE LASER TRABECULOPLASTY IN OPEN ANGLE GLAUCOMA

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#### Purpose

To compare the IOP-lowering effect and safety between 360 degree pattern scanning laser trabeculoplasty(PLT) and inferior 180 degree selective laser trabeculoplasty(SLT).

#### Methods

40 patients with primary open angle glaucoma and normal tension glaucoma were treated with 360 degree PLT and 28 patients with the same diagnosis were treated with inferior 180 degree SLT.

Intraocular pressure was checked at 1 day, 1 week, 1 month and 2, 3, 6 months after trabeculoplasty. Anterior chamber reaction and ocular pain was checked at postoperative 1 day. Peripheral anterior synechia was examined at 6 months postoperatively.

#### Results

At 6 months postoperative, the PLT group had mean IOP  $17.52 \pm 3.49$  mmHg with mean reduction of 15.0%, while the SLT group had mean IOP of  $18.18 \pm 3.41$  mmHg with mean reduction of 17.4%.

There were no differences in IOP reduction between two groups.

There was no severe complication in both groups.

#### Conclusions

PLT and SLT are equally effective statistically in lowering IOP over a 6 month period ( $p = 0.965$ ). Both 360° PLT and inferior 180° SLT seem safe procedure that guarantees the successful intraocular pressure decrease.

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## P-WT-166

### BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED-DOSE COMBINATION AS AN ADJUNCT TO TRAVOPROST 0.004%/TIMOLOL 0.5% FIXED-DOSE COMBINATION THERAPY IN OAG OR OHT

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#### Purpose

To evaluate the additive intraocular pressure (IOP)-lowering effect of twice-daily brinzolamide 1%/brimonidine 0.2% fixed-dose combination (BBFC) when used as an adjunct to once-daily travoprost 0.004%/timolol 0.5% fixed-dose combination (TTFC) in patients with open-angle glaucoma or ocular hypertension who were already receiving TTFC (maximal medical therapy).

#### Methods

Patients on TTFC with a mean IOP  $\geq 19$  mmHg and  $\leq 28$  mmHg were randomized (1:1) to receive BBFC (n = 67) or vehicle (n = 67) for 6 weeks. The efficacy endpoints were the mean change in diurnal IOP (averaged over 09:00 h and 11:00 h) from baseline (BL) at Week 6 (primary), mean diurnal IOP at Week 6 and the mean change and mean % change from BL in IOP at 11:00 h and 09:00 h at Week 6.

#### Results

This study (NCT02730871) was terminated prematurely due to recruitment challenges. The mean age of patients was 65.7 years; 54.5% were female. At BL, the mean IOP was 21.6 mmHg and 21.8 mmHg in the BBFC+TTFC and vehicle+TTFC groups, respectively. The mean change in diurnal IOP from BL at Week 6 was statistically significant and greater with BBFC+TTFC (-4.25 mmHg) than with vehicle+TTFC (-2.11 mmHg) with a treatment difference (TD) of -2.15 mmHg (95% confidence interval [-2.8, -1.5]; ( $P < 0.001$ )). The mean diurnal IOP at Week 6 was lower with BBFC+TTFC than vehicle+TTFC (17.42 mmHg vs 19.57 mmHg). At Week 6, BBFC+TTFC showed a greater mean change and mean % change in IOP than vehicle+TTFC, at the peak (11:00 h: -5.38 mmHg vs -2.52 mmHg; TD -2.85 mmHg; -24.96% vs -11.74%, TD -13.21%; both  $P < 0.001$ ) and trough (09:00 h: -4.49 mmHg vs -3.15 mmHg; TD -1.33 mmHg;  $P = 0.022$ ; -20.23% vs -14.08%, TD -6.15%;  $P = 0.018$ ) points. Results of the sensitivity analysis of the primary endpoint were similar in the subset of patients with a 15.00 h time-point measurement. The mean change in IOP from BL at 15.00 h was -5.2 mmHg with BBFC+TTFC (n = 23) and -3.0 mmHg with vehicle+TTFC (n = 24) at Week 6. In total, 11.9% in the BBFC+TTFC and 7.5% in the vehicle+TTFC groups had ocular adverse events (AEs). The most common ocular AEs were punctate keratitis (3.0%) with BBFC+TTFC and eye irritation (3.0%) with vehicle+TTFC.

#### Conclusions

BBFC+TTFC as maximal medical therapy demonstrated a clinically relevant and statistically significant reduction in mean diurnal IOP compared with vehicle+TTFC. The AEs with BBFC+TTFC were consistent with the known safety profile of the individual medications. BBFC+TTFC may provide a maximal medical therapy option for patients with OAG or OHT.

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## P-WT-167

### MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION IN CONTROLLED PRIMARY OPEN ANGLE GLAUCOMA BY MEDICATION

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#### Purpose

To investigate effectiveness of micropulse diode laser transscleral cyclophotocoagulation in eyes with primary open angle glaucoma (POAG) controlled intraocular pressure by medication, whether the effectiveness of laser operation can replace medical treatment.

#### Methods

Group of 27 eyes of 22 patients with medically controlled primary open angle glaucoma was enrolled in prospective non-randomised study. Micropulse cyclophotocoagulation (MP-CPC) was performed at duty cycle (2 watt power, on time 0.5 msec and off time 1.1 msec for the total exposure of 100 seconds). Treatment success was defined as an intraocular pressure (IOP) reduction by 20%.

#### Results

Patients had a mean follow-up time of  $24 \pm 4.5$  months. The mean IOP before MP-CPC was  $20 \pm 3.4$  mmHg. Treatment success rates were 55% at 3 months, 48% at 6 months and 40% at 24 months and 35% last follow-up. The mean number of IOP lowering medications was not reduced from baseline to last follow-up. Complications of MP-CPC included 2 patients with transient blurred vision, 1 patient with anterior uveitis > 1 month and 1 patient with transient diplopia. Most patients were negatively tolerant of peribulbar anesthesia.

#### Conclusions

MP-CPC was effective and safe treatment for patients with POAG in adjunct to IOP-lowering therapy, the potential of the laser to replace the medication was low.

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## P-WT-169

### BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED COMBINATION ADJUNCTIVE TO TRAVOPROST 0.004%/TIMOLOL 0.5% FIXED COMBINATION IN OAG OR OHT: A SUBGROUP ANALYSIS

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#### Purpose

To determine the effect of baseline (BL) characteristics on the additive intraocular pressure (IOP)-lowering of twice-daily brinzolamide 1%/brimonidine 0.2% fixed-dose combination (BBFC) as an adjunct to once-daily travoprost 0.004%/timolol 0.5% fixed-dose combination (TTFC) in patients (pts) with open-angle glaucoma (OAG) or ocular hypertension (OHT).

#### Methods

In this multicentre study (NCT02730871), pts with a mean IOP  $\geq 19$  to  $\leq 28$  mmHg while on TTFC treatment, were randomised (1:1) to receive adjunctive BBFC (n = 67) or vehicle (n = 67) for 6 weeks. The mean change and mean % change in IOP from BL at Week (W) 6 were descriptively assessed in subgroups based on BL age category: 18–64 and  $\geq 65$  years (y); sex; race; and IOP category: 19–24 and  $> 25$ –28 mmHg.

#### Results

The mean (SD) IOP at BL was comparable between the BBFC+TTFC and vehicle+TTFC groups in the 19–24 mmHg subgroup (n = 64 vs 60): 21.4 (1.43) vs 21.6 (1.40) mmHg and 25–28 mmHg subgroup (n = 3 vs 5): 26.7 (0.58) vs 25.6 (0.55) mmHg. The mean (SD) IOP reduction from BL at W6 was higher with BBFC+TTFC vs vehicle+TTFC in both IOP subgroups (19–24 mmHg: 4.4 [2.63] vs 2.4 [2.92] mmHg; 25–28 mmHg: 5.0 [5.66] vs 3.2 [4.38] mmHg); the corresponding mean % reduction was 20.7% vs 10.9%, and 18.6% vs 12.6%, respectively. The mean IOP reduction from BL at W6 was higher with BBFC+TTFC vs vehicle+TTFC in both age subgroups (18–64 y [n = 25 each] 4.2 [2.65] vs 2.8 [3.02] mmHg;  $\geq 65$  y [n = 42 each] 4.6 [2.74] vs 2.2 [3.02] mmHg); the corresponding mean % reduction was 20.0% vs 13.2%, and 21.0% vs 9.9%, respectively. The mean reduction and mean % reduction at W6 was higher with BBFC+TTFC vs vehicle+TTFC in both genders (male [n = 35 vs 26]: 4.8 [2.65] mmHg, 22.0% vs 2.2 [2.90] mmHg, 10%; female [n = 32 vs 41]: 4.0 [2.73] mmHg, 19.1% vs 2.6 [3.10] mmHg, 11.8%). Most pts in both groups were White (BBFC+TTFC n = 50; vehicle+TTFC n = 57) with higher mean IOP reduction from BL at W6 in the BBFC+TTFC group (4.2 [2.60] vs 2.2 [2.90] mmHg); the mean % reductions were 19.3% vs 10.1%. The mean and mean % IOP reduction at W6 in the BBFC+TTFC vs vehicle+TTFC in Asians was 3.0 (2.55), 14% vs 2.6 (1.99), 12.9% mmHg (n = 6 vs 7) and in “Other” race category was 6.0 (2.06), 28.6% vs 5.7 [5.77], 25.8% mmHg (n = 9 vs 3).

#### Conclusions

In this preplanned, descriptive exploratory analysis, BBFC+TTFC resulted in additional clinically relevant IOP-lowering over vehicle+TTFC in pts with OAG/OHT, irrespective of BL age and gender or IOP category.

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## P-WT-170

### MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION- EVALUATING THE LASER OUTPUT OF THE MICROPULSE P3 LASER DELIVERY DEVICE FOLLOWING REPEATED USE

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#### Purpose

MicroPulse transscleral cyclophotocoagulation (MPTSCP) is an increasingly popular treatment modality for patients with glaucoma. Although the MP3 probe is described for single use, some centers use it repeatedly to cut cost. The aim of this study is to examine the laser efficacy of the MP3 laser delivery system after repeated use.

#### Methods

This is an observational study carried out using Cyclo G6 Glaucoma laser system with MicroPulse P3 (MP3) laser delivery probes. Six probes were used in this study. Laser output was determined using a laser power meter.

The MP3 probe was placed in the power meter and its first reading was obtained after 10s. Following that, the probe was swiped on a surgical cloth for 40s. At the 50th second, the probe was placed back into the power meter and fired continuously till the 100th second. Laser output would be read off every 10s from the 50th to 100th second. Cycle was repeated every 10 minutes and this was repeated for the remaining probes. Maximum observed power output for each probe cycle was recorded as well..

#### Results

Each probe could be used repeatedly up to 90 minutes (9 cycles) before it gets terminated. Highest observed output was 835 mw. When examining the differences in laser output for each cycle, no significant difference was observed for the first 4 cycles. For the remaining 5 cycles, the differences, however, were significantly different (suggestion of upward trend).

#### Conclusions

Repeated use of MP3 probe may be associated with increased laser output- may not be the desirable treatment effect.

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**P-WT-171**

**SUBCAPSULAR CATARACT FORMATION AFTER LASER IRIDOTOMY PERFORMED AS A PREPARATION FOR PHAKIC IOL (INTRAOCULAR LENS) IMPLANTATION**

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**Purpose**

Laser iridotomy is a common treatment performed in angle-closure glaucoma patients. It is also performed in high myopia patients as a preparation for phakic IOL implantation. Although it is a rather common procedure, unexpected complications; such as endothelial cell damage, cataract formation, intraocular pressure spike and iris tissue-related complications, may occur. We would like to introduce a case report of posterior subcapsular cataract formation after laser iridotomy performed as a preparation for phakic IOL implantation in a high myopia patient.

**Methods**

23 year old male patient with high myopia received laser iridotomy for preparation of phakic IOL surgery. Laser setting was 500 µm spot size, 0.5 sec duration, 100mW power for Argon laser contraction and 50µm spot size, 0.02 sec duration, 1000mW power for Argon laser punch. Yag laser setting was 3.4mJ. In this particular patient, posterior subcapsular cataract occurred in both eyes after laser iridotomy, and patient's best corrected vision was 0.5 in the right eye and 1.0 in the left eye. 14 days after laser iridotomy, cataract surgery was performed on the right eye. Regarding the patient's young age, tri-focal lens (AT Lisa tri 839MP) was inserted for improvement of far and near vision.

**Results**

Patient's vision recovered to 1.0 at near & far on POD #1, and during 12 months of follow up, visual acuity was stable and intraocular lens location was perfectly intact. Although posterior subcapsular cataract also noted on the left eye corrected vision was 1.0 and the patient preferred close follow up for the time being.

**Conclusions**

Although the patient is under stable condition, extra cautions should be taken in laser iridotomy procedures for patients preparing for phakic IOL surgery. Also, explanation of possible complications before treatment is mandatory.

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## P-WT-172

### MP3 PLUS: A MODIFIED MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION TECHNIQUE FOR THE TREATMENT OF REFRACTORY GLAUCOMA

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#### Purpose

To describe and to determine the efficacy and safety profile of MP3 Plus, a novel technique using modified micropulse transscleral cyclophotocoagulation (MPTCP) in cases of refractory glaucoma or failed MPTCP treatment.

#### Methods

Thirty-two eyes from 29 patients with uncontrolled intraocular pressures who had previous MPTCP or refractory glaucoma were included in the study and underwent the MP3 Plus treatment under peribulbar or general anaesthesia. The laser was set to micropulse mode at 2 watts with a duty cycle of 31.3%. Treatment times varied between 100 and 120 seconds. The probe was applied in a continuous sliding motion, delivering an envelope of micropulses to the eyes, avoiding the 3 and 9 o'clock meridians and any glaucoma drainage implants or trabeculectomy sites. This procedure was then modified so that each patient received additional pulses of 1.5 to 2.2 watts for 2 seconds, with a duty cycle of 40.5% for a total of 12 – 16 shots over both the superior and inferior perilimbal regions. Patients were followed up at 2 weeks, 1 month, 3 months and 6 months post-treatment.

#### Results

The patients had an average of  $1.28 \pm 0.73$  glaucoma procedures prior to MP3 Plus of which 87.5% underwent previous MPTCP with a suboptimal IOP lowering response. The average duration from the last MPTCP treatment was  $55.39 \pm 56.88$  weeks. The baseline pre-treatment IOP was  $32.6 \pm 11.3$  mmHg ( $n = 32$  eyes) and the post-treatment IOP at 1, 3 and 6 months were  $20.4 \pm 7.9$  mmHg ( $n = 26$ ;  $p < 0.0001$ ),  $29.2 \pm 12.9$  ( $n = 17$ ;  $p = 0.086$ ) and  $23.6 \pm 9.0$  mmHg ( $n = 14$ ;  $p < 0.05$ ) respectively. Of the 32 eyes who presented for follow up, 65.4%, 52.9%, and 57.1% experienced a reduction of more than 20% in IOP at 1 month, 3 months and 6 months, respectively. The average number of glaucoma medications used prior to laser was  $3.5 \pm 1.1$ . At 3 months follow up, there was a statistically significant reduction in number of glaucoma medications used from  $3.4 \pm 0.9$  to  $3.1 \pm 0.9$  ( $p < 0.05$ ). At 6 months, the reduction in number of glaucoma medications was  $3.5 \pm 0.9$  to  $3.2 \pm 0.8$  ( $p = 0.096$ ).

#### Conclusions

The MP3 Plus technique is a safe and effective treatment option in eyes with refractory glaucoma or previous failed MPTCP. This novel technique may be a viable approach for patients who warrant further IOP lowering, reduction in the number of medications or as a temporizing procedure prior to glaucoma surgery.

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## P-WT-173

### FIXED COMBINATION OF BRIMONIDINE TARTRATE AND BRINZOLAMIDE IN THE TREATMENT OF THE EARLY STAGE OF PRIMARY OPEN-ANGLE GLAUCOMA

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#### Purpose

To determine the intraocular pressure (IOP) reducing parameters of a long-term use of fixed combination of brimonidine tartrate and brinzolamide (FCBB) in patients with the early stage of primary open-angle glaucoma (POAG).

#### Methods

The study involved examination and treatment of early stage of POAG using a fixed combination of brimonidine tartrate and brinzolamide in “naïve” patients, patients with contraindications to the use of beta-blockers, as well as the used of fixed combination of timolol and brinzolamide (FCTB). The observation Protocol included visual acuity testing, IOP determination using Maklakov tonometry, standard automated perimetry and kinetic perimetry.

#### Results

During the period of observation, there was conversion from early stage of POAG to the developed stage of the disease in 10.42% and 9.09% of the eyes in the groups that received a fixed combination of brimonidine tartrate and brinzolamide, and in 14.29% of the eyes treated with a fixed combination of timolol and brinzolamide. At the end of the 24<sup>th</sup> weeks of the therapy, a reduction in the sensitivity of the retina by > 6 decibels was observed in 8.33% and 9.09% of eyes in groups treated with FCBB, and in 11.43% of eyes in the groups treated with FCTB.

#### Conclusions

The fixed combination of brimonidine / brinzolamide in early stage of primary open-angle glaucoma offers an effective decrease in the average IOP level after 6 months of treatment in “naïve” patients by 32.77% relative to baseline, and when switching therapy from prostaglandin analogs and beta-blockers - by 33.69%. Administration of the FCBB normalizes IOP in patients with contraindications to beta-blockers and prostaglandin analogs.

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## P-WT-174

### DIODE LASER CYCLOPHOTOCOAGULATION IN THE MANAGEMENT OF ANTERIOR STAPHYLOMA IN CHILDREN

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#### Purpose

To assess the safety and efficacy of diode laser-induced hypotony in the management of anterior staphyloma secondary to high intraocular pressure (IOP) in children.

#### Methods

Children aged 12 years or less presenting with anterior staphyloma and high IOP causing a cosmetic deformity and/or causing corneal exposure due to protrusion of the cornea underwent diode laser cyclophotocoagulation (CPC) to induce globe shrinkage by inducing hypotony. Laser was applied circumferentially while avoiding 3 and 9 o'clock positions, 50-60 applications of 2500-3000 mW for a duration of 2500 milliseconds were delivered while using the popping sound of each application to confirm the destruction of ciliary processes. Patients were seen on day 1 then at 1 week, 2 weeks, 1 month, 3 months and 6 months postoperatively. Outcomes were the reduction in axial length (AXL) of the globe and complications.

#### Results

Twelve eyes of patients aged  $4 \pm 2.8$  years were included (range 14 days to 8.7 years). Nine eyes had a congenital staphyloma, two were posttraumatic and one following corneal infection. All eyes had no visual potential (No perception of light or in case of very young children showed multiple anomalies and did not follow light). Eyes received an average of  $55.9 \pm 3.3$  applications of diode cyclophotocoagulation with average power  $2744.4 \pm 187.8$  mW. Globe shrinkage was noted within the first 2 weeks in 10 out of the 12 eyes. There was a significant reduction in the AXL ( $P < 0.001$ ) at 1, 3 and 6 months. In three eyes the staphyloma recurred, and another laser treatment was needed to shrink the globe. We did not encounter any devastating complications (eg, scleral perforation, endophthalmitis).

#### Image



### Conclusions

Diode laser CPC is a safe and effective treatment that can be used to induce shrinkage of anterior staphylomas, thus improving cosmesis and reducing the risk of corneal perforation and infection due to corneal exposure. The staphyloma may recur, and the laser treatment may need to be repeated several times to achieve a smaller size of the staphyloma.

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## P-WT-175

### SD-ANGLE OCT WITH PILOCARPINE DROP HELP CHOOSING CANDIDATES FOR YAG PERIPHERAL IRIDECTOMY WITH GREATER RELIABILITY WITH LESS PERSONAL BIAS

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#### Purpose

Indentation Gonioscopy is the Gold Standard for diagnosis and management of Angle Closure Diseases. There are many reasons for under-performance of gonioscopy. OCT is being more available as versatile tool and most of the machines are equipped with anterior segment tools. SD-OCT could evaluate those cases suspected by LACD with objective quantification. Ambiguity or personal opinions become important in borderline cases in gonioscopy. Treating all of them may result in over-treatment and if we do not treat in needed cases, we might be losing them and their sights forever.

#### Methods

It was a prospective trial to find usefulness of Angle SD-OCT in conjunction with Pilocarpine to select cases for YAG PIs in Primary Angle Closure spectrum. Number of subjects 152. Divided into two groups- LACD > 0.5 (normal volunteers and established POAG Patients (50 no) and LACD ≤ 0.5 (156 no). All patients had LACD measurements, gonioscopy without and with indentation, SD-Angle OCT. They received pilocarpine drops after initial steps and reassessed. YAG PIs done where angles deepened significantly after pilocarpine instillation. Cut off value for YAG PI was SD-OCT Angle ≤ 20° and / or increase after Pilo is > 50%. Whole protocol repeated after PIs. Clinical photographs taken in all steps.

#### Results

Among suspects, 104 (202 eyes) 68.4% advised YAG PI on basis of cut off value. 52 (114 eyes; 54%) had PI done. Average change in angle in advised cases 8.02° (183.5%; p-value < 0.05) where as in un-advised cases 1.85° (10.69%). Huge difference was between advised and non-advised angles (p-value < 0.05). After YAG PI, angles remained deep. No significant difference post-pilo and post-YAG angles (p > 0.05).

#### Conclusions

Though gonioscopy considered the reference-standard assessment for anterior chamber angle is plagued by subjectivity and underperformance. The technique requires considerable. The decision to perform a LPI is often highly subjective. Adopting Post-pilo Angle SD-OCT can reduce doubt, ambiguity or personal opinions. Our study is probably first observation. Patients advised PI but not done will be studied as cohort for long-term change in angles.

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## P-WT-176

### UVEAL & OCULAR ADNEXAL LYMPHOMA MASQUERADING AS UVEITIS WITH SECONDARY GLAUCOMA - A CASE REPORT

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#### Purpose

To report an interesting case of Uveal & Ocular Adnexal Lymphoma masquerading as uveitis with secondary glaucoma.

#### Methods

Case report.

#### Results

A 60 year old gentleman presented with uveitis with secondary glaucoma in right eye, waxing and waning in nature. His systemic examination with blood reports were normal. He was PCR positive for Tuberculosis for an AC tap and was started on Anti Tubercular Treatment following which the inflammation in his eye was controlled. He underwent a cataract surgery in the quiescent stage. 2 months later the uveitis recurred with boggy looking conjunctiva and an elevated lesion at the posterior pole. OCT showed a choroidal elevation which was confirmed on B scan. An incisional biopsy of conjunctiva was done which revealed him to have Extramarginal zone lymphoma. He was treated by an oncologist with external beam radiotherapy with complete resolution of the tumor.

#### Conclusions

Incorrect diagnosis of uveitic masquerade will result in severe visual compromise. Awareness of the entity and application of correct diagnostic procedures will help in reaching a timely and early diagnosis. This will not only prevent visual loss but also other life threatening complications.

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## P-WT-177

# TRANSSCLERAL CYCLOPHOTOCOAGULATION IN REFRACTORY GLAUCOMA IN EYES WITH GOOD VISION

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### Purpose

Transscleral diode laser cyclophotocoagulation (TSCPC) is a well-known method of treatment for advanced and refractory glaucoma, but it is not used routinely in eyes with good vision. This prospective study was conducted to evaluate the efficacy and safety of TSCPC in eyes with refractory glaucoma and best corrected visual acuity (BCVA) better than 0,3.

### Methods

This prospective interventional case series included 30 eyes with refractory glaucoma of 27 consecutive patients treated with TSCPC. BCVA varied from 0,3 to 0,5; mean IOP prior to procedure was  $40 \pm 12$  mmHg. The 810 nm infrared diode laser was delivered at 1200 mW for 4 seconds over  $270^\circ$ - $300^\circ$ . The power was increased in 150 mW increments until an audible “pop” is heard, followed by a decrease of 150 mW to complete the treatment. A reduction in the number of antiglaucoma drops (AGD) and an IOP of 11-21 mmHg at the last follow-up visit was defined as success. Patients were followed at baseline, week 1, month 1, 3 and 6 after the TSCPC.

### Results

A mean of 1.3 treatments were given per eye, with 8 eyes (26%) requiring retreatment at the 1st month of follow up. Mean IOP decreased to  $26.5 \pm 5.0$  mmHg at 1 week,  $20.0 \pm 5.3$  mmHg at 1 month,  $19.7 \pm 3.4$  mmHg,  $18.2 \pm 2.7$  mmHg at 6 month. The overall success rate was 84%. AGD were reduced from  $2.0 \pm 1.0$  at baseline to  $1.1 \pm 1.2$  at 1 month, to  $1.7 \pm 1.0$  at 3 months and to  $2.2 \pm 1.2$  at 6 months follow-up. No patient had hypotony. TSCPC procedure failed in 3 patients with neovascular refractory glaucoma.

### Conclusions

1. This study suggests a role of TSCPC as an effective, safe and rapid method of treatment in patients with refractory glaucoma with good vision over a 6-month period.
2. IOP becomes stably reduced only by the 3rd month after the TSCPC.
3. Studies with longer follow-up and larger sample size are needed to evaluate a long-term efficacy of TSCPC procedure.

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**P-WT-178**

**PHACOEMULSIFICATION+ENDOCYCLOPHOTOCOAGULATION  
AND AB INTERNO TRABECULOTOMY VS  
PHACOEMULSIFICATION+ENDOCYCLOPHOTOCOAGULATION IN OPEN ANGLE  
GLAUCOMA**

Maria Corina Ponte\*

**Purpose**

To evaluate the medium-term efficacy and safety of combined phacoemulsification with endocyclophotocoagulation and *ab interno* trabeculotomy versus phacoemulsification with endocyclophotocoagulation in patients with uncontrolled open angle glaucoma.

**Methods**

Comparative prospective randomized clinical study evaluated the 12 month outcomes of patients with open angle glaucoma who underwent combined phacoemulsification with endocyclophotocoagulation and *ab interno* trabeculotomy *ab interno* (intervention I) vs phacoemulsification with endocyclophotocoagulation(intervention II). The primary outcome measure was mean preoperative and postoperative intraocular pressure (IOP); secondary outcomes included: report complete and qualified success, failure, number of glaucoma medications, visual acuity and complications.

**Results**

A total of 46 eyes of 36 patients were included, basal preoperative IOP was  $16.96 \pm 3.66$  for group I and  $15.64 \pm 4.88$  for group II and  $11.44 \pm 2.15$  mmHg and  $12.45 \pm 1.90$  mmHg respectively ( $p = 0.031$ ) at 12 months follow-up. Complete succes was 44.44% for intervention I and 59.09% for intervention II; Qualified succes was 31.0% and 40.91% respectively. Medications fell from  $2.0 \pm 1.4$  to  $0.8 \pm 1.0$  in the intervention I and  $1.5 \pm 1.3$  to  $1.0 \pm 1.5$  in intervention II ( $p = 0.895$ ). visual acuity improved similar in both groups. Complications were mild and resolve without reoperations.

**Conclusions**

Patients with uncontrolled open angle glaucoma at 12 months follow up shows reduction of IOP efficiently and safety with both procedures. When *ab interno* trabeculotomy is added to phachoemulsification and ECP mean IOP is reduced more and this difference comparing both interventions studied is clinically significant.

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## P-WT-179

### MICROPULSE CYCLOPHOTOCOAGULATION OUTCOMES IN FILIPINO PATIENTS WITH REFRACTORY GLAUCOMA

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#### Purpose

To report the outcomes of micropulse transscleral cyclophotocoagulation in the management of Filipino patients with refractory glaucoma.

#### Methods

Retrospective chart review of patients with refractory glaucoma who underwent micropulse cyclophotocoagulation at the Tzu Chi Foundation from January 2016 to August 2018. Baseline parameters obtained for each patient include age, gender, best-corrected visual acuity (BCVA), pre-operative intraocular pressure (IOP), and number of glaucoma medications. Post-operatively, IOP and number of glaucoma medications were recorded at the following timepoints: 1 day, 1 week, 1 month, 2 months, 3 months, 6 months, 12 months, and 18 months.

#### Results

Forty seven (n = 47) patients underwent micropulse cyclophotocoagulation under retrobulbar anesthesia with the following settings: 2W for 50 to 80 seconds. Of the 47 patients, 34% (16/47) were male and 66% (31/47) were female with an average age of 57.8 years old (range = 1 to 91 years old). Pre-operative BCVA was fixed and follows for the pediatric patient (n = 1) while adult patients' BCVAs were 20/50 (n = 1), 20/200 (n = 1), counting fingers (CF) (n = 2), hand movement (HM) (n = 11), light perception (LP) (n = 3), and no light perception (NLP) (n = 28), without improvement in vision post-operatively. Deterioration of one line was seen in the patient whose baseline BCVA was 20/40. Mean follow-up time was 55 months with an average IOP decrease of 39.7%  $\pm$  4.8% (23.7 mmHg  $\pm$  5.2 mmHg) while number of glaucoma medications used decreased from 2.3 to 2.25 18 months. Retreatment was necessary for 21.3% (10/47) which resulted in similar levels of IOP decrease post-operatively (43.0%  $\pm$  19.2%, 24.55 mmHg  $\pm$  12 mmHg).

#### Conclusions

Micropulse Transscleral Cyclophotocoagulation (MP-TCP) is a relatively new modality and is effectively used in reducing intraocular pressure in refractory glaucoma. The device, IRIDEX Laser System (IRIDEX Corporation, USA) delivers pulsed thermal elevation which does not result in coagulative tissue damage (MM Solano, 2017) (Matthew E. Emanuel, 2017). Of the 47 patients included in this study, an average IOP decrease of 39.7% (or 23.7 mmHg) was seen while 21.3% of patients needed repeat treatment showing that micropulse transscleral cyclophotocoagulation may be a viable option in managing refractory glaucoma.

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## P-WT-180

### OMIDENEPAG ISOPROPYL 0.002%: A NOVEL OCULAR HYPOTENSIVE AGENT WITH A NEW MECHANISM OF ACTION

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#### Purpose

To investigate the mechanism of action and clinical effects of omdidenepag isopropyl (OMDI), a novel hypotensive agent.

#### Methods

A receptor binding assay of OMDI and its hydrolyzed form, omdidenepag (OMD), to human recombinant prostanoid receptors DP1-2, EP1-4, FP, and IP was performed. Functional assays evaluated the agonistic activities of OMDI and OMD using cultured cells expressing selected receptors. The effect of OMDI on aqueous humor dynamics (AHD) was also evaluated in cynomolgus monkeys with laser-induced ocular hypertension (OHT). Following 7 days of dosing with OMDI 0.002%, aqueous humor flow and outflow facility were evaluated by fluorophotometry, and uveoscleral outflow was calculated. FUJI, a multicenter open-label clinical study (NCT02822742), was conducted to assess safety and intraocular pressure (IOP)-lowering efficacy of OMDI in patients with primary open-angle glaucoma or OHT who were latanoprost non-/low responders. Following a 1–4-week washout period and 8-week run-in period with latanoprost 0.005%, patients with an IOP reduction  $\leq 15\%$  at the end of the run-in were treated with OMDI 0.002% QD for 4 weeks. The primary endpoint was change from baseline in mean diurnal IOP at Week 4.

#### Results

Binding and functional assays found that OMD is a selective EP2 receptor agonist. The AHD study showed that OMDI lowers IOP by increasing outflow facility and uveoscleral outflow. In FUJI, the full analysis set comprised 26 patients; two prematurely discontinued for a lack of efficacy. Mean baseline (after run-in) diurnal IOP ( $\pm$ SD) was  $23.1 \pm 2.8$  mmHg, indicating latanoprost non-/low response. After switching to OMDI, change from baseline in mean diurnal IOP at Week 4 was  $-2.99$  mmHg (95% CI  $-3.87, -2.11$ ;  $P < 0.0001$ ). No serious adverse events (AEs) were reported. Six ocular AEs were reported in three patients. AEs of the anterior chamber cell ( $n = 2$ ), conjunctival hyperemia ( $n = 2$ ), and erythema of eyelid ( $n = 1$ ) were mild, related to OMDI, and resolved without intervention. One ocular AE (retinal hemorrhage) was not considered treatment-related.

#### Conclusions

OMDI was shown to act as a selective, non-prostaglandin, EP2 agonist which lowered IOP through increased conventional and uveoscleral outflow pathways, differentiating it from FP agonists, that predominantly increase uveoscleral aqueous humor outflow. In the FUJI study, OMDI 0.002% provided additional IOP reduction in latanoprost non-/low responders, with few AEs.

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## P-WT-181

### INVESTIGATION OF PHYSICAL AND VISUAL FUNCTION FACTORS AFFECTING SUCCESSFUL EYEDROP INSTILLATION

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#### Purpose

To investigate the physical and visual function affecting success of eye drop instillation.

#### Methods

Enrolled subjects were glaucoma patients who were hospitalized at our hospital followed by glaucoma surgeries from March 2017 to January 2018. Patients were asked to instill hyaluronic acid eye drops into both eyes at the sitting position on a chair without backrest on the fifth to sixth post-operative day. Two examiners evaluated if instillation was successfully completed. Definitions of failure of instillation satisfied the following conditions; dropping eyedrops around the eyes, contacting the tip of the eyedropper bottle to the patient's face, instilling two or more eyedrops at one trial. Patients who satisfied the above definition one or both eyes were categorized as a failure group. We also investigated the following tests including SARA (Scale for the assessment and rating of ataxia), pinch force, posterior flexion angle defined as neck posterior flexion angle and trunk extension angle at instillation trial, best corrected visual acuity of better eye, and mean deviation of static visual field test of better eye to investigate related factors to instillation failure. Parameters with p values of less than 0.05% were considered as statistically significant factors to instillation failure.

#### Results

A total of 60 patients with  $68.7 \pm 9.5$  years old including 32 of male subjects participated in this study. Thirty-five (58.3%) patients were categorized as failure group. The most common reason for the failure is dropping on the lower eyelid accounting for about 50% of the failure. The univariate analysis showed the elderly, the low pinching force, and small posterior flexion angle were significantly related to the failure. After the multivariate analysis, only the posterior flexion angle was involved in failure of instillation.

#### Conclusions

The most relevant factor for instillation failure was the insufficient posterior flexion angle. It may be useful to advise patients keeping a proper position and using a seat with backrest for successfully install eyedrops.

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## P-WT-182

### QUANTITATIVE COMPARISON OF TEAR LIPID LAYER IN UNILATERAL GLAUCOMA EYE AND NORMAL EYE

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#### Purpose

To compare the lipid layer thickness (LLT) via the LipiView interferometer between the treated eye with glaucoma medication and untreated normal eye in the unilateral glaucoma patients, and evaluate the impact of topical glaucoma medication on the LLT parameters in glaucoma eyes.

#### Methods

We measured the lipid layer thickness (LLT) with the LipiView® Ocular Surface Interferometer (Tear-Science® Inc, Morrisville, NC) which recorded three LLT parameters: average, minimum, and maximum. The participants were glaucoma patients in the unilateral eye treated with topical glaucoma medications for more than 12 months. The factors associated with LLT parameters in glaucoma eyes were investigated with multiple regression analysis.

#### Results

Thirty patients with unilateral NTG were enrolled in the present study. In the interferometer, Lipid layer average, minimum, and maximum were  $64.83 \pm 16.50$ ,  $51.63 \pm 16.73$ , and  $82.53 \pm 20.62$  in glaucoma eyes,  $77.26 \pm 17.81$ ,  $62.83 \pm 20.99$ , and  $86.13 \pm 15.42$  in normal eyes. Lipid layer average and minimum were significantly thinner than those in normal eyes ( $P < 0.001$ ,  $P < 0.001$ , respectively). Longer duration of glaucoma eyedrops and higher glaucoma medications were associated with the lower LLT average, and increasing glaucoma medications have significant correlation with lower LLT minimum in glaucoma eyes ( $P < 0.001$ , adjusted  $R^2 = 0.593$ ,  $P < 0.001$ , adjusted  $R^2 = 0.135$ , respectively).

#### Conclusions

The present study highlight that the glaucoma patients with long-term glaucoma treatments or using many glaucoma eyedrops need to be interested in LLT parameters which was useful for objectively assessing ocular surface disease.

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## P-WT-184

### A COMBINED METHOD FOR LASER TREATMENT OF PRIMARY NARROW-ANGLE (MIXED) GLAUCOMA

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#### Purpose

To evaluate the outcomes of a combined method for laser treatment – the laser iridectomy in combination with the selective laser trabeculoplasty (LI+SLT) – in patients with primary narrow-angle (mixed) glaucoma.

#### Methods

Seventy-two eyes of 72 patients with initial stage of primary narrow-angle (mixed) glaucoma were included in the analysis. The average age of the patients was  $65.1 \pm 6.56$  years. The follow-up period was up to 4 years after laser treatment. Laser iridectomy was performed as the first stage to enlarge the profile of anterior chamber angle (ACA) and to eliminate relative papillary block. The ACA opening gave a possibility in case of insufficient IOP decrease to carry out selective laser trabeculoplasty (SLT). Iridotomy and SLT were realized by Tango Laser unit (Laserex company, Australia). Stages of the combined treatment: laser iridectomy and selective laser trabeculoplasty were performed immediately one after the other in all patients.

#### Results

IOP was  $24.47 \pm 1.85$  mmHg at baseline and  $19.14 \pm 2.80$  mmHg at 4 years after LI+SLT, and the number of medications decreased from  $2.2 \pm 0.4$  at baseline to  $1.02 \pm 0.1$  at 4 years postoperatively. No complications were noted.

A week after laser treatment there was a significant decrease ( $P < 0.05$ ) of intraocular pressure (IOP) by 6.9mmHg on average (28.2%) of the original. In the long-term postoperative follow-up period, the average decrease of IOP was 23.4% and was achieved in 87.5% of cases (63 eyes of 72). The IOP decrease to normal occurred in 9 eyes after the repeated SLT. The visual acuity remained unchanged in 80.5% of cases. The decrease of the vision was due to the progression of complicated cataract. Limits of peripheral visual field remained stable by the end of the follow-up period in 96% of cases. Within the observation period, according to computer perimetry data, negative dynamics was recorded in 8.3% of cases (6 eyes). According to HRT, negative dynamics in the form of a decrease in the volume of the neural rim, an increase in the area of the optic disc excavation was noted in 7% of cases (5 eyes).

#### Conclusions

The proposed method of combined laser treatment allows to achieve the IOP normalization due to an expansion of ACA after LI with a subsequent activation of trabecula by SLT in 87.5% of patients. The simultaneous operation of two stages – laser iridectomy and SLT is safely and enables significantly to reduce the duration of treatment and rehabilitation of patients.

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## P-WT-185

### EFFECT OF LASER PERIPHERAL IRIDOTOMY ON CONTRAST SENSITIVITY USING SPAETH RICHMAN CONTRAST SENSITIVITY TEST

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#### Purpose

Evaluation of Contrast Sensitivity in patients undergoing Laser Peripheral Iridotomy (LPI) using Spaeth Richman Contrast Sensitivity Test (SPARCS).

#### Methods

This was a pilot prospective interventional cohort study. 30 consecutive patients, 40 years of age or older diagnosed as primary angle-closure suspects (PACS) or with primary angle closure (PAC) in both eyes were recruited after taking a written, informed consent. LPI was performed using standard procedure in all eyes. Detailed history, clinical examination and contrast sensitivity testing using SPARCS was performed in all patients before and 2 weeks after the procedure. Statistical analysis were carried out using IBM Statistical Package for Social Sciences (SPSS Version 23 for Windows).

#### Results

There were more female subjects (66.67%, 20 out of 30). The mean age was  $49.93 \pm 10.43$  years and presenting acuity was  $0.02 \pm 0.06$  (LogMAR). The mean VCD, MD (dB), PSD (dB) were  $0.34 \pm 0.09$ ,  $-2.36 \pm 1.72$ , and  $2.34 \pm 0.81$  respectively. There was statistically significant decrease between the pre ( $15.17 \pm 3.83$  mmHg) and post ( $11.70 \pm 1.53$ ) LPI IOP ( $P < 0.001$ ), however no statistically significant difference between the pre ( $73.47 \pm 9.88$ ) and post SPARCS contrast sensitivity ( $74.23 \pm 12.99$ ) scores. The group wise analysis showed similar trend between PAC and PACS patients.

#### Conclusions

LPI does not affect contrast sensitivity assessment using the SPARCS test at 2 weeks after the procedure. Our findings add to the data that affirms the safety and efficacy of the procedure with eyes having PAC or PACS.

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## P-WT-186

# EFFICACY OF MICROPULSE TRANSCLERAL CYCLOPHOTOCOAGULATION IN UNCONTROLLED GLAUCOMA AT SRINAGARIND HOSPITAL, THAILAND: 1-YEAR RESULT

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## Purpose

To Evaluate the efficacy and safety of Micropulse transcleral cyclophotocoagulation (MPCPC) in Thai patients with uncontrolled glaucoma: 1-Year Results.

## Methods

A prospective case series study. From Nov 23, 2016 to June 11, 2018, 21 eyes of 15 patients were included. The patients underwent MPCPC (MicroPulse® P3 Glaucoma Device (MP3), CYCLO G6™, IRIDEX, USA). Laser settings of 2 Watts applied for a 120 seconds treatment time. The probe was applied and move a continuous sliding motion in the superior and inferior quadrants avoiding the 3, 9 o'clock meridians. Retrobulbar anesthesia was performed in all cases. Changes in VA, IOP, anterior chamber reaction and the number of medication were observed before laser treatment and again at 1 week, 1, 3, 6 and 12 months after MPCPC.

## Results

21 eyes of 15 patients. Diagnoses were POAG (26.7%), PACG (26.7%) and secondary glaucoma (46.6%). The mean age of the study group was  $50.2 \pm 19.6$  years (12-76 years). Preoperative BCVA were range 6/9 to HM. 73% of patients underwent previous glaucoma surgery. The mean IOP before MPCPC was  $21.9 \pm 8.06$  (range 12-46) mmHg. The mean IOP were significantly lower than before laser treatment at 1 week  $10.26 (\pm 7.78)$  mmHg (95%CI 7.53-15.73,  $p = 0.001$ ), 1 month  $11.47 (\pm 7.31)$  mmHg (95%CI 6.71-15.87,  $p = 0.001$ ) and 3 months  $16.71 (\pm 8.18)$  mmHg (95%CI 2.31-8.15,  $p = 0.001$ ), but no statistical significance at 6 months  $17.15 (\pm 10.34)$  mmHg (95%CI -0.71-10.61,  $p = 0.083$ ) and 12 months  $17.00 (\pm 9.29)$  mmHg (95%CI -2.46-12.86,  $p = 0.168$ ). The mean number of IOP lowering medications was reduce from 3.62 at baseline to 3.14 (95%CI 0.10-0.84,  $p = 0.014$ ), 2.70 (95%CI 0.12-1.77,  $p = 0.026$ ) and 3.42 (95%CI -0.48-0.82,  $p = 0.586$ ) at 3, 6 and 12 months, respectively. Treatment success rate were 76.2%, 47.6% and 57.1% at 3, 6 and 12 months, respectively. The serious adverse event occurred in one patient with nausea/vomiting and bradycardia, other complications with mild side effects occurred in all patients were moderate postoperative pain, mild inflammation in anterior chamber but complete resolved after 1 week, 1 patient with hypotony, 1 patient with corneal decompensation and 1 patient with loss of BCVA. Further glaucoma surgery was needed in 3 patients for achieved success.

## Conclusions

MPCPC is an effective treatment for lowering IOP in case of uncontrolled glaucoma. The success rate is decrease after 3 months, need for repeat treatments or further glaucoma surgery should be considered. The incidence of significant visual loss and systemic adverse events in this study should be further explored.

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## P-WT-187

### EFFICACY AND SIDE EFFECTS OF RIPASUDIL HYDROCHLORIDE HYDRATE (RIPASUDIL)

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#### Purpose

To investigate the effectiveness and side effects of ripasudil.

#### Methods

53 eyes (mean age:  $63.2 \pm 12.6$  years) of 53 patients with glaucoma who used 3 or 4 anti-glaucoma eye drops were targeted. In the combination of 4 drugs, 26 patients in the switched group that were observable 12 months after switching topical brimonidine to ripasudil and 27 patients in the added group that were observable 12 months after the addition of ripasudil in combination with 3 agents were classified. Intraocular pressure and corneal endothelial cell density before and after switching or addition were examined. We examined side effects after switching or addition.

#### Results

In the switched group, 18.1 mmHg before switching was 16.3 mmHg ( $p < 0.01$ ) in 12 months after switching and in the added group, 17.3 mmHg before addition was 14.6 mmHg ( $p < 0.01$ ) after addition, meaning significant decrease intraocular pressure showed that. The corneal endothelial cell density was 2234 mm<sup>2</sup> in 2338 mm<sup>2</sup> in the switched group and 2148 mm<sup>2</sup> in the added group, 2162 mm<sup>2</sup> was not significantly different. As a side effect, 2 cases of blepharitis were observed in the switched group and 5 cases in the added group, with an average period of 10.1 months until onset. Three cases of allergic conjunctivitis were observed.

#### Conclusions

Switching or addition to ripasudil is effective and there is no change to corneal endothelial cell density, but attention should be paid to allergic reactions such as blepharitis.

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## P-WT-188

### ADDITIVE IOP LOWERING OF BRINZOLAMIDE 1%/BRIMONIDINE 0.2% BID FIXED-DOSE COMBINATION IN OAG OR OHT PATIENTS RECEIVING PGA: A PHASE IV STUDY RESULTS

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#### Purpose

To determine the additive intraocular pressure (IOP)-lowering effect of twice-daily brinzolamide 1%/brimonidine 0.2% fixed-dose combination (BBFC) as an adjunct to a prostaglandin analog (PGA) in patients with open-angle glaucoma (OAG) or ocular hypertension (OHT) insufficiently controlled with PGA monotherapy.

#### Methods

In this Phase IV, clinical study (NCT02419508), adult patients with OAG/OHT on PGA monotherapy with mean IOP of  $\geq 19$  and  $< 32$  mmHg were randomized to receive BBFC+PGA (n=96) or vehicle+PGA (n=92) for 6 weeks. The primary endpoint was the mean change in diurnal IOP from baseline (BL; averaged over 09:00 h and 11:00 h) at Week (W) 6. Secondary endpoints included mean change, and mean % change from BL, in diurnal IOP at W6 (averaged over 09:00 h [trough] and 11:00 h [peak]), and mean change and mean % change from BL in diurnal IOP at W2.

#### Results

The mean age of the patients was 67.2 years; 52.4% were female. At BL, the mean diurnal IOPs in the BBFC+PGA and vehicle+PGA groups were similar (22.8 mmHg and 22.9 mmHg, respectively). The primary objective was met, at W6, the mean change in diurnal IOP from BL was greater with BBFC+PGA than vehicle+PGA [-5.59 mmHg vs -2.15 mmHg; treatment difference [TD]: -3.44,  $P < 0.001$ ]. Mean diurnal IOP at W6 and mean % change in diurnal IOP from BL at W6 was 17.2 mmHg (-24.7%) with BBFC+PGA and 20.9 mmHg (-9.5%) with vehicle+PGA (TD: -3.44 [-15.11%]; both  $P < 0.001$ ]) BBFC+PGA showed a greater mean change in IOP from BL at W6 than vehicle+PGA at both trough (09:00 h: -4.83 mmHg vs -2.50 mmHg; TD -2.34 mmHg;  $P < 0.001$ ) and peak (11:00 h: -7.02 mmHg vs -2.42 mmHg; TD -4.60 mmHg;  $P < 0.001$ ) points. Comparable results were obtained in the subgroup of patients with 16:00 h data (BBFC+PGA [n=56]: -5.3 vs vehicle+PGA [n=63]: -2.4 mmHg). There was a notable change in mean diurnal IOP and mean % change in diurnal IOP from BL at W2 with BBFC+PGA (-5.2 mmHg; -22.8%) vs vehicle+PGA (-1.3 mmHg; -5.9%). Ocular adverse events (AEs) were reported in 21.1% and 8.7% of patients in the BBFC+PGA and vehicle+PGA groups, respectively. The most frequently reported AEs were ocular hyperemia (BBFC+PGA: 5.3% vs vehicle+PGA: 1.1%) and conjunctival hyperemia (BBFC+PGA: 4.2% vs vehicle+PGA: 1.1%).

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### Conclusions

BBFC+PGA produced clinically significant reductions in mean diurnal IOP compared with vehicle+PGA in OAG/OHT patients. The AEs with BBFC+PGA were consistent with the known safety profile of the individual medications.

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**P-WT-189**

**EFFECTS OF CARTEOLOL HYDROCHLORIDE / LATANOPROST COMBINATION OPHTHALMIC SOLUTION ON OCULAR SURFACE**

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**Purpose**

To investigate the influence of carteolol hydrochloride / latanoprost combination ophthalmic solution (Mikeluna) on the ocular surface.

**Methods**

20 subjects who were able to observe 6 months after switching from latanoprost (Xalatan) single agent to Michelna, 20 cases (mean 66.5 years/ single group) and Xalatan and 0.5% timolol from Mikeluna 15 subjects switched 15 eyes (mean 62.7 years / combined group) were included. Intraocular pressure before and after switching, corneal epithelium barrier function, tear film breakup time (BUT), severity of punctate surface keratopathy (AD score) were evaluated. The corneal epithelial barrier function was evaluated by measuring the fluorescein uptake concentration with a fluorophotometer FL-500.

**Results**

The intraocular pressure was 15.4 mmHg in the single group 17.4 mmHg, 15.2 mmHg in the combined group 15.7 mmHg, and a significant decrease was observed in the single group. BUT was 7.9 seconds for 6.9 seconds in the single group and 8.0 seconds for the combined group 8.3 seconds, and there was no significant difference in both groups. The AD score was significantly decreased in both groups. The concentration of uptake of fluorescein was 106.3 ng / ml to 80.3 ng / ml in the single group and from 120.0 ng / ml to 74.8 ng / ml in the combined group, and a significant decrease was observed in the combined group.

**Conclusions**

Michelna has less influence on the ocular surface.

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## P-WT-190

### ONE-YEAR EFFICACY OF ADJUNCTIVE USE OF RIPASUDIL, A RHO-KINASE INHIBITOR, AND FACTORS RELATED TO THE EFFICACY

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#### Purpose

To evaluate the one-year efficacy of adjunctive use of Ripasudil, a rho-kinase inhibitor, and factors related to the efficacy in eye with glaucoma.

#### Methods

Subjects were 97 eyes of 66 patients with glaucoma. Ripasudil (0.4%) (GLANATEC®; Kowa Company, Ltd., Nagoya, Japan), a new rho-kinase inhibitor that lowers IOP by modulating the actin cytoskeleton and altering the conventional outflow of the aqueous humor were prescribed as an addition to or a replacement for their previous eye drops. We examined the amount of IOP reduction at 3, 6, 12 months after adding or switching. Factors related to the IOP reduction, including glaucoma diagnosis, refraction, lens status, baseline IOP, number of glaucoma medications at baseline, and history of glaucoma filtering surgery were investigated by multiple regression analysis.

#### Results

The mean age was 63.6 years in the addition group (n = 69 eyes) and 60.2 in the switching group (n = 28 eyes), respectively. The mean numbers of eye drops before adding or switching were 3.3 and 4.1, respectively. The average IOP (mean ± SD) in the addition group / switching group before Ripasudil instillation was 16.1 ± 5.0 / 17.8 ± 4.4 mmHg, and 15.0 ± 4.5 / 16.8 ± 3.9 mmHg at 3 months, 14.4 ± 4.9 / 17.4 ± 4.6 mmHg at 6 months, and, 14.8 ± 3.9 / 17.7 ± 5.9 mmHg at 12 month after instillation. The IOP significantly decreased at 3, 6, 12 months after adding Ripasudil, but did not decrease at any time points after switching. In multiple regression analysis, higher IOP before adding Ripasudil (p = 0.049), and no history of glaucoma filtering surgery (p = 0.039) in switching group were significantly related to the higher rate of IOP reduction at 12 months.

#### Conclusions

The IOP-lowering effect of adding Ripasudil at 1 year was higher in eyes with higher baseline IOP. However, Ripasudil may not be effective in altering the conventional outflow in eyes with history of glaucoma filtering surgery.

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## P-WT-191

# HIGH-INTENSITY FOCUSED ULTRASOUND NEW NON-INVASIVE ALTERNATIVE FOR GLAUCOMA TREATMENT. REPORT OF THE FIRST CASES IN LATIN AMERICA

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### Purpose

To evaluate the safety and efficacy of the ultrasonic coagulation of the ciliary body with glaucoma patients. The EyeOP1 device (Eye Tech Care, Rillieux-la-Pape, France), which was used in the study, uses miniaturized transducers to produce High intensity focused ultrasound (HIFU). The treatment consisted of the sequential activation of each transducer with a duration of 8 seconds.

### Methods

This prospective and experimental study was conducted in the Glaucoma department of the Clínica Internacional de la Visión de Ecuador (Daule, Ecuador). The main inclusion criteria was the diagnosis of glaucoma with a baseline intraocular pressure (IOP)  $\geq 21$  mmHg during the maximum systemic and topical hypotensive treatment. The antihypertensive drugs were discontinued after surgery and then were prescribed only if the postoperative IOP was  $\geq 21$  mmHg during follow-up visits. The patients were evaluated before and 1, 7, 14, 30, 90 and 180 days (until the congress date) after the procedure.

### Results

12 eyes were included. The mean preoperative IOP was  $35.08 \pm 12.73$  mmHg. Average cup 0.95. On days 1, the mean IOP was significantly reduced to 25.83 mmHg. On 7 day, the mean IOP reduced to 19.08 mmHg. At the moment we do not present treatment failures.

### Conclusions

Ultrasonic coagulation of the ciliary body is a non-invasive, safe procedure with few adverse reactions and effective in reducing IOP. It has greater efficacy in Primary Open Angle Glaucoma than in patients with refractory glaucoma.

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## P-WT-192

### A RETROSPECTIVE REVIEW COMPARING THE SAFETY AND EFFICACY OF 120 VERSUS 160 APPLICATIONS OF SELECTIVE LASER TRABECULOPLASTY

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#### Purpose

To compare the effectiveness and safety of 120 applications versus 160 applications of Selective Laser Trabeculoplasty (SLT) at reducing intra-ocular pressure (IOP) from baseline in glaucoma patients over a 1 year period.

#### Methods

A retrospective chart review was conducted, comprising 376 eyes from 199 patients who underwent SLT treatment performed by the same glaucoma sub-specialist from 2014 to 2015. Data was obtained on patients' clinical features, management and outcomes. Patients were treated with either 120 applications or 160 applications of SLT per 360° of trabecular meshwork over two sessions. Statistical analyses were performed comparing baseline IOP with IOP at 6 weeks and 1 year follow-up after completion of treatment. The incidence and severity of transient IOP rises immediately post-SLT was also recorded.

#### Results

Both SLT regimes were effective at reducing IOP. Univariate *t*-tests showed that the 160 applications group had significantly greater mean reduction of IOP from baseline at both 6 weeks (4.6 vs 3.6 mmHg,  $p = 0.015$ ) and 1 year time points (4.1 vs 2.8 mmHg,  $p = 0.019$ ). However, when multivariate analyses were used to account for the effects of clustering and include other covariates such as age, baseline IOP, history of previous SLT there was no significant difference between success rates of the two treatment groups at either time points. Higher baseline IOP was associated with greater IOP reduction at 6 weeks ( $P < 0.001$ ) and 1 year ( $P < 0.001$ ) for both treatment groups. There was no statistical difference in incidence and severity of IOP spikes at 1-hour post-SLT between the two treatment groups.

#### Conclusions

SLT produces a significant IOP lowering effect and treatment with 160 applications per 360° may be more effective than 120 applications per 360°. 160 applications of SLT does not increase the risk of transient IOP spikes.

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## P-WT-193

### EFFICACY OF TRANSSCLERAL DIODE LASER CYCLOPHOTOCOAGULATION IN THE MANAGEMENT OF END-STAGE GLAUCOMA

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#### Purpose

To evaluate the safety and efficacy of transscleral diode laser cyclophotocoagulation (TSCPC) in patients with end-stage glaucoma.

#### Methods

This retrospective study included 23 eyes of 23 patients (9 females and 14 males) with end-stage glaucoma. TSCPC was performed for uncontrolled intraocular pressure (IOP) and pain sensation in these patients. Visual acuity, IOP change, number of medications needed, pain sensation and complications were analyzed.

#### Results

Mean age of the patients were  $61.48 \pm 13.43$  years; mean follow-up time was  $27.30 \pm 21.83$  months. Mean IOP was  $37.61 \pm 7.35$  mmHg preoperatively;  $23.67 \pm 7.90$  mmHg at postoperative 1st month ( $p = 0.001$ ),  $21.07 \pm 8.68$  mmHg at postoperative 3rd month ( $p = 0.002$ ), and  $20.20 \pm 11.16$  mmHg at postoperative 6th month ( $p = 0.007$ ). Mean number of glaucoma medications used was 3.91 preoperatively and 3.22 postoperatively ( $p = 0.004$ ). Mean pain scores were 2.67 preoperatively and 0.89 postoperatively ( $p = 0.004$ ). There were no significant complications including hypotony.

#### Conclusions

TSCPC resulted in significant reduction in IOP and glaucoma medication use with decreased pain sensation in this study. TSCPC is found to be effective and safe in the treatment of end-stage glaucoma patients.

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# Other

## P-WT-194

# ASSOCIATION BETWEEN FUCHS ENDOTHELIAL DYSTROPHY AND ACUTE ANGLE CLOSURE AND APPROACH TO MANAGEMENT

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## Purpose

to report on the association between Fuchs endothelial dystrophy and Acute Angle Closure and approach to management.

## Methods

case report.

## Results

This is a case of a 62 year old female with acute angle closure, hazy cornea, intraocular pressure (IOP) elevation of the right eye, occludable angles on the left eye and cataracts. The right eye underwent attempted pupilloplasty and peripheral iris retraction while laser iridotomy was done on the left eye. Glaucoma medications were given to control residual IOP elevation. On follow up, despite controlled IOP, the right cornea remained edematous while the left cornea showed a focal area of descemet membrane folds. Fuchs endothelial dystrophy (FED) was suspected. Corneal pachymetry and specular microscopy were done which revealed zero endothelial cell count on the right eye and low cell count with significant polymegathism on the left eye.

This brings about the question on the relationship between angle closure and FED. In a study by Setala *et al*, there was 10% less endothelial cell count in eyes with acute angle closure (AAC) attack compare to the contralateral eye. Bigar *et al* documented bilateral corneal guttae in 35% of AAC patients in their study. Lowenstein *et al* noted that in 73% of FED patients with angle closure, an acute attack occurs prior to the manifestation of FED.

The management of this patient involved trabeculectomy of the right eye to control IOP followed by cataract surgery and corneal transplant. Cataract surgery was performed on the left eye while the cornea was still clear despite low cell count. Patient was advised possible corneal transplant surgery in the future for the left eye.

## Conclusions

Acute IOP elevation may be associated with corneal endothelial cell loss. FED should be ruled out in patients with angle closure attacks. The need and timing for surgery (glaucoma, cataract and/or corneal transplant surgery) will depend on the status of the cornea, lens, angles and IOP control.

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2. Bigar *et al*. Corneal endothelial changes in primary acute angle-closure glaucoma. *Ophthalmology* 1982
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## P-WT-195

### DEEP LEARNING SYSTEM EVALUATION FOR THE DETECTION OF GLAUCOMA FROM COLOUR FUNDUS PHOTOGRAPHS

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#### Purpose

A retrospective study to evaluate the performance of an automated deep learning system (Pegasus, Visulytix Ltd., UK) in detecting glaucoma using publicly available ORIGA fundus photography.

#### Methods

Six ophthalmologists, of varying levels of experience, and the deep learning system graded 110 fundus images of patients randomly sampled from the Singapore Malay Eye Study (SiMES) [1,2]. The sample was stratified such that 50 were from patients diagnosed with glaucoma, 50 were non-glaucoma, and 10 (5 glaucoma and 5 non-glaucoma) were duplicates. All images were clinically gradable. Both the human graders and the deep learning system were compared to the original clinical diagnosis, which was taken as the gold standard. The performance of the ophthalmologists and the deep learning system were assessed in terms of the Area Under the Receiver Operating Characteristic curve (AUROC), whilst the intra- and inter-observer agreements (Cohen's Kappa coefficient) were determined and compared. In addition, the deep learning system performance was compared to the "best case" consensus scenario, which was the combination of ophthalmologists whose consensus opinion most closely matched the gold standard. Confidence intervals at the 95% significance level were determined using a bootstrap technique with 1,000 replications.

#### Results

The deep learning system achieved an AUROC of 92.4% (95% CI: 88.0-96.2) compared to ophthalmologist AUROCs that ranged from 69.6% (95% CI: 60.1-78.9) to 84.8% (95% CI: 77.8-91.1) and the "best case" consensus scenario (excluding the worst grader) AUROC of 89.0% (95% CI: 82.9-94.5). The agreement between the deep learning system and the gold standard was 0.715 (95% CI: 0.596-0.832), whilst the highest ophthalmologist agreement with the gold standard was 0.613 (95% CI: 0.479-0.737). Intra-observer agreement ranged from 0.62 to 0.97 for ophthalmologists, compared to the deep learning system that provided perfect repeatability. PDLS's time to read and interpret was 8 sec per image with a total time of 14.7 minutes vs. the average for human readers of  $1.5 \pm 0.7$  minutes per image and a total average of  $2.8 \pm 1.2$  hours to read.

#### Conclusions

In the patient sample studied, the deep learning system outperformed the best case consensus scenario involving six ophthalmologists. However, due to the relatively small patient sample, it could not be determined that this result was statistically significant. Future work will extend this study to a larger sample of patients.

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## P-WT-196

### SELECTIVE LASER TRABECULOPLASTY IN PATIENTS WITH ANGLE RECESSON GLAUCOMA: A CASE SERIES

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#### Purpose

To describe the results of selective laser trabeculoplasty (SLT) in eyes with Angle Recession Glaucoma. To our knowledge, this is the first report of SLT being used as treatment modality for angle recession glaucoma, Argon laser trabeculoplasty (ALT) tried before for angle recession glaucoma and found to have minimal therapeutic effect.

#### Methods

Retrospective case series of 4 eyes of 4 patients with history of non-penetrating injury to the eye resulted in angle recession glaucoma. The gonioscopic examination was performed pre-treatment, to confirm angle recession. All eyes underwent SLT; post-treatment, best-corrected visual acuity (BCVA), intraocular pressure (IOP), number of glaucoma medication, additional need for intervention, and complications were recorded, SLT was successful when resulted in IOP reduction by 20% or medication reduction and maintaining target IOP without the need for further intervention during follow up period of more than 3 months.

#### Results

Mean age was 44 years. 2 out of 4 were female.

3 out of 4 patients SLT succeed to lower the IOP (from 21 to 12 mmHg in one eye and from 26 to 20 mmHg with reduction in medication in the second patient) or to reduce glaucoma medication (3<sup>rd</sup> patient stopped glaucoma medication with non significant change in her IOP from 10 to 14 mmHg till her last follow up visit 45 months later)

Patient with failed treatment, had another session of SLT, which also failed and he underwent tube surgery.

Patients were followed up for 4-45 months post treatment, the patient with successful SLT had stable glaucoma for the period of follow up.

#### Conclusions

predicting the IOP outcome in SLT is difficult in patients with angle recession glaucoma, success will be noticed early in the post treatment period and is maintained for years, repeating SLT in case of early failure has poor prognosis and is not recommended. Results are encouraging, but well organized clinical trial is needed to confirm SLT effectivity and safety in angle recession glaucoma eyes.

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## P-WT-197

### TREATMENT OF PAPILLOMACULAR RETINOSCHISIS IN GLAUCOMA PATIENTS WITH AN ACQUIRED OPTIC DISC PIT

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#### Purpose

Glaucomatous eyes have focal structural abnormalities in the optic disc head, including acquired pits of the optic nerve. The presence of macular retinoschisis or macular detachment is presumably associated with the acquired pits of the optic nerve, although the source of the intraretinal/subretinal fluid has not been identified. We herein report two cases of primary open-angle glaucoma patients with an acquired optic disc pit and papillomacular retinoschisis, who were successfully treated with pars plana vitrectomy (PPV).

#### Methods

An observational case report. Patients were examined and followed up using spectral-domain optical coherence tomography (SD-OCT).

#### Results

SD-OCT images revealed a small focal excavation of the optic nerve head in the inferotemporal quadrant and papillomacular retinoschisis that extended to the macula in the right eye of case 1 and in the left eye of case 2. One of the patients (case 1) also showed macular detachment. Since there was no spontaneous improvement of the papillomacular retinoschisis and macular detachment, PPV with internal limited membrane (ILM) peeling was performed on both patients. SD-OCT images showed the papillomacular retinoschisis and macular detachment resolved gradually after surgery, and this resulted in improvement in visual acuity and visual field defects.

#### Conclusions

PPV with ILM peeling is a possible choice of treatment, when visual function is affected by the persistent papillomacular retinoschisis and/or macular detachment.

#### References

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## P-WT-198

### PRIMARY CONGENITAL GLAUCOMA IN DENMARK, 1977-2016: EPIDEMIOLOGY, SURGICAL PROCEDURES AND VISUAL OUTCOME

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#### Purpose

To perform an epidemiological survey of all patients in Denmark diagnosed with primary congenital glaucoma (PCG) in the last 40 years from 1977 through 2016 in order to investigate the incidence, risk factors and to evaluate the long term prognosis of the disease and surgical survival.

#### Methods

A retrospective, nation-wide study based on the Danish National Patient Register (NPR) of all children with PCG born in Denmark from 1977 to 2016 with review of medical files was performed. We defined PCG as glaucoma due to isolated angle dysgenesis with symptoms within the first 2 years of life. We calculated the incidence of PCG in 4 decades 1977-1986, 1987-1996, 1997-2006 and 2007-2016. In addition, we evaluated the risk of PCG considering gender, consanguinity, family history, ethnicity, comorbidity, prematurity. We also noticed age at first symptoms, age at diagnosis and diagnostic delay throughout the decades. We performed a chart review and reviewed the surgical methods used and their success rates and additionally called the patients in for a follow up visit to evaluate their visual function.

#### Results

118 patients diagnosed with PCG and born in the time period from January 1 1977 to December 31 2016 were identified. The overall annual incidence in the period from 1977 to 2016 was 4.8 in 100,000 live born. Of the 118 patients, 74 (62.7%) were male and 44 (37.3%) were female. A total of 16 (13.6%) of these children were diagnosed with either somatic or psychiatric disease.

Around 87% of the eyes had a trabeculotomy done as primary procedure.

Of the 162 eyes 67.9% had a visual acuity > 6/18 while 12.3% had a visual acuity < 6/120. Binocular visual acuity in the children with bilateral PCG was > 6/60 in 85.1% and 3% < 6/120.

#### Conclusions

Primary congenital glaucoma is a potentially blinding disease, but in this study visual acuity in 68% of the eyes is better than 6/18 which is useful information to be able to give to the parents.

13.6% (16 out of 118) of the children with primary congenital glaucoma had a somatic or psychiatric disease, syndrome or developmental defect. Thirteen of these had bilateral PCG. We would recommend that a routine referral for a thorough pediatric examination be implemented in the regimes for children diagnosed with PCG.

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## P-WT-199

# WHAT TYPE OF DISC HEMORRHAGE IS A RISK FACTOR FOR GLAUCOMA PROGRESSION? DEVELOPMENT OF THE NOMOGRAM USING FUNDUS PHOTOGRAPH

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## Purpose

This study aims to develop a nomogram to predict the progression of glaucoma by combining topographic features of disc hemorrhage (DH) in patients with open angle glaucoma (OAG).

## Methods

We reviewed the medical records of patients who were detected DH during follow up with primary open angle glaucoma between January 2010 and March 2018, retrospectively. The patients were divided into two groups based on OCT and VF finding: Glaucoma progression group (n = 52) and Glaucoma non-progression group (n = 38). We compared topographic features by fundus photo and red-free photo between the two groups to find factors that could predict the glaucoma progression. Multiple logistic regression analysis was performed to select prognostic factors, and we constructed a nomogram to predict the progression of glaucoma.

## Results

DH at the border of retinal nerve fiber layer (RNFL) defect ( $P < 0.001$ ) and peripapillary DH ( $p = 0.009$ ) were significantly higher in progression group. Angular extent of DH, location of DH, and proximal location of DH were factors associated with glaucoma progression. Based on multivariable logistic regression, we used angular extent, location of DH, and proximal location of DH to construct the nomogram. The area under the receiver operating characteristic curve of the nomogram for predicting glaucoma progression was 0.811.

## Conclusions

We developed the nomogram using topographic features of DH as a novel and accurate screening method to predict the glaucoma progression in patients with OAG and aid ophthalmologists and other clinicians to decide whether to intensive care.

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## P-WT-200

### NEW INNOVATION GLAUCOMA MANAGEMENT: NIO GLAUCOMA MOBILE APP

Pankaj Bendale\*

#### Purpose

Glaucoma diagnosis flow chart begins with suspicion on clinical examination. many time patient gets over investigated depending on strong clinical suspicion. With large no of patient being not under clinical care as off, we need judicious use of resources to reach them & bring them under care.

So NIO glaucoma mobile app was designed to sort out those patients which really need further work up & those can be serially followed probably with only just disc photo.

#### Methods

So initial small pilot study of our was conducted to assess help of this app in further management of patients. 5 ophthalmologist who were advising glaucoma work up based their clinical suspicion and again based on the score derived from app were studied.

5 ophthalmologist used app whenever they felt case requires further Glaucoma work up. App score was calculated. Patient were subjected to detail Glaucoma work up including perimetry, pachymetry, OCT RNFL analysis & baseline DISC photo.

Single Glaucoma specialist reviewed patient again with all investigations & app score.

#### Results

Total of 134 patients were enrolled. score above 10 in 82 case & less than 10 in 52 cases. mean age in both group was 65+/-5.6 yrs and 62.4+/- 8.6 yrs in both eyes. Glaucoma work up being positive & patient actually put on medications after Glaucoma specialist opinion were 62 out of 82 in cases having APP score more than 10. Glaucoma work up being negative & patient are just serially asked to follow up after Glaucoma specialist opinion were 46 out of 52 in cases having APP score less than 10. Significant P value ( P = 0.036).

#### Conclusions

It was concluded that rate of glaucoma work coming positive was significant high when app score was more than 10. when app score was less than 10, again chance of glaucoma work up turning negative was significantly high. So we conclude that with the help of this app, we can judiciously use resources and can definitely avoid lot of unnecessary detail glaucoma work up ( Perimetry, OCT RNFL analysis) which are cost saving for patients. These things matter in resource hungry nation like ours with most of patient class paying through their pockets than having any medical insurance. Another advantage of App is serial record maintenance which most important in Glaucoma to assess course of disease over a period to predict long term behaviour of disease.

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## P-WT-201

# ADHERENCE OF GLAUCOMA SURGICAL TRIALS TO THE WORLD GLAUCOMA ASSOCIATION GUIDELINES IN THE ERA OF MIGS

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## Purpose

The purpose of this study was to determine how well surgical trials using microinvasive glaucoma surgeries (MIGS) conform to the World Glaucoma Association (WGA) guidelines.

## Methods

Using a predefined search strategy, the following databases were searched for comparative trials involving MIGS in the English peer-reviewed literature from 2000 to June 21, 2018: Medline, EMBASE, BIOSIS, Cochrane and Web of Science. From the WGA guidelines, 53 outcomes were selected for evaluation: methodology (31), definition of success (7), ethics (10), postoperative complications (1), economic evaluation (1) and statistical reporting (3). Each article was assessed by two reviewers and differences were resolved by consensus.

## Results

Twenty-eight eligible publications were identified; three were longer-term follow-ups from a previous publication, leaving 25 distinct studies. There were 10 randomized controlled trials (RCT) and 15 non-randomized comparative trials (non-RCT). The mean total score out of 53 was  $24.2 \pm 6.2$  (45.7% compliance):  $28.1 \pm 6.2$  (53%) and  $21.6 \pm 4.7$  (40.8%) for RCT and non-RCT, respectively. The mean follow-up was  $19.9 \pm 11.6$  months (range, 6-48). Mean % compliance for each subsection were: methodology 48.9%; definition of success 21.1%; ethics 55.6%; postoperative complications 88%; economic evaluation 0%; and statistical reporting 37.3%. In 16 studies (64%), at least one author reported an association with the industry. 32% of studies reported an author being a shareholder. 24% of studies had industry as an author. The primary IOP endpoint was defined as both an upper limit and percentage reduction in only 4 (16%) studies (1 RCT, 3 non-RCT). An IOP-based survival curve was provided in 7 (28%) studies (none of the RCTs). Two studies (8%) had an IOP scatter plot. Twelve studies (48%) reported 95% confidence intervals. The use of Goldmann applanation tonometry for intraocular pressure (IOP) measurement was mentioned in 18 (72%) studies. Only 4 (16%) studies used the mean of three diurnal IOP readings as the baseline IOP.

## Conclusions

Published comparative MIGS trials show low adherence (45.7%) to the WGA guidelines. Developing standardized methodology and reporting of results of glaucoma surgical trials could greatly enhance interpretation and transparency of study outcomes and facilitate comparisons between trials. Authors and journals should be encouraged to follow the WGA guidelines.

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## P-WT-203

# PROGRESSION TO BLINDNESS IN 20 YEARS AMONG PATIENTS WITH GLAUCOMATOUS VISUAL FIELDS IN A TERTIARY HOSPITAL IN THE PHILIPPINES

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## Purpose

To determine the visual field (VF) rates of change among patients with glaucomatous patterns of VF loss and those who will become blind based on residual life expectancy as well as the factors associated with a fast rate of progression and blindness at expected death.

## Methods

This was a retrospective study of the VF series of patients with glaucomatous pattern VF defects in at least one eye in a tertiary hospital in the Philippines. VF data were recorded and reviewed. Rates of VF change, calculated in decibels (dB) per year for each eye, together with the residual life expectancy based on age and sex were used to predict the mean deviation or defect (MD) at the end of a patient's expected lifetime. A patient was considered blind if the computed MD reached a value of 22 dB (Octopus®) or -22 dB (Humphrey®) or worse in the better eye. Factors associated with a fast rate of progression ( $>1$  dB/year for Octopus® or  $< -1$  dB/year for Humphrey®) and blindness were also established.

## Results

1016 eyes of 583 patients were eligible for this study. Overall, 613/1016 (60.3%), 95% CI [57.3%,63.3%] of eyes showed a decline in VF MD per year, however, only 98/1016 (9.7%), 95% CI [7.9%,11.5%] of eyes showed fast progression. Among patients with VF series in both eyes, 43/433 (9.9%), 95% CI [7.11,12.75] were predicted to progress to blindness in their expected lifetime. In multivariate analysis, factors associated with a fast rate of progression were the baseline MD ( $P < 0.001$ ) and male sex ( $p = 0.041$ ) whereas those associated with blindness at death were age  $< 60$  years ( $p = 0.003$ ), baseline MD ( $p = 0.022$ ), presence glaucomatous VF defect pattern on both eyes ( $p < 0.001$ ), and a fast rate of progression ( $P < 0.001$ ).

## Conclusions

Conclusion: Less than 10% of patients will reach blindness in their expected lifetime under a routine clinical setting. Because of the association of age and baseline MD on blindness, the valuable role of early disease detection is underscored. VF progression rates as well as the individual's residual life expectancy should be incorporated in glaucoma care to determine whether treatment should be escalated in order to prevent blindness.

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## P-WT-204

# GLAUCOMA LOGISTICS – PREVENTING BLINDNESS – A NEW SWEDISH STRATEGY FROM THE COUNTY OF ÖSTERGÖTLAND

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## Purpose

The aim of this study is to reduce the future number of blind people in Sweden by introducing an improved screening strategy and follow up for glaucoma during regular visits to private optometrists. The aim is to increase the specificity of the referrals from optometrists to ophthalmologist in a way that has not been done in the Sweden before. At present there is a steady increase in delay for glaucoma patients at most ophthalmology clinics in Sweden, leading to an increase in visual impairment that could have been prevented. The great increase of glaucoma due to an aging population will most likely not be matched with an increase in public funding. This study aims at addressing this by changing the logistics between private optometrists and public ophthalmologists.

## Methods

Comparison between two ophthalmology departments.

The county of Östergötland is served by two major hospitals each with an ophthalmology department. The only criterion today for referral to an eye clinic in Östergötland is a raised IOP above 25 mmHg.

Change in criteria for referral to one of the Hospitals (Norrköping).

For those optometric practices that refer to Norrköping Hospital ophthalmology department, the criteria will change.

i) All customers aged 50-79 years that have an IOP of 26-29 mmHg, need verified visual field defects before they can be referred to the Hospital.

ii) An improved screening by optometrists to find glaucoma that are not identified by today's system. All customers aged 70-75 years with a moderately raised IOP of 17-25 mmHg will here be included.

## Results

Ethical approval has been given, the project started September 2018. Information with startup data will be presented at WGC-2019.

## Conclusions

In a world with a great shortage of ophthalmologists and with a great increase of glaucoma we need to find new ways to address the challenge, unless we are to accept a steady increase of visual impairment. We need to get the right patients in at the right time, to maximize the ophthalmologists' time in the fight against visual impairment. This project addresses that challenge.

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## P-WT-205

### RISK STRATIFICATION OF GLAUCOMA PATIENTS SUITABLE FOR VIRTUAL CLINICS IN UK - INNOVATIVE AND REPLICABLE RESTRUCTURING OF LOCAL SERVICES

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#### Purpose

Monitoring and treatment glaucoma patients is associated with substantial healthcare costs and resource consumption. With limited capacity, funding, clinicians, patients within the hospital eye service (HES) risk losing vision due to delayed care.

Virtual clinics bypass the need for face-face clinical interaction. Patient information can be gathered by ophthalmic technicians and reviewed later by a clinician. This allows more patient data to be assessed, enabling clinicians more time in direct consultation with complex cases.

We can risk stratify the population in terms of disease progression and visual loss to determine those suitable for virtual clinics.

#### Methods

All adult glaucoma related follow-up consultations in a tertiary referral centre in Edinburgh (UK), were analysed retrospectively over 3 months. We used clinic letters on 'TrakCare', an electronic national patient management system, to gather information such as; patient demographics, intraocular pressures, history, imaging, investigations, intervals between treatment and follow-up.

#### Results

Of the identified patients (n = 2,108), 56.2% (n = 1185) were from glaucoma clinics, 43.8% (n = 923) from general clinics. Mean age was 72.2 ± 13.0 and 52% (n = 1096) female. Mean duration for treatment change in both groups was 2.5 ± 3.5 years and follow-up 6.0 ± 3.7 months. 182 patients (9.4%) had MD < 22 dB in the worse eye and 48 patients (2.5%) had MD < 22 dB in the better eye. Most had a slow rate of progression with an overall median rate of change -0.18 dB per year (IQ range -0.67 to 0.16 dB per year).

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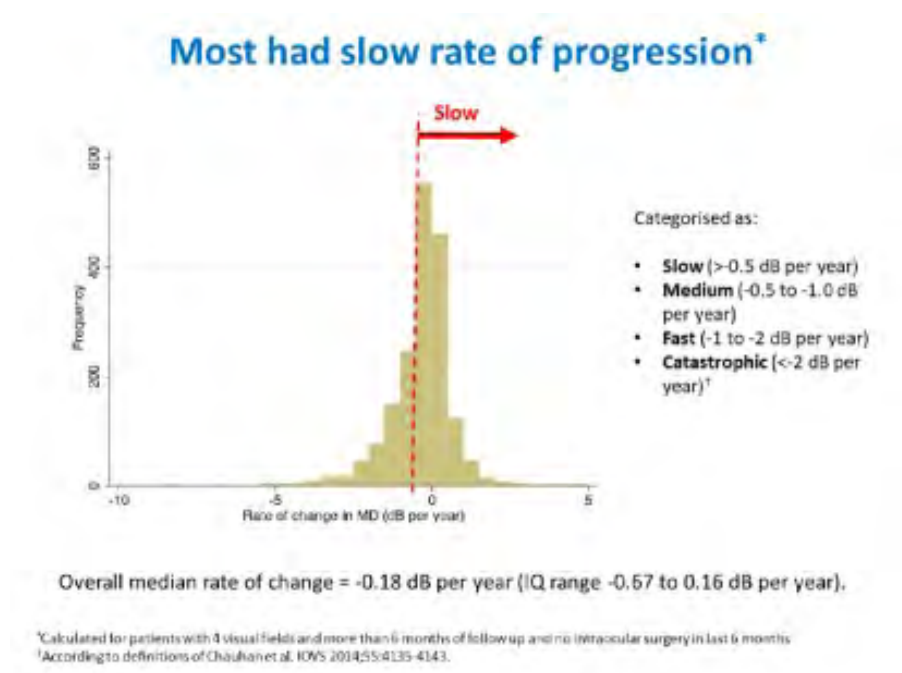
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## Conclusions

Classification of patient groups provide crucial information for restructuring of local glaucoma services to create replicable care pathways. Here, the proportion of eligible patients was 58.6%, including those with treated angle closure or suspect, pigment dispersion and pseudoexfoliation without glaucoma. It may appear high but with clinician judgment, exclusion of those with rapid progression or severe disease, figures fall to 8.7%. Clinical conditions may fluctuate so all data should be reviewed and treatment tailored accordingly. A 'one size fits all' approach is not appropriate.

However the concept is generally accepted by patients, particularly if they understand their disease status and risk of clinical progression. Virtual clinics introduce a new model of service delivery, assisting monitoring of patients with chronic ocular disease. It increases outpatient capacity, reduces costs and helps streamline referrals to HES.

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## P-WT-206

### DIURNAL IOP FLUCTUATION IN PATIENTS WITH GLAUCOMA AFTER GELATIN STENT PLACEMENT

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#### Purpose

Intraocular pressure (IOP)-lowering performance and safety of an *ab interno*, minimally invasive gelatin stent (XEN<sup>®</sup> 45, Allergan plc) was previously assessed in patients with refractory glaucoma.<sup>1</sup> The purpose of the present post-hoc analysis was to evaluate diurnal IOP fluctuation in patients who completed the 12-month visit.

#### Methods

This study enrolled refractory glaucoma patients aged  $\geq 45$  years with baseline medicated IOP between 20-35 mmHg on maximally tolerated medical therapy (MTMT), and visual field mean deviation of  $-3$  dB or worse. Diurnal IOP was measured at baseline and postoperative month 12; at each visit, three measurements were obtained over 8 hours (hours 0, 4, and 8). Diurnal IOP fluctuation was defined as the diurnal IOP value range (max-min). Change from baseline in diurnal IOP fluctuation was analyzed using a paired *t*-test. Association between diurnal IOP fluctuation change from baseline to month 12 and each baseline patient characteristic (glaucoma type, prior incisional glaucoma surgery, and mean diurnal IOP  $\geq 25$  and  $< 25$  mmHg) was tested by multiple linear regression or analysis of covariance model.

#### Results

In this study, 65 patients were implanted and 52 completed the 12-month visit. Mean (SD) diurnal IOP at baseline ( $n = 65$ ) and month 12 ( $n = 52$ ) was 25.1 (3.7) and 15.9 (5.2) mmHg, respectively. Mean (SD) diurnal IOP fluctuation at baseline was 3.36 (3.10) vs 2.31 (1.55) mmHg at month 12 (mean [SD] change from baseline of  $-1.07$  [3.63] mmHg [ $p = 0.039$ ]). Mean diurnal IOP fluctuation from baseline to month 12 did not differ significantly by patient baseline characteristics. There was a trend toward greater diurnal fluctuation at month 12 with greater glaucoma medication use (increase in IOP fluctuation by 0.28 mmHg with each added glaucoma medication used at month 12).

#### Conclusions

Implantation of the *ab interno* gelatin stent in refractory glaucoma patients consistently reduced IOP across all diurnal timepoints at month 12, and IOP fluctuation at postoperative month 12. Baseline and month 12 IOP fluctuations, respectively, are similar to those reported in patients receiving MTMT and post-trabeculectomy.<sup>2</sup>

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## P-WT-207 IATROGENIC GLAUCOMAS

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### Purpose

To present clinical features in uveitis-glaucoma-hyphema syndrome in different scenarios: Iris-claw IOL, Anterior chamber IOL, 3 pieces displaced IOL or 1 piece displaced IOL.

### Methods

Clinical case series.

#### Iris-claw IOL

Case 1: Patient with spontaneous recurrent hyphema. Background: Post-traumatic surgery with iris-claw IOL 30 years ago. Exploration: IOL instability, iris atrophy, blood cells in the anterior segment and vitreous hemorrhage. Treatment: removal of IOL and new IOL.

#### Anterior chamber IOL

Case 2: Postoperative of cataract surgery with IOL placement in the anterior chamber (AC) due to the instability of the bag. Exploration: Inclined IOL due to a remnant of the anterior capsule around the lower haptic, blood cells and inflammation. Treatment: IOL repositioning and anterior capsule removal.

Case 3: Background: Myopia Magna with AC IOL 30 years ago, being phakic. Exploration: AC IOL, cataract, synechiae and iris atrophy due to lens friction. Treatment: extraction of the AC IOL and phacoemulsification with new IOL in the bag.

#### 3 pieces displaced IOL

Case 4: Patient with recurrent hyphema related with physical effort. Background: Post-traumatic surgery with three-piece IOL 15 years ago. Exploration: IOL of three pieces with optics and one haptic in AC, iris atrophy and pigment dispersion in the trabecular meshwork. Treatment: IOL relocation.

Case 5: IOL of three pieces in the sulcus, with an incorrect orientation, inverted, haptic in the counter-clockwise direction. Treatment: IOL reposition.

#### 1 piece displaced IOL

Case 6: IOL of one piece in the sulcus, with an unstable position, blood cells in the anterior segment and vitreous hemorrhage.

Case 7: IOL of one piece in the bag, displaced at a lower temporal level with pseudophacodonesis, presenting trabecular mesh pigment, blood cells in the anterior segment and iris atrophy.

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### Results

Intraocular lens IOL relocation and medical treatment were required in these cases being able to prevent other attacks.

### Conclusions

Uveitis-Glaucoma-Hyphema syndrome (UGH) is a rare complication caused by intraocular irritation of intraocular lenses (IOL) that leads to transillumination defects of the iris and pigment dispersion, to micro hyphema and hyphemas with elevated intraocular pressure (IOP) and damage to the optic nerve. The most common cause is the rubbing of the anterior chamber lenses, but it can occur from any pseudophakic lens.

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## P-WT-209

### OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY OF OPTIC DISC PERFUSION IN PRIMARY OPEN ANGLE GLAUCOMA

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#### Purpose

To investigate optic disc perfusion differences between normal and primary open angle glaucoma eyes using optical coherence tomography angiography.

#### Methods

This prospective comparative cross-sectional selective pilot study was performed on 45 eyes of 45 primary open angle glaucoma (POAG) patients and 30 eyes of 30 healthy age-matched controls. POAG patients were divided into 3 groups normotensive glaucoma (NTG), juvenile primary open angle glaucoma (JPOAG) and adult onset high tension POAG (AO HTPOAG) with 15 eyes in each group. Normal control group are composed of 2 age matched groups; 20 eyes of controls for NTG and AO HTPOAG and 10 eyes of controls for JPOAG. OCT and OCTA were performed using swept source TOPCON 3D OPTICAL COHERENCE TOMOGRAPHY DRI OCT Triton. The optic nerve head (ONH) was imaged with a 4.5 × 4.5 mm scan and assessed in 4 different levels; the superficial Papillary, deep papillary, outer retina level and choroidal level. Density map images gave qualitative data. These images were processed using Image J program (IJ 1.46 r edition) for determining vascular density index (VDI). Structural and functional glaucoma parameters were tested and correlated with VDI.

#### Results

VDI in OCT angiograms, as a quantitative assessment, ONH perfusion was significantly lower in the glaucoma group when compared with the normal. This reduction was more significant in NTG followed by JPOAG and AO HTPOAG with average VDI was reduced by 20.03%, 13.71% and 6.29% respectively. In qualitative assessment the dense microvascular network that was visible on OCTA in normal discs, was markedly attenuated in glaucoma patients. This reduction *i.e.* ischemia may have a primary element as detected by decreased VDI at choroidal level in all 3 groups NTG, JPOAG and AO HTPOAG that reduced by (41.42%, 29.25% and 17.37% respectively). In addition, it may be secondary to elevated IOP. The VDI was correlated significantly with all functional and structural parameters and disease severity.

#### Conclusions

OCTA may offer insights into the pathophysiology of glaucomatous damage and the role of vasculature in the disease pathogenesis. Hence, it may be a promising technology in glaucoma management.

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## P-WT-210

# REAL WORLD TREATMENT AND OUTCOMES FOLLOWING TRABECULECTOMY IN US CLINICAL PRACTICE: AN ANALYSIS OF THE AAO IRIS REGISTRY

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## Purpose

To assess real-world clinical outcomes and healthcare resource utilization after trabeculectomy in US clinical practice using the AAO IRIS registry.

## Methods

This was part of a large-scale, observational, retrospective cohort study of treatment and outcomes following glaucoma procedures conducted in the American Academy of Ophthalmology IRIS registry, a large national Electronic Health Record-based database. Patients with a diagnosis of open-angle glaucoma (OAG) or ocular hypertension (OHT) were included in this analysis if they underwent trabeculectomy during the index period (Jan 2015 – Jun 2016), in a practice contributing data to the registry for 12 months pre- and 24 months after the index procedure, with no prior glaucoma surgery in the previous 12 months. Intraocular pressure (IOP) was evaluated at multiple time points over the first 24 months; and health care resource utilization was assessed at 12 and 24 months post-index. Eyes contributed to a given assessment if observed in the relevant visit window; and were not censored if additional surgical procedures were required, or drop medications were increased.

## Results

101,706 OAG/OHT patients received a glaucoma procedure during the index period, of whom 7,617 (7.68%) underwent trabeculectomy in N = 8,907 eyes, with no prior surgery in the prior 12 months. In trabeculectomy patients, the mean (SD) number of physician visits for glaucoma-related care was 12.24 (7.56) [N = 7,484] and 16.64 (11.01) [N = 7,513] at 12 and 24 months, respectively. In eyes undergoing trabeculectomy, mean (SD) IOP at baseline (-60 to 0 days) was 22.37 (9.21) mmHg [N = 5,936]. The mean (SD) observed IOP change from baseline was 9.19 (9.75) at 6 months ± 4 weeks [N = 2,529]; 8.30 (9.46) mmHg at 12 months ± 8 weeks [N = 2,780]; and 8.66 (9.60) mmHg at 24 months ± 8 weeks [N = 2,070].

## Conclusions

In one of the largest real-world cohorts of OAG/OHT patient eyes undergoing trabeculectomy in US clinical practice assessed to date, the observed reduction in IOP was 8.3 mmHg and 8.7 mmHg at 12 and 24 months post-procedure. Additional analyses are ongoing to assess the contribution of subsequent surgical treatments and/or use of adjunctive medications, and rates of surgical complications. There was significant healthcare resource utilization at 12 and 24 months post-trabeculectomy, with a mean of 12 and 17 physician visits, respectively.

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## P-WT-211

# RELATIONSHIP BETWEEN INTRAOCULAR PRESSURE, BLOOD PRESSURE AND CEREBROSPINAL FLUID PRESSURE AND IMPACT ON OCULAR BIOMECHANICS AND PERFUSION

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## Purpose

The levels of intraocular pressure (IOP) and cerebrospinal fluid pressure (CSFp) are major contributors to the biomechanical status of the optic nerve head (ONH) tissue. In addition, the level of blood pressure (BP) has been shown to influence the ONH perfusion. Alterations in both the biomechanical and hemodynamical conditions of the optic nerve tissues have been hypothesized as potential causes of glaucomatous damage, but it remains unclear how to quantify their relative importance in a specific individual with given IOP, CSFp and BP. Due to the difficulty of isolating these factors in experimental and clinical studies, we propose a Mathematical Virtual Simulator (MVS) to estimate biomechanical and hemodynamical conditions in the ONH of specific patients.

## Methods

The MVS takes as inputs the values of IOP, CSFp (from which we define the translaminal pressure difference  $TLPd = IOP - CSFp$ ), BP, axial length and central corneal thickness. The MVS provides biomechanical outputs (distribution of stresses and strains in the ONH tissues) and hemodynamical outputs (blood velocity and pressure in the microvasculature within the lamina cribrosa). The MVS is utilized as a virtual laboratory to identify ranges of the input values, considered individually or in combination with the others, that are likely to give pathological biomechanical and/or hemodynamical conditions in the ONH.

## Results

MVS simulations indicate that similar TLPd values correspond to similar biomechanical conditions in the ONH but different hemodynamical conditions depending on the IOP level (up to 10% differences for IOP changes of 5mmHg) and the BP level (up to 25% differences for 10mmHg changes in mean arterial BP). CSFp variations do not seem to have notable effects on the velocity of central retinal artery (CRA) and the central retinal vein (CRV) both pre- and post-lamina, whereas small fluctuations occur in the CRV velocity due to higher IOP.

## Conclusions

Mathematical Virtual Simulator is capable of characterizing biomechanical and hemodynamical conditions associated with specific values of IOP, BP and CSFp, thereby providing a quantitative tool to identify the most likely disease process in a given patient. This information might help advance glaucoma management towards personalized approaches.

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## P-WT-213

# THE LONG-TERM EFFECT OF CONTINUOUS POSITIVE AIR PRESSURE ON THE INTRAOCULAR PRESSURE IN PRIMARY OPEN-ANGLE GLAUCOMA WITH OBSTRUCTIVE SLEEP APNEA

Pradtana Hirunpatravong\*

## Purpose

We studied influence of long-term CPAP therapy on IOP, blood pressure, ocular perfusion pressure and glaucoma progression in primary open angle glaucoma (POAG) patients.

## Methods

Prospective control study. We enrolled 12 eyes from 6 POAG patients who aged 35 and over, newly diagnosed OSA, and had indication for CPAP therapy. CPAP was continues for 12 months. We monitored IOP every 3 months. Visual field was done at baseline and 12 months.

## Results

The mean IOP after CPAP therapy for 12 months was  $19.08 \pm 3.47$  mmHg is increase significantly ( $P = 0.006$ ) compare with mean IOP  $17.83 \pm 2.88$  mmHg baseline IOP (average IOP 3 months before CPAP therapy). The rising rate of IOP is  $0.69 \pm 0.47$  /years ( $P = 0.138$ ) before CPAP used. The rate of IOP rising is increase to  $1.13 \pm 0.47$  /years ( $P = 0.016$ ). The ocular perfusion pressue (OPP) after 12 months of CPAP is  $42.21 \pm 5.29$  decrease from baseline at  $45.24 \pm 7.09$  ( $P = 0.06$ ). Results showed that PSD value of 24-2 SWAP visual field was reduced from  $5.34 \pm 3.92$  to  $4.77 \pm 3.73$  ( $P = 0.025$ ). Anti-glaucoma medication was add to a patient due to increase IOP without glaucoma progression evidence.

## Conclusions

Patients with POAG and OSA demonstrated significant IOP rising after CPAP therapy but not shown progression of glaucomatous damage. MD, PSD and VFI not showed a significant difference after CPAP therapy.

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## P-WT-214

# GLAUCOMA FILTRATION SURGERY BY OPHTHALMOLOGY TRAINEES IN AUSTRALIA – A SURGICAL AUDIT

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## Purpose

To evaluate the surgical trabeculectomy outcomes of Ophthalmology Trainees in a tertiary teaching hospital in Australia.

## Methods

A retrospective audit of patients who underwent trabeculectomy surgery between July 2017 and July 2018 at Liverpool Hospital, Sydney, Australia. Patients were identified by analysing electronic surgical lists and verified with both patient chart and electronic records. The following data were collected: glaucoma type, pre- and post- operative intraocular pressure (IOP) and best corrected visual acuity, complications and number of bleb needling and anti-metabolite injections post-operatively. Success rates were defined according to a postoperative IOP < 18 or < 12mmHg and will be represented by Kaplan Meier survival curves and pre- and post-operative IOP scatter plots.

## Results

Thirty-eight patients underwent either trabeculectomy or combined trabeculectomy/ cataract extraction at Liverpool Hospital. Of these cases, 29 (76.3%) were performed by trainee Ophthalmologists under Consultant supervision. The preoperative best corrected LogMAR vision and IOP was 0.23 and 23.3mmHg respectively. Mean IOP was  $11.3 \pm 7$ mmHg and  $9.6 \pm 5$ mmHg at 3 and 6 month post operation respectively. An IOP  $\leq 18$  was achieved in 92% of patients at 3 months and 93% at 6 months. An IOP  $\leq 12$  was achieved in 75% at month 3 and 81% at 6 months. The mean logMAR best corrected visual acuity at 6 months was 0.14.

There was no statistically significant difference between IOP outcomes in Trainees and Consultant surgeons at either 3 months ( $P = 0.4$ ) or 6 months ( $P = 0.42$ ) post operation. Two patients of the trainee group required bleb or flap revision (6.9%), one patient required subsequent Baerveldt tube insertion and another patient required reformation of the anterior chamber.

## Conclusions

Trainee performed trabeculectomy surgery achieved comparable IOP outcomes at 6 months and complication rate is comparable to national standards<sup>1</sup>.

## References

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## P-WT-215

### SELF-CHECKING SHEET (CLOCK CHART® DRIVING EDITION) FOR BINOCULAR VISUAL FIELD DEFECTS

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#### Purpose

We developed a simplified self-check screening sheet (CLOCK CHART® Driving Edition: CLOCK CHART® DE) to help those possible patients to notice binocular visual field (VF) defects and explored sensitivity and reproducibility of the CHART.

#### Methods

The CLOCK CHART® DE has four targets of a child, bicycle, car and traffic light displayed at 10°, 15°, 20°, and 25° eccentricities, respectively. By rotating the CHART 360°, the subject comes to realize the VF defects by his/herself. This study enrolled 150 eyes 75 glaucoma patients (33 males, 42 females, mean age, 61.4 ± 12.2 yo) and sensitivity was calculated using CLOCK CHART® DE and HFA SITA-Standard 30-2. Binocular VF was formed using IVF (Integrated VF). When 2 or more contiguous test points less than 10 dB were detected within 30°, the subject was diagnosed with VF defects. The stage of glaucoma was classified binocularly (using both eyes) by counting the number of response points that are 10 dB or higher of the 76 points in IVF. In this study, 62 subjects (83%) showed 76 to 57 response points; 14 subjects (19%), 56 to 37 points; and no subjects showed lower than 37. To explore reproducibility of VF, all the 75 cases were tested employing 2 methods to measure VF defects: 1) the self-check method in which the subjects themselves turned the sheet and 2) the supported method in which the examiner helped the patient in rotating the sheet. These 2 methods were performed 3 times for each method, totaling 6 times for each subject.

#### Results

The sensitivity of CLOCK CHART® DE was 84% and that at the eccentricity 10°, 15°, 20°, and 25° was 69%, 73%, 74%, and 76%, respectively, when 2 or more contiguous test points (<10 dB) within the central 30° were defined as the VF defect. Presence of reproducibility CLOCK CHART® DE was confirmed when the same results were obtained from 3 measurements. Reproducibility of CLOCK CHART® DE was 91% (self-check) and 81% (supported). For the superior hemifield, reproducibility was 93% (self-check) and 93% (supported). For the inferior hemifield, reproducibility was 95% (self-check) and 82% (supported).

#### Conclusions

CLOCK CHART® DE is an easy-to-check screening chart, which enabled the patients to notice by themselves VF defects with both eyes open. There were no differences in sensitivity and reproducibility when the patients self-checked, or rotated the CHART by themselves compared to when the examiner helped the patient in rotating the CHART.

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## P-WT-216

### EVALUATING THE EFFECTIVENESS OF EDUCATION IN IMPROVING THE KNOWLEDGE OF INDIVIDUALS ABOUT GLAUCOMA

Khosrow. Jadidi\*

#### Purpose

Glaucoma has symptoms and complications that are quite slow and difficult to diagnose. On the other hand, the level of awareness of individuals is very low in relation to this disease. Promoting levels of knowledge play an important role in preventing irreversible damage to glaucoma. In this regard, this study was designed to evaluate the role of education in improving the knowledge of individuals about glaucoma.

#### Methods

This quasi-experimental study was performed on 122 volunteers. At first, the demographic data of the subjects were recorded. Before the beginning of the intervention, the level of knowledge about the disease was evaluated by a researcher-made questionnaire with 12 questions. Subjects were then trained in a one-day training session on glaucoma, and then the level of knowledge was added to the questionnaire again and compared with pre-training data.

#### Results

In this study, 50 men and 72 women with a mean age of  $51.36 \pm 14.23$  years participated. The results of statistical analysis have shown that the training process involving 7 axes including Glaucoma definition, Causes of glaucoma, People with higher risk of disease, Normal IOP, Glaucoma detection tests and Surgical benefits significantly improved the Level of knowledge ( $P\text{-value} < 0.05$ ). It was also found that in other areas, the level of awareness of individuals developed after training. However, the level of awareness was not significant ( $P\text{-value} > 0.05$ ). Educational sessions had the most impact on the transfer of knowledge about normal intraocular pressure and had the least impact on the reasons for the increasing prevalence of glaucoma.

#### Conclusions

Based on the results of this study, it can be concluded that training as an early intervention tool has a significant role in promoting the level of knowledge of individuals about glaucoma.

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## P-WT-217

# MIDTERM OUTCOME OF MITOMYCIN C AUGMENTED TRABECULECTOMY IN OPEN ANGLE GLAUCOMA VERSUS ANGLE CLOSURE GLAUCOMA

Swathi Kanduri\*

## Purpose

To evaluate the efficacy and safety of Trabeculectomy with Mitomycin C (MMC) in Open angle glaucoma Versus Angle closure glaucoma.

## Methods

Medical records of patients who underwent Trabeculectomy with MMC were reviewed and followed for 3 years, divided into 2 groups: group 1: Open Angle Glaucoma (n = 41), group 2: Angle Closure Glaucoma (n = 67). Success criteria was measured as Intraocular Pressure (IOP) < 21mmhg with (qualified) or without (complete) use of Antiglaucoma medications (AGM).

## Results

A total number of 108 eyes of 137 patients is undertaken. Mean preoperative IOP in group1 was  $31.4 \pm 10.5$ mmhg and group2 was  $33.1 \pm 9.4$  which reduced to  $10.5 \pm 3.4$ ,  $10.5 \pm 2.6$ ,  $11.6 \pm 3.6$ ,  $11.0 \pm 2.7$ ,  $11.0 \pm 2.7$  in group1 and  $10.9 \pm 2.8$ ,  $12.0 \pm 3.8$ ,  $12.8 \pm 4.9$ ,  $12.4 \pm 3.9$ ,  $12.4 \pm 3.7$  in group 2 with P value = 0.566, 0.032, 0.168, 0.049, 0.049 at 3,6months, 1, 2, 3 years respectively with  $P < 0.001$  at each visit. Number of AGM was reduced from  $0.75 \pm 0.89$  to  $0.43 \pm 0.55$  at 3yrs ( $P = 0.002$ ). At 36 months follow up, Overall, 50.0% and 48.2% of eyes achieved complete and qualified success respectively. Sub group analysis showed that Success rate was higher in group1 (100%) compared to group 2(97%). Overall, complications such as Hypotony (1.8%), Choroidal detachment (2.8%), encapsulated bleb (2.8%) and Bleb leakage (1.8%) were encountered.

## Conclusions

Primary Trabeculectomy with MMC is safe and effective means of controlling IOP in both groups with good success and low rates of sight threatening complications.

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## P-WT-218

# TO IDENTIFY MORPHOLOGICAL RISK FACTORS FOR DEVELOPMENT OF GLAUCOMA IN MICROPHTHALMIC EYES UNDERGOING CONGENITAL CATARACT

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### Purpose

To identify morphological risk factors for development of glaucoma in microphthalmic eyes undergoing congenital cataract.

### Methods

Eyes with a minimum follow up of 1 year in both groups underwent UBM examination for anatomical measurements and morphological changes. (SLE, IOP and fundus done as a routine).

### Main Outcome Measure

Anatomical measurement and morphological changes of anterior and posterior chamber structures.

### Results

Raised IOP developed in 11 of 35 microphthalmic eyes(31.4%) versus 3/25 (12%) control eyes.

There was no difference in quantitative angle structure parameters in parameters in microphthalmic and control group. Elongated ciliary process(37% vs 0 % ;P = 0.003), Ciliary body insertion on posterior surface of iris (28 % vs 4 %; p = 0.0185 ) , High Insertion of Iris (40%% vs 12% %; p = 0.0217 ) , Iris hypoplasia ( 51 % vs 21% %; p = 0.0168 ) were significantly more common in microphthalmic eyes compared to control eyes.

There was no difference in quantitative angle structure parameters in parameters in microphthalmic and control group.

Of all abnormal morphological features , Ciliary body insertion on posterior surface of iris (Odd's ratio 29.33) and elongated ciliary processes (odd's ratio 22.5) seems to predict development of glaucoma in microphthalmic eyes while closed angle(odd's ratio 75) , high iris insertion(odd's ratio 315) and flat pars plicata (odd's ratio 100) seems to be predictor of development of glaucoma in control group of congenital cataract.

### Conclusions

Of all abnormal morphological features , Ciliary body insertion on posterior surface of iris (Odd's ratio 29.33) and elongated ciliary processes (odd's ratio 22.5) seems to predict development of glaucoma in microphthalmic eyes while closed angle(odd's ratio 75) , high iris insertion(odd's ratio 315) and flat pars plicata (odd's ratio 100) seems to be predictor of development of glaucoma in control group of congenital cataract.

Anterior chamber angle structure in microphthalmic eyes with congenital cataract and congenital cataract are identical. However microphthalmic eyes had significantly different morphological features in iris-ciliary body region compared control group. Abnormal insertion of ciliary body to posterior surface of iris and elongated ciliary processes seems to be a risk factor for development of glaucoma subsequently.

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## P-WT-219

### OCULAR PERFUSION PRESSURE AND THE RISK OF OPEN-ANGLE GLAUCOMA: SYSTEMATIC REVIEW AND META-ANALYSIS

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#### Purpose

To conduct a systematic review and meta-analysis to analyze the association between ocular perfusion pressure (OPP) and open-angle glaucoma (OAG).

#### Methods

Studies were identified by searching PubMed and EMBASE databases. The pooled mean difference in OPP between glaucoma patients and controls were evaluated using random-effects model. Subgroup analyses according to the type of glaucoma based on baseline intraocular pressure (IOP) and meta-regression were performed to explore the source of heterogeneity among studies.

#### Results

A total of 45 studies were identified including 3,131 patients with glaucoma and 9,202 controls. A considerable amount of heterogeneity of studies was observed ( $I^2 = 70.1\%$ ,  $P < 0.001$ ). OAG patients had significantly lower OPP than controls (pooled mean difference = -3.6 mmHg, 95% CI -4.83 – -2.41,  $P < 0.001$ ). Subgroup analysis revealed that OAG patients with high baseline IOP had significantly lower OPP than controls (pooled mean difference = -4.7 mmHg, 95% CI -7.41 – -1.94,  $P < 0.001$ ), but not in those with low baseline IOP (pooled mean difference = -1.43 mmHg, 95% CI -3.43 – 0.56,  $P = 0.159$ ).

#### Conclusions

Low OPP was significantly associated with OAG and the association was also significant in those with high baseline IOP. Our meta-analysis results suggest that individuals with low OPP are at significantly increased risk of developing OAG.

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## P-WT-220

### THE EFFECT OF COMMON BEVERAGE ON THE DEVELOPMENT OF GLAUCOMA

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#### Purpose

To investigate the association between consumption of coffee, tea or soda and glaucoma.

#### Methods

A population-based, cross-sectional survey was performed between 2010 and 2011, and a total of 7,608 participants were included in the analyses. Data on demographics, comorbidities, and health-related behaviors were obtained, and comprehensive ophthalmic examinations were performed. Multivariate regression analysis (adjusting for age, sex, diabetes, systemic hypertension, body mass index, smoking status and alcohol consumption) was used to assess the correlation between consumption of coffee, tea or soda and the development of open angle glaucoma (OAG).

#### Results

There was no significant difference in the intraocular pressure among the consumers of three beverages. Coffee consumption showed a statistically significant relationship with the presence of OAG, while no significant relationship was found between consumption of tea or soda and OAG. Compared with participants who didn't consume coffee, the adjusted odds ratio for OAG was 2.11 (95% CI, 1.19 ~ 3.14) for those who consume coffee. The robust effect of coffee consumption on OAG was observed in male, though not in female.

#### Conclusions

Coffee consumption may affect the development of glaucoma. Further studies are warranted to determine the exact underlying mechanisms.

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## P-WT-221

# PRACTICE OF TARGET INTRAOCULAR PRESSURE SETTING IN GLAUCOMA MANAGEMENT - AN AFRICAN SETTING

Nkiru Kizor - Akaraiwe\*

## Purpose

To evaluate the practice of target pressure setting in glaucoma treatment.

## Methods

A retrospective study of patients diagnosed with glaucoma at the Eye Specialists hospital, Enugu, Nigeria from January 2014 – December 2016. Information from medical records were collected up to a year after presentation: socio-demographics, visual acuity, central visual field, documented target pressure, apparent use of target pressure in subsequent management decision and attending doctor at visits (general ophthalmologist or glaucoma specialist) were noted. Information on practice of target pressure was also collected from the attending doctors using a questionnaire. Data was recorded and analyzed using SPSS version 22.

## Results

A total of 607eyes of 338 glaucoma patients presented between January 2014 to December 2016. Mean age was  $60.6 \pm 14.6$ years (range 12 – 96years) and 190(56.2%) were males.

Within one year of management, 81eyes of 43patients (13.3%) had target pressure documented. Of these, 49eyes of 26 patients (60.5%) had target pressure documented at commencement of treatment( $p = 0.000$ ).Mean time of setting target pressure after commencement of treatment was  $4.2 \pm 3.59$  months (range 1 - 12months). Glaucoma specialists were more likely to document target pressure both at commencement of treatment 45/49eyes (91.8%) or after 30/32eyes (93.8%). However only 45 of 250 eyes (18.0%) seen by glaucoma specialists at diagnosis had target pressure documented before commencement of treatment.

At one year of setting target pressure, target pressure was achieved in 51eyes (62.5%).Target pressure setting apparently influenced change in the management of glaucoma in 34/81(42.0%) eyes. Of these 34 eyes, number of eye drops increased in 10(29.4%), drops were changed in 9(26.5%), reduced in 2(5.9%), laser was required in 6(17.7%) and surgery in 7(20.6%) to achieve target pressure.

None of the 10 attending ophthalmologists document target pressure always even though 30% of them always set target pressure.

## Conclusions

The practice of setting target pressure in glaucoma management was found to be low amongst the study population. Glaucoma specialists were more likely to do so and it seems to be useful in practice. Increased education on its documentation is required.

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## P-WT-222

# EFFECT OF 2% GANCICLOVIR EYE DROPS ON CYTOMEGALOVIRUS POSITIVE POSNER-SCHLOSSMAN SYNDROME

Xiangmei Kong\*

## Purpose

To observe the effect of 2% ganciclovir eye drops on those Posner-Schlossman syndrome (PSS) patients with positive cytomegalovirus in aqueous humor.

## Methods

Fifty cases clinically diagnosed as PSS with positive cytomegalovirus. All patients underwent aqueous and serum analysis for CMV by enzyme linked immunosorbent assay (ELISA) and polymerase chain reaction (PCR). The history and clinical signs were noted, 2% ganciclovir eye drops was prescribed for topical use and follow up was performed. Pearson Chi-square test was used for the comparison of factors including keratic precipitates (KPs), Tyndall, and paired t test was used for factors including intraocular pressure (IOP), corticoid dosage, and IOP lowering medication dosage.

## Results

After topical antiviral therapy with the mean time of 5.4 weeks, the clinical manifestations of CMV positive PSS cases improved. The granulomatous or middle sized KPs got less (from 95% to 52%), coin-shaped KPs almost disappeared (from 22% to 2%), and Tyndall reaction disappeared (from 12% to 0%). The mean IOP value decreased from  $26.2 \pm 10.9$  mmHg to  $15.5 \pm 3.6$  mmHg. Furthermore, corticoid use decreased (from  $2.6 \pm 0.9$  times / day to  $0.7 \pm 1.0$  times / day), cases that do not use corticoid increased from 6% to 60%, and 17 cases (65.4%) out of those 26 cases who were corticoid dependent before could withdraw corticoid. The number of IOP lowering eye drops also decreased (from  $1.5 \pm 1.1$  kinds to  $0.8 \pm 1.1$  kinds), and the proportion of cases without IOP lowering medication increased from 24% to 58%. Those 13 cases that accepted CMV re-test of aqueous humor were all CMV negative after treatment. Some characteristics could help to identify CMV-positive PSS: iris depigmentation (96%), coin-shaped KPs, loss of corneal endothelium (average loss rate of  $10.8\% \pm 5.5\%$ ), and high IOP during attack.

## Conclusions

Topical treatment with 2% ganciclovir eye drops had a good short-term effect on CMV-positive PSS patients, which contributed to inflammation and IOP control, reduced the dosage of corticoid and IOP lowering drugs, and greatly reduced the proportion of corticoid-dependent. Further long-term follow up study is still needed.

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## P-WT-223 INFORMATION MANAGEMENT IN GLAUCOMA SUSPECTS

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<sup>1</sup>University of California Berkeley, Berkeley, <sup>2</sup>Topcon Healthcare Solutions, Oakland, United States

### Purpose

One of the most challenging clinical decisions in managing patients who are glaucoma suspect is when is it appropriate to initiate therapy. Since there is a distinct difference between people who are glaucoma suspects (GS) and those with glaucoma (G), it is reasonable to suggest that the manner in which the two groups are managed should also be different. As a result, the way clinical information is analyzed and utilized may also be different.

The management of G and GS patients involves the assessment of various physical tissue measurements including retinal nerve fiber layer (RNFL), ganglion cell layer (GCL), neural rim estimation (NRE), and intraocular pressure (IOP) and psychophysical measurements including threshold visual field (TVF). The outcome for the ophthalmic management of G is to preserve useful vision for the patient's lifetime. The results of the assessments (RNFL, GCL, NRE, IOP, and TVF) over time are used to create a trend line to predict the patient's visual trajectory. Clinical treatment decisions made if the trajectory of a patient's trend line has a slope that demonstrates a more rapid decay than anticipated. Current available (Carl Zeiss Meditec FORUM Glaucoma Workplace™) analysis and display algorithms guide the clinician by displaying trend analysis information for the various assessments in G. But the question remains if these analysis and display algorithms are the ideal format for patients who retain a diagnosis of a GS. Could another format be optimum for the management of GS?

### Methods

The emphasis in managing GS should be where clinical treatment decisions are made, *i.e.*: (1) on the earliest detection of change of the RNFL, GCL, or NRE, IOP or TVF and then (2) the earliest correlation between structure and function.

### Results

This poster demonstrates a strategy for clinical testing information management specifically designed for the GS. The proposed analysis and presentation guide the clinician in identifying the earliest evidence of change and the confirmatory presence of a structure function correlation.

### Conclusions

Although current analysis and display algorithms are used for patients with G or GS, they are more optimally designed for progressive change. The algorithm presented may be an alternative that is better attuned to the management of GS.

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## P-WT-224

# COMPARISON OF SURGICAL OUTCOMES BETWEEN AB-INTERNO TRABECULECTOMY USING A KAHOOK DUAL BLADE AND ISTENT TRABECULAR MICRO-BYPASS STENT

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### Purpose

To compare surgical outcomes of phacoemulsification combined with iStent (phaco-iStent) versus phacoemulsification combined with ab-interno trabeculectomy using Kahook Dual Blade (Phaco-KDB).

### Methods

This was a retrospective chart review of 112 patients with mild to moderate open angle glaucoma and had undergone phaco-iStent or phaco-KDB procedure between 2016 and 2018. Preoperative and postoperative data up to 6 months were collected. Primary outcomes included change in intraocular pressure (IOP), final IOP, and medication reduction. Surgical success was defined as the % of patients who achieved medication reduction while remaining at final IOP of 18 or lower. Both common and vision-threatening complications over the course of 6 months follow up were also recorded.

### Results

61 patients had undergone phaco-iStent and 51 patients had phaco-KDB. The type and severity of glaucoma were similar between the two groups ( $p = 0.064$ ,  $0.559$ ). Preoperative IOP was xxxx in the phaco-iStent group, and xxx in the phaco-KDB group. There was no significant difference in the IOP change ( $p = 0.9941$ ) or the final IOP at 6 months ( $p = 0.605$ ) between the two groups, both decreasing mean IOP by 2.46mmHg at 6 months. However, only the phaco-KDB group was able to reduce the number of medication by 50% (from  $1.7 \pm 1.1$  to  $0.8 \pm 1.0$ ) while remaining at the target IOP of 18 or lower, and the iStent group remained on the same number of medication ( $1.4 \pm 1.1$ ) at 6 months ( $p < 0.05$ ). Complications were rare in both groups, but hyphema was more common in the KDB group ( $<0.1\%$ ,  $p = 0.02$ ). There was no vision-threatening complications or those that require additional procedures.

### Conclusions

Both phaco-iStent and phaco-KDB can effectively reduce IOP, but phaco-KDB is more likely to reduce number of medications and achieve final IOP of 18 or lower. Complications are transient and rare in both procedures.

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## P-WT-225

### CLINICAL CHARACTERISTICS OF GLAUCOMA PATIENTS FOLLOWING REFRACTIVE SURGERY FOR MYOPIA CORRECTION

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Seung Hyuck Lee\*

#### Purpose

To evaluate the clinical characteristics of glaucoma patients after intraocular phakic intraocular lens(IOL) implantation or corneal ablation for correction of high myopia.

#### Methods

This was a retrospective, case control study. 21 subjects (10 glaucoma suspects with high myopia, 11 control with high myopia) were enrolled. Visual field test was performed using SITA 24-2 program of Humphrey field analyzer before and after surgery, and mean deviation (MD) and pattern standard deviation (PSD) from Humphrey SITA strategy was also compared perioperatively. Central corneal thickness, cup to disc (C/D) ratio, gonioscopy and intraocular pressure were compared perioperatively.

#### Results

The mean refractive error was -10.54 Diopter and the follow up period was 12 months after phakic IOL implantation. The mean photopic pupil diameter was 3.01mm (range: 2.53-3.5mm). Vertical C/D ratio was 0.68 and the ratio was not changed until 12 months postoperative. No significant change of MD and PSD was recognized after surgery.

#### Conclusions

LASIK or LASEK and phakic intraocular lens implantation may be a viable option in some glaucoma suspects. But, careful patient education and life long follow up is mandatory after surgery.

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## P-WT-226

# EFFECT OF MACULAR SURGERY WITH INTERNAL LIMITING MEMBRANE PEELING ON PROGRESSION OF VISUAL FIELD DEFECT: A PRELIMINARY STUDY

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## Purpose

To investigate the possibility of visual field defect after macular surgery with internal limiting membrane (ILM) peeling.

## Methods

This study was designed retrospectively. In this study, we used indocyanine green (ICG) or brilliant blue G (BBG) to facilitate the visualization of the ILM. The visual field defect was evaluated using a Humphrey visual field test at before and after the surgery.

## Results

A total of five patients with glaucoma were included in this study. Among those, seven eyes underwent pars plana vitrectomy with ILM peeling, facilitated by ICG in three eyes and BBG in four eyes. On the comparison of visual field defect, we found the progression of visual field defect on five eyes, regardless of surgical dye. Specific difference data for visual field defect is as follows; the difference of mean deviation value per year is -0.41dB in case 1 (BBG), -1.19dB in case 2 (BBG), -1.15dB in case 3 (BBG), -6.29dB in case 4 (ICG), +0.17dB in case 5 (ICG), -0.68dB in case 6 (BBG), and +0.29dB in case 7 (ICG).

## Conclusions

Our preliminary study suggests that macular surgery with ILM peeling may affect on the progression of visual field defect in patients with glaucoma. Therefore, clinicians should take specific precautions before macular surgery against its risk of visual field defect progression in glaucoma patients.

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## P-WT-227

# INCIDENCE OF SURGICAL GLAUCOMA SECONDARY TO ANTI-VEGF INTRAVITREAL INJECTIONS IN A 2 YEARS STUDY

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<sup>1</sup>*Glaucoma, University of British Columbia, Vancouver, Canada*

## Purpose

To assess the data of all patients who underwent Glaucoma Surgery in 2016 and 2017 and relate it to anti-VEGF intravitreal injections.

## Methods

A retrospective study is being conducted to analyze the information from all the patients who underwent Glaucoma Surgery in the period from January 2016 to December 2017, with one of the attending doctors at the main Glaucoma reference center in Vancouver, British Columbia. All patients who were having intravitreal treatment with anti-VEGF medication at the time they needed Surgery to control the intraocular pressure are being included. We excluded those patients who had intravitreal injections with steroid medication and the patients who developed neovascular glaucoma.

## Results

As the study is not yet finalized, the numbers and the information gathered from the study will be updated by the time of presentation. At this time, in a period of 4 months, 57 Glaucoma surgeries have been performed (40 Trabeculectomies or Combined Trabeculectomies with Cataract Extraction, 2 Deep Sclerectomies, 20 Tube Shunt devices, 1 Cataract extraction combined with i-Stent device, 5 Xen gel stent devices). From this total, 22 patients were regularly having intravitreal injections. Three of these 22 patients had Neovascular Glaucoma and therefore, will be excluded from the study. Thirteen patients were being treated for Age-related Macular Degeneration, 2 had central or branch vein occlusion, 3 had Diabetic Retinopathy and 1 presented with idiopathic retinal ischemia. The number of injections at the time the patient was referred to the Glaucoma Specialist and before proceeding to Surgery will also be assessed. Visual acuity before and after Surgery, as well as IOP and number of drops will also be evaluated.

## Conclusions

One third of the patients who needed Glaucoma Surgery for Intraocular Pressure (IOP) control were being treated with intravitreal Anti-VEGF injections. The relationship between the number of injections and the IOP elevation, the pre-existing risk factors for developing Glaucoma before starting anti-VEGF protocols, and the impact of such high rate of Glaucoma Surgeries for the Health System still need to be better analyzed.

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## P-WT-228

### QUALITY OF LIFE AND CONTRAST SENSITIVITY BASED STUDY IN PATIENTS WITH GLAUCOMA

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#### Purpose

Although most patients with early stage glaucoma do not report any specific symptoms or changes in vision, the pathology, since its beginning, may affect the visual-related quality of life (VrQoL) and vision-related activities. Contrast sensitivity (CS) strongly impact these skills.

A new online CS test, SPARCS, which evaluates the ability to detect contrast at peripheral and central areas, has recently been developed for glaucoma.

Citicoline is a dietary supplement that promotes cholinergic transmission and cells integrity. Homotaurine is an amino acid active against neurodegenerative amyloid-related pathologies, lately available even for glaucoma.

The aim of this study is to evaluate the impact of a supplementation with a fixed-combination of citicoline 500mg and homotaurine 50mg (CIT/HOMO) on CS and VrQoL as neuroprotective and neuroenhancer add-on strategy to IOP-lowering therapy.

#### Methods

In this multicenter, prospective, open-label, cross-over study subjects affected by POAG or OH, with MD  $\geq$  -12 and a stable IOP, were randomized to:

- Group A, n = 44: IOP lowering therapy  $\rightarrow$  IOP lowering therapy + CIT/HOMO supplementation
- Group B, n = 65: CIT/HOMO supplementation + IOP lowering therapy  $\rightarrow$  IOP lowering therapy

At each timepoint T0, T1 (4 months/cross-over) and T2 (8 months) we evaluated VF, SPARCS, IOP and VrQoL with GQL-15 questionnaire.

#### Results

After CIT/HOMO supplementation, SPARCS score (Group A: 90.0 vs 82.0; Group B: 85.5 vs 79.0  $P < 0.0001$ ) and GQL-15 (Group A: 26.0 vs 30.0; Group B: 24.0 vs 28.0  $P < 0.0001$ ) were improved. IOP-lowering therapy alone was not associated with a significant improvement neither in CS (82.0 vs 82.0  $p = 0.16$ ) nor in GQL-15 (30.0 vs 29.0  $p = 0.44$ ) in Group A. At T2 both parameters got worse (SPARCS 77.0 vs 86.0; GQL-15 28.0 vs 24.0  $P < 0.0001$ ) in Group B, therefore 4 months after the end of the treatment there has been a loss of the benefit obtained returning to the baseline values. In both groups IOP remained unaltered. Interestingly we found a slight improvement in visual field after treatment

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(Group A: -1.25MD vs -1.63MD  $p = 0.13$ ; Group B: -1.1MD vs -1.9MD  $P < 0.0001$ ). Data are presented as median.

### Conclusions

CS plays an important role on daily functions and activities in glaucoma patients. Moreover the fundamental visual performance tests (e.g. visual field/acuity) are based on the ability to discriminate the contrast. CIT/HOMO could be a valuable nutraceutical option to support this essential function from early-stage glaucoma.

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## P-WT-229

### BAYES LINEAR REGRESSION WITH VARIATIONAL AUTOENCODER

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#### Purpose

To apply variational auto encoder (VAE) to variational Bayes linear regression (VBLR: IOVS 2014) trained with the data from University of Tokyo hospital.

#### Methods

The training data included 7070 eyes of 4166 patients: institutional data including all of VFs more than five times. Test data was consisted of 911 eyes of 547 subjects, with more than 10 VF tests for each subject, excluding the first VFs to avoid learning effect. Prior to applying VBLR, VAE was applied to the data. Prior distribution in the VBLR was computed using training data. Using test data, TD values of the 11th VF were predicted using TD values of 52 test points from the second to the tenth VFs (VF2-10) in each eye. The same procedure was iterated using different series of VFs: VF2-2 to VF2-9. The prediction performance was calculated through the root mean squared error (RMSE).

#### Results

RMSEs (mean) without VAE were 5.3, 5.0, 4.9, 4.7, 4.5 4.4 4.2 4.1, and 3.9 for VF2-2 to VF2-10 respectively, and those with VAE were 5.5, 5.3, 5.0, 4.8, 4.5 4.3, 4.1, 4.0, 3.8.

#### Conclusions

VAE may contribute to improving visual field prediction with relatively a lot of visual fields.

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## P-WT-230

### CHARACTERISTIC OF FACIAL FEATURES AMONG MALAY PRIMARY ANGLE CLOSURE GLAUCOMA PATIENTS: AN OBSERVATIONAL CASE SERIES

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#### Purpose

To report the unique characteristic of facial features among Primary Angle Closure Glaucoma (PACG) patients in Malay ethnicity in a Malaysian regional referral hospital.

#### Methods

Case series report of patients with Primary Angle Closure Glaucoma (PACG) that follow up in Glaucoma clinic, Hospital Sultanah Bahiyah, Alor Setar, Malaysia (Pictures will be shown in the full report).

#### Results

We observed some similar salient facial features among the Primary Angle Closure Glaucoma (PACG) patients of Malay ethnicity in our Glaucoma clinic. These features were not commonly seen in other ethnicity. In this preliminary case series, we are reporting five Malay patients of PACG which are follow up in Hospital Sultanah Bahiyah, Alor Setar, Malaysia. The subjects have similar facial morphology which are: prominent superciliary arch, down slanting of glabella area, deep sloping over glabella-root of nose region and apparent deep-seated eyeball appearance.

#### Conclusions

The reported features could be risk factors in Primary Angle Closure Glaucoma and need further evaluation to ascertain the importance and its application in our clinical practice.

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## **P-WT-231**

### **TREATMENT OUTCOMES OF SECONDARY GLAUCOMA WITH CYTOMEGALOVIRUS IRITIS**

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#### **Purpose**

We investigated treatment outcomes of secondary glaucoma patients associated with cytomegalovirus iritis.

#### **Methods**

The retrospective results of 19 eyes of 19 patients with high intraocular pressure were investigated. Cytomegalovirus DNA was detected by PCR in the anterior aqueous humor in all patients. A 0.5% ganciclovir was added to steroid and glaucoma eye drops after the detection of the cytomegalovirus DNA. We performed glaucoma surgeries for the patients with poor medically controlled IOP.

#### **Results**

The age was  $59.7 \pm 13.7$  years (range: 30-81 yrs), and the observational period was  $36.3 \pm 28.2$  months (range: 9-72 months). Mean IOP at the first visit to our hospital was  $24.3 \pm 11.4$  mmHg (range: 10-41 mmHg), and the mean eye drop score was  $3.3 \pm 1.5$  (range: 1-6). The IOP was medically controlled in 9 of the 19 eyes; however the glaucoma surgery was necessary for 10 eyes. The details of glaucoma surgery were: trabeculectomy in 7 eyes, and trabeculotomy in 3 eyes. The IOP at the last visit (the mean observation period:  $17.3 \pm 18.9$  months) was  $15.6 \pm 9.2$  mmHg (range: 5-33 mmHg), and the mean eye drop score was  $1.5 \pm 2.0$  (range: 0-5). The IOP was controlled under 21 mmHg in 5 of the 7 eyes with trabeculectomy, and 2 of the 3 eyes with trabeculotomy. We performed additional trabeculectomy in the 3 eyes. There was no significant difference in the periods from the onset of the disease to the cytomegalovirus DNA detection between the surgery group and the non-surgery group.

#### **Conclusions**

Half of the patients with high IOP were controlled with medical therapy. The glaucoma surgeries are necessary for the medically uncontrolled glaucoma patients with cytomegalovirus iritis.

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## P-WT-232

# PRIMARY CONGENITAL GLAUCOMA: BASELINE FEATURES AND SHORT TERM SURGICAL OUTCOME

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## Purpose

This study was undertaken to study the demographic and clinical characteristics, risk factors and one year outcome of combined trabeculotomy and trabeculectomy of the children ( $\leq 3$  years of age) with primary congenital glaucoma presenting to this eye hospital.

## Methods

Retrospective review of records of all the children ( $\leq 3$  years) with primary congenital glaucoma who presented to the Glaucoma clinic between 2013 and 2017 was done. Diagnosis of congenital glaucoma was made only after examination under anaesthesia (EUA). Children with IOP  $> 21$  mmHg associated with enlarged corneal diameter ( $> 11$ mm in newborn;  $> 12$ mm in a child  $< 1$  year or  $> 13$  in a child of any age), corneal haze, Haab striae, buphthalmos and increased axial length were defined to have congenital glaucoma<sup>1</sup>. All diagnosed children underwent combined trabeculotomy with trabeculectomy of one eye in the same sitting and the second eye in bilateral cases after 2 weeks.

## Results

48 children were diagnosed with primary congenital glaucoma in this period; 32 (66.7%) had bilateral involvement (80 eyes were included in this study). There were 33 (67%) boys and 15 (33%) girls. Mean age of initial presentation was  $11.7 \pm 8.9$  months. Mean horizontal corneal diameter, IOP and the axial length were  $12.4 \pm 1$ mm,  $42 \pm 8.72$ mmHg (range, 18-55) and  $23.98 \pm 1.7$ mm respectively. Consanguinity was observed in 13 (27%) children. IOP control of  $\leq 21$  mmHg was achieved in 65% with surgery alone that increased to 78% with medication at 1 year.

## Conclusions

This study provided a baseline data on the present scenario of primary congenital glaucoma in the region with consanguinity being identified as an important risk factor. The results of treatment were comparable to other studies in the literature<sup>2,3,4</sup>

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## P-WT-233 THE EFFECT OF ND:YAG LASER POSTERIOR CAPSULOTOMY ON INTRAOCULAR PRESSURE

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### Purpose

This prospective descriptive study was done to evaluate the effect of Nd:YAG laser posterior capsulotomy and its different energy level on the intraocular pressure (IOP) of patients with posterior capsule opacification (PCO) in eyes that had undergone uncomplicated phacoemulsification or small incision cataract surgery.

### Methods

We studied 267 pseudophakic eyes with PCO of 244 patients at Mechi Eye Hospital, Nepal. They were examined preoperatively and 1 hour, 2 hour and 1 month after Nd:YAG laser capsulotomy. Patients were divided into two groups according to total energy used during the procedure ( $\leq 50$  mJ = group I,  $> 50$  mJ = group II). None of the patients received any anti-glaucoma medications before the procedure. Only those patients whose IOP was  $> 20$  mmHg after the treatment received topical timolol maleate 0.5% after the procedure.

### Results

Mean total energy used was  $28.30 \pm 13.51$  mJ in group I and  $82.75 \pm 31.28$  mJ in group II. Though statistically insignificant, the rise in IOP was greater in group II after the procedure. In group I, IOP increased both 1 and 2 hour postoperatively ( $P = .108$ ) and ( $P = .000$ ) respectively and declined to preoperative levels at 1 month ( $P = .403$ ). In group II also the IOP increased both 1 and 2 hour postoperatively ( $P = .003$ ) and ( $P = .000$ ) respectively and returned to preoperative levels at 1 month ( $P = .907$ ). The IOP increment in 2<sup>nd</sup> hour from 1<sup>st</sup> hour was statistically significant in group I only ( $P = .036$ ) compared to group II ( $P = .421$ ). The postoperative IOP increased to the level of  $> 20$  mmHg in 12 eyes. These were managed with topical timolol maleate 0.5%.

### Conclusions

The results indicate that routine use of topical anti-glaucoma medications before the Nd:YAG laser posterior capsulotomy may not be necessary.

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## P-WT-234

# COMPARISON OF CENTRAL CORNEAL THICKNESS MEASUREMENTS USING OPTICAL AND ULTRASOUND PACHYMETRY IN GLAUCOMA PATIENTS AND ELDERLY AND YOUNG CONTROLS

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## Purpose

To compare central corneal thickness (CCT) using optical and ultrasound pachymetry in patients with open-angle glaucoma and young as well as elderly, healthy controls. Further to investigate whether the devices could be used interchangeably.

## Methods

Sixty-nine eyes of 41 glaucoma patients, 51 eyes of 32 elderly and 50 eyes of 25 young controls were consecutively included in this cross-sectional observational study. Optical CCT measurements were obtained using the non-contact Specular Microscope CEM-530 (NCSM). Ultrasound pachymetry (USP) was measured using the Pachy Meter SP 3000. Linear mixed models and Bland-Altman plots were used for statistical analysis.

## Results

In young, healthy subjects ( $27.2 \pm 4.8$  years), the mean CCT taken with NCSM and USP was  $562.1 \pm 33.6 \mu\text{m}$  and  $565.8 \pm 35.8 \mu\text{m}$ , respectively. This was significantly different (USP>NCSM,  $P = 0.019$ ). In elderly, healthy subjects ( $70.6 \pm 10.7$  years) CCT measured with NCSM ( $562.5 \pm 27.8 \mu\text{m}$ ) compared to USP ( $564.9 \pm 27.1 \mu\text{m}$ ) was not statistically significantly different ( $P = 0.121$ ). In glaucoma patients ( $65.0 \pm 11.1$  years), USP measured thinner CCT values compared to NCSM, without significant differences between the devices (NCSM  $525.3 \pm 32.3 \mu\text{m}$ ; USP  $522.9 \pm 33.15 \mu\text{m}$ ;  $P = 0.067$ ).

## Conclusions

Ultrasound pachymetry measures CCT higher than optical pachymetry in young, healthy subjects. This difference is no longer observed in elderly subjects and is even reversed in glaucoma patients. A higher ultrasound velocity of the cornea in elderly and glaucoma patients could explain this. The devices could be used interchangeably in older and glaucoma patients, but not in young individuals.

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## P-WT-235

# COMPARISON OF THE EFFECT OF 1% CYCLOPENTOLATE AND 1% TROPICAMIDE ON THE INTRAOCULAR PRESSURE IN TYPE II DIABETIC PATIENTS

Miraj Pokharel\*

## Purpose

Intraocular pressure (IOP) is an inherent important physiological characteristic in maintaining structure and function of the eye. The normal range of IOP is approximately 11 to 21 mmHg<sup>2</sup> in the normal population and the mean amplitude of the daily fluctuation ranges from approximately 3 mmHg to 6 mmHg. Diabetic patients are in risk of increase in IOP because of microvascular damage which impair the blood flow to optic nerve and hypoxia in the retina. Mydriatic drugs (1% Tropicamide and 1% Cyclopentolate) are regularly used for dilated fundoscopic examination. This study aimed to find out the effect of 1% Cyclopentolate and 1% Tropicamide on the IOP in Type 2 diabetic patients.

## Methods

A comparative cross sectional study was conducted in the Department of Ophthalmology, BPKIHS Dharan. A total of 300 patients diagnosed with Type 2 diabetes mellitus were enrolled and divided into two groups including 150 patients in each group. Group A patients received 1% Tropicamide and group B received 1% Cyclopentolate drug for the dilation of the pupil. IOP was recorded before and after 30 minutes of the instillation of both the drugs. Detailed ophthalmological examination was done before instillation of drugs. Data were entered in Microsoft Excel and analyzed by SPSS version 11.0 Data were expressed in frequency, percentage, mean $\pm$ SD and chi-square test, independent T test, paired T test and ANOVA were applied to test the statistical significance considering  $p \leq 0.005$  as significant at 95% confident interval.

## Results

Group A patients had  $12.95 \pm 2.62$  mmHg baseline IOP which was significantly increased to  $14.66 \pm 2.53$  mmHg after instillation of drug ( $p = 0.0001$ ). Similarly, IOP was also significantly increased in group B patients from  $13.61 \pm 2.66$  mmHg to  $14.67 \pm 2.56$  mmHg after instillation of drug ( $p = 0.0001$ ). The change in IOP was significantly higher in group A patients ( $1.70 \pm 0.56$  mmHg) as compared to group B patients ( $1.05 \pm 0.48$  mmHg) ( $p = 0.0001$ ).

## Conclusions

Both group of drugs significantly increased the intra ocular pressure in Type 2 Diabetes Mellitus patients. The increase in IOP is significantly higher in group A as compared to group B.

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## P-WT-236 ACUTE ANGLE CLOSURE AFTER PTERYGIUM EXCISION

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### Purpose

Pterygium excision is a common extraocular procedure. Complications after surgery are usually mild, non-visual-threatening and self-limited. Acute angle closure glaucoma is a rare complication. We are reporting 2 cases which acute angle closure was found after pterygium excision with conjunctival graft.

### Methods

A retrospective chart review was conducted.

### Results

In the first case, a 66 year-old man presented with pterygium induced astigmatism OD. Slit-lamp biomicroscopy was unremarkable except symmetry mild cataract OU. Pterygium excision with conjunctival graft OD was scheduled. Topical antibiotic and 0.5% tetracaine hydrochloride were administered preoperatively. Topical 1:1000 adrenaline was also used topically to prevent intraoperative bleeding. The pterygium excision with conjunctival graft was performed under subconjunctival 2%Xylocaine hydrochloride with adrenaline injection. On the day after the surgery, the patient developed acute angle closure OD. In the second case, a 67 year-old female with underlying diabetes mellitus with glaucoma suspect from enlarged cup-to-disc ratio was scheduled for pterygium excision with conjunctival graft. The pterygium excision with conjunctival graft was performed under subconjunctival 2%Xylocaine hydrochloride with adrenaline injection. After the surgery, the patient developed acute angle-closure glaucoma OU. Acute attack was broken with laser peripheral iridotomy OU. Residual extensive peripheral anterior synechiae caused IOP elevation. This patient underwent combined phacoemulsification with goniosynechialysis as a definitive treatment.

### Conclusions

Preoperative meticulous anterior chamber assessment and gonioscopy are important. Sympathomimetic drugs and psychological stress carry a risk of causing AACG in patients showing anatomical abnormalities.

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## P-WT-237

### MANAGEMENT OF PATIENTS OF IRIDOCORNEAL ENDOTHELIAL SYNDEROME (ICE SYNDEROME ) WITH SECONDARY GLAUCOMA

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#### Purpose

Outcome of intraocular pressure (IOP) control in patients of Irido-corneal endothelial (ICE) syndrome with secondary glaucoma.

#### Methods

Glaucoma is a frequent association with ICE syndrome. Managing glaucoma in these patients is a challenge. Medical records of 22 eyes of 22 patients with ICE syndrome presenting to Glaucoma Clinic of a tertiary eye centre between 2003 - 2013 were retrieved. Demographic data included visual acuity (VA), IOP, clinical findings, treatment and outcome at last follow-up (FU). Main outcome measures were IOP control, VA and medication required.

#### Results

22 patients (10 males and 12 females), mean age was  $44.55 \pm 11.77$  years. 10 patients had Essential Iris Atrophy, 9 patients had Chandler Syndrome while 3 patients had Cogan-Reese Syndrome. 8/10 patients who underwent Corneal Confocal Microscopy had ICE cells. 8 patients (36.37%) with pre-treatment IOP of  $16.71 \pm 8.75$ mmHg on  $1.00 \pm 1.00$  drug after mean FU of  $41.57 \pm 31.91$  months maintained IOP of  $16.57 \pm 3.6$ mmHg on  $1.29 \pm 1.11$  drugs. In patients requiring surgery, 8 had trabeculectomy, 6 underwent glaucoma drainage device (GDD), of these 3 after failed trabeculectomy. In trabeculectomy group, IOP reduced from  $22.43 \pm 7.44$ mmHg on  $3.29 \pm 0.94$  anti-glaucoma medications to  $13.29 \pm 4.71$ mmHg on  $0.43 \pm 0.79$  medications at last FU. Two eyes required bleb revision. In GDD group, IOP reduced from  $32.33 \pm 13.59$ mmHg on  $3.17 \pm 0.75$  anti-glaucoma medications to  $15.67 \pm 6.25$ mmHg on  $0.83 \pm 0.75$  medications at last FU. Two eyes underwent cyclophotocoagulation for refractory glaucoma. Mean number of surgeries required was 1.5.

#### Conclusions

Glaucoma associated with ICE syndrome requires predominantly surgical management and although successful, multiple procedures are often required.

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## P-WT-238

### HISTOPATHOLOGY USING LIGHT MICROSCOPY- A COST EFFECTIVE METHOD TO IDENTIFY NANOPHTHALMOS

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#### Purpose

Nanophthalmos is challenging to manage in all age groups. No Indian studies on histopathology & immunohistochemistry of nanophthalmic sclera.

#### Methods

Observational comparative study of sclera from 5 nanophthalmic eyes (sclerostomy during cataract surgery) & age matched 5 cadaver sclera. Routine H & E stains with histochemistry & immunohistochemistry.

#### Results

On light microscopy cadaver sclera had regular arrangement of sweeping fibres & nanophthalmic subjects had thickened fibres with fraying and lightly stained cores, irregular serrated edges & randomly interspersed fibroblasts. No difference on staining for glycosaminoglycan (alcian blue). Anti-fibronectin antibody showed positivity in clustered fibres in nanophthalmos & less intense diffuse staining in cadaver scleral tissue.

#### Conclusions

Electron microscopy though is the standard & preferred tool to detect histopathological changes, simple cost effective light microscopy can still be used to conclusively identify nanophthalmos and pave for further research to correlate clinically.

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## P-WT-239

### CLINICAL PROFILE AND TREATMENT OUTCOMES IN PATIENTS WITH NANOPHTHALMOS

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#### Purpose

To understand the clinical profile and treatment outcomes in patients with nanophthalmos.

#### Methods

Medical records of patients with nanophthalmos were analyzed retrospectively. Basic demographic details & clinical details were recorded. Glaucoma was defined as IOP > 21 mm of hg with disc/field damage.

#### Results

We included records of 288 eyes(144 patients) with nanophthalmos. Mean age at presentation was 48.76(+15.99, range 5 to 74 years)and 55.6% were females. Mean BCVA was 0.60(6/24) and spherical equivalent was +9.00(+4.65). The mean IOP was 18.03(+8.83), which was higher in females ( $p = 0.030$ ). 172 eyes had closed angles on gonioscopy. Presence of PAS had 5.30times higher odds of having glaucoma. The mean axial length was 17.64(+1.73)& was inversely correlated to the mean RCS thickness of 1.97(+0.25)( $r = -0.26$ ,  $p\text{-value} = 0.0001$ ). The average lens thickness was 4.27(+0.70)). Fundus revealed hypermic small discs in 181 eyes, retinitis pigmentosa in 15 eyes, uveal effusion in 6 eyes and glaucomatous disc damage in 36 eyes. Amblyopia was seen in 31%, Yag PI was performed in 68% and 25% had glaucomatous disc damage. Total of 116 eyes underwent either a cataract surgery alone (56)/cataract with sclerostomy (60)with the average IOL power as 38.15(+11.80, range 20.00 to 74.00). Post-operative BCVA and IOP significantly improved( $p = 0.0001$ )Cataract surgery alone had more complications than sclerostomy with cataract surgery( $p = 0.04$ ) Uveal effusion was the most common post op complication (15), followed by severe fibrin reaction(5) and aqueous misdirection(3).

#### Conclusions

Nanophthalmos is a rare disorder which may present as hyperopia, angle closure glaucoma, retinitis pigmentosa, uveal effusions or amblyopia. Glaucoma is more common in females and those with closed angles & PAS in Nanophthalmos eyes. Performing a cataract with concomitant sclerostomy had significantly reduced the occurrence of uveal effusions compared to cataract surgery alone.

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## P-WT-240

# INTRA-OPERATIVE ASOCT: EFFECT OF PHACOEMULSIFICATION ALONE VS PHACO-ENDOCYCLOPLASTY ON ANGLE RECESS IN PLATEAU IRIS SYNDROME - A PRELIMINARY REPORT

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## Purpose

To document change in the anterior chamber angle (ACA) via intra-operative Anterior Segment OCT (ASOCT) post phaco as well as post phaco-endocycloplasty in Plateau Iris Syndrome (PIS).

## Methods

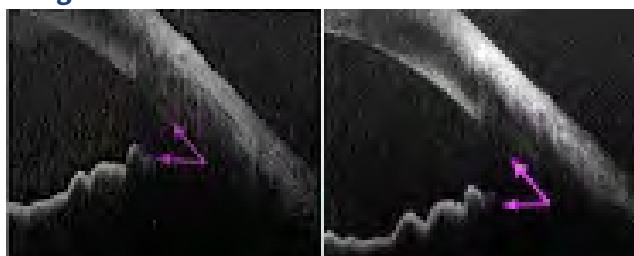
Prospective, cross-sectional study. Study was IRB approved and informed consent obtained from each participant.

Consecutive patients with gonioscopy and Ultrasound Biomicroscopy (UBM) documented PIS, post laser peripheral iridotomy (LPI), and cataract undergoing Phaco-endocycloplasty (PE) via a superior incision, were recruited. Intra-operative ASOCT (Bioptigen Envisu) was mounted on the operating microscope and images were captured first following phaco and then after undergoing endocycloplasty for 210-270 degrees. Images were captured at 3, 6 and 9 o'clock hours and compared to 12 o'clock (control).

## Results

5 eyes of 5 patients with PIS post LPI were included; 3 eyes were right eyes. Average age of patients was 62 years. ACA was measured and was found to be  $40.7 \pm 1.0$ ,  $40.2 \pm 8.2$  and  $39.3 \pm 11.1$  degrees at 3, 6 and 9 o'clock respectively post phaco, all of which was statistically insignificant when compared to control image at 12 o'clock ( $p = 0.38$ ,  $0.61$  and  $0.87$  respectively). The ACA increased by 24.1, 16.7 and 18.0 degrees post endocycloplasty at 3, 6 and 9 o'clock respectively, all statistically significant ( $p = 0.012$ ,  $0.037$  and  $0.021$ ). Difference in ACA superiorly at 12 o'clock was 1.01 degree post phaco and after endocycloplasty ( $p = 0.756$ ).

## Image



## Conclusions

This is the first such study involving intra-operative ASOCT in PIS showing a widening of the anterior chamber angle post endocycloplasty, significantly more than after phaco alone.

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## P-WT-241

### BLOOD PRESSURE VARIABILITY IN OPEN-ANGLE GLAUCOMA PATIENTS

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#### Purpose

To evaluate the correlation between blood pressure variability (BPV) parameters and severity of open-angle glaucoma.

#### Methods

A total of 127 naïve open-angle glaucoma patients who visited CHA Glaucoma and Cardiovascular Clinic were enrolled in this hospital-based, cross-sectional, cohort study. Calculated BPV parameters were obtained from 24-h ambulatory blood pressure monitor (ABPM) data. They included the nocturnal dip ratio (ND, more than 10%), morning blood pressure surge ratio (MBPS), and weighted fashion standard deviation of systolic BP (wSD). Full eye examination was performed, and the glaucoma severity index was evaluated using the mean deviation (MD) of the visual field (early damage, >-6dB; moderate-to-severe damage, ≤-6dB).

#### Results

During age-, gender-, and intraocular pressure-matched comparisons of the early glaucoma damage group and moderate-to-severe damage group, subjects with a high wSD (≥16) showed moderate-to-severe damage ( $P < 0.05$ ). This was observed in both the no antihypertensive medication group and antihypertensive medication group. Multiple logistic regression analysis showed that the diastolic MBPS ratio (OR, 1.024), proportion of subjects with diastolic MBPS ratio ≥ 20% (OR, 2.692), wSD value (OR, 1.135), and proportion of subjects with wSD ≥ 16 (OR, 4.014) were significantly associated with moderate-to-severe damage ( $P < 0.05$ ).

#### Conclusions

BPV parameters were associated with glaucoma severity, indicating that 24-h ABPM appears to have a reasonable predictive value in determining the glaucoma status. BPV evaluation may be crucial for optimally managing open-angle glaucoma patients receiving antihypertensive medication. Future longitudinal studies are required to evaluate the association between BPV parameters and glaucoma progression.

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## P-WT-242

### COMPUTER ASSISTED GLAUCOMA DETECTION USING FUNDUS IMAGES

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#### Purpose

One of the most used methods in clinical practice to diagnose glaucoma is the Cup-to-Disc Ratio; this ratio is usually calculated manually by trained ophthalmologists from retinal fundus images: this is time-consuming and sensitive to error. This limitation has led to the implementation of automatic tools based either on classical image processing techniques, or based on machine learning algorithms such as deep convolutional networks. In this work we present an automatic software tool that supports trained doctors in the screening of glaucomatous patients from healthy ones. It is based on image processing algorithms for segmentation of anatomical structures in fundus images. Tests were conducted on a set of 29 images, reaching an average absolute error of 18%.

#### Methods

Morphological image processing is used as follows: 1) Segmentation of the optic disc, take the red channel of the fundus image; equalize the histogram and compute a reference measure of the mean amount of pixels that belong to the disc. 2) Segmentation of the blood vessels, use the green channel. To remove the macula the original image is convolved by a median filter. A new threshold is computed to isolate the blood vessels. 3) Segmentation of the cup, use the blue channel and apply the ISNT rule; the first three segments detect the boundaries of the blood vessels inside the cup. The temporal segment is used to detect the external boundary of the cup using the pixel intensities. 4) Cup-to-Disc Ratio measurement, the algorithm uses a geometric mean to obtain the mean radius, if it is greater than 0.6 the eye is classified as suspicious for glaucoma. See Figures 1 and 2.

#### Results

Tests were conducted over 29 fundus images. A stand-alone application was developed to allow the trained doctor to provide the measure of the Cup-to-Disc ratio for each image according to his/her experience and train the algorithm. There is an absolute error of 18%, for some images the error is high due to the accuracy in the detection of the internal boundary of the cup where the internal blood vessels mislead the algorithm. See table 1.

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## Image

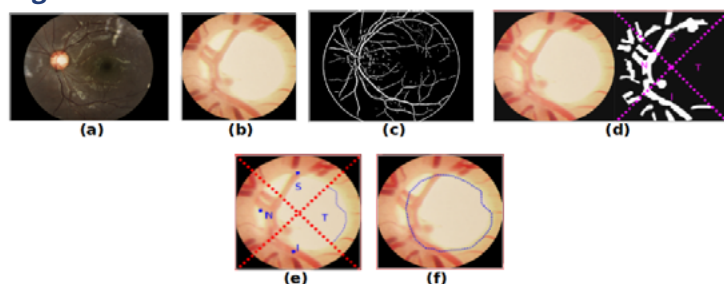


Figure 1. Segmentation Steps. (a)Original fundus image. (b)Segmentation of the optic disc. (c)Segmentation of the blood vessels. (d) Segmentation of the blood vessels inside the optic disc. (e)Segments centroids. (f) Segmentation of the cup.

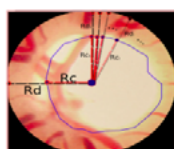


Figure 2. Ratio of radius

Table 1. Results absolute error

ID	Doct or	Algorith m	Absolute Error
Image 1	0,8	0,613	19%
Image 2	0,5	0,740	24%
Image 3	0,6	0,713	11%
Image 4	0,3	0,697	40%
Image 5	0,2	0,485	29%
Image 6	0,5	0,563	6%
Image 7	0,6	0,585	1%
Image 8	0,6	0,708	11%
Image 9	0,2	0,485	29%
Image 10	0,7	0,660	4%
Image 11	0,7	0,713	1%
Image 12	0,6	0,604	0%
Image 13	0,8	0,613	19%
Image 14	0,8	0,530	27%
Image 15	0,5	0,740	24%
Image 16	0,5	0,563	6%
Image 17	0,4	0,549	15%
Image 18	0,1	0,631	53%
Image 19	0,1	0,568	47%
Image 20	0,1	0,585	49%
Image 21	0,7	0,826	13%
Image 22	0,5	0,497	0%
Image 23	0,4	0,515	11%
Image 24	0,3	0,487	19%
Image 25	0,3	0,514	21%
Image 26	0,4	0,583	18%
Image 27	0,4	0,631	23%
Image 28	0,5	0,569	7%
Image 29	0,5	0,537	4%

## Conclusions

It is presented a tool that computes automatically the Cup-toDisc Ratio. Further work is intended to overcome the precision in the segmentation of the cup, by implementing approaches based on partial differential equations, which have demonstrated to provide better refinement at the pixel level

treatment, taking into account the mathematical structure of the image.

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## P-WT-243

# ACUTE BILATERAL ANGLE CLOSURE INDUCED BY THE INFUSION OF MONOCLONAL ANTIBODY (DARATUMUMAB) IN TREATING A PATIENT WITH RELAPSING MULTIPLE MYELOMA

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## Purpose

To report a case of acute bilateral angle closure after infusion of Daratumumab in treating relapsing multiple myeloma.

## Methods

An interventional case report.

## Results

A 63-year-old male with an underlying of relapsing multiple myeloma and cast nephropathy presented with acute bilateral eye pain with raised intraocular pressure (IOP) 14 hours after his first infusion of monoclonal antibody (daratumumab; Darzalex, Janssen, Biotech, Horsham, PA). The examination revealed shallow anterior chamber without iris bombe appearance. Both eyes were pseudophakic. The refraction showed myopic shift compared to his prior measurement. His ultrasound biomicroscopy and anterior segment optical coherence tomography showed 360-degree bilateral cilio-choroidal effusion. The diagnosis of drug-induced bilateral acute angle closure was made and the patient was prescribed 1% atropine eyedrop along with topical and systemic IOP lowering medications. The IOPs were normalized without systemic glaucoma medication at day 3. Serial examinations showed gradual deepening of anterior chamber and decrease of suprachoroidal fluid. The visual acuity and refraction were back to his baseline at day 7 after the infusion. Given very limited options of his cancer treatment, after an extensive discussion with hemato-oncologists, the patient decided to continue with the second infusion at day 7 per the weekly-scheduled cancer regimen. Without the discontinuation of topical antiglaucoma and cycloplegic medication, the patient showed no sign of recurrent bilateral acute angle closure after the second infusion. His anterior segment imaging revealed complete resolution of the suprachoroidal fluid at day 8. It should be noted that he also received high filter hemodialysis at day 5, 6, and 8 (6 hours after the second infusion of daratumumab) due to his nephropathy.

## Conclusions

We report the second case of bilateral acute angle closure induced by daratumumab infusion. However, our report shows no recurrence after the second administration of the drug. We were unable to conclude as to whether it was a prophylactic effect of cycloplegic drug and/or hemodialysis, or this adverse reaction of daratumumab occurred in an idiosyncratic pattern. It may be acceptable to continue daratumumab in this kind of situation, however, with close monitoring.

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## P-WT-244

# GLAUCOMA IN THE JAPANESE HALLERMANN-STREIFF SYNDROME: CASE REPORT

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## Purpose

Hallermann-Streiff Syndrome is a rare congenital disease and about 200 cases have been reported worldwide. It is characterized by multiple congenital disorders including microphthalmia and congenital cataract, but many other ocular features were reported, including glaucoma. The aim of our study is to report four Japanese cases of Hallermann-Streiff Syndrome.

## Methods

All the patients were diagnosed as Hallermann-Streiff Syndrome by pediatric geneticists. Detailed phenotype of four Japanese patients was investigated including interview about the past history, family history, eyedrops, the height, and comprehensive eye examinations including corneal endothelial specular microscopy, detailed ocular biometry, axial length measurement, intraocular pressure measurement, slit-lamp examination, fundus examination, and ocular coherence tomography.

## Results

We identified all the four female patients with bilateral microphthalmia and congenital cataract and the five typical features of Hallermann-Streiff Syndrome: dyscephalia with bird-face and hypoplasia of the mandible, proportioned dwarfism, dental anomalies, hypotrichosis, cutaneous atrophy of the nose. Mean age at presentation was  $41.8 \pm 9.3$  years old. Mean best corrected visual acuity was  $1.2 \pm 0.5$  logMAR. Mean intraocular pressure was  $9.9 \pm 5.5$  mmHg. Mean axial length was  $16.9 \pm 4.1$  mm. Mean corneal endothelial density was  $1742.3 \pm 494.1$  cells/mm<sup>2</sup>. Three patients developed glaucoma, one patient from 2 months old and two other patients from 25 and 34 years old. Two patients underwent glaucoma surgery.

## Conclusions

We describe three out of four Hallermann-Streiff Syndrome patients with glaucoma.

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## P-WT-245

### JAPANESE LOWER NORMAL PRESSURE GLAUCOMA STUDY: RISK FACTORS FOR GLAUCOMA PROGRESSION

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#### Purpose

To identify risk factors for glaucoma progression in Japanese normal tension glaucoma (NTG) patients with a mean IOP of 12.3 mmHg without treatment.

#### Methods

This prospective 5-year study included 90 NTG patients and we followed closely with no medication. Visual field (VF) examinations were performed every 3 months and disc/peripapillary retina photographs taken every 6 months. The definition of progression was based on the Humphrey VF SITA 24-2, and on the progression of disc/peripapillary retina judged by three observers. The covariates in Cox's proportional hazard model were gender, age, refraction, mean deviation (MD), pattern standard deviation (PSD), mean intraocular pressure (IOP), IOP fluctuation, body mass index (BMI), central corneal thickness (CCT), vertical cup/disc ratio (vC/D),  $\beta$ -PPA/disc ratio, systolic blood pressure (BP), diastolic BP and disc hemorrhage (DH). Covariates with P-values < 0.2 on univariate analysis were entered into the multivariate model.

#### Results

We enrolled 90 patients [age, 53.9 years; baseline IOP, 12.3 mmHg; MD, -2.8 dB]. Glaucoma progression probability at 5 years was 66% (95% CI, 55%–78%). DH, IOP fluctuation and vC/D, IOP fluctuation and vC/D, and DH and IOP fluctuation were significant predictors ( $P \leq .036$ ) when progression was defined by deterioration of VF and/or disc/peripapillary retina, only by VF, and only by disc/peripapillary retina, respectively.

#### Conclusions

In Japanese NTG patients with a mean IOP of 12.3 mmHg, DH, IOP fluctuation, and greater vC/D significantly contributed to glaucoma progression.

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## P-WT-246

### THE EFFECT OF STEEP TRENDELENBURG POSITIONING DURING ROBOT-ASSISTED LAPAROSCOPIC RADICAL PROSTATECTOMY ON INTRAOCULAR PRESSURE AND VISUAL FUNCTION

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#### Purpose

To evaluate intraocular pressure (IOP) changes in normal eyes during robot-assisted laparoscopic radical prostatectomy (RALP) and to investigate the effect on visual function.

#### Methods

We measured IOP of 52 patients with normal eyes undergoing RALP. IOP was measured while awake before anesthesia and supine (A), immediately after induction of anesthesia and supine (B), 1 hour after anesthesia in a steep Trendelenburg position (C), under anesthesia in a steep Trendelenburg position at the end of the procedure (D), before awakening from anesthesia and supine (E), and after awakening and supine (F). Ophthalmic examinations including visual acuity, IOP, optical coherence tomography scans were performed before RALP and at 1 and 3 months after RALP.

#### Results

Mean IOP (mmHg) for each time point was as follows: A =  $20.8 \pm 3.7$ , B =  $13.7 \pm 3.8$ , C =  $27.0 \pm 6.0$ , D =  $29.4 \pm 7.7$ , E =  $19.9 \pm 5.9$ , F =  $21.8 \pm 4.9$ . Mean IOP significantly increased during RALP at the end of the period of steep Trendelenburg position compared with supine position ( $P < 0.01$ ). Visual acuity, mean IOP and mean thickness of peripapillary retinal nerve fiber layer and macular ganglion cell complex showed no statistically significant differences between before and after RALP.

#### Conclusions

IOP increased during RALP, but visual function and retinal structure showed no significant changes after RALP in normal eyes. The temporary elevation of IOP during RALP has little or no risk in patients with normal eyes.

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## P-WT-247

# LIFE-THREATENING SUPRASellar ANEURYSM PRESENTING WITH OPTIC DISC EXCAVATION MIMICKING GLAUCOMA

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## Purpose

To demonstrate that a suprasellar aneurysm can be associated with optic disc excavation, resembling glaucomatous optic neuropathy. And to alert that there are non-glaucomatous causes of pathologic optic disc cupping, some of which may be life-threatening.

## Methods

A 62-year-old Chinese female presented with bilateral progressive blurred vision for 6 months. She had no other ocular or neurologic symptoms and denied any personal and family medical history. She had been diagnosed and treated as a glaucomatous patient prior to presentation and was placed on 0.04% Travoprost ophthalmic solution for both eyes. She was referred from a private practitioner for optic disc excavation survey and visual field test. On her first visit to our department, the best corrected visual acuity was 0.5 in the right eye and 0.2 in the left eye. She had intraocular pressure 14 mmHg in OD and 13 mmHg in OS. The biomicroscopy showed normal and deep /silent anterior chamber. The pupillary light reflex was normal. Fundoscopy showed bilateral optic disc excavation: a cup-disc ratio of 0.7 in OU, pale temporal neuroretinal rim OU with bayoneting of vessels and superior and inferior temporal thinning of the neuroretinal rim in OS. There was remarkable nerve fiber layer defect accompanying with the thinning of neuroretinal rims. Visual field revealed widespread loss in both eyes, particularly over bilateral temporal field missing temporal crescent. Chiasmal compression was suspected and, later MRI disclosed a large suprasellar aneurysm (28mmX23mm) compressing the optic nerve.

## Results

The patient was referred to a neurosurgeon and diagnostic angiography was subsequently arranged. Unfortunately, just after performing angiography she lost consciousness unexpectedly in the hospital toilet. An emergent craniotomy was performed and clipping the aneurysm was undergone smoothly. After a half year of surgery, her visual field got improvement but visual acuity (BCVA was 0.3 in OD and 0.2 in OS) did not recover.

## Conclusions

Optic disc excavation with focal retinal nerve fiber layer defect is most commonly associated with glaucoma; however, clinicians need to be aware that there are non-glaucomatous causes of pathologic disc cupping, like in our case of the suprasellar aneurysm. Careful interpretation of bilateral progressive poor visual acuity, temporal neuroretinal rim pallor, atypical visual field defect and utility of neuroimaging studies are necessary to diminish unpredictable medical emergencies.

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## P-WT-248

# REPEATABILITY OF SCLERAL SPUR TRACKING FOR ANGLE ANALYSIS AND REGISTRATION (STAR) FOR ANTERIOR CHAMBER ANGLE MEASUREMENTS WITH SS-ASOCT

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### Purpose

To evaluate the repeatability of anterior chamber angle measurements in eyes with open angle and in eyes with angle closure using STAR and manual measurements in SS-ASOCT images.

### Methods

STAR is a novel algorithm for 360 degrees semi-automatic measurements of the anterior chamber angle. The scleral spur is automatically identified by STAR after manual detection of scleral spur in four cardinal meridians. The anterior segment of twenty eyes of 20 subjects with open-angle and twenty eyes of 20 patients with angle closure were imaged in 18 equally-spaced B-scans with SS-ASOCT (CASIA II, Tomey, Japan) three times in one single visit. Anterior opening distance (AOD 500) were measured by STAR and manually. Average, nasal, temporal, superior and inferior AOD 500 were analyzed. The intraclass correlation coefficient (ICCs) and repeatability coefficients (RC) were calculated to evaluate the test-retest repeatability.

### Results

The ICC for AOD measured by STAR ranged between 0.977 and 0.992 in open-angle eyes, and between 0.954 and 0.985 in angle closure eyes. The ICC for AOD measured manually ranged between 0.992 and 0.995 in open-angle eyes, and between 0.965 and 0.987 in angle closure eyes. The RCs of AOD measured by STAR ranged between 0.045 and 0.075 for eyes with open-angle; and between 0.041 and 0.071 for eyes with angle closure. The corresponding manual measurements were between 0.33 and 0.048, and between 0.033 and 0.048, respectively.

### Conclusions

STAR demonstrated high test-retest repeatability for anterior chamber angle measurements.

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## P-WT-249

### EYE MODELS FOR SURGICAL SIMULATION OF MINIMALLY INVASIVE GLAUCOMA SURGERY

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#### Purpose

Surgical simulations can be effective for ophthalmology residents and fellows to prepare for a surgery which he or she has not experience prior to performing that surgery on a patient. And in recent years, many devices for minimally invasive glaucoma surgery (MIGS) have been developed and clinical applications are expected. In this study, we aimed to develop eye models for surgical simulation similar to human eyes aiming at improving the techniques of glaucoma surgery and developing new devices.

#### Methods

We succeeded in fabrication of the sclera model with the structure of the Schlemm's canal by molding process using 3D printing models. We fabricated the sclera model with mechanical properties similar to human sclera. Artificial trabecular meshwork(TM) was fabricated, by using blowing method, with a thickness and stiffness within the range values of the human tissue. Polyvinyl chloride (PVC) was the main polymer used in fabrication of TM. The thickness of artificial TM was controlled by adjust the concentration of the PVC.

#### Results

TM was an appropriate structure evaluated by using a laser microscope. And also glaucoma surgeons evaluated the eye models by the Kahook Dual Blade® (NEW WORLD MEDICAL®, USA). The surgeons could successfully remove the artificial TM.

#### Conclusions

Eye models for surgical simulation in this study were effective for surgical training and developing new devices.

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## P-WT-250

### USEFULNESS OF FLAMMER SYNDROME QUESTIONNAIRE FOR GLAUCOMA PATIENTS

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#### Purpose

Flammer syndrome shows a specific vascular response to external stimuli and has been reported to be associated with glaucoma. Flammer syndrome questionnaire (FSQ) score has been used as a detection method for the syndrome, but the normal value of Japanese does not exist. In this study, the relationship between normal value of FSQ score and glaucoma prevalence was examined.

#### Methods

FSQ score consisting of 15 questions was calculated for 229 glaucoma patients and 823 control groups, and comparison was made between the two groups. In addition, we examined the relationship between question items and glaucoma prevalence using logistic regression analysis.

#### Results

The FSQ score was  $1.41 \pm 1.62$  in the control group and  $1.75 \pm 1.80$  in the glaucoma patient group, both of which were significantly higher in females (*t*-test,  $p < 0.01$ ). In logistic regression analysis, FSQ total score was significantly associated with glaucoma disease (odds ratio [95%CI], 2.68[1.33-5.39],  $p < 0.01$ ). In multiple logistic regression analysis, each of four question items (low blood pressure (odds ratio 3.14,  $p < 0.01$ ), Cold hands and feet (odds ratio 1.74,  $p < 0.01$ ), reduced feeling of thirst (odds ratio 1.95,  $p < 0.01$ ), tendency toward perfectionism (odds ratio 2.01,  $p < 0.01$ )) showed a significant association with glaucoma prevalence.

#### Conclusions

FSQ score will be high in female and glaucoma patients. FSQ has the possibility of screening for glaucoma patients who are prone to blood flow disorder.

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## P-WT-251 DIAGNOSTIC DILEMMA OF A CASE OF UNILATERAL OPEN ANGLE GLAUCOMA

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### Purpose

To report on a case of a young patient diagnosed with unilateral open angle glaucoma with advanced optic nerve damage presenting with symptomatic episodic increases in intraocular pressure.

### Methods

Case report.

### Results

This is a case of a 19 year old female who presented with a 3 month history of sudden blurring of vision of the right eye associated with vomiting and right eye pain. Patient had a similar episode a year prior to consult, which spontaneously resolved. On presentation, her intraocular pressure (IOP) was elevated at 60mmHg on the right eye (OD) while the left eye (OS) had normal IOP. She was given oral and topical anti-glaucoma medications. On follow-up, IOP decreased to 17 mmHg OD. Best corrected visual acuity (BCVA) was 20/125 OD and 20/20 OS. No anterior chamber reaction or keratic precipitates seen. Gonioscopy demonstrated bilateral open angles without synechia. Fundus exam showed advanced glaucomatous optic neuropathy OD and a normal optic disc OS.

Visual fields and Optical Coherence Tomography (OCT) results corresponded with the optic nerve findings of the right eye showing advanced structural and functional damage and normal findings of the left eye.

Trial of discontinuing the anti-glaucoma medications was done to establish the pattern of IOP elevation. The pressure of the right eye did not increase after discontinuation.

Due to the advanced nerve damage, trabeculectomy was done. Persistent hypotony post-trabeculectomy prompted revision of the bleb. IOP became stable at low teens.

Posner-Schlossman Syndrome was considered because of the unilateral presentation and pattern of IOP increase. Aqueous humor was sent for polymerase chain reaction (PCR) for herpes simplex virus and cytomegalovirus, which came out negative. Genetic testing was done for the myocilin gene with results still pending.

### Conclusions

Due to the presence of advanced glaucomatous changes and lack of signs of anterior chamber inflammation, a diagnosis of unilateral juvenile open angle glaucoma is considered. Juvenile open angle glaucoma is usually bilateral but can also be highly asymmetric, presenting earlier in only one eye. Therefore, it is important to regularly monitor the fellow eye for increased IOP and early glaucomatous changes.

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## P-WT-252

# ASSOCIATION BETWEEN CENTRAL CORNEAL THICKNESS AND OCULAR DOMINANCE IN SOUTH INDIAN POPULATION

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## Purpose

To investigate association between central corneal thickness (CCT) and ocular dominance among non-pathological eyes. Unlike macular ganglion cell inner plexiform layer (GC IPL) and retinal nerve fiber layer (RNFL) thickness in normal individuals<sup>1</sup>, CCT's association with ocular dominance has not been studied.

## Methods

Participants of the study included 87 outpatients and volunteers with bilateral non-pathological eyes. Data was collected from a tertiary eye care institute, Southern India. This study was performed according to the tenets of the Declaration of Helsinki. To determine the dominant eye, hole-in-a-card test was utilized<sup>2</sup>. Masked of the ocular dominance result, an independent observer measured CCT at the visual axis with specular microscopy (CEM - 530, Nidek, Canada) by non-contact modality. Automated settings were used and CCT was measured by asking the patient to fixate on an internal fixation target and three readings were obtained from each eye. The right eye was first examined. Average of the three CCT readings was used for analysis. Statistical methods included paired t test (for comparison of eyes within patient) and Chi square test to assess association between ocular dominance and CCT. A p value less than 0.05 was considered statistically significant.

## Results

The 87 volunteers studied were aged  $37.6 \pm 14.8$  years and 62.1% were female. CCT was  $525.5 \pm 28.4$   $\mu$ m in the right eye and  $534.8 \pm 29.8$   $\mu$ m in the left eye. Right eye was dominant in 63(72.4%) patients. CCT in the dominant eye was  $528.0 \pm 29.5$   $\mu$ m and was significantly thinner ( $P < 0.001$ ) than the non-dominant eye ( $532.2 \pm 29.3$   $\mu$ m). This was true in 69.0% of the patients. However, thinner cornea in a person was not indicative of a dominant eye ( $p=0.535$ ).

## Conclusions

As with other populations right eye dominance was commonly seen in South Indian Population among non-pathological eyes. CCT is different between dominant and non-dominant eye. Yet this result cannot be applied to an individual by labeling the eye with thinner cornea as the dominant eye.

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## P-WT-253

### ACHIEVING AN IOP OF LESS THAN 12 MM HG IN SEVERE GLAUCOMA

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#### Purpose

This study aims to assess the number of medications and/or surgeries required to achieve an IOP of less than 12 mm of Hg in patients with glaucoma.

#### Methods

This study is a hospital based, cross-sectional chart review of patients with primary and secondary glaucoma routinely following up at the Glaucoma Clinic and/or the OPD of Dr. R. P. Centre for Ophthalmic Sciences, AIIMS, New Delhi, India. Patients who fulfilled the inclusion criteria were selected and the data was analyzed with respect to the number of medications and/or surgeries required to achieve an IOP of  $\leq 12$  mm of Hg and  $\geq 6$  mm of Hg. This was analyzed on the basis of diagnosis as well. The percentage decrease of IOP was calculated.

#### Results

302 eyes of 205 patients fit into the criteria. All the patients had a follow up of  $\geq 5$  years. The mean age of the patients was  $50.35 \pm 20.73$  years. The baseline IOP of patients was  $32.75 \pm 10.93$  mm of Hg with a range of 10-70mm of Hg. The final IOP after management with medication, surgery or both surgery and medication combined was  $10.29 \pm 1.80$ mm of Hg with a range of 6-12 mm of Hg. 85 eyes (27.77%) were controlled on medication alone. 39 (45.88%) were controlled with one medication, 26 (30.59%) on two medications, 16 (18.82%) on three medications and 4 (4.71%) on 4 medications. 153 (50%) of the patients underwent surgery (trabeculectomy). 141(92.16%) attained the target IOP with only one surgery, whereas, 12 (7.84%) required two surgeries. 67 (21.90%) eyes underwent trabeculectomy and required medication thereafter. Out of which, 35 (52.23%) needed only one medication, 23 (34.33%) needed two medications and 9 (13.43%) needed 3 medications. The mean number of medications required in the medication only group was  $1.81 \pm 0.90$  and in the medications after surgery group it was  $1.57 \pm 0.59$ . The mean number of surgeries carried out was  $1.03 \pm 0.17$ . The percentage decrease in IOP was  $64.27 \pm 15.12$  with a range of 14.28 to 91.67. The percentage decrease in IOP in PACG was  $63.85 \pm 14.15$ , in POAG it was  $57.43 \pm 16.36$  and in JOAG it was  $73.64 \pm 11.04$ .

#### Conclusions

For arresting the progression in VF, a target IOP of  $\leq 12$  mm of Hg is required in advanced glaucoma. In this study, the target IOP was achieved with medication in one third of the patients, with surgery(trabeculectomy) alone in half of the patients and the remaining patients required surgery and medication, all over a period of  $\geq 5$  years.

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## P-WT-254

# RESIDENT COMPETENCY ASSESSMENT TOOLS FOR ND:YAG LASER PERIPHERAL IRIDOTOMY AND SELECTIVE LASER TRABECULOPLASTY

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## Purpose

To develop an evaluation tool for assessing resident performance of Nd:YAG laser peripheral iridotomy (LPI) and selective laser trabeculoplasty (SLT) compatible with competency-based medical education (CBME) curricula implementation worldwide.

## Methods

A competency assessment checklist and global rating scale (GRS) were developed for both Nd:YAG LPI and SLT performance. The GRS was based off previously studied surgical and ophthalmology-specific technical skills assessment methods.<sup>1-2</sup> A modified Delphi process was used to critique and adjust the evaluation tools. Content experts received the assessment tools, videos containing examples of residents being evaluated with the tools on a SimuleYE training model, and a survey for feedback. The survey design was based off a previous study for the Ophthalmic Clinical Evaluation Exercise.<sup>3</sup> The expert opinions on the checklist and GRS were taken into consideration and the appropriate changes were implemented when restructuring the evaluation tools. The revised checklist and GRS were then recirculated to the content experts along with further feedback surveys, and the process was repeated until a 80% consensus was achieved.

## Results

A final revised checklist and GRS with both face and content validity were established for resident performance of both Nd:YAG LPI and SLT.

## Conclusions

These evaluation tools can be used in ophthalmology residency training programs to help meet the growing demands for accountability and proof of competency that CBME curricula mandates. Assessing both LPI and SLT competency was completed using an inanimate model, allowing for residents to develop skills and receive both formative and summative feedback before performing these procedures on live patients. This study established face and content validity, however predictive validity and reliability should be assessed in future evaluation.

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## P-WT-255

# PRIMARY EXTRADURAL ORBITAL MENINGIOMA AND SECONDARY GLAUCOMA - A CASE REPORT

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## Purpose

To report a clinical case of a patient with coexisting an exceedingly rare orbital tumor - primary intraosseous meningioma and secondary glaucoma.

## Methods

Interventional case report.

## Results

46 year-old female patient who complained of visual loss and ocular pain admitted to our ophthalmology department with a diagnosis of proptosis of the left eye. The patient presented visual field loss in both temporal and inferonasal regions of the left eye (MD -18,56 dB) with decreased central visual acuity (20/100) but 20/20 acuity in the right eye. She had a left relative afferent pupillary defect. The fundus examination revealed 0,6 cup-to-disc ratio in both eyes, however the left disc also was pallor. Intraocular pressures were 13 mmHg (in the right eye) and 25 mmHg (in the left eye) and central corneal thickness of both eyes were normal. Cranial magnetic resonance imaging demonstrated a widespread sclerotic focal lesion suggesting an intraosseous meningioma of the sphenoid and temporal bones, growing into the orbit and compressing the optic nerve. The patient underwent craniectomy and subtotal removal of the tumor. Histopathology revealed a primary intraosseous meningioma (PIM). The visual acuity recovered to 20/20, visual field improved significantly postoperatively (MD -1,48 dB) and IOP in the left eye decreased to 18 mmHg. The postoperative condition was stable and no tumor recurrence was found during 2 years of follow-up.

## Conclusions

The primary orbital meningioma is aggressive in behavior despite its benign histopathological features. Loss of vision and elevated intraocular pressure are frequently seen. The tumor could be fatal for vision if surgery fail to control its intracranial extension.

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## P-WT-256

# APPOSITIONAL ANGLE CLOSURE AND CONVERTING OF PRIMARY ANGLE CLOSURE INTO GLAUCOMA AFTER LASER PERIPHERAL IRIDOTOMY

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## Purpose

To determine the relationship between appositional angle closure (AAC) and the converting of primary angle closure (PAC) into primary angle closure glaucoma (PACG) after laser peripheral iridotomy (LPI). Other baseline risk factors were also investigated.

## Methods

This was a prospective cohort study. Consecutive patients with PAC after LPI were included and those with 5 or more reliable visual field tests in at least 5 years were finally analyzed. AAC at baseline was diagnosed when the trabecular meshwork and iris were located appositionally on the ultrasound biomicroscopy image. The criteria for the eyes with PAC converting into PACG were based on developing glaucomatous optic neuropathy and corresponding visual field defects. Other factors were also compared between converting eyes (PAC eyes converting into PACG) and non-converting eyes (PAC eyes without converting into PACG).

## Results

One hundred twenty-eight patients were assessed at baseline. Eighty eyes of 58 patients fulfilled the inclusion criteria. The mean follow-up period was  $6.67 \pm 1.33$  years. PAC converting into PACG was observed in 20 eyes (25.0%). The frequency of PAC converting into PACG was significantly higher in eyes with  $> 2$  quadrants of AAC at baseline (58.3%, 7/12) than those with  $\leq 2$  quadrants of AAC (19.1%, 13/68) ( $p < 0.05$ ). And that frequency in eyes with angle closure (synechia closed combined with AAC)  $> 2$  quadrants at baseline (41.7%, 10/24) was significantly higher than those with angle closure  $\leq 2$  quadrants was (17.9%, 10/56) ( $p < 0.05$ ). Compare with nonconverting group, the age was elder, the vertical cup-to-disc ratio at baseline was higher and the IOP fluctuation of follow-up was greater in converting group (all  $p < 0.05$ ).

## Conclusions

One fourth of PAC eyes of Chinese patients converted into PACG in more than 5 years after LPI. Extensive AAC  $> 2$  quadrants were related to the PAC converting. Elder age, higher VCDR at baseline, IOP fluctuation of follow-up were also associated with PAC converting.

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## P-WT-258

### MACULAR MORPHOLOGY IN JUNIOR HIGH SCHOOL STUDENTS USING OCT VERTICAL IMAGE

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#### Purpose

Irregular configuration of posterior eye, such as staphyloma, dome-shaped macular, affects visual field sensitivity. Vertical cross-sectional image of the macula region in optical coherence tomography (OCT) can detect mild posterior staphyloma, which is undetectable by fundus photo examination. However, there is no report about the chronological change of posterior eye along with growth. The purpose of this study was to investigate the irregularity of posterior eye in junior high school student.

#### Methods

A prospective cross-sectional observational study of 173 right eyes in healthy junior high school students (age 12 or 13 years) was performed. Axial length was measured with OA-2000 (TOMEY, Japan). Vertical cross-sectional image of macula was obtained with OCT machine 3D OCT-1 Maestro (Topcon, Japan). First, they were classified based upon its vertical symmetry, and then sub-classified them into such subgroups as convex, flat, concave and dome type according to retinal pigment epithelium curvature. The axial length difference between symmetry and asymmetry group was analyzed using Mann-Whitney U test.

#### Results

Mean axial length was  $23.57 \pm 1.21$  mm. One hundred and forty nine eyes were categorized to symmetric group, of which 118 eyes were place in convex, 1 eye in flat, 1 eye in concave, and 29 eyes in dome type. Twenty four eyes were categorized to asymmetric group, of which 17 eyes in convex, 1 eye in flat, none in concave, and 6 eyes in dome type in upper part, 1 eye in convex, 1 eyes in flat, 7 eyes in concave, and 15 eyes in dome type in lower part. The axial length in symmetry group was significantly longer than that that in asymmetry groups. ( $p = 0.004$ ).

#### Conclusions

There was already irregularity of the posterior pole of the eyes in junior high school students.

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## P-WT-259

### INTRAOCULAR PRESSURE CHANGES FOLLOWING DROPPED NUCLEUS: OUR EXPERIENCE AT HOSPITAL SELAYANG

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#### Purpose

To evaluate the intraocular pressure (IOP) and visual outcomes of Pars Plana Vitrectomy (PPV) for dropped nucleus post phacoemulsification.

#### Methods

This was a retrospective case series of patients who underwent PPV for dropped nucleus from January 2015 to August 2017. All patients underwent PPV with phacofragmentation/lens removal and secondary intraocular lens implantation. Patients (excluding known glaucoma or glaucoma suspects) were selected from hospital electronic medical record with follow up till post-operative third and sixth month. Major outcome parameters were: pre-phacoemulsification versus post-PPV best corrected visual acuity (BCVA) and pre-PPV versus post-PPV IOP.

#### Results

Total of 30 patients were included in the study with mean age of  $67.4 \pm 10.3$  SD years. Average pre-PPV highest IOP are  $28.6 \pm 15.3$  SD mmHg and majority 19(63.3%) patients with pre-PPV IOP higher than 22mmHg. 13 (43.3%) patients required two or more anti-glaucoma medications (acetazolamide and anti-glaucoma eye drops) prior to PPV. All patients had significant reduction in IOP post PPV with average of  $14.3 \pm 2.8$  SD mmHg [ $P = 0.000013$ ] and no reported cases of persistent high IOP at post operatively third and sixth months. Patients also experienced significant visual improvement from mean pre-phacoemulsification BCVA logMAR  $1.58 \pm 1.24$ SD to post-PPV BCVA logMAR  $0.42 \pm 0.26$  SD [ $P = 0.00003$ ] at third or sixth month follow up. Majority 17 (56.7%) patients achieved good post PPV BCVA equal or better than logMAR 0.3(Snellen = 6/12)

#### Conclusions

Majority patients with dropped nucleus post PPV achieved significant improvement in the final visual acuity. Pre-operative high IOP also significantly reduced in the most cases post PPV.

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## P-WT-260

# COMPARISON OF SURGICAL OUTCOMES OF TRABECULECTOMY AND TRABECULOTOMY COMBINED WITH CATARACT SURGERY IN EXFOLIATION GLAUCOMA

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### Purpose

To compare surgical outcomes of trabeculectomy with adjunctive mitomycin C and trabeculotomy combined with cataract surgery in patients with exfoliation glaucoma.

### Methods

This study was retrospective comparative case series. We analyzed 45 patients that underwent surgery between January 2012 and December 2015 with a minimum follow-up of 12 months. Patients with previous glaucoma surgeries were excluded. Group A comprised of 33 eyes of 29 patients that underwent trabeculectomy with adjunctive mitomycin C, while Group B included 18 eyes of 16 patients that underwent trabeculotomy combined with cataract surgery. Main outcome measures were IOP, number of anti-glaucoma medications and surgical success rate. Surgical success was defined as an IOP between 5mmHg and 21mmHg or 5mmHg and 15mmHg (with/ without glaucoma medications) without additional glaucoma surgery or loss of light perception.

### Results

The mean follow-up duration was 35.4 months in group A and 34.0 months in group B. Mean preoperative IOP was 20.3 mmHg in group A and 20.9 in group B. Mean postoperative IOPs were 10.8 and 14.7 mmHg at 12 months, and 11.4 and 15.0 mmHg at 24 months ( $P < 0.001$ ). The number of antiglaucoma medications decreased from 4.5 to 0.4 in Group A and from 2.9 to 0.4 in Group B at 12 months after the surgery ( $P < 0.01$ ). Survival rates in groups A and B were 91 vs 89% within the 1<sup>st</sup> target IOP range (5-21 mmHg), and 76 vs 50% within the 2<sup>nd</sup> target IOP range (5-15 mmHg) at 12 months.

### Conclusions

Both surgical procedures were effective in reducing IOP and number of glaucoma medications in exfoliation glaucoma. However, trabeculotomy combined with cataract surgery resulted in lower surgical success to achieve the target IOP under 15mmHg compared with trabeculectomy with adjunctive mitomycin C.

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## P-WT-261 JUVENILE UVEITIC GLAUCOMA - NEW TREATMENT PARADIGMS

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### Purpose

Paediatric uveitis may have a debilitating impact upon children due to treatment failure and disease progression resulting in Paediatric Cataract and Glaucoma. Biologic agents are a relatively new treatment with promising outcomes that need to be explored in a real-world setting. Traditionally corticosteroids (both topical and oral) and immunosuppressive agents such as methotrexate were used for the treatment of uveitis.

### Methods

Retrospective, chart review over an 8-year period of 27 paediatric uveitis patients (49 eyes) at a quaternary referral eye hospital in Sydney, Australia treated with biologic agents followed up to 1 year were included. Chart review of demographic data, treatment efficacy, failure and safety were reviewed.

### Results

Of the 27 patients, 49 eyes, 43% had increased IOP at presentation and 25% some form of glaucomatous optic neuropathy. Biologic therapy over 1 year was effective with prednisolone reduced to < 5mg/day in 5 of 6 patients (83%), number of systemic steroid-sparing agents was reduced to ≤ 1 in 2 of 4 patients (50%), and cessation of topical steroid achieved in 12 of 41 of eyes (29%). Glaucoma surgery was performed in 11 eyes (22.4%) and Cataract surgery in 12 eyes (24.5%).

### Conclusions

Biologic therapy was demonstrated to be effective and safe in paediatric uveitis in the real-world setting. It resulted in reduction of the corticosteroid burden, and number of steroid-sparing agents. This in turn will hopefully reduce glaucoma secondary to steroid response and trabecular work damage. Intraocular inflammation was improved with maintained visual acuity and low incidence of adverse events.

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## P-WT-262

### SUPRACHOROID STRUCTURE AND ITS ROLE IN UVEOSCLERAL OUTFLOW

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#### Purpose

An alternative approach to treat glaucoma is the drainage of aqueous humor into suprachoroidal space<sup>1</sup> to increase uveoscleral outflow.<sup>2</sup> Aqueous outflow requires pressure gradients, which is obviously absent for the uveoscleral flow,<sup>3,4</sup> as most of the parts of this pathway stay within the single cavity. With the absence of pressure gradient there must be some dedicated structures responsible for fluid passage. Due to lack of sufficient suprachoroid morphology data<sup>5</sup> there is a controversy regarding the mechanism of uveoscleral flow.

We performed an experimental study of autopsy donor eyes to identify structures possibly involved in fluid passage along the suprachoroidal space.

#### Methods

We used 16 autopsy donor eyes for microdissection. 10x25 mm scleral strip was removed from limbus towards posterior pole of the eye. We used irrigation with BSS in different directions to observe flow-induced movement of suprachoroidal lamellae. 3D-videorecording and in-vitro SD-OCT were used for visualization/registration. Histological sections and flat specimens of suprachoroid stained with hematoxylin-eosin, and vimentin stain were examined as well. Additional in-vivo OCT in 10 patients confirmed microdissection data.

#### Results

Exposed suprachoroid looked like gentle veil covering the surface of choroid. Alternate BSS flow revealed a multi-layered three-dimensional structure of suprachoroid which is composed of multiple "choroid-based flaps" forming posteriorly opened pockets. Irrigation directed from posterior pole towards the limbus inflated these pockets. Reverse flow pressed lamellae back to choroid. Histological examination of flat specimens and transverse sections with conventional stain revealed multiple "flocks" with no certain structure. Vimentin stain demonstrated continuous films instead of indefinite "fibers". Relatively solid and posteriorly directed lamellae naturally resist the retrograde fluid movement while easily lean down to choroid when irrigated in proper direction from anterior segment towards posterior pole. Such structure may convert different pressure fluctuations (due to blood pulse, external pressure, ciliary muscle contraction, etc) into sequential posterior movement of portions of fluid. In-Vitro OCT revealed oblique suprachoroidal lamellae along the all suprachoroid, except sub-macular area.

#### Conclusions

Valve-like structure of suprachoroid can be responsible for fluid passage along the uveoscleral outflow pathway.

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# Structural and Functional Testing

## P-WT-263

### VESSEL DENSITY CHANGES IN THE PERIPAPILLARY AND MACULAR AREA IN PSEUDOEXFOLIATION GLAUCOMA

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#### Purpose

The aim of the study was to evaluate whether optical coherence tomography angiography (OCTA) can detect altered vessel density (VD) in pseudoexfoliative early glaucomatous eyes.

#### Methods

The macular and peripapillary VD of 23 eyes, comprising 9 eyes diagnosed with pseudoexfoliative early glaucoma (MD  $\geq$  -6.0 dB) and 14 healthy age-matched control eyes, was examined using a commercial spectral domain OCTA system (RTVue-XR Avanti, Optovue, Fremont, CA). 4.5×4.5-mm scan centered on the optic nerve head and 6×6-mm scan centered on the fovea.

#### Results

Mean  $\pm$  SD age was  $67.22 \pm 3.7$  years in the glaucoma group and  $67.3 \pm 7.3$  years in the control group ( $p > 0.05$ ). The mean peripapillary retinal nerve fiber layer (RNFL) was  $89.89 \pm 17.43 \mu\text{m}$  in glaucoma group and  $109.21 \pm 16.8 \mu\text{m}$  in control group ( $p = 0.015$ ). Compared with normal eyes, glaucomatous eyes had lower peripapillary perfused VD in both inside disc and peripapillary area (all  $P < 0.05$ ). Although all the parafoveal VD parameters of the glaucomatous eyes were lower than these of control eyes the difference was not statistically significant (all  $p > 0.05$ ).

#### Conclusions

The retinal perfused VD decreased in pseudoexfoliative glaucomatous eyes in both peripapillary and parafoveal area. The reduction of the peripapillary perfusion was found to be more prominent in this study.

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## P-WT-264

### COMPARISON OF THREE METHODS OF TONOMETRY PRIOR AND FOLLOWING MYORING IMPLANTATION IN PATIENTS WITH KERATOCONUS

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Seyed Aliasghar Mosavi\*

#### Purpose

To study the measurement of intraocular pressure (IOP) before and after implantation of intrastromal corneal ring (MyoRing) in patients with keratoconus. To study the measurement of intraocular pressure (IOP) before and after implantation of intrastromal corneal ring (MyoRing) in patients with keratoconus.

#### Methods

We compared the IOP of 32 eyes which underwent MyoRing implantation prior and six months post operation using Goldman applanation (as gold standard), Icare, and Corvis ST (uncorrected, corrected and corrected with cornea biomechanics).

#### Results

The resulting intraocular pressure measurements prior to surgery using Icare and Corvis (corrected with cornea biomechanics) overestimated the IOP, however measurements by uncorrected Corvis underestimate the IOP. Likewise, the intraocular pressure measurements after surgery by Icare and Corvis (corrected with cornea biomechanics) overestimated the IOP but measurements by uncorrected Corvis underestimated the IOP.

#### Conclusions

Consistent intraocular pressure measurements on eyes with Myoring in keratoconus was not obtained when we measured the IOP by Icare and Corvis prior and after surgery however it was achieved using Goldman applanation tonometer.

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## P-WT-265

### RATES OF FAST & CATASTROPHIC VISUAL FIELD LOSS IN THREE GLAUCOMA SUBTYPES

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#### Purpose

Comparing the distribution of visual field progression rates between glaucoma subtypes is challenging when different subtypes are investigated in differently constructed studies (e.g. different inclusion and exclusion criteria, or different regression analysis methods) performed on geographically differing populations. Here we compare the distribution of visual field progression rates in three subtypes (primary angle closure glaucoma (PACG), primary open angle glaucoma (POAG), and juvenile open angle glaucoma (JOAG)) drawn from a single care setting.

#### Methods

We assessed glaucoma patients treated in an Indian tertiary care setting with at least four visual field assessments. We determined rates from a single eye of each of 525 patients using linear regression of the summary index Mean Deviation (MD) over time. The main outcome measures were the proportions of fast (<-1.0 to -2.0 dB/year) and catastrophic (<-2 dB/year) visual field progression. Bootstrapped 95% confidence intervals allowed comparison with published data from a large clinical cohort in Canada (Chauhan *et al.*, 2014).

#### Results

The combined proportion of fast and catastrophic progressors in our cohort was less than half that in the Canada dataset (2.3% vs 5.8%), despite median progression rates differing by only 0.03 dB/year. PACG, POAG and JOAG represented 45, 32 and 12% of our cohort, respectively. Baseline MD values were similarly distributed between these subtypes. All subtypes showed a similar shaped distribution for progression rates, with median progression rates of -0.03, -0.05 and 0.02 dB/year for PACG, POAG, and JOAG, respectively. Combined proportions of fast and catastrophic progression rates did not significantly differ between subtypes.

#### Conclusions

Differences in fast and catastrophic visual field progression can exist despite only small changes in median progression rates, highlighting the importance of considering the full shape of the progression rate distribution when comparing the risk of devastating visual field loss.

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## P-WT-266

### MACULAR VESSEL DENSITY IN EYES WITH UNTREATED PRIMARY OPEN ANGLE GLAUCOMA AND A HEMIFIELD DEFECT

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#### Purpose

To compare macular vessel density (MVD) and inner macular thickness of eyes with untreated primary open angle glaucoma (POAG) and a hemifield defect with ones of normal eyes.

#### Methods

Thirty-six eyes of 36 patients with untreated POAG and a hemifield defect, and 30 eyes of 30 normal subjects matched by age, sex, refractive errors and systemic blood pressure were enrolled in the study. Optical coherence tomography angiography imaging was performed using RTVue XR Avanti™ (Optovue, Inc), and MVD and the inner macular thickness was measured in an annular region with an inner diameter of 1mm and outer diameter of 3mm centered on the fovea. Wilcoxon signed rank tests were used to evaluate differences between defective and normal hemifields in eyes with POAG, and Mann-Whitney U tests were used to evaluate differences between normal hemifield of eyes with POAG and normal eyes.

#### Results

In eyes with POAG, there were no significant differences between MVD corresponding to the normal hemifield and the one corresponding to the defective hemifield ( $46.0 \pm 5.1\%$  vs.  $44.9 \pm 4.7\%$ ,  $p = 0.239$ ). However, MVD corresponding to the normal hemifield was significantly lower than the one of normal eyes ( $46.0 \pm 5.1\%$  vs.  $48.9 \pm 4.9\%$ ,  $p = 0.043$ ). In contrast, the inner macular thickness corresponding to the defective hemifield was significantly lower than the one corresponding to the normal hemifield ( $109.5 \pm 13.4 \mu\text{m}$  vs.  $116.1 \pm 9.5 \mu\text{m}$ ,  $p < 0.001$ ). However, there were no significant differences between the inner macular thickness of the normal hemifield and one of normal eyes ( $116.1 \pm 9.5 \mu\text{m}$  vs.  $119.9 \pm 7.9 \mu\text{m}$ ,  $p = 0.079$ ).

#### Conclusions

Reduced MVD was observed in the apparently normal hemifield of eyes with untreated POAG. Since there were no significant differences between the inner macular thickness of the normal hemifield and one of normal eyes, there is a possibility that vascular changes might occur earlier than structural changes at at least the macular region.

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## P-WT-267

### PROGRESSION PATTERN OF INITIAL SINGLE HEMIFIELD DEFECT IN GLAUCOMA PATIENTS

Sung Uk Baek<sup>1</sup>, Kyung Wha LEE<sup>1</sup>, Young Kook Kim<sup>2</sup>, Ki Ho Park<sup>2</sup>, Jin Wook Jeoung<sup>2</sup>

<sup>1</sup>Ophthalmology, Hallym University Sacred Heart Hospital, Anyang, <sup>2</sup>Ophthalmology, Seoul National University Hospital, Seoul, Korea, Republic Of

#### Purpose

To investigate clinical outcomes of primary open angle glaucoma (POAG) with an initial single hemifield defect in visual field (VF) test and its related risk factors for involving the opposite hemifield during follow-up (FU).

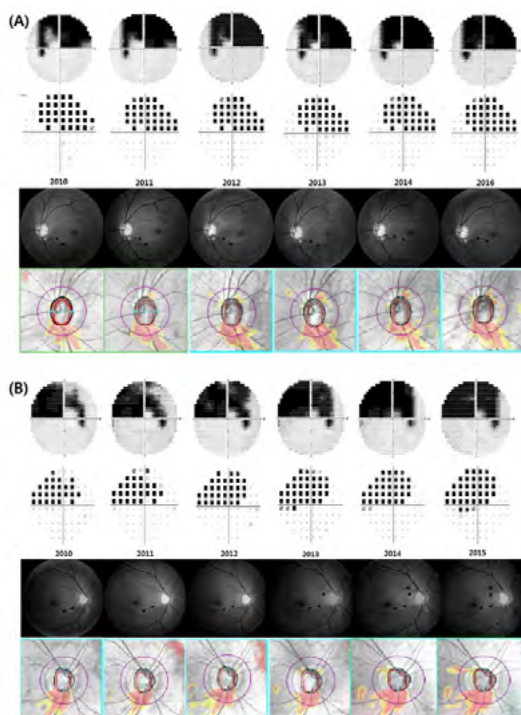
#### Methods

This longitudinal observational study included 108 POAG eyes of 108 patients that met the following conditions: 1) single hemifield defect at initial VF examination; 2) FU longer than 5 years. Patients were divided into 'Group A' (sparing the opposite hemifield, figure A) and 'Group B' (involving the opposite hemifield, figure B) according to the patterns of VF progression. Baseline demographic and clinical characteristics were compared between the two groups. The Cox proportional hazards model were used to identify the risk factors for involving the opposite hemifield.

#### Results

The average FU period was 7.9 years, and 63 eyes (58.3%) were classified as Group A and 48 eyes (41.7%) as Group B. Between the two groups, no significant differences were found in the FU periods (7.8 vs. 8.0 years), baseline VF mean deviation (-9.67 vs. -10.06 dB), mean baseline IOP (17.21 vs. 16.87 mmHg), or percentage reduction in IOP (21.6 vs. 20.6 %) (all  $P < 0.05$ ). The multivariate Cox proportional hazards model indicated that older age (HR = 1.704;  $P = 0.025$ ) and absence of optic disc vertical tilt (HR = 1.430;  $P = 0.017$ ) were risk factors for involving the opposite hemifield.

#### Image



### Conclusions

In POAG with an initial single hemifield defect, 41.7% showed involving the opposite hemifield during the average 8.0-years of FU. Older age and absence of optic disc vertical tilt were significantly associated with greater probability of involving opposite hemifield.

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## P-WT-268

# A DEEP LEARNING ALGORITHM TO AUTOMATICALLY SEGMENT THE TRABECULAR MESHWORK FROM ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IMAGES

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### Purpose

To develop an automatic deep learning algorithm to segment the trabecular meshwork (TM) from serial high definition anterior segment optical coherence tomography (ASOCT) images.

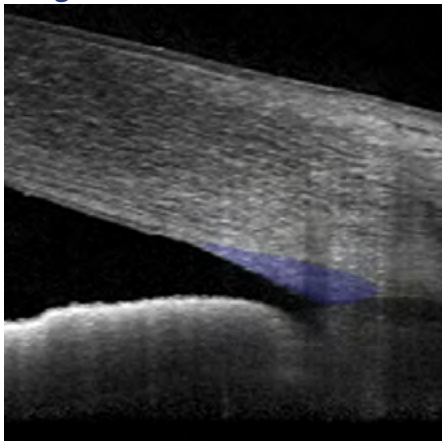
### Methods

A total of 30 eyes from 30 subjects were included. For each subject, the anterior segment of the eye was imaged using ASOCT (Spectralis) at baseline and acute intraocular pressure (IOP) elevations of approximately 20 and 30 mmHg from baseline (via ophthalmodynamometry). Each scan comprised 4 serial horizontal B-scans. Image dimension was 177×1024 pixels with a pixel size of 10.84 µm. A total of 360 B-scans were obtained from these 30 subjects. All images were manually segmented by an expert observer (MB) to identify the trabecular meshwork. These images were divided into two sets: the training set (315 images) and the testing set (70 images). A full-resolution residual network was trained to automatically segment TM from the images. The accuracy of the algorithm was assessed against manual segmentations using the Dice similarity coefficient.

### Results

The Dice similarity coefficient was 0.76 (95% CI 0.72, 0.80) for the trabecular meshwork in images unseen by the algorithm.

### Image



### Conclusions

The TM can be successfully segmented out from serial ASOCT images. This automatic algorithm may be useful to assess TM morphology and its changes with various IOP levels. This technique may be useful in determining the biomechanical changes in TM and in evaluating glaucoma at different stages.

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## P-WT-269

### RETINAL NERVE FIBER LAYER THICKNESS AND VISUAL FIELD CHANGES IN OBSTRUCTIVE SLEEP APNEA: A META - ANALYSIS

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#### Purpose

Obstructive sleep apnea (OSA) is associated with significant vascular disorders of the eye. It causes several structural and functional changes in the posterior segment through various altered physiological activities such as vascular dysfunction and hypoxia. Association of glaucoma and OSA is still unclear with conflicting results reported from the existing studies. Therefore, our objective was to assess the association of Retinal nerve fiber layer thickness and visual field changes with OSA and its severity by performing a meta-analysis.

#### Methods

Relevant Literature was extracted from PubMed and Scopus databases till April 2018 using following keywords: “obstructive sleep apnea (OSA),” “Optical coherence tomography,” “retinal nerve fiber layer thickness,” “retinal sensitivity,” “visual fields.” Summary of pooled mean difference (MD) with 95% Confidence Intervals(CI) was calculated for both RNFL and visual field changes. RNFL changes were reported in severity wise and visual field changes reported through a mean deviation. Rev Man (Review manager) 5.2.0 software was used to perform statistical analysis, and a P-value  $\leq 0.05$  was considered to be statistically significant.

#### Results

12 studies involving 829 eyes (456 OSA and 373 controls) were included to calculate RNFL changes and eight studies involving 1247 eyes (847 OSA and 400 controls) were included to calculate visual field changes in the final meta-analysis. The MD of RNFL thickness in total OSA subjects was  $-3.46 \mu\text{m}$  ( $P < 0.0001$ ) (mild  $-1.85 \mu\text{m}$  ( $P = 0.02$ ), moderate  $-2.62 \mu\text{m}$  ( $P = 0.0009$ ), severe  $-5.14 \mu\text{m}$  ( $P < 0.0001$ )), whereas the MD of visual field changes in OSA subjects was  $-1.55$  ( $P < 0.0001$ ) when compared with controls.

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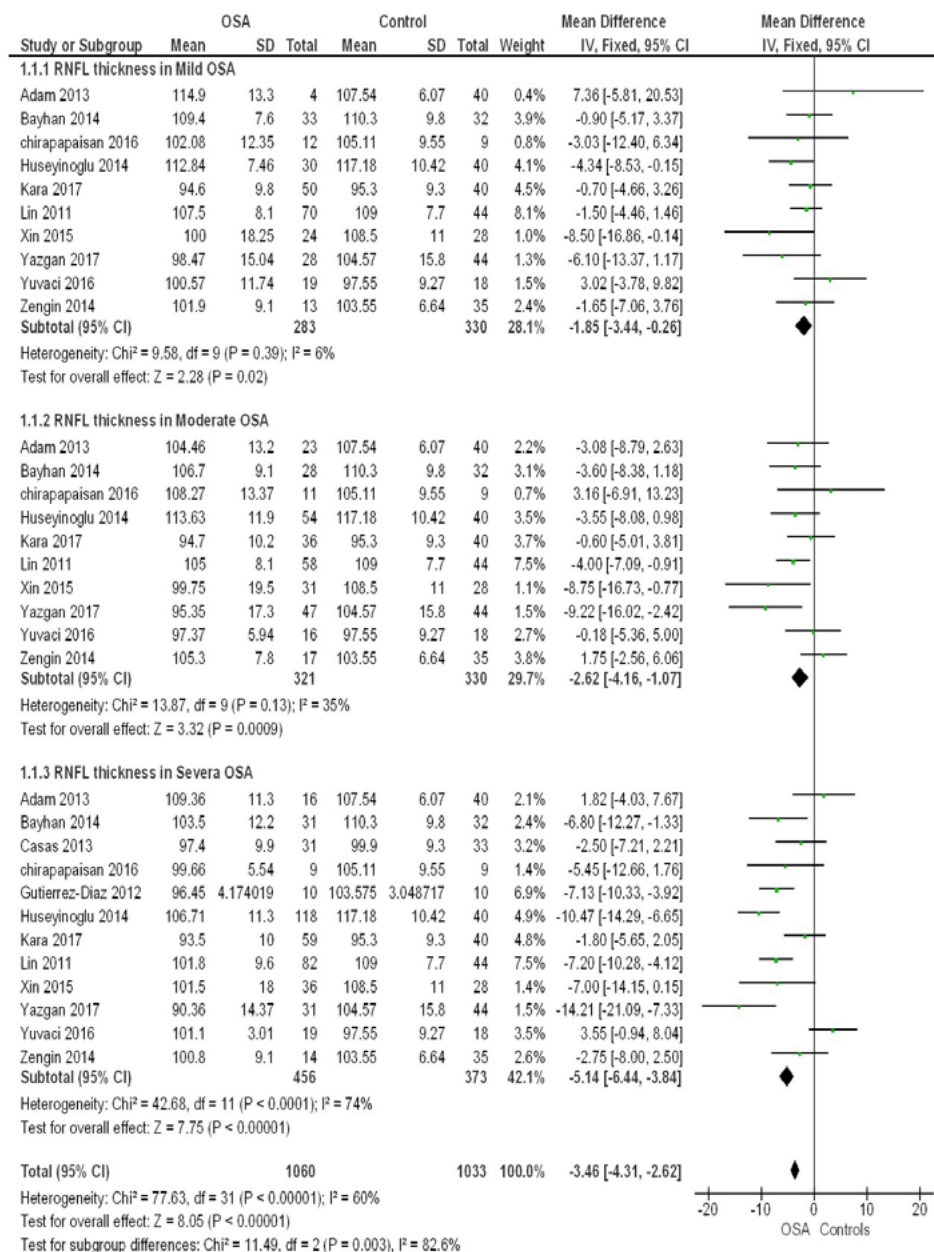
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## Conclusions

Results of the meta-analysis showed a significant reduction of RNFL thickness and retinal sensitivity in the OSA group. It was also noticed that RNFL thickness inversely proportional to the severity of the disease in a subgroup analysis.

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## P-WT-270

### INVESTIGATING THE PERFORMANCE OF CHANGE ANALYSIS PRINTOUT FOR DETECTING DISEASE SEVERITY AND PROGRESSION OF GLAUCOMA

Tutul Chakravarti\*

#### Purpose

Investigating the performance of Change Analysis Printout for detecting disease severity & progression of glaucoma in a retrospective chart analysis.

#### Methods

We studied 24 patients (average age  $65.2 \pm 10$ , 37 eligible eyes) with SITA-standard 24-2 visual field (VF) tests. In this retrospective study VF based glaucoma staging was applied for stages 0-3. There are 5 groups of patients: (i) early (12), (ii) moderate (7), (iii) advanced glaucoma (7), (iv) no glaucoma with early cataract (5), and (v) no glaucoma (6). HFA II 720 gives an analytical summary of changes in VF overtime in the form of box plot, a summing up of global indices, & a linear regression of MD. The box plot summarizes total deviation values for each test. Linear regression analysis of MD slope evaluated the Rate of Progression. Four criteria marked severity: (A) value of 50<sup>th</sup> percentile (B) 85<sup>th</sup> percentile; (C) 15<sup>th</sup> percentile; (D) the worst point of the box plot. We studied 4<sup>th</sup>, 5<sup>th</sup> & 6<sup>th</sup> box plot (out of 6-8 follow-ups for 5 years) to obtain the best values avoiding the learning effects of first 3.

#### Results

The average value of the 50<sup>th</sup> percentile in early, moderate & advanced glaucoma was: -1.33 dB, -6.9 dB, -11.43 dB respectively & for two non glaucoma groups -2.20 dB & -0.22 dB ( $p = 0.000$ ). Similarly, 15<sup>th</sup> & 85<sup>th</sup> percentile value varied wildly among glaucoma groups according to the severity. The 15<sup>th</sup> percentile values for early, moderate & advanced was -3.2 dB, -13 dB & -22 dB respectively & was only -2.2 dB for normal cohort ( $p = 0.000$ ). The average 85<sup>th</sup> percentile value was -3.3 dB & -5.3 dB for moderate & severe group, clearly different from early glaucoma (0.47 dB) & in non glaucoma group (0.25 & 0.67 dB,  $p = 0.000$ ). Difference in the values among 5 groups with variable disease severity is statistically significant (Kruskal Wallis Test). We used Mann-Whitney U test for glaucoma and non-glaucoma groups.

#### Conclusions

Results indicate that the positions of the boxplot landmarks identify the deviations at percentile rankings. Early glaucoma is typically with long tail (mean worst point -18.62 dB) but 15<sup>th</sup> percentile is normal. A long box plot indicates that the deviation is distinctly more severe in some locations than in others, so the 15 & 85 percentile deviations are dissimilar. Lengthening of the box, especially the inferior arm, over time indicates the development & deepening of localised defects. In the change analysis printout the boxplots are used to suggest at a glance the presence & nature of a change through a series of visual fields.

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## P-WT-271

# THE ASSOCIATION OF IRIS COLOR AND DYNAMIC IRIS CHANGE ASSESSED BY THREE-DIMENSIONAL SWEEP-SOURCE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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### Purpose

To compare iris anatomical features between eyes with light and dark iris and to assess the relationship between iris color and the dynamic light-to-dark iris change.

### Methods

Subjects with light iris (blue, green, grey, hazel, and light brown) and dark iris (brown and dark brown) were recruited. Iris color determination was based on the Iris Color Classification System. Parameters related to iris thickness (IT) (average IT750/IT2000 and area IT750/IT2000) and iris volume from three-dimensional swept-source anterior segment optical coherence tomography were acquired in light (350-400 lux) and dark (0.1 lux) conditions. Multiple linear regression models with adjustment for potential confounders were used for analysis.

### Results

Data from 116 participants were available for analysis. Fifty-one eyes were in light iris group and 65 eyes were in dark iris group. Eyes in dark iris group showed higher values in all IT parameters (all  $P < 0.05$ ) except area IT750 in room light measurement ( $p = 0.30$ ). There was no significant difference in iris volume between the 2 groups. For change from light to dark conditions, analysis with the adjustment for baseline IT showed that darker irides significantly increased in average IT750 ( $B\ 0.83$ ,  $p = 0.022$ ), area IT750 ( $B\ 36.61$ ,  $p = 0.046$ ), and area IT2000 ( $B\ 36.07$ ,  $p = 0.009$ ). There was no evidence of the association between iris color and change in iris volume.

### Conclusions

Iris color had a significant association with iris thickness. Darker irides increased peripheral thickness more than lighter irides in physiologic pupil dilation from light to dark conditions.

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## P-WT-272

### SEQUENTIAL CHANGES IN RETINAL VESSEL DENSITY AND GANGLION CELL COMPLEX THICKNESS AFTER ACUTE PRIMARY ANGLE CLOSURE ATTACK

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#### Purpose

In acute primary angle closure (APAC) glaucoma eyes, decrease of peripapillary retinal vessel density (VD) compared with the contralateral unaffected eyes has been previously reported<sup>1-3</sup>. In this study, we evaluated the sequential changes of macular VD and macular ganglion cell complex (GCC) thickness after APAC attack.

#### Methods

In this prospective observational study, consecutive 11 eyes of 11 patients with APAC who were newly diagnosed and underwent cataract surgery were studied. Macular VD was measured with optical coherence tomography (OCT) angiography in the 4 areas; superior, temporal, inferior, and nasal. Macular GCC were measured with OCT at 6 areas; superior, nasal superior, nasal inferior, inferior, temporal inferior, and temporal superior using built-in software. Both parameters were evaluated at 1 week, 1 month, and 3 months after surgery.

#### Results

Intraocular pressure (IOP) just after APAC ( $56.3 \pm 15.1$  mmHg) was successfully reduced at 1 week ( $16.5 \pm 9.8$  mmHg,  $P < 0.01$ ), 1 month ( $13.7 \pm 2.0$  mmHg,  $P < 0.01$ ) and 3 months ( $12.7 \pm 1.4$  mmHg,  $P < 0.01$ ) after surgery. There were no significant differences in the macular VD and in the macular GCC thickness at any measurement area at 1 month ( $p > 0.05$  for all) and 3 months ( $p > 0.05$  for all) compared with those at 1 week.

#### Conclusions

Macular VD or Macular GCC thickness seemed not to be affected in the short-term after successful treatment for APAC.

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## P-WT-273

### APPLICATION OF ISNT AND IST RULES ON RETINAL NERVE FIBER LAYER THICKNESS IN GLAUCOMA

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#### Purpose

We determined the applicability of inferior>superior>nasal>temporal (ISNT) and inferior>superior>temporal (IST) rules on retinal nerve fiber layer (RNFL) thickness using spectral domain optical coherence tomography (SD-OCT) in glaucoma, glaucoma suspect and healthy eyes.

#### Methods

A cross sectional study which included 40 eyes of 40 normal subjects, 40 eyes of 40 glaucoma suspect subjects, 40 eyes of 40 patients with glaucoma. Inferior temporal, superior temporal, nasal and temporal RNFL thickness were evaluated using Spectralis SD-OCT. The ISNT rule and IST rule were considered intact if there was a gradual decrease in RNFL thickness in the order of inferior temporal>superior temporal>nasal>temporal and inferior temporal>superior temporal>temporal.

#### Results

The ISNT rule was intact in 62.5%, 30%, and 15% of eyes in the control, glaucoma suspect, and glaucoma groups, respectively, and the distribution was significantly different among groups ( $P < 0.001$ ). The IST rule was intact in 82.5%, 62.5%, and 32.5% of eyes in the control, glaucoma suspect, and glaucoma groups, respectively, and the distribution was significantly different among groups ( $P < 0.001$ ).

#### Conclusions

The ISNT rule and IST rule with inferior temporal, superior temporal, nasal, temporal RNFL thickness may have clinical value in the diagnosis of glaucoma and glaucoma suspect.

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## P-WT-274

### CORNEAL AND ANGLE PARAMETERS AFTER LASER IRIDOTOMY COMBINED WITH IRIDOPLASTY ASSESSED BY DUAL SCHEIMPFLUG ANALYZER

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#### Purpose

To investigate the changes in anterior and posterior corneal curvature and corneal aberrations, along with anterior chamber angle (ACA) after laser iridotomy (LI) combined with peripheral iridoplasty (PI) using dual Scheimpflug Analyzer.

#### Methods

In this prospective observational study, dual Scheimpflug Analyzer images were acquired before and after LI plus PI. Corneal curvature of both axial and instantaneous map from anterior and posterior cornea, respectively and total corneal power (TCP) was acquired. These corneal parameters from three zones (central, middle, and peripheral) and total corneal wavefront aberration, trefoil, and coma were obtained. ACA from 4 quadrants, ACD (Anterior chamber depth), anterior chamber volume (ACV), and intraocular pressure (IOP) were also inspected.

#### Results

ACD increased significantly from  $2.15 \pm 0.25$  mm to  $2.18 \pm 0.24$  mm ( $p = 0.002$ ). ACV and ACA from all four quadrants increased significantly after the laser treatment (all  $p < 0.05$ ). IOP decreased significantly from  $16.9 \pm 3.1$  mmHg to  $14.7 \pm 2.9$  mmHg following LI plus PI ( $p = 0.000$ ). Corneal axial and instantaneous curvature from three zones on the anterior and also posterior corneal surface showed no significant changes after LI plus PI (all  $p > 0.05$ ). TCP, total corneal wavefront aberration, trefoil, and coma also revealed no significant changes after the laser procedure (all  $p > 0.05$ ).

#### Conclusions

Treatment with LI combined with PI did not affect the corneal parameters from both anterior and posterior surfaces. LI plus PI is considered to be a safe and effective laser procedure.

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## **P-WT-275** **OCT- ANGIO AND OPTIC DISC DRUSEN**

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### **Purpose**

To evaluate optic disc drusen using multimodal modalities featuring optical coherence tomography (OCT) and OCT- Angio: superficial, choriocapillaris and choroid plexus.

### **Design**

Retrospective observational case series.

### **Methods**

Eyes with optic disc drusen confirmed with autofluorescence imaging, CT or contact B-scan ultrasonography were examined with enhanced depth imaging high definition radial OCT (EDI-HD radial-OCT) and 3x3mm OCT angiography (Angioplex™ OCT Angiography). Data from ONH, RNFL, ganglion cells analysis and visual fields were also analysed. To evaluate the interest of OCT-Angio in differential diagnosis between optic disc drusen and optic disc edema and crowded disc, patients with optic disc edema and crowded disc were also studied.

### **Results**

Fourteen eyes of 7 patients with optic disc drusen were evaluated. EDI HD Radial -OCT showed multiple optic disc drusen with different reflectivity behaviour. All eyes had the same pattern of choriocapillaris and choroid plexus angiography: no fluxus was detected in microvasculature and in retinal vessels below drusen material. The superficial plexus was abnormal when abnormalities of RNFL thickness were found. There was a correlation between the type of optic disc drusen and the pattern of reflectivity behaviour, RNFL thickness and superficial plexus abnormalities. Seven crowded discs without RNFL abnormalities were analysed and the pattern of OCT-Angio was normal. Three optic discs edema were analysed and showed an increase capillarity on peripapillary region and deep plexus.

### **Conclusions**

The OCT- Angio had a specific pattern in optic disc drusen. The protein deposits of the optic disc drusen mask the blood flow and consequently the choriocapillaris and choroid plexus pattern seems to be an important contribution to diagnosis and help in the differential diagnosis between optic disc drusen and crowded disc and oedema disc. The evaluation of the superficial plexus seems to be relevant in of optic disc drusen complication.

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## P-WT-276

### CLINICAL FEATURES OF MICROVASCULATURE IN SUBZONES OF PARAPAPILLARY ATROPHY IN MYOPIC EYES

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#### Purpose

To investigate the microvasculature in subzones of parapapillary atrophy and its influencing factors in healthy myopic eyes.

#### Methods

The cross-sectional study included 55 healthy myopic eyes with parapapillary atrophy. The superficial and deep microvascular densities were delineated and measured in alpha, beta and gamma zones respectively using optical coherence tomography angiography. Linear regression analysis was performed to explore the relationship between the vascular parameters and the structural parameters of each subzone including the width, the area, and corresponding retinal nerve fiber layer thickness, etc.

#### Results

The mean age and mean axial length of the participants were  $27.55 \pm 5.72$  years and  $25.19 \pm 1.08$  mm. Among alpha, beta, gamma zones, the beta zone showed the lowest radial peripapillary capillary density, which was negatively correlated with the area and width of beta zone ( $P < 0.05$ ). The gamma zone showed the highest radial peripapillary capillary density, which was positively correlated with the retinal nerve fiber layer thickness of gamma zone ( $P < 0.01$ ). Compared with alpha zone, both gamma and beta zones showed marked decrease of choriocapillaris. The beta zone showed a lower deep microvascular density than that of gamma zone ( $P < 0.01$ ). Deep microvascular density in beta and gamma zones were negatively correlated with the width of beta zone and gamma zone, respectively ( $P < 0.01$ ).

#### Conclusions

Topographic differences on superficial and deep microvasculature were found in the subzones of parapapillary atrophy. The microcirculatory deficiency in beta zone parapapillary atrophy may exist in myopic eyes.

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## P-WT-277

### TO STUDY THE MACULAR THICKNESS IN PATIENTS WITH DIABETES & SEE IF IT CAN AFFECT THE SAME IN PATIENTS WITH GLAUCOMA & DIABETES

Rita Dhamankar\*

#### Purpose

Purpose- To study the individual and combined effects of diabetes and glaucoma on macular thickness and ganglion cell complex thickness.

#### Methods

We grouped 145 eyes into four groups: Normal (49), Diabetic (41), Glaucoma (32), and Diabetes with Glaucoma (21). Glaucoma diagnosis was based on Standard Automated Perimetry (SAP: Humphrey), optic nerve head examination and intraocular pressure on Goldmann applanation tonometry. Patients having duration of Diabetes, based on their HbA1C results equal to or greater than 5 years were included. We used RTVue SD-OCT (AVANTI) to measure topographic GCC map (7mm X 7mm) and Retina Map Scan (6mm X 6mm outer region and 4mm X 4mm inner region) for retinal thickness parameters.

#### Results

The mean (SD) age was 54.5 (9.0), 61.4 (9.0), 58.6 (9.2) and 64.5 (9.2) for normal, diabetes, glaucoma, and both (diabetes and glaucoma) groups respectively. 62% were males and 38% were females.

For GCC analysis, the mean (SD) total average GCC thickness (microns) for normal, diabetes, glaucoma, and both (diabetes and glaucoma) was 97.56(6.95), 95.88(12.33), 70.79(11.53) and 79.76(10.78) respectively. In the pairwise comparison, we found a statistically significant difference in GCC values among all groups ( $P < 0.05$ ) except between normal and diabetic patients. A similar trend was observed for the other GCC parameters including superior and inferior average GCC, FLV and GLV.

The central foveal thickness (microns) was significantly lower ( $p = 0.04$ ) in glaucoma group (mean [SD]: 231.53 [24.55]) compared with diabetic group (mean [SD]: 251.12 [20.49]); while there was no statistical significance observed among any of the other groups.

For macular thickness measurement, the central foveal thickness and other macular thickness parameters (parafoveal and perifoveal regions) showed no statistical differences between the normal and diabetic groups, and between the glaucoma and glaucoma with diabetes groups.

The paired comparisons between the other groups in macular thickness demonstrated variable results.

#### Conclusions

There was no difference between Normal & Diabetes group, & between Glaucoma & glaucoma with diabetes group, we can therefore conclude that Diabetes does not act as a confounding factor while looking at macular thickness in patients with Glaucoma. However no conclusions can be drawn from the GCC parameters.

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## P-WT-278

### RELATIONSHIP BETWEEN NOCTURNAL PEAK IOP RECORDED BY CONTACT LENS SENSOR AND DISEASE PROGRESSION IN TREATED GLAUCOMATOUS EYES

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#### Purpose

To study the association between nocturnal IOP peak recorded by contact lens sensor[CLS] and glaucoma progression in treated glaucomatous eyes.

#### Methods

Forty glaucoma patients were recruited from glaucoma clinic. Nineteen patients were labelled as progressors on current anti glaucoma treatment despite controlled day time IOP measured by applanation tonometry whereas twenty one patients were clinically stable showing no progression. Worse eye of each patient was selected for placement of contact lens sensor [24 hour ambulatory CLS monitoring].

#### Results

Progressors were found to be significantly more prone to night spikes than non progressors. [ $\chi^2 = 6.812$ ;  $n = 40$ ;  $p < .009$ ], thus, showing a definite association between the two. Association between nocturnal IOP peak and various other variables like age, gender, mean day time IOP and systemic illness [diabetes/hypertension] was also studied. A positive correlation was established between female gender and nocturnal IOP spike with a significantly higher proportion of females showing night spike than their male counterparts [ $\chi^2 = 5.763$ ;  $n = 40$ ;  $p = 0.016$ ]. Other parameters did not show significant relationship with nocturnal IOP spike.

#### Conclusions

Dynamic 24 hour IOP recording by Contact lens sensor is extremely beneficial in detecting nocturnal IOP peaks and thus, can potentially improve clinical care of glaucoma patients especially those showing progression.

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## P-WT-279

### CORRELATION OF MGCC THICKNESS AND CENTRAL 10-2 VISUAL FIELD CHANGES OF ADULT PATIENTS WITH PRIMARY OPEN ANGLE GLAUCOMA: A MULTICENTER STUDY IN NIGERIA

Ayika Emenike\*

#### Purpose

To correlate the optical coherence tomography (OCT) macula ganglion cell complex (mGCC) thickness and the visual field (VF) defects of corresponding macula areas on 10-2 test of standard automated perimetry (SAP) in primary open angle glaucoma (POAG) patients.

#### Methods

In this cross sectional study, 317 consecutive consenting adults, >40years diagnosed with early and moderate POAG were recruited from tertiary and private eye centers in Lagos state. Clinical evaluation, OCT, and SAP tests were carried out by the same senior ophthalmic resident, trained OCT operator and ophthalmic assistants respectively, in order to avert inter observer errors. Print outs were reviewed by glaucoma specialist.

#### Result

Readings from 504 eyes were analyzed. There was significant correlation between mGCC of the inferior macula area and corresponding superior hemifield VF defects ( $r = 0.117$ ,  $P < 0.01$ ), and also the total mGCC and corresponding global VF defect ( $r = 0.118$ ,  $P < 0.01$ ). Using linear regression, all macula areas had significant association with their corresponding VF: superior mGCC with inferior hemifield ( $R^2 = 0.018$ ,  $P < 0.05$ ); inferior mGCC with the superior hemifield ( $R^2 = 0.014$ ,  $P < 0.01$ ) and total mGCC with the global VF loss ( $R^2 = 0.014$ ,  $P < 0.01$ ).

#### Conclusion

This significant correlation between mGCC thickness and corresponding VF defects in early to moderate POAG suggests using serial 10-2 VF tests to evaluate for glaucoma or its progression in suspects, may be a cost friendly option than serial OCT in low income settings. Good clinical acumen is still vital in evaluation and test interpretation.

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## P-WT-280

### RETINAL NERVE FIBER LAYER ANALYSIS IN PARKINSONIAN SYNDROMES USING SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY

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#### Purpose

The accurate diagnosis of Parkinsonian syndromes is still very difficult. And At the same time, new technologies have been developed, such as the Optical Coherence Tomography (OCT), for the early detection of retinal nerve fiber layer (RNFL) loss and analysis of the optic nerve head. In this study we evaluated the OCT as a possible new method for the diagnosis and follow-up of patients with Parkinsonian syndromes.

#### Methods

Prospective and descriptive study was performed at the Department of Ophthalmology and Visual Sciences, and the Department of Neurology and Neurosurgery, Escola Paulista de Medicina, Universidade Federal de São Paulo. Patients with definite diagnosis of Parkinsonian Syndromes were selected according to clinical criteria. All patients were submitted to: anamnesis, refraction and visual acuity, tonometry, slit-lamp biomicroscopy and fundoscopy. After that, all patients were submitted to Spectralis® spectral domain optical coherence tomography (SD-OCT) scanning (software version 4.0, Heidelberg Engineering, Dossenheim, Germany), which provides the thickness of the RNFL in four quadrants (superior, nasal, inferior and temporal) around the head of the optic nerve, the mean foveal thickness and the mean central foveal thickness.

#### Results

The study included eleven patients, consisted of 6 female and 5 male, with a mean age of  $63,9 \pm 11,28$  years old. The mean visual acuity were  $0,05 \pm 0,08$  LogMAR units in the right eye and  $0,03 \pm 0,05$  in the left eye. Mean macular thickness, mean central foveal retinal thickness and peripapillary RNFL thickness at superior, inferior, nasal and temporal quadrants were analysed. The mean foveal thickness were  $270,5 \pm 34,4 \mu\text{m}$  in the right eye and  $263,8 \pm 23,2 \mu\text{m}$  in the left eye. The mean central foveal thickness were  $231,6 \pm 19,4 \mu\text{m}$  in the right eye and  $227,6 \pm 18,7 \mu\text{m}$  in the left eye. Peripapillary RNFL thickness at superior, inferior, nasal and temporal quadrants in the right eye were  $126,4 \pm 19,3 \mu\text{m}$ ,  $127,0 \pm 27,2 \mu\text{m}$ ,  $76,5 \pm 19,0 \mu\text{m}$ ,  $71,8 \pm 14,3 \mu\text{m}$ , respectively, and in the left eye were  $122,1 \pm 19,6 \mu\text{m}$ ,  $128,9 \pm 25,0 \mu\text{m}$ ,  $76,2 \pm 12,4 \mu\text{m}$ ,  $68,2 \pm 15,6 \mu\text{m}$ , respectively.

#### Conclusions

In summary, we evaluated the average and per quadrant RNFL thickness values, the mean foveal thickness and the mean central foveal thickness using SD-OCT in patients with Parkinsonian syndromes. Our study is a reference for future studies, as a major step in the attempt to discover new complementary tests, for diagnosis and follow-up of patients with Parkinsonian syndromes.

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## P-WT-281

### FACTORS RELATED TO SUPERIOR AND INFERIOR HEMI-FIELD DEFECTS IN PRIMARY OPEN ANGLE GLAUCOMA

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#### Purpose

To investigate factors related to superior and inferior hemi-field defects in primary open angle glaucoma (POAG).

#### Methods

Sixty-seven subjects with newly diagnosed, untreated POAG underwent optical coherence tomography (OCT) of the disc area, macular ganglion cell complex (mGCC), and circumpapillary retinal nerve fiber layer (cpRNFL) thickness within 6 months of visual field (VF) test. Based on the VF and OCT results, 40 subjects had a superior and 27 an inferior hemi-field defect. Clinical data including visual acuity, refractive error, disc hemorrhage, VF indexes, and medical history were recorded.

#### Results

Average mGCC and cpRNFL thickness corresponding to the defective hemi-fields were thinner in the superior defect group than in the inferior defect group ( $P = 0.001$  and  $0.049$  respectively). Average total deviation (TD) of the superior and inferior hemi-field defects was comparable between the two groups. However, the superior defect group had a higher prevalence of defects ( $P = 0.003$ ) and lower TD ( $P < 0.001$ ) within central 5 degrees of VF than the inferior defect group. In multiple regression analyses, the temporal-lower and inferior-temporal cpRNFL thickness were significant contributing factors to the inferior mGCC thickness in the superior defect group. In the inferior defect group, refractive error, disc area, and temporal-upper and inferior-temporal cpRNFL thicknesses contributed to the superior mGCC thickness.

#### Conclusions

The damages in mGCC and cpRNFL were limited to the inferior hemisphere in the superior hemi-field defect group. The thickness of the superior mGCC in the inferior hemi-field defect group was not only associated with thickness of cpRNFL, but also refractive errors and disc area. Since the progression of inferior VF defect may significantly influence patients' quality of vision, care should be taken in glaucomatous eyes with myopia and small sized disc.

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## P-WT-283

### SELF-DIRECTED HOME MONITORING OF VISUAL FIELD WITH IPAD TABLET PERIMETER: SHORT-TERM COMPLIANCE AND RELIABILITY

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#### Purpose

The iPad-based app (Melbourne Rapid Fields, MRF) has been shown to produce perimetric results with high correlation with the Humphrey Field Analyzer (HFA) (1). In this study, we examined the short-term compliance and reliability of perimetric results by patients performing self-directed MRF test on iPad at home.

#### Methods

44 patients with either controlled glaucoma (n = 40) or normal (n = 4) were recruited into a 6-week longitudinal home monitoring study. Each patient underwent visual field assessment in-clinic using the HFA and the MRF, followed by a 20-minute training session on how to perform MRF test at home. Viewing distance was fixed with a specially designed viewing hood. Each patient was asked to perform MRF at home on a weekly basis using a loan iPad. Each week, a notification was sent in the form of a mobile phone message or email as a reminder. Exclusion criteria were: inability to understand English instructions given by the iPad, acuity worse than 6/12, intraocular surgery in past 6 months. Comparisons were made by establishing correlations (Pearson) and using Bland-Altman methods (Bias, 95% Limits of Agreement, LoA).

#### Results

The average number of home tests performed over the 6 week period was  $5.1 \pm 2.2$ , with 55% of patients (n = 24) completed all 6 tests and 86% of patients completed  $\geq 1$  test at home. Six patients were unable to perform testing at home due to technical issues or social reasons. Pearson's correlation for MD between MRF performed in clinic and HFA was  $R = 0.80$ . Pearson's correlation for average MD between self-directed MRF tests performed at home and HFA was  $R = 0.83$ . 95% LoA for the variability of MD values obtained by home MRF test was  $\pm 4.38$  dB, which is comparable to the known 95% LoA of repeated HFA tests (approximately  $\pm 4.0$  to  $\pm 5.0$  dB). There is a tendency for greater test-retest variability in patients with worse visual field defects as indicated by MD ( $r = 0.52$ ).

#### Conclusions

This is the first study to examine the compliance and reliability of self-directed visual field testing in glaucoma patients using a tablet device at home. This study shows good compliance in the short term and that self-directed visual field testing at home can produce comparable results to HFA obtained in the clinic. Future longer-term studies of visual field home monitoring may therefore be feasible.

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## P-WT-284

# THE EFFECT OF FEMTOSECOND LASER CATARACT SURGERY ON THE INTRAOCULAR PRESSURE AND PERIPAPILLARY RETINAL NERVE FIBER LAYER THICKNESS

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### Purpose

Studies of femtosecond laser pretreatment in cataract surgery, suggest intraocular pressure (IOP) may increase.<sup>1,2</sup> This IOP elevation may compromise the peripapillary retinal nerve fiber layer (RNFL). However, this has not been proven. The aim of this study is to evaluate the effect of femtosecond laser cataract surgery (FLACS) on the IOP and peripapillary RNFL.

### Methods

This prospective observational study included 133 consecutive patients (133 eyes), and no associated ocular diseases, who underwent FLACS between December 2017 and August 2018. Femtosecond laser pretreatment was performed using the Femto LDV Z8 with Liquid Optics Interface. The IOP was measured immediately before and 2 minutes after the femtosecond laser pretreatment, using a rebound tonometer (iCare PRO). Peripapillary RNFL thickness measurements were performed by spectral domain optical coherence tomography before FLACS and at 1 month postoperatively. The vacuum time was recorded.

### Results

The mean IOP was  $20.2 \pm 3.6$  mmHg and  $21.9 \pm 5.1$  mmHg before and after femtosecond laser pretreatment, respectively (mean increase from baseline  $1.7 \pm 4.3$  mmHg) ( $P < .0001$ ). In 25% of patients there was an IOP rise of 5 mmHg and beyond (maximal increase 14 mmHg). Compared to preoperative RNFL measures, statistically significant thicker postoperative values were found in all the studied sectors ( $p < .0001$ ). Mean difference:  $8.1 \pm 6.1 \mu$ ,  $10.2 \pm 13.4 \mu$ ,  $7.6 \pm 5.6 \mu$ ,  $8.4 \pm 7.9 \mu$ ,  $7.6 \pm 6.2 \mu$ , for the average, superior, nasal, inferior, temporal sectors, respectively. No decrease in RNFL thickness was observed in any of the patients. The mean vacuum time was  $2.07 \pm 0.16$  min. There was no correlation between the IOP rise and RNFL thickness increase, and between IOP rise or RNFL thickness increase and vacuum time.

### Conclusions

Although femtosecond laser pretreatment causes a rise in IOP, FLACS does not cause thinning of peripapillary RNFL, in patients with normal eyes.

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## P-WT-285

### DECREASED SURFACE AREA IN OCCIPITAL CORTEX IS ASSOCIATED WITH PUPIL REFLEX IN GLAUCOMA PATIENTS

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#### Purpose

To analyze the correlation between structural characteristics of occipital cortex measured by 3-Tesla magnetic resonance imaging (3T MRI), and the pupillary reflex in glaucoma patients.

#### Methods

This was a cross-sectional study involving glaucoma patients and healthy volunteers. All participants performed SITA-standard 24-2 automated perimetry (SAP), frequency doubling perimetry (FDT) (psychophysical tests), optic disc stereophotograph, spectral-domain optical coherence tomography (Cirrus HD-OCT), and MR. In addition, patients were tested in the dark with light stimuli using the Ganzfeld system, and pupil diameter was measured with the assistance of an eye tracker. Comparison between glaucoma and control patients was performed using ttest. Structure-function correlation was performed using bootstrap resampling method for clustered data.

#### Results

48 volunteers were included (30 glaucoma patients and 18 healthy volunteers) and 70.21% was female. Mean age was  $61.8 \pm 10.0$  and  $55.7 \pm 7.7$  years in glaucoma and healthy group, respectively ( $p = 0.630$ ). An association was observed between the average area of occipital pole in right hemisphere in glaucoma group and the sustained pupillary response to the blue flash ( $p = 0.025$ ). And, an association was observed between the average area of occipital pole in right hemisphere in glaucoma group and the sustained pupillary response to the right flash ( $p = 0.024$ ).

#### Conclusions

This study showed a correlation between structural damage measured by MR and functional damage measured by pupillary reflex in glaucoma.

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## P-WT-286

### PERIPAPILLARY CAPILLARY PLEXUS DENSITY AND MACULAR VESSEL DENSITY IN EYES WITH PSEUDOEXFOLIATION SYNDROME

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#### Purpose

The aim of this study was to compare the radial peripapillary capillary plexus density (RPC) and macular vessel density (VD) among eyes with pseudoexfoliation syndrome (PEX) and controls.

#### Methods

Optical coherence tomography angiography (OCTA) images (4.5 × 4.5 mm) of the optic nerve head were obtained using a commercial spectral domain OCTA system (RTVue-XR Avanti, Optovue, Fremont, CA). The macular VD was measured at two different levels of segmentation (superficial and deep retinal vascular plexus) with a 6 × 6-mm macula scan. Capillary plexus density was calculated as the ratio of pixels associated with capillaries to the pixels in the annulus after large blood vessel removal.

#### Results

Fourteen eyes with PEX and 14 age-matched control eyes were analyzed. All study participants had neither vascular pathology, diabetes, nor retinal disease. The whole image RPC density was 44.9 % in PEX eyes and 45.6 % in control eyes ( $p = 0.70$ ). The superficial macula whole-image vessel density was 44.7% in PEX eyes and 46.2 % in control eyes ( $p = 0.47$ ). The parafoveal vessel density was 43.5 % in PEX eyes and 47.6 in control eyes ( $p = 0.07$ ). All peripapillary and macular VD parameters of eyes with PEX are lower than control eyes however the difference was not statistically significant ( $p > 0.05$ ) except for superficial nasal parafoveal VD ( $p = 0.02$ ).

#### Conclusions

Although the reduction of the VD was not found to be significant, PEX seems to cause alteration in both peripapillary and macular VD. The decrease would be significant in the future studies with more patients.

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## P-WT-287

# ASSESSMENT OF INTRAOCULAR PRESSURE AND ANGLE CHANGES POST-PERIPHERAL IRIDOTOMY IN SPECTRUM OF PRIMARY ANGLE CLOSURE DISEASE BY SS-OCT

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### Purpose

To assess changes in intraocular pressure (IOP) and angle parameters post-YAG peripheral iridotomy (PI) in subgroups of primary angle closure suspects (PACS), primary angle closure (PAC) and primary angle closure glaucoma (PACG).

### Methods

It was a prospective observational study of 90 eyes of 90 patients, with 30 eyes in each sub-group. IOP and SS-OCT measured anterior segment & angle parameters of AC depth (ACD), lens vault (LV), angle opening distance (AOD500,750), trabecular iris space area (TISA500,750), angle recess area (ARA500,750), trabecular iris angle (TIA500,750), iridotrabecular contact (ITC), iris volume (IV) and iris thickness (IT500) were studied pre-PI and 3 weeks post-PI, and their values were compared.

### Results

The median pre-PI IOP of 17mmHg (12-26), 16mmHg (12-24), 21mmHg (14-70) reduced significantly to 12mmHg (10-16), 14mmHg (10-18) & 14mmHg (10-40) in PACS, PAC & PACG respectively, all  $P < 0.05$ . ACD, LV, AOD (500,750), TISA (500,750), ARA (500,750) and TIA (500,750) differed significantly between pre- & post-PI in all three subgroups with  $PACG > PAC = PACS$  (all  $P < 0.05$ ). The median pre-PI ITC of 7% (0-38), 25% (4-89), 94% (3-100) reduced significantly to 3% (0-27), 17% (1-74) and 71.5% (90-100) post-PI in PACS, PAC and PACG respectively (all  $P < 0.05$ ). The % increase in ACD, AOD (500,750), ARA (500, 750), TISA (500, 750) and TIA (500,750) was significantly greater in PACG as compared to PAC and PACS. Spearman's correlation coefficient between the visual field index and pre-PI ITC was -0.545 ( $p < 0.05$ ) in all eyes. There was positive relation between IOP and ITC both pre- and post-PI, Spearman's correlation coefficient being 0.3449 ( $p < 0.05$ ) pre-PI and 0.2740 ( $p < 0.05$ ) post-PI in all eyes. The Median IV and IT500 in primary angle closure disease were 24.07 mm<sup>3</sup> (12.76-34.39) and 0.36mm (0.25-0.46) respectively, which showed no significant change after PI.

### Conclusions

YAG-PI reduces IOP & widens angle significantly in  $PACG > PAC = PACS$ , with significant decrease in ITC in all the three groups. Residual parts of angle closure may still persist after PI, which may be due to established synechial angle closure, a thick iris or lens induced closure mechanisms.

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## P-WT-288

### EFFECT OF TROPICAMIDE ON LASER FLARE METER MEASUREMENTS IN PATIENTS WITH PSEUDOEXFOLIATION

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#### Purpose

To investigate the effect of 1% tropicamide eye drops on aqueous flare measurements acquired with laser flaremeter in patients with pseudoexfoliation syndrome/glaucoma (PXS/PXG).

#### Methods

Thirty three eyes of 33 patients with PXS/PXG were enrolled. Patients with history of other ocular disease or intraocular surgery, and who had severe posterior synechia that hindered pupil dilatation were excluded. Besides routine ophthalmological examination anterior chamber aqueous flare levels were measured by laser flaremeter device (FM 600, Kowa, Kowa Company Ltd, Nagoya, Japan) before and after 1% tropicamide (Tropamid, Bilim, Turkey).

#### Results

The mean age of 33 (25 males, 8 females) was  $67.3 \pm 7.1$  (range, 53-85) years. Patients had a mean BCVA of  $0.25 \pm 0.41$  (range, 1.80-0.00) logMAR units, cup/disc ratio of  $0.45 \pm 0.22$  (0.2-1), RNFL of  $85.06 \pm 15.25$  (44-106)  $\mu$  and IOP of  $15.33 \pm 2.82$  (range, 9-20) mmHg. The median laser flare value increased insignificantly from  $14.68 \pm 8.40$  (range, 3.4-40.4) photon/ms pre-dilatation to  $15.41 \pm 10.74$  (range, 3.8-46.8) photon/ms post-dilatation ( $p > 0.05$ ; dependent  $t$ -test).

#### Conclusions

As a result, anterior chamber flare values in patients with pseudoexfoliation do not significantly differ after instillation of 1% tropicamide and this agent can safely be used for dilatation during examination of patients with PXS or PXG.

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## P-WT-289

### EVALUATION OF PHOTOPIC NEGATIVE RESPONSE(PHNR) USING RETEVAL™ IN GLAUCOMA EYES

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#### Purpose

To evaluate correlation between photopic negative response(PhNR), visual field and retinal nerve fiber layer thickness(RNFLT) in glaucoma eyes using RETeval™, the electroretinogram (ERG) measuring device with skin electrode specification.

#### Methods

Forty-seven eyes of twenty-seven patients with glaucoma and twenty-four eyes of twelve normal subjects were studied. We recorded the PhNR of the full-field ERG using RETeval™. The stimulus intensity was 1.5 cd/m<sup>2</sup> at a rate of 3.4Hz using red flashing light with 10cd/m<sup>2</sup> blue back light under mydriasis, and 100 responses were averaged. We measured the amplitude of PhNR (the negative trough between 60 and 100msec after stimulus onset) and the ratio between the PhNR and b-wave amplitude (PhNR/B ratio). We measured the RNFL around optic nerve head using Swept Source Optical Coherence Tomography(OCT). The mean deviation (MD) of the visual field was obtained by static visual field analysis. To determine that there were significant differences between normal subjects and glaucoma patients regarding PhNR amplitudes and the ratio of the b-wave to the PhNR amplitudes, we used the Mann-Whitney U-test. We also used Pearson's coefficient of correlation to determine the degree of correlation between the PhNR amplitudes, the PhNR/b-wave ratio and the MD value of the static visual field and the RNFLT. P-values of < 0.05 were taken to indicate statistical significance.

#### Results

The amplitude of the PhNR and the PhNR/b ratio in glaucoma eyes were significantly smaller than those of normal subjects. ( $p = 0.428 \times 10^{-6}$ ,  $p = 0.120 \times 10^{-6}$ , respectively) The amplitude of the PhNR and the PhNR/b ratio in glaucoma eyes were significantly correlated with the MD. ( $r = 0.460$  and  $p = 0.017$ ,  $r = 0.511$  and  $p = 0.396 \times 10^{-3}$ , respectively) The amplitude of the PhNR and the PhNR/b ratio in glaucoma eyes were also significantly correlated with the RNFLT. ( $r = 0.537$  and  $p = 0.242 \times 10^{-3}$ ,  $r = 0.583$  and  $p = 0.505 \times 10^{-4}$ , respectively).

#### Conclusions

This study indicates that the measurement of the PhNR of the full-field ERG using RETeval™ system may help electrophysiological evaluation of retinal inner layer function for glaucoma patients.

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## **P-WT-290** **IS(N'T) IT POSSIBLE (NOT) TO PERCEIVE SCOTOMAS?**

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### **Purpose**

In the diagnosis of glaucoma the detection of scotomata are important. Newest research show that the classic view of (non) visual perception in scotomata is changing. The new hozions in visual perception is changing also scotomata research.

### **Methods**

Interdisciplinary scientific literature is reviewed.

### **Results**

Visual perception in and around scotomata are important for the visual perception in the brain. They are different from the classical view not only in automated visual field tests but also in tests like Amsler Grid tests. The problem is not only the perception of the patient. Many visual tests are designed to show the scotomata for cilinical evaluation. Newest research show that up to 50 % of scotomata cannot be diagnosed with the visual field or Amsler Grid Tests. Patients can see illusionary images or fill in images in scotamata. Which may have impact on self consciousness of the patients im the disease and about their ability to be eye witnesses in forensic sciences. These changes can be seen in answers to four questions: "Is(n't) it possible (not) to perceive scotomas?" The answers to these questions have clinical importance in diagnosis and follow up of glaucoma. Subjectively it is becoming more and more difficult to evaluate the visual function in relation to scotomata in patients correctly.

### **Conclusions**

The perception and its deficiencies in scotomata are in focus of visual perception research. The change of knowledge in visual perception in scotomata makes some results in visual field evaluation examinations unreliable. The results of these tests should be evalated with the knowledge of "normal" and "scotomata" visual perception.

### **References**

Recent visual perception studies about visual field and scotomata sholud be taken into consideration for glaucoma diagnosis and follow up.

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## P-WT-291

### CLINICAL CHARACTERISTICS OF GLAUCOMA PATIENTS WITH DISC HEMORRHAGE IN DIFFERENT LOCATIONS

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#### Purpose

Disc hemorrhages (DHs) in glaucomatous eyes are frequently associated with retinal nerve fiber layer (RNFL) defects, and commonly found in the inferotemporal and superotemporal sectors, and disc poles, while DHs in healthy eyes are more arbitrarily distributed.<sup>1</sup> We aimed to demonstrate the clinical characteristics and outcomes of eyes with unilateral DH at different locations.

#### Methods

In this retrospective and longitudinal study, patients with DHs at the superior, superotemporal, inferotemporal, or inferior sector were classified as the “susceptible area” group, while those with DHs at other locations were defined as the “less susceptible area” group.<sup>2</sup> The structural and functional outcomes were analyzed by Humphrey visual field (VF) analyzer and spectral domain-optical coherence tomography (OCT). The RNFL thickness change rate ( $\mu\text{m}/\text{year}$ ) and the mean deviation (MD) slope ( $\text{dB}/\text{year}$ ) was calculated by dividing the difference of RNFL thickness or MD at baseline and at specific time point by the time interval.

#### Results

Forty-three eyes with DHs at susceptible area had less myopic spherical equivalent ( $p = 0.035$ ), more peripapillary type DH ( $p = 0.013$ ), larger average cup-to-disc ratio ( $p = 0.005$ ), cup volume ( $p = 0.002$ ), and disc area ( $p = 0.001$ ) on OCT examinations. Thirty-three eyes in “less susceptible area” group had less association with RNFL defects (12.1%,  $p = 0.001$ ), and greater tilted ratio ( $p = 0.009$ ) of the optic disc. In long-term follow-up, the sectoral RNFL thickness change rate at the DH sector was significantly more rapid in the “susceptible area” group within two years ( $-4.2 \pm 8.3$  vs  $-0.1 \pm 3.7$ ,  $p = 0.013$ ), while the average RNFL thickness change rate was not significantly different ( $-1.7 \pm 2.4$  vs  $-1.5 \pm 1.6$ ,  $p = 0.681$ ). The “susceptible area” group had greater MD slope than that of the “less susceptible area” group within four years ( $-0.32 \pm 0.51$  vs  $-0.05 \pm 0.45$ ,  $p = 0.047$ ). 16.9% of eyes had localized VF progression at DH corresponding area proved by guided progression analysis and Garway-Heath map. All of them had DHs in susceptible area.

#### Conclusions

DHs in superotemporal and inferotemporal regions had more subsequent structural and functional deterioration, while those with DHs in temporal quadrant and nasal side had a more stable clinical course.

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## P-WT-292

# BINOCULAR VISUAL FIELD IN VARIOUS STAGES OF PRIMARY GLAUCOMA AND ITS IMPACT ON LIFE PERCEPTION IN DIFFERENT ENVIRONMENTS

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### Purpose

To investigate the impact of binocular visual field (BVF) in various stages of primary glaucoma on patient's perception of daily life in different environments.

### Methods

This was a cross-sectional study included 240 patients diagnosed with unilateral or bilateral primary glaucoma, and 31 normal control subjects. The Humphrey II Field Analyzer (750) was used to test the monocular visual field (MVF) and calculate the integrated visual field mean deviation (IVF MD). Based on the IVF MD results, patients were divided into 4 groups, the normal BVF, early stage, moderate stage, and late stage group. All subjects in different groups underwent matching tests with simulating pictures of words, street view, and full scene to investigate their perception in different circumstances. Comparison was made between the normal control group and the primary glaucoma patients in various stages.

### Results

There was no significant difference among the different groups in age, gender, and bilateral intraocular pressure. The binocular visual acuity in moderate and late stage groups were lower than the other groups. The IVF MD (dB) was  $-1.08 \pm 1.25$  in normal control,  $-2.26 \pm 1.15$  in normal BVF of glaucoma patients,  $-4.88 \pm 0.59$  in early stage,  $-8.49 \pm 1.68$  in moderate stage, and  $-21.30 \pm 5.45$  in late stage group. In the simulating pictures test, 87.1% normal subjects matched the "unmodified pictures" in all the circumstances. For the normal BVF glaucoma groups, 58.3%, 67.5%, 60.0% patients matched the "unmodified pictures" in words, street view, and full scene tests accordingly. As the disease progressed with worsen BVF, the results of words perception tests progressed from "unmodified picture" to "blurred tunnel", while the rate of "blurred parts" was increased in the late stage. In street view perception tests, results progressed from "unmodified picture" to "missing parts", with an increased rate of "blurred tunnel" in the late stage. In full scene tests, results progressed to "missing parts", with a relatively high rate of "blurred tunnel" and "blurred parts" in the late stage.

### Conclusions

Primary glaucoma patients have different perceptions when compared to healthy individuals. The progression in binocular visual field loss in various stages of glaucoma can affect patients' life perception in different circumstances.

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## P-WT-293

### CLUSTER ANALYSIS OF LONGITUDINAL VISUAL FIELDS IDENTIFIES PATTERNS OF PROGRESSION IN GLAUCOMA PATIENTS

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#### Purpose

Standard automated perimetry (SAP) is currently the standard of care in glaucoma monitoring. Detection of true progression is commonly limited by noise and variance inherent to SAP in clinical practice. Grouping of neighbouring test locations exhibiting similar characteristics may improve the precision of SAP as well as assist likely areas of progression. We aimed to identify and map SAP test points that exhibit statistically similar rates of change in glaucoma.

#### Methods

Longitudinal sensitivity thresholds (dB) were retrospectively extracted from the Humphrey Visual Field Analyzer (HFA) from the Prince of Wales Hospital Eye Clinic and Centre for Eye Health, Sydney, Australia. Patients monitored for  $\geq 2$  years due to glaucoma risk ( $n = 160$ ) or confirmed open angle glaucoma ( $n = 110$ ) with  $\geq 5$  visual field test results (HFA Central 24-2 SITA Standard) were eligible for inclusion. Slopes of visual field sensitivity change (dB/year) were calculated with linear regression for mean deviation (MD) score and 52 locations across the 24-2 test grid. Physiological blind spot (2 points) were excluded. Within-groups linkage hierarchical cluster analysis was applied (SPSS Statistics version 25) as per Phu *et al.*<sup>1</sup>

#### Results

Glaucoma suspects had a mean (SD) age of 55.0 (10.0) years. Median MD change was 0.094 dB/year (IQR: -0.08 to 0.25). Cluster analysis of individual test locations revealed a statistically uniform rate of change across the central visual field with the exception of superior edge points. Glaucoma patients had a mean (SD) age of 76.0 (8.4) years. Median change in MD was -0.12 dB/year (IQR: -0.39 to 0.17), which was significantly different to zero (Wilcoxon Signed Rank Test). Cluster analysis of individual test locations resulted in groups of points that share progression rates located within superior and inferior hemifields and in the nasal step region ranging from -0.06 to -0.25 dB/year.

#### Image

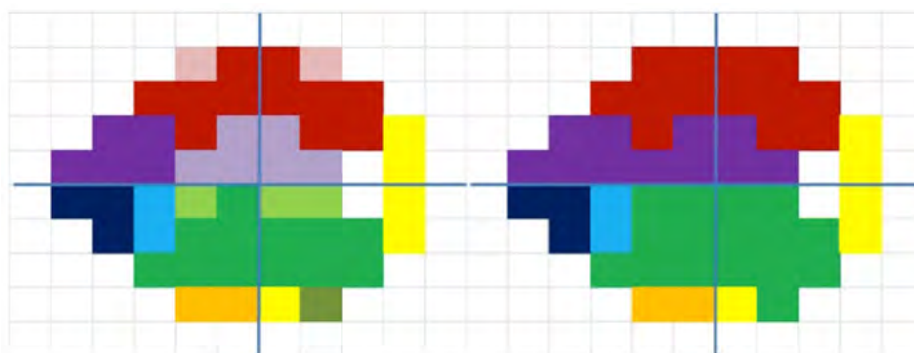


Figure 1: Representative colour maps of the 24-2 test grid showing clusters (Left:11, Right:7) of test locations that exhibited similar rates of change in glaucoma patients. Each colour represents a unique cluster.

### Conclusions

Cluster analysis of longitudinal central visual field data revealed statistically significant patterns of progression that resembled nasal step, arcuate and central defects in glaucoma patients. Grouping these locations may assist in reducing variability of SAP which currently considered individual points and may guide test grid pattern design.

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## P-WT-295

### ASSESSING CHANGE IN CONTRAST SENSITIVITY IN PATIENTS WITH SEVERE PRIMARY OPEN ANGLE GLAUCOMA USING SPAETH RICHMAN CONTRAST SENSITIVITY TEST

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#### Purpose

To assess change in contrast sensitivity in patients with severe primary open angle glaucoma (POAG) using a computer based, contrast sensitivity test, Spaeth Richman Contrast Sensitivity Test (SPARCS) over a period of 6 months.

#### Methods

In this prospective observational study of 30 eyes of 15 patients with severe POAG (using Hodapp Anderson Parrish criteria), BCVA, IOP, number of anti-glaucoma drugs, additional interventions, visual fields using HVF analyzer and SPARCS score were recorded and compared, at the index visit and 6 months follow up visit.

#### Results

The mean age was  $56.73 \pm 8.32$  years (44-82), 8 were male, 7 female. The mean MD changed from  $-19.37 \pm 5.04$  to  $-19.63 \pm 5.56$ , mean PSD changed from  $11.49 \pm 2.61$  to  $11.72 \pm 2.54$  and mean SPARCS from  $54.97 \pm 15.66$  to  $54.77 \pm 16.64$  over 6 months. There was no statistically significant difference between the visual field parameters and SPARCS scores on the basis of number or type of anti-glaucoma drugs. The Spearman correlation coefficient (2-tailed) was 0.274 ( $p = 0.142$ ) for SPARCS1 vs MD1 at the index visit and -0.163 ( $p = 0.389$ ) for SPARCS1 vs PSD1. At 6 months the Spearman correlation coefficient was 0.391 ( $p = 0.03$ ) for SPARCS2 vs MD2 and -0.212 for SPARCS2 vs PSD2. The correlation coefficients between SPARCS1/2, MD1/2 and PSD1/2 were 0.856, 0.748 and 0.497 respectively ( $P < 0.001$ ).

#### Conclusions

Detection of glaucoma progression is currently based on visual field progression and structural assessment using expensive disc morphology analyzers. SPARCS can be used as an adjunct to monitor progression in such patients especially in resource poor settings.

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## P-WT-296

### MEASUREMENT OF EYE MOVEMENT DURING STIMULATING TO PHYSIOLOGIC SCOTOMA BY HEIJL-KRAKAU METHOD WITH HEAD-MOUNTED PERIMETER IMO®

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#### Purpose

The reliability of standard automated perimetry (SAP) result is affected by the fixation stability of the subject. The Heijl-Krakau method, monitoring physiological blind spot, is widely used for assessing fixation reliability with SAP. However, there is no report to confirm an accuracy of fixation loss response by the Heijl-Krakau method to the best of our knowledge. The purpose of this study was to evaluate an accuracy of the Heijl-Krakau method by measuring eye positions during stimulating blind spot.

#### Methods

This study enrolled two thousand one hundred fifty-three eyes 1155 glaucoma patients (mean age,  $61.6 \pm 14.9$  yo). All patients underwent a head-mounted perimeter imo® SAP test. The imo® has an eye-tracking system which records eye position during test and assists the device with stimulating corrected point corresponded to eye movement. All stimulus presentations were classified into 3 groups, 1) fixation loss (FL) stimulus: subjects responded to Heijl-Krakau stimulus presentation, 2) non-FL stimulus: subjects didn't respond to Heijl-Krakau stimulus presentation, 3) total stimulus: all other stimulus except for Heijl-Krakau stimulus presentation. We compared the amount of fixation displacement between the FL, the non-FL, and the total stimulus by Mann-Whitney U test.

#### Results

The median of the amount of the fixation displacement in the FL, the non-FL, and the total stimulus were  $3.2^\circ$ ,  $1.4^\circ$  and  $1.5^\circ$  respectively. The amount of the fixation displacement in the FL stimulus was significantly larger than that of the non-FL and the total stimulus. When we defined the fixation displacement in the range of  $0 \leq \text{degree} \leq 1$  as "stable eye fixation", 14% of the stimulus points were "stable eye fixation" in the FL stimulus.

#### Conclusions

The stimulation of the Heijl-Krakau method with imo® was theoretically presented on the physiologic scotoma. However, 14% of the stimulus points by the Heijl-Krakau method were judged to be fixation loss response, even though stable eye fixation was observed by imo eye-tracking system. Our results suggest that the Heijl-Krakau method would overestimate fixation loss response.

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## P-FS-001

# LONGITUDINAL ANALYSES OF PHYSIOLOGICAL AGING EFFECT ON THICKNESS OF RETINAL GANGLION CELL-RELATED LAYERS AND SAP SENSITIVITY IN NORMAL JAPANESE EYES

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<sup>4</sup>Ophthalmology, Kanto Central Hospital, Mutual Aid Association of Public School Teachers, Tokyo, Japan

## Purpose

Previous studies indicated that declines in the spectral-domain optical coherence tomography (SD-OCT)-measured thicknesses of retinal ganglion cell (RGC)-related retinal layers (structure) generally preceded that in the standard automated perimetry (SAP)-measured sensitivity in the early stage of glaucoma. Though previous studies showed that both structure and SAP sensitivity declined along with aging in normal eyes, the aging-related declines in the structure and SAP sensitivity have not been compared in the same normal eyes. We compared aging-related declines in SAP sensitivities and SD-OCT-measurement results in the corresponding retinal areas in the same normal eyes that had been longitudinally followed.

## Methods

We retrospectively analyzed the follow-up results of Humphrey Field Analyzer 24-2 SITA-S program tests (HFA-24-2) and circumpapillary and macular Cirrus SD-OCT (Carl Zeiss Meditec, Dublin, Ca) measurements of 88 eyes of 47 normal subjects aged  $54.5 \pm 13.8$  (SD) years. Change rates of the average sensitivities of the all HFA 24-2 points ( $SAP_{average}$ ), that of the central 4 points ( $SAP_{central4}$ ), circumpapillary retinal nerve fiber layer thickness (cpRNFLT) and ganglion cell-inner plexiform layer thickness corresponding to the 4 central points with  $2^\circ$  of visual angle adjusted for RGC displacement ( $GCIPLT_{central4}$ ) were analyzed using the linear mixed model adjusting for the age, baseline values, axial length and disc area (JMP® Pro 13, SAS Institute Inc., Cary, NC).

## Results

Aging-related declines in the  $SAP_{average}$  and  $SAP_{central4}$  were -0.63 and -0.82 dB/decade ( $P < 0.001$ ), respectively, and they were significantly greater with higher age and baseline SAP sensitivities ( $P < 0.001$ ) for both  $SAP_{average}$  and  $SAP_{central4}$ . Aging-related declines in the cpRNFLT and  $GCIPLT_{central4}$  were not significant ( $P = 0.575$  and  $0.839$ , respectively), but it was significantly greater with greater disc area ( $P < 0.001$ ) and baseline cpRNFLT ( $P = 0.004$ ) for cpRNFLT and with higher age ( $P = 0.004$ ) for  $GCIPLT_{central4}$ .

## Conclusions

As far as the current normal subjects were concerned, aging-related decline could not be detected for cpRNFLT and  $GCIPLT_{central4}$ , while SAP sensitivities in the corresponding retinal regions showed significant aging-related decline, suggesting that structure-function relationship in the physiological aging process may be different from that after start of glaucomatous damaging processes.

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## P-FS-002

### INTER-EYE CORRELATIONS IN RETINAL NERVE FIBER LAYER THICKNESS RATES OF CHANGE

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#### Purpose

To determine inter-eye correlations of the rates of change of retinal nerve fiber layer thickness (RNFL) as measured by spectral-domain optical coherence tomography (SD-OCT) in controls and glaucoma patients.

#### Methods

Prospective longitudinal cohort study of patients with glaucoma and healthy controls. Longitudinal linear mixed-effects models with best linear unbiased predictions were applied to estimate rates of change in the superior and inferior quadrants and mean global RNFL. Linear regression analysis and Pearson's correlation coefficients were calculated for inter-eye comparison of slopes within a patient.

#### Results

375 glaucoma and 276 healthy eyes were followed for an average of  $4.7 \pm 1.5$  years. For inter-eye correlations, a subgroup of 100 binocular glaucoma patients and 69 binocular controls was further evaluated. Mean global RNFL slopes of change were  $-0.50 \pm 0.46$   $\mu\text{m}/\text{year}$  in controls and  $-0.51 \pm 0.94$   $\mu\text{m}/\text{year}$  in eyes with glaucoma ( $P = 0.61$ ). Binocular controls had a higher inter-eye correlation of the global RNFL (Pearson's  $r = 0.714$ ,  $P < 0.001$ ) than binocular glaucoma patients (Pearson's  $r = 0.450$ ,  $P < 0.001$ ). Test of equality of the correlation coefficients showed a statistically significant difference between controls and glaucoma for inter-eye rates of change ( $P = 0.01$ ).

#### Conclusions

Inter-eye correlations in RNFL rates of change were stronger in controls than in the glaucoma group. These findings can be further used for the evaluation of asymmetric thinning of the RNFL to aid diagnosis and assessment of progression with SD-OCT in glaucoma.

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**P-FS-003**

**RELATIONSHIP BETWEEN PATTERN ELECTRORETINOGRAM AND OPTIC DISC MORPHOLOGY IN GLAUCOMA**

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**Purpose**

To evaluate the relationship between pattern electroretinogram (ERG) and optic disc morphology in glaucoma suspect and glaucoma.

**Methods**

86 eyes of glaucoma suspect and 145 eyes of manifest glaucoma subjects were included in this study. Average peripapillary retinal nerve fiber layer (RNFL) thickness were obtained with spectral-domain optical coherence tomography (OCT) and optic disc imaging was performed using Heidelberg retinal tomograph (HRT). The evaluation of visual function was done with perimetry (SITA and FDT) and pattern ERG (PERG). Scatter plots and correlation coefficients were evaluated between visual function and RNFL thickness or optic disc structure.

**Results**

Scatter plots of PERG and perimetry according to RNFL thickness change showed that PERG started to decrease earlier than did perimetry. The differences between linear and logarithmic  $R^2$  were largest for the scatter plot of SITA 24-2 (linear  $R^2 = 0.415$ ; logarithmic  $R^2 = 0.443$ ) and smallest for P50 amplitude of PERG (linear  $R^2 = 0.136$ , logarithmic  $R^2 = 0.138$ ). In glaucoma suspect, HRT parameters such as cup shape measure (CSM) and linear cup-disc ratio (CDR) had significant correlations with PERG amplitudes. ( $P = 0.016$  for P50 and  $0.049$  for N95 in CSM,  $P = 0.012$  for P50 in CDR). However, in glaucoma patients, mean RNFL thickness was associated with PERG amplitude ( $P = 0.011$  for P50 and  $0.002$  for N95).

**Conclusions**

PERG deterioration occurred earlier than perimetry according to RNFL thickness decrease. PERG amplitudes were significantly correlated with disc morphology in glaucoma suspect. These results may suggest PERG can detect ganglion cell dysfunction before they die.

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**P-FS-004**

**PROGRESSIVE OPTIC DISC TILT IN YOUNG MYOPIC GLAUCOMATOUS EYES**

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**Purpose**

To explore the progressive change and associated factors of optic disc tilt in young myopic glaucomatous eyes by analyzing longterm follow-up data.

**Methods**

Optic disc images were obtained from spectral-domain optical coherence tomography enhanced depth imaging from at least five different visits. The disc tilt angle (DTA) defined as the angle between the Bruch's membrane opening plane and the optic canal plane was estimated at the central frame that pass through the optic disc in each visit. Glaucoma progression was assessed on the basis of changes noted on serial optic disc and retinal nerve fiber layer (RNFL) photographs or changes in the visual field (VF). Linear mixed effect model was used to assess the influence of parameters [age, gender, baseline and follow-up intraocular pressure (IOP), RNFL thickness, VF mean deviation (MD), axial length (AXL), central corneal thickness (CCT)] and presence of glaucomatous progression upon DTA change.

**Results**

A total of 28 eyes of 28 young myopic primary open-angle glaucoma patients (AXL > 24.0 mm; mean age, 24.3 ± 5.0 years; mean follow-up, 4.1 ± 1.0 years) were included. DTA was 6.9 ± 3.6 degrees at baseline and 9.9 ± 4.7 degrees at last visit, which was significantly different ( $P < 0.001$ ). Worse VF MD ( $P < 0.001$ ) and longer AXL ( $p = 0.007$ ) revealed a significant association with increase of DTA.

**Conclusions**

Young myopic glaucomatous eyes showed progressive tilting in their optic disc. Progressive optic disc tilting in young myopic glaucomatous eyes may be related to either continuous axial myopic shift or glaucomatous structural change.

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## P-FS-005

# THE RELATIONSHIP BETWEEN PERIPAPILLARY VESSEL DENSITY AND VISUAL FIELD MEAN SENSITIVITY IN PSEUDOEXFOLIATION GLAUCOMA AND PRIMARY OPEN ANGLE GLAUCOMA

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### Purpose

To investigate whether the relationship between circumpapillary vessel density (cpVD) and visual field (VF) mean sensitivity (MS) differs between pseudoexfoliation glaucoma (PXG) and primary open angle glaucoma (POAG).

### Methods

The cpVD and retinal nerve fiber layer thickness (RNFLT) were obtained using optical coherence tomography angiography (AngioVue/RTVue-XR) in 98 eyes from 98 subjects (age and VF mean deviation (MD) matched 49 PXG and 49 POAG). Global and regional (superotemporal (ST), superonasal (SN), nasoupper (NU), nasolower (NL), inferonasal (IN), inferotemporal (IT), temporolower (TL), and temporoupper (TU)) cpVD and RNFLT were compared between 2 disease categories, and structure- and vasculature-function relationship (RNFLT vs. VFMS, cpVD vs VFMS) were assessed using multiple linear regression models controlling for the confounding factors in 2 disease groups.

### Results

While there was no difference in age, axial length, VF mean deviation (MD), average retinal nerve fiber layer thickness between the two groups, the initial, mean and maximum intraocular pressure (IOP) were higher and the average cpVD was lower in the PXG group than POAG group. In both PXG and POAG eyes, the cpVD was significantly associated with the corresponding VFMS in all 8 sectors ( $P < 0.05$ ). In PXG eyes, the RNFLT associated with the corresponding VF MS in 3 sectors (semipartial correlation coefficient (sr): 0.504 to 0.549,  $P < 0.05$ ): ST, IT and TL, while RNFLT of all 8 sectors were associated with corresponding VF MS in POAG (sr: 0.272 to 0.681,  $P < 0.05$ ).

### Conclusions

PXG eyes have lower cpVD than POAG eyes of similar glaucoma severity. PXG eyes showed more cpVD- VFMS association than RNFLT- VFMS relationship. Therefore, OCTA may be useful in monitoring pseudoexfoliation glaucoma.

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**P-FS-006**

**SCREENING FOR GLAUCOMATOUS VISUAL FIELD DEFECTS: EYE MOVEMENT PERIMETRY VS FREQUENCY DOUBLING PERIMETRY**

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**Purpose**

In Eye Movement Perimetry (EMP), the Saccadic Reaction Time (SRT) to the seen visual stimuli is used as a measure of visual field responsiveness. SRT is known to be significantly delayed in glaucoma patients.<sup>1,2</sup> On this basis, we developed an EMP screening protocol using a Tobii 120 infrared eye tracking device integrated with a test grid that focused on visual areas with the highest susceptibility to glaucomatous loss.<sup>1</sup> This study aimed at estimating the accuracy of EMP protocol and the comparison of its clinical performance with Frequency Doubling Perimetry (FDP).

**Methods**

104 healthy subjects and 73 primary glaucoma patients aged above 20 years underwent a comprehensive ophthalmic evaluation. It included visual field test using the 24-2 SITA standard protocol on the Humphrey Field Analyser which was followed by both the 26-point protocol in EMP and the C-20-1 protocol in FDP in random order. During EMP, all subjects were instructed to fixate at a central target and respond to a seen peripheral stimulus by initiating an eye movement for changing fixation to that target followed by the refixation of the central target.<sup>1</sup> SRT limits for discriminating healthy from glaucoma patients were calculated using age-corrected cluster analysis. For analysis on the EMP, mean SRTs calculated from location wise values were used. For analysis on the FDP, the Robin scores calculated for each participant based on the number, location and defect depth of abnormal points were used.<sup>3</sup> Receiver Operating Characteristic (ROC) curves were plotted for determining the sensitivity and specificity of EMP and FDP.

**Results**

Mean age (SD) of the healthy subjects was 48 (13) years and glaucoma patients were 52 (13) years. Healthy subjects had a mean SRT of 467 (78) ms and a mean Robin score of 1 (2), whereas glaucoma patients had 676 (94) ms and 29 (20) respectively. EMP and FDP could accurately classify 72 (99%) and 64 (88%) patients respectively. The Area Under the Curve obtained from the ROC analysis of EMP (0.958) and FDP (0.952) was comparable with a specificity of 98% and 97% respectively and a sensitivity of 88% (p = 0.81).

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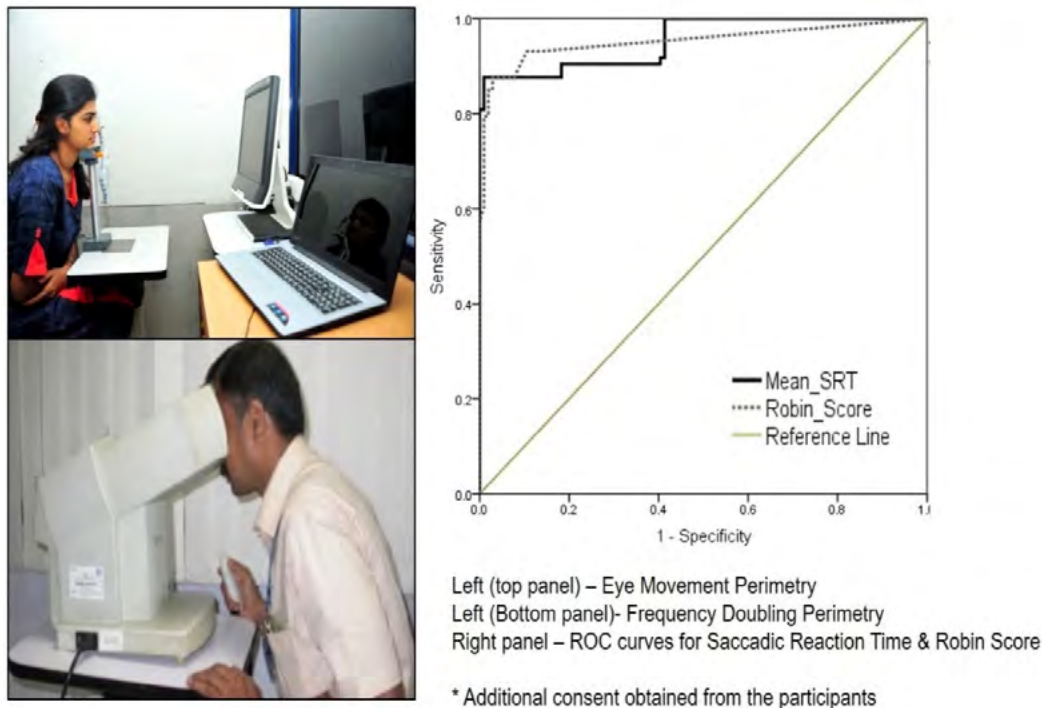
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## Conclusions

EMP showed a higher True Positive Rate (98.6%) and comparable sensitivity and specificity values with that of FDP in detecting visual field defects in glaucoma. Moreover, as EMP permits the natural reflexive eye movements during visual field assessment resembling a real-life test setting, it can be an easily administrable screening method.

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## P-FS-007

### DEVELOPING A METHOD TO PREDICT MEAN DEVIATION OF 10-2 TEST FROM 24-2 TEST IN THE STANDARD AUTOMATED PERIMETRY

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#### Purpose

To develop a method to predict mean deviation (MD) of Humphrey Field Analyser (HFA) 10-2 visual field (VF) from total deviation (TD) value of test locations obtained with 24-2 HFA VF test.

#### Methods

In total, 6892 pairs of 24-2 and 10-2 HFA VF tests that were measured within the period of 3 months were extracted from an anonymized HFA VF database that mainly consists of glaucomatous VFs. A prediction model was built using Lasso (least absolute shrinkage and selection operator) regression where 10-2 MD was response variable and TD values and foveal threshold of 24-2 VF were predictor variables. Complexity parameter (lambda) was optimized by 10-fold cross-validation to select the predictor variables and their coefficients for the best model. Subsequently, prediction ability was assessed using a validation dataset (external 376 VF pairs of 24-2 and 10-2 HFA VF tests, which consist of only glaucomatous eyes).

#### Results

Out of the 54 test locations of 24-2, 12 locations within the central 10 degrees were chosen as the predictor variables. The coefficient was highest at the para-foveal lower nasal test location (0.1642). The average of 24-2 MD of the validation dataset was  $-12.27 \pm 9.0$  dB (mean $\pm$ SD). The mean prediction error between the predicted and the measured 10-2 MD values in each VF pair was 1.72dB. In 342 (91%), 361 (84%), and 267 (71%) validation VF pairs, 10-2 MD were predicted within the accuracy of 3dB, 2dB, or 1dB, respectively.

#### Conclusions

MD of HFA 10-2 test can be predicted using TDs of 24-2 test measured in the same period. Our prediction model may be useful to estimate macula visual function without performing an additional test in glaucoma patients.

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## P-FS-008

### ELEVATED INTRAOCULAR PRESSURE AND HIGH PACHYMETRY, WHAT THE OPHTHALMOLOGIST DO IN BARCELONA, SPAIN

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#### Purpose

To evaluate how many patients with Central Corneal Thickness (CTC) over 600  $\mu$ . (Micras) are treated with intraocular antihypertensive treatments. We also evaluated the record of Ocular Fundus, Campimetry, Arterial Hypertension, Diabetes and Refractive disorders.

#### Methods

From 3.303 pachymetries, performed in our center from 2010 to 2016, we selected 1.263 all with more than 600  $\mu$  CCT. From these we take a random sample, with, random number generator without repetition, Nosetup.org program.

We get a valid sample of 295 pachymetries.

We used the ultrasonic pachymeter DHG 5100E. Checking over all the Medical Histories we did a statistical analysis of age, gender, treatments, Ocular Fundus, Campimetry, Refractive aberrations, Diabetes, Family Background and arterial Hypertension and Family History with SPSS statistic program.

#### Results

Most of the patients were not treated, 67,4% and 32,6% of them received treatments.

The mean CCT of the group was 621,5  $\mu$ .

Most of the important features are not recorded (around 60% of the cases) in the Clinical History. In the recorded cases 68,1% of the Ocular Fundus are normal and 73,9% of Visual Field are normal.

#### Conclusions

We know that actually, Intra Ocular Pressure is the only modifiable risk factor of glaucoma. According to studies, most of the values obtained with the Goldmann Tonometer should conform to CCT. A high IOP itself is not a Diagnostic of glaucoma. In our media we don't treat most of the thick Corneas. We need to record all the values and exams in the Clinical history.

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**P-FS-009**

**SWEPT SOURCE OPTICAL COHERENCE TOMOGRAPHY'S GLAUCOMA, HOOD REPORT AND CHOROIDAL THICKNESS PARAMETERS IN ADULTS WITH BETA THALASSEMIA MAJOR**

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**Purpose**

The purpose of this study was to assess the role of swept source optical coherence tomography's (SS OCT) glaucoma, Hood report parameters in macular ganglion cell layer + (GCL+), Retinal nerve fibre layer (RNFL) and choroidal thickness changes within Beta Thalassemia major patients.

**Methods**

Fourteen eyes of seven multi and regular blood transfused Beta Thalassemia major patients on chelation therapy (Thalassemic Group) and age and sex matched 24 eyes of 12 healthy individuals (Control Group) were included in the study. All Beta Thalassemia major patients and healthy individuals underwent a complete ophthalmologic evaluation and SS OCT analyses. Macular GCL+, RNFL and choroidal thickness changes within Beta Thalassemia major patients.

**Results**

In the thalassemic group, the mean macular GCL+ thickness  $76,6 \pm 10,4 \mu\text{m}$ ; total RNFL  $115,5 \pm 12,5 \mu\text{m}$ ; Choroidal thickness  $424,6 \pm 10,7 \mu\text{m}$ . In control group the mean macular GCL+ thickness  $70,8 \pm 6,2 \mu\text{m}$ ; total RNFL  $106,1 \pm 10,2 \mu\text{m}$ ; Choroidal thickness  $326,5 \pm 9,8 \mu\text{m}$ . GCL+, total RNFL and choroidal thickness in thalassemic group significantly thicker than control group ( $P < 0,005$ ). In 6 eyes of 3 thalassemic patients GCL+ thickness extremely thicker than control group and other thalassemic patients.

**Conclusions**

To the best of our knowledge this is the first study that which investigated SS OCT GCL+, RNFL and Choroidal thickening in Beta Thalassemia patients. These findings need further investigation to understand the reason of macular ganglion cell+, RNFL, choroidal thickness differences.

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## P-FS-010

### STRUCTURE-FUNCTION RELATIONSHIP WITH 2 DIFFERENT SPECTRAL DOMAIN OCT PLATFORMS

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#### Purpose

To compare the Structure-Function (SF) relationship using 2 different spectral domain OCT platforms.

#### Methods

Retrospective study of patients with a diagnosis of glaucoma or glaucoma suspect and peripapillary retinal nerve fiber layer (pRNFL) measurements using Cirrus HD-OCT (Carl Zeiss Meditec, Dublin) and/or Spectralis OCT (Heidelberg Engineering Inc., Heidelberg). Included eyes were required to have a 24-2 sita-standard visual field (VF) test obtained with the Humphrey Field Analyzer II (Carl Zeiss Meditec, Dublin) no more than 1 year apart from the OCT test.

RNFL thickness at the ~3.45mm diameter ring from both OCT platforms was correlated to Mean Deviation (MD) and Average Deviation (AD).

Segmented regression models were fitted to estimate tipping points. Linear mixed effects models with splines at the estimated tipping points were then fitted. Goodness of fit was evaluated using R<sup>2</sup>. The relative contribution of both OCT platforms to predict VF damage was compared using F-tests for nested models.

Neither OCT, nor VF tests were excluded on the basis of signal or reliability for the primary analysis.

#### Results

1.324 eyes of 692 patients met inclusion criteria, 65% had Spectralis OCT, 24% Cirrus OCT and 11% both platforms. 62% of patients were female and average age was 61 years. 74% of patients had no or mild visual field defect (MD > -6dB), 13% moderate visual field defect (MD -6 dB to -12 dB) and 14% advanced visual field defect (MD < -12 dB).

Estimated tipping points for Cirrus and Spectralis was 78  $\mu$ m and 69  $\mu$ m using AD as outcome. Both platforms had the same tipping point at 75  $\mu$ m using MD as outcome.

R<sup>2</sup> for models predicting MD based on average pRNFL thickness were 0.38 for Cirrus and 0.56 for Spectralis.

In the subset of cases with both OCT platforms, R<sup>2</sup> was 0.42 for Cirrus and 0.57 for Spectralis. When using AD as the outcome, similar results were obtained.

Spectralis significantly contributed to the model in which Cirrus was used to predict VF MD ( $P < 0.001$ ), while Cirrus did not add to the model in which Spectralis predicted VF MD ( $p = 0.46$ ).

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### Conclusions

Our results support the hypothesis that when pRNFL thickness at the 3.45mm ring is used as a single structural parameter, measurements obtained by Spectralis OCT correlate better with the VF than Cirrus OCT. The retrospective nature of our study as well as the fact that most OCT tests were not obtained at the same time limit the strength of our findings that require further confirmation.

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## P-FS-011

# THE USE OF TRYPAN BLUE AS AN AQUEOUS TRACER DYE TO ASSESS TRABECULECTOMY FUNCTION AND INVESTIGATE POST-TRABECULECTOMY HYPOTONY

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### Purpose

To study the lymphatic drainage of trabeculectomy blebs using trypan blue.

To correlate lymphatic drainage with bleb function and classify them accordingly.

To investigate the cause of hypotony post-trabeculectomy.

### Methods

*Design:* This is a prospective cross-sectional study in a tertiary care centre. 13 glaucoma patients post-trabeculectomy were included in this study.

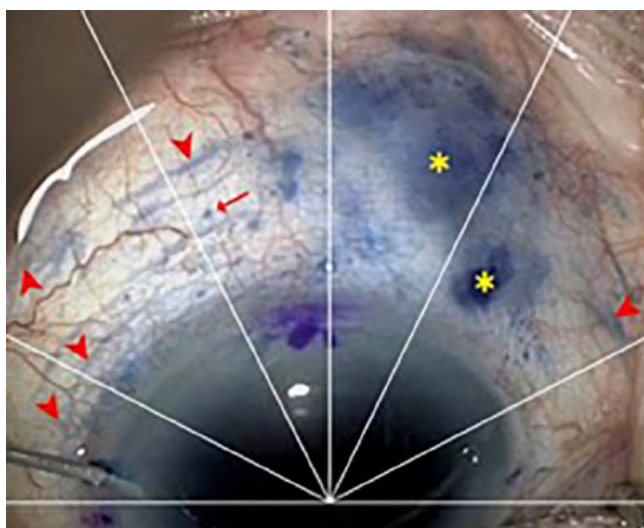
*Intervention:* Trypan blue was injected into the anterior chamber.

*Main outcome measure:* The duration taken for dye to stain a drainage bleb or lymphatics is recorded. The extent of the lymphatic structures were measured in clock hours. Intraocular pressure (IOP) prior to surgery was recorded.

### Results

8 post-trabeculectomy subjects had dye stained lymphatic vessels at mean 28sec indicating lymphatic connections to the bleb with lower IOP (12.6 mmHg,  $p = 0.013$ ) than the 5 with no lymphatic vessel staining and mean IOP 23.6mmHg. Lymphatic extent was inversely related to IOP ( $p = 0.021$ ).

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## Conclusions

A system for classification of lymphatic drainage of bleb is developed. A new cause of hypotony, “lymphatic overdrain” is identified. Lymphatic connection to drainage blebs is related to IOP reduction post-trabeculectomy.

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## P-FS-013

# EFFECT OF COLD PROVOCATION ON VESSEL DENSITY IN EYES WITH PRIMARY OPEN ANGLE GLAUCOMA: AN OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY STUDY

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## Purpose

The cold pressor test (CPT) induces a cardiovascular response, which may affect ocular blood flow and neuronal function. This study assessed whether or not optical coherence tomography angiography (OCT-A) can be used to evaluate CPT-induced ocular hemodynamic changes in healthy eyes and in eyes with primary open-angle glaucoma (POAG).

## Methods

Twenty-two healthy subjects and 23 subjects with POAG and a retinal fiber layer defect in only one hemifield underwent OCT-A imaging to evaluate CPT-induced vessel density (VD) changes in the peripapillary and macular areas. The CPT was performed by submerging a subject's right hand in cold water (0–4°C) up to the wrist for 1 minute. Mann-Whitney *U* tests and Wilcoxon signed-rank tests were used to compare study groups and CPT-induced changes, respectively.

## Results

Baseline peripapillary and macular VD measurements were significantly lower in subjects with POAG than in healthy controls (all  $p < 0.05$ ). Post-CPT VD measurements did not significantly differ from baseline in either healthy or glaucomatous eyes. Additionally, CPT-induced changes in VD did not differ between the undamaged and damaged hemifields in glaucomatous eyes (all  $p > 0.05$ ). Changes in VD were also not significantly influenced by a subject's self-reported history of cold extremities.

## Conclusions

The CPT does not induce significant VD changes, as measured by OCT-A, in the peripapillary or macular areas of either healthy eyes or eyes with POAG. The VD, an all-or-nothing flow measure, may not be sensitive enough for evaluating cold-induced ocular hemodynamic changes.

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## P-FS-014

### CORRELATION OF OPTIC COHERENCE TOMOGRAPHY FINDINGS AND OPHTHALMIC ARTERY RESISTIVITY INDEX: COMBINED RESULTS OF RANDOMIZED CONTROLLED CLINICAL TRIALS

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#### Purpose

To investigate the association between retinal thickness parameters of optic coherence tomography (OCT) measurement and resistivity index (RI) of ophthalmic artery (OA).

#### Methods

This prospective randomized controlled clinical study included 284 eyes of 166 subject, 48 eyes of 40 XFS patients, 51 eyes of 31 XFG patients, 14 eyes of 7 NTG patients, 81 eyes of 42 POAG patients and 90 eyes of 46 healthy subjects. All subjects were given a complete ophthalmological examination including evaluation of retinal nerve fiber layer (RNFL) thickness and ganglion cell complex (GCC) parameters with spectral-domain OCT (SD-OCT). Color Doppler imaging was performed to evaluate orbital flow parameters of OA. A masked radiologist obtained the peak systolic velocity (PSV) and end diastolic velocity (EDV) of OA. RIs were calculated. Then we searched for a correlation with retinal thicknesses and RI of OA.

#### Results

The mean OARI values were  $0.72 \pm 0.05$ ,  $0.74 \pm 0.08$ ,  $0.73 \pm 0.04$ ,  $0.71 \pm 0.06$  and  $0.68 \pm 0.05$  cm/sec-second, respectively in XFS, XFG, NTG, POAG and healthy subject. There was a statistically significant difference between the controls and the other groups ( $p = 0.00$ ). RNFL parameters were not found to be correlated with RI. OARI was not found correlated to the age in XFS. OARI was not found to be correlated with RNFL and GCC parameters in XFS. OARI was positively correlated to the age (Pearson correlation coefficient,  $r$  of  $+0.655$  with  $p$ -value of  $0.000$ ) in XFG. OARI was positively correlated to the age ( $r = +0.796$ ,  $p = 0.001$ ) in NTG. A negative correlation was found between OARI and superior RNFL and superior GCC ( $r = -0.542$  and  $-0.575$  with  $p = 0.04$  and  $0.03$ , respectively) in NTG. OARI was positively correlated to the age ( $r = +0.392$ ,  $p = 0.000$ ) in POAG. GCC parameters were not found to be correlated with RI. A negative correlation was found between OARI and superior and nasal RNFL ( $r = -0.318$  and  $-0.235$  with  $p = 0.00$  and  $0.03$ , respectively) in POAG.

#### Conclusions

The superior and nasal RNFL thicknesses have been affected by the hemodynamic changes in OA with negative correlation in POAG. The superior RNFL and superior GCC thicknesses have been affected by the hemodynamic changes in OA with negative correlation in NTG. Other quadrants those are not affected by the hemodynamic changes in OA would be more accurate and reliable in terms of glaucoma recognition and follow-up.

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## P-FS-015

# CHANGES OF THE BRUCH'S MEMBRANE AND OF THE RETINAL NERVE FIBER LAYER ASSESSED BY OPTICAL COHERENCE TOMOGRAPHY AFTER FILTRATION SURGERY

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### Purpose

Lowering of the intraocular pressure (IOP) in patients with Primary Open Angle Glaucoma (POAG) by filtration surgery can induce morphological changes of the bulbus and structures of the retina. In this study we evaluated changes of the Bruch's membrane based parameters and retinal nerve fiber layer (RNFL) derived by spectral-domain optical coherence tomography (SD-OCT).

### Methods

Longitudinal SD-OCT imaging of the optic nerve head (ONH) was performed in twenty eyes of twenty patients with medically uncontrolled POAG before and after IOP-lowering filtration surgery (trabeculectomy or deep sclerectomy). The ONH parameter minimum rim width (MRW) and the size of the Bruch's membrane opening (BMO) were derived from 24 radial B-scans centered on the ONH. Measurements of the RNFL were also recorded.

### Results

The average pre-operative IOP was 23,2 +/- 6,3 mmHg. One month post-operatively the average IOP declined to 13,6 +/- 7,7 mmHg ( $P < 0,01$ ). Due to the IOP-lowering there was a significant decompression of the peripapillary retinal structures; the temporal MRW increased from 136,6 +/- 9,8  $\mu\text{m}$  to 218,0 +/- 76,4  $\mu\text{m}$  (60,0%) and the nasal MRW increased from 187,2 +/- 10,7  $\mu\text{m}$  to 206,0 +/- 7,8  $\mu\text{m}$  (10,0%). There was no significant change of the area of the automatically detected BMO ( $p = 0,25$ ).

IOP-lowering surgery also caused a decompression of the temporal part of the RNFL from 63,3 +/- 10,0  $\mu\text{m}$  to 67,0 +/- 9,7  $\mu\text{m}$  ( $p = 0,02$ , increase of 5,9%) and of the nasal part of 59,6 +/- 7,4  $\mu\text{m}$  to 62,8 +/- 8,1  $\mu\text{m}$  ( $p = 0,02$ , increase of the RNFL of 5,4%).

### Conclusions

IOP-lowering surgery in patients with medically uncontrolled POAG shows a significant increase of the peripapillary retina (MRW). These changes are greater at the temporal part compared to the nasal part of the ONH. There were no significant changes in the area of the BMO. Interestingly, there were also changes of the RNFL thickness with a similar pattern like the MRW.

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## P-FS-016

### PERIPAPILLARY AND MACULAR NERVE FIBER LAYER EVALUATION IN PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS - DIAGNOSTIC ABILITIES

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#### Purpose

To assess and compare diagnostic capabilities of two retinal nerve fiber layer (RNFL) parameters from different fundus areas - peripapillary RNFL (Sup/Inf/Nas/Temp/Total pRNFL) and macular RNFL (Sup/Inf/Total mRNFL) in primary open-angle glaucoma (POAG) patients using spectral-domain optical coherence tomography (SD-OCT).

#### Methods

The total number of the participants in our prospective study was 414 (483 eyes) aged 45-84 years (mean  $66.7 \pm 8.7$ ). They were divided into 6 groups: controls (150), ocular hypertension (31), preperimetric glaucoma-PPG (49), and three groups of perimetric glaucoma stages: early (80), moderate (34), and advanced (70). Spectral-domain OCT was performed using Topcon 3D OCT 2000+ device and the quantitative data for RNFL thickness were obtained from two protocols: Circle for pRNFL and Glaucoma Analysis-Macula for mRNFL. We used comparative and ROC-analysis to evaluate diagnostic accuracy.

#### Results

The results showed that the thickness of all investigated RNFL parameters progressively decrease with glaucoma progression. For each POAG stage after PPG the parameter with highest diagnostic accuracy was Total mRNFL (AUROC 0.879 in PPG; 0.929 in early stage; 0.989 in moderate stage; and the max of 1.000 in advanced glaucoma). Comparison analysis in AUROC values showed only two significant differences between Total mRNFL (0.929) and Inf pRNFL (0.867) in early glaucoma, and between Sup mRNFL (0.907) and Total mRNFL (0.989) in moderate glaucoma. In addition we applied comparison analysis between Total mRNFL and the other macular parameters: GCL+ (ganglion cell layer + inner plexiform layer thickness), and GCL++ (mRNFL and GCL+). It showed that the highest diagnostic accuracy possess GCL++ without any significance from mRNFL diagnostic possibilities.

#### Conclusions

The current research investigate a new SD-OCT macular parameter - mRNFL and its diagnostic possibilities for different stages of POAG. It proves that mRNFL could be used in every day clinical practice of the ophthalmologist as independent parameter with very high diagnostic possibilities for early stages of glaucoma when only structural changes are visible.

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## P-FS-017

# POST-DILATATION ANGLE CONFIGURATION USING THE SWEEP SOURCE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IN UNTREATED PRIMARY ANGLE CLOSURE SUSPECTS

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### Purpose

To evaluate the changes in irido-trabecular contact (ITC) index on swept source anterior segment coherence tomography (SS-OCT) images before and after dilatation in untreated primary angle closure suspects (PACS).

### Methods

This cross-sectional cohort study enrolled 106 eyes from the untreated arm of a multi-center interventional RCT involving 479 subjects over the age of 50 years who were diagnosed as bilateral asymptomatic PACS. PACS was defined using the ISGEO criteria.<sup>1</sup> Biometric data was documented using by IOLMaster (Carl Zeiss Meditec, Dublin, CA), 360 degree scans of the angles were captured using swept source SS-OCT (SS-1000, Tomey Corporation, Nagoya, Japan) before and after dilatation in dark room conditions. Ultrasound biomicroscopy (UBM; Suwei Electronic Technology, Tianjin, China) was performed in undilated state to capture cross-sections of primary angle meridians. The SS-OCT images were analyzed to calculate the ITC index<sup>2</sup> using the in-built semi-automated software and the UBM images were analyzed to categorize the eyes with plateau iris configuration.<sup>3</sup> Outcome measures included change in ITC index before and after dilatation and change in intraocular pressure before and after dilatation. Multivariate regression analysis was performed to look for factors influencing the increase/ decrease of ITC index after dilatation.

### Results

Of the 106 subjects randomized, the majority were Chinese (93.4%) and female (79.2%) with mean age of  $67.9 \pm 6.5$  years. Mean pre-dilatation ITC index was  $45.3 \pm 23.7$  and post-dilatation ITC index was  $46.05 \pm 25.9$  with a mean change of  $0.78 \pm 16.5$  ( $p = 0.62$ ). Mean pre-dilatation IOP was  $14.9 \pm 2.5$  mmHg and post-dilatation IOP was  $15.6 \pm 2.1$  mmHg with a mean increase of  $0.66 \pm 2.5$  mmHg ( $p = 0.007$ ). Fifty three eyes (50.0%) showed an increase in ITC index after dilatation and an equal proportion showed a decrease. An increase in ITC index was associated with female gender ( $\beta = 8.7$ ,  $p = 0.027$ ) and lens vault ( $\beta = 15.9$ ,  $p = 0.023$ ). None of the demographic or biometric factors influenced the decrease in ITC index.

### Conclusions

Angle closure worsened marginally in 50.0% of subjects with narrow angles after dilatation. Acute angle closure in at-risk eyes may be related to active physiological factors and not just static biometric variables.

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**P-FS-018**

**ASSOCIATION BETWEEN RIGHT-LEFT DIFFERENCE IN VISUAL FIELD DEFECT AND IN VESSEL DENSITY IN EYES WITH PRIMARY OPEN ANGLE GLAUCOMA**

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**Purpose**

To investigate the association between a right-left difference in visual field defect and in vessel density or parameters measured by optical coherence tomography (OCT) in primary open angle glaucoma (POAG).

**Methods**

The medical records of 40 patients with POAG were reviewed. Peripapillary vessel density (PVD) and macular vessel density (MVD) were evaluated with OCT angiography (OCTA). Ganglion cell complex thickness (GCC), circumpapillary RNFL thickness (cpRNFL), and Rim Area were measured with OCT. Relationships between right-left differences in mean deviation (MD) and in intraocular pressure (IOP), spherical equivalent (SE), PVD, MVD, GCC, cpRNFL, or Rim Area were evaluated using Spearman's rank correlation coefficients. Multiple regression analysis was used to detect factors contributing to a right-left difference in MD.

**Results**

The right-left difference in MD were correlated with differences in PVD ( $r = 0.572$ ,  $P < 0.001$ ), MVD ( $r = 0.554$ ,  $P < 0.001$ ), GCC ( $r = 0.698$ ,  $P < 0.001$ ), cpRNFL ( $r = 0.703$ ,  $P < 0.001$ ), and Rim Area ( $r = 0.669$ ,  $P < 0.001$ ), but not with IOP or SE. Multiple regression analysis showed that a difference in GCC was the only significant contributor to a right-left difference in MD (slope 0.138, 95% confidence interval 0.071–0.204;  $P < 0.001$ ).

**Conclusions**

Although a right-left difference in vessel density was correlated with a difference in MD, a difference in GCC was a significant contributor to a right-left difference in visual field defect in eyes with POAG.

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## P-FS-019

### SERIAL COMBINED WIDE-FIELD OCT MAPS (PANOMAPS) FOR DETECTION OF EARLY-GLAUCOMATOUS STRUCTURAL PROGRESSION

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#### Purpose

To evaluate the potential usefulness of serial analysis of combined wide-field optical coherence tomography (OCT) maps (PanoMaps) for detection of structural progression in patients with early glaucoma.

#### Methods

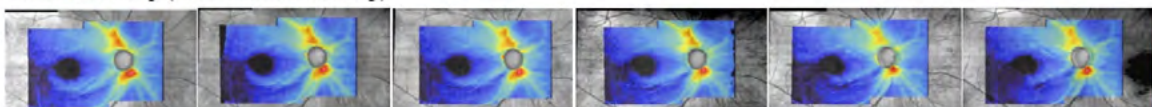
Retrospective observational study. Ninety four (94) patients ( $51.4 \pm 12.3$  years; 51.1% Female; all Korean) with early primary open-angle glaucoma (OAG) with a minimum 3-year follow-up involving serial spectral-domain OCT (SD-OCT) measurement. Patients were divided into a nonprogressor group ( $n = 47$ ) and a progressor group ( $n = 47$ ) on the basis of serial stereo-disc photography and red-free photography. Serial combined wide-field OCT maps (PanoMaps) integrating parapapillary retinal nerve fiber layer (RNFL) and macular ganglion cell - inner plexiform layer (GCIPL) maps were generated with the embedded software of serial SD-OCT (HD-OCT 4000, Carl Zeiss Meditec, Inc., Dublin, CA). Glaucoma specialists then assessed the structural-progression detection ability of those serial wide-field OCT maps for early-glaucomatous eyes and compared their sensitivity with those of RNFL and GCIPL guided progression analyses (GPAs).

#### Results

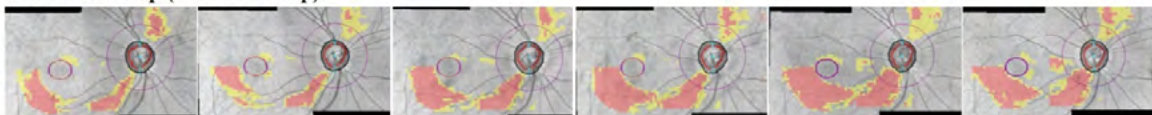
The serial wide-field OCT map analysis showed good agreement for detection of structural progression between the two glaucoma graders (PanoMap thickness map: kappa = 0.649, PanoMap deviation map: kappa = 0.833). These maps showed early-glaucomatous structural-progression detection abilities comparable to those of RNFL and GCIPL GPAs (sensitivities of PanoMap thickness map, PanoMap deviation map, RNFL GPA, and GCIPL GPA = 63.8, 83.0, 83.0, and 66.0%, respectively, all p-values > 0.05; specificities of PanoMap thickness map, PanoMap deviation map, RNFL GPA, and GCIPL GPA = 93.6, 95.7, 84.8, and 93.6%, respectively, all p-values > 0.05).

#### Image

Serial Panomap (RNFL Thickness map)



Serial Panomap (Deviation map)



#### Conclusions

The serial combined wide-field OCT maps integrating RNFL and GCIPL maps performed well in detecting structural progression in early-glaucomatous eyes. Confirmation in an independent prospective study might provide greater confidence in this conclusion.

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## P-FS-020

### ORIENTATION OF THE TEMPORAL NERVE FIBER RAPHE MEASURED WITH WIDE FIELD SWEEP SOURCE OPTICAL COHERENCE TOMOGRAPHY

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#### Purpose

To develop a novel method to measure the orientation of the temporal nerve fiber raphe using wide-field en face images of swept source optical coherence tomography (SS-OCT), to investigate the normal variation of orientation, and to determine the association of orientation with anatomic factors such as age or axial length.

#### Methods

Three-dimensional scans of 12 x 12 mm width from SS-OCT (PLEX Elite 9000, Carl Zeiss Meditec.) were achieved in normal subjects. The orientation of the temporal raphe was measured from wide-field averaged en face images of retinal layers below the inner limiting membrane. From the fovea, five points showing absence of retinal nerve fiber were positioned at 1 mm intervals toward temporal direction. From these points, the best-fitted line projected from foveal center was defined as the orientation of temporal raphe. Using this line, the raphe's angle relative to the horizontal midline of retina (FoRaph) was determined, and the fovea-disc angle relative to the horizontal midline (FoDi) was also measured. In FoRaph and FoDi angle, clockwise direction in case of the right eye was considered as positive. In addition, fovea-disc-raphe angle (FoDiRaph), defined as the angle between FoRaph and FoDi, was determined.

#### Results

In this study, 41 eyes of 41 subjects were included. The mean raphe's angle (FoRaph) was  $2.55^\circ \pm 4.85^\circ$ , with ranges from  $-9.15^\circ$  to  $12.22^\circ$ , and the mean fovea-disc angle (FoDi) was  $6.87^\circ \pm 4.10^\circ$ , with ranges from  $-2.24^\circ$  to  $14.87^\circ$ . The mean fovea-disc-raphe angle (FoDiRaph) was  $170.58^\circ \pm 3.37^\circ$ , with ranges from  $163.3^\circ$  to  $177.2^\circ$ . These results were generally in agreement with findings of previous studies. The fovea-disc-raphe angle was not correlated with age or axial length.

#### Conclusions

The orientation of temporal raphe was measured from wide field en face image using SS-OCT. The individual variability of the raphe orientation was not correlated with other anatomical factors. When the raphe orientation is considered important for improving the structure-function relationship, the measurement method in this study may be useful in clinical settings.

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## P-FS-021

### AUTOMATIC DIFFERENTIATION OF GLAUCOMA VISUAL FIELD FROM NON-GLAUCOMA VISUAL FIELD USING DEEP CONVOLUTIONAL NEURAL NETWORK

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#### Purpose

To develop a deep neural network able to differentiate glaucoma from non-glaucoma visual fields based on visual field (VF) test results, we collected VF tests from 3 different ophthalmic centers in mainland China.

#### Methods

Visual fields obtained by both Humphrey 30-2 and 24-2 tests were collected. Reliability criteria were established as fixation losses less than 2/13, false positive and false negative rates of less than 15%.

#### Results

We split a total of 4012 PD images from 1352 patients into two sets, 3712 for training and another 300 for validation. There is no significant difference between left to right ratio ( $P = 0.6211$ ), while age ( $P = 0.0022$ ), VFI ( $P = 0.0001$ ), MD ( $P = 0.0039$ ) and PSD ( $P = 0.0001$ ) exhibited obvious statistical differences. On the validation set of 300 VFs, CNN achieves the accuracy of 0.876, while the specificity and sensitivity are 0.826 and 0.932, respectively. For ophthalmologists, the average accuracies are 0.607, 0.585 and 0.626 for resident ophthalmologists, attending ophthalmologists and glaucoma experts, respectively. AGIS and GSS2 achieved accuracy of 0.459 and 0.523 respectively. Three traditional machine learning algorithms, namely support vector machine (SVM), random forest (RF), and k-nearest neighbor (k-NN) were also implemented and evaluated in the experiments, which achieved accuracy of 0.670, 0.644, and 0.591 respectively.

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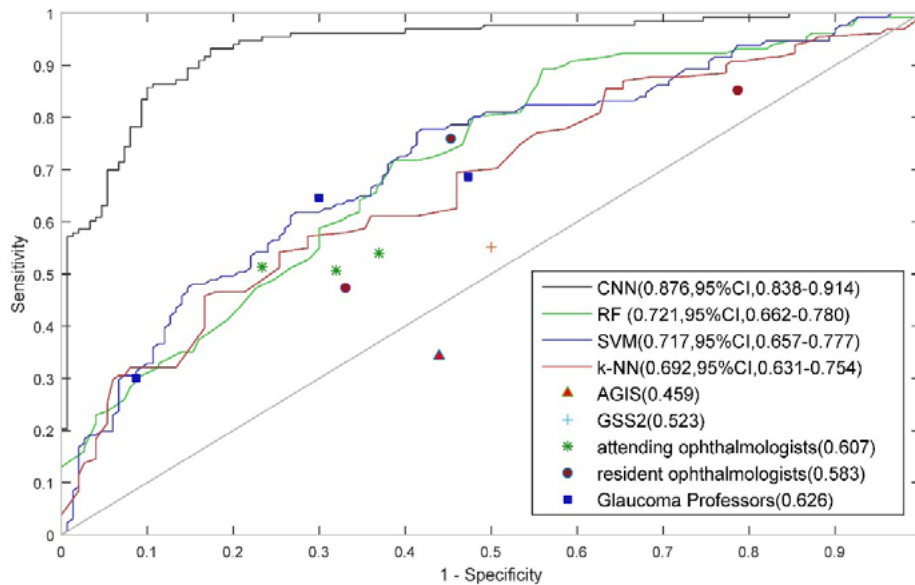
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## Conclusions

Our algorithm based on CNN has achieved higher accuracy compared to human ophthalmologists and traditional rules (AGIS and GSS2) in differentiation of glaucoma and non-glaucoma VFs. It will be a powerful tool to distinguish glaucoma from non-glaucoma VFs and may help screening and diagnosis of glaucoma in the future.

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## P-FS-022

### UNDERSTANDING CORNEAL BIOMECHANICAL PARAMETERS IN NORMAL TENSION GLAUCOMA AFTER WATER DRINKING TEST

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#### Purpose

To evaluate the changes after Water Drinking Test (WDT) on Goldmann Aplanation Tonometry Intraocular Pressure (IOPgat), Corneal Compensated IOP (IOPcc), Corneal Hysteresis (CH) and corneal resistance factor (CRF) in Normal Tension Glaucoma Patients.

#### Methods

Prospective observational study involving 28 eyes from 15 patients with clinical and perimetric evidence of glaucoma neuropathy and normal non-medicated IOP. All subjects ingested 1000 mL of water in 5 minutes and IOPgat was measured just before and one hour after the test, as also IOPcc, CH and CRF which were measured by using Ocular Response Analyzer (ORA). Statistical analyses were performed and variables were examined with a paired *t*-test and Wilcoxon test. Spearman's correlation was used to evaluate the association between IOP values and corneal parameters.

#### Results

The mean age of participants was  $70.93 \pm 9.44$ , 60% being female and 40% male, with mean Central Cornea Thickness  $518.6 \pm 37.97 \mu\text{m}$ . Baseline IOPgat and IOPcc (mmHg $\pm$ SD) were  $12.00 \pm 0.54$  and  $18.14 \pm 1.82$ , respectively. One hour after test, statistically significant increases in both variables were observed ( $P < 0.01$ ), and final measurements were correspondingly  $14.21 \pm 0.52$  and  $21.12 \pm 1.81$ . We did not observe any statistically significant changes in CH or CRF. Spearman's correlation revealed a moderate negative correlation between initial and final IOPcc and CH measurements ( $r = -0.441$   $P < 0.01$ ) and ( $r = -0.483$   $P < 0.01$ ). We also found a strong and moderate correlation between initial and final values of IOPgat and IOPcc ( $r = 0.782$   $P < 0.01$ ) and ( $r = 0.447$   $p = 0.02$ ), respectively.

#### Conclusions

IOP increasing after water drinking test seems to occur without variation in corneal parameters. IOPcc variation can be greater in patients with low corneal hysteresis. Goldmann Aplanation Tonometry significantly underestimates ORA IOP readings. We must be alert to people who have low CH in order to avoid potentially harmful IOP fluctuations in NTG patients.

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## P-FS-023

# CORRELATION BETWEEN OPTIC DISC SIZE ASSESSMENT USING VEIN-TO-DISC DIAMETER RATIO AND DISC SIZE ASSESSMENT BY DISC AREA IN OPTICAL COHERENCE TOMOGRAPHY

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## Purpose

To assess if disc size classification using the vein-to-disc diameter ratio (VDR) from fundus photographs is correlated to disc size classification by disc area on OCT in non-glaucomatous and glaucomatous eyes.

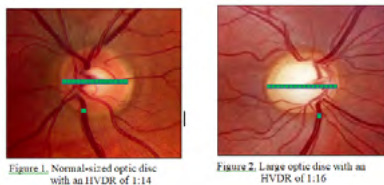
## Methods

This is a cross-sectional study of optic disc photographs and the matching optic disc cube scan using the Zeiss Cirrus optical coherence tomography. All eyes were classified as either glaucomatous or non-glaucomatous. The diameter of the inferior temporal retinal vein was measured at the disc border while horizontal and vertical disc diameters were measured from the edge of the scleral rim. The ratio was then recorded as the VDR, and the disc was classified as small if the VDR was less than 1:12, normal if 1:12 to 1:14, or large if the VDR was greater than 1:14. The matching OCT scans were examined and the disc was classified as small if the disc area is less than 1.33 mm<sup>2</sup>, normal if the disc area is 1.34 to 2.50 mm<sup>2</sup> or large if the disc area is greater than 2.50 mm<sup>2</sup>. Results were recorded and analyzed using Chi-square and Kendall rank correlation.

## Results

A total of 215 eyes were included in the non-glaucomatous group and 116 eyes for the glaucomatous group. The average horizontal VDR (HVDR) in the non-glaucomatous group was 1:14.02 +/- 2.08, while the average HVDR in the glaucomatous group was 1:14.97 +/- 2.79 (p-value = .002). The average vertical VDR (VVDR) in the non-glaucomatous group was 1:15.39 +/- 2.33, while the average VVDR in the glaucomatous group was 1:16.63 +/- 3.15 (p-value = <.001). Using Kendall rank correlation, HVDR and OCT showed a strong correlation with a coefficient of 0.471 only in the non-glaucomatous group. The horizontal and vertical VDR in the glaucomatous group, and VVDR in the non-glaucomatous group showed only a fair correlation with disc size assessment by OCT.

## Image



## Conclusions

Disc size assessment using the horizontal vein-to-disc diameter ratio is strongly correlated to disc size assessment by disc area in OCT only in non-glaucomatous eyes. Therefore, HVDR may be a useful tool for distinguishing a suspicious small or normal-sized optic nerve with a large CDR which warrants further diagnostic evaluation from a large optic nerve with a proportionally large physiologic cup.

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## P-FS-024

### SENSITIVITIES OF CORTICALLY MEDIATED OBJECTIVE PERIMETRY CORRESPOND LINEARLY WITH RNFL LOSS

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<sup>1</sup>John Curtin School of Medical Research, <sup>2</sup>Medical School, Australian National University, <sup>3</sup>Neurology, The Canberra Hospital, Canberra, <sup>4</sup>Centre for Eye Research, University of Melbourne, Melbourne, Australia

#### Purpose

Multifocal pupillographic objective perimetry (mfPOP) is a developing technology. Combined mfPOP and mfVEP studies indicate strong cortical input to mfPOP.<sup>1</sup> A recent mfPOP innovation is a 30-2 style report, which simplifies comparison with SAP and enables standard structure/function models to be applied. Here we further examine cortical input by comparing mfPOP, HFA and Matrix data in occipital-pole stroke using principal curve analysis (PCurvA). We then extend the PCurvA method to glaucoma patients comparing mfPOP, HFA and peripapillary-RNFL losses. These results illustrate that mfPOP sensitivities are consistent with cortical input and are linear with pRNFL loss.

#### Methods

We enrolled 25 glaucoma patients and 27 stroke patients. For the stroke patients we examined Intra-class Correlations (ICC) between the mfPOP, SITA and Matrix perimetry data. We also used principal curve analysis (PCurvA) to compare the perimetry methods in an assumption-free manner<sup>2</sup> (R princurve library, Free Software Foundation). For the glaucoma patients we used the structure-function method of Jansoni et al.<sup>3</sup> to produce RNFL equivalent data from HFA and mfPOP, and then applied PCurvA to those data.

#### Results

Among the stroke patients all 3 perimetry methods showed features like homonymous hemianopias and ICCs collectively showed good agreement ( $r = 0.90$ ,  $P < 0.0001$ ). However, PCurvA of HFA or Matrix vs. mfPOP showed a nonlinear relationship, suggesting HFA or Matrix under-reported early damage compared to mfPOP. Consequently, while ICCs between Matrix and HFA were high ( $r = 0.96$ ,  $P < 0.0001$ ) those between mfPOP and Matrix or HFA were only fair at 0.59 and 0.57 ( $P < 0.005$ ). For glaucoma patients the PCurvA data showed a very similar nonlinear relationship between the HFA glaucoma data and RNFL thickness, where an initial 60% reduction in thickness produced a 10% loss of sensitivity (Figure). After that sensitivity declined rapidly with RNFL loss. By comparison the mfPOP data was much more linear with RNFL loss. Correlations for HFA and mfPOP against RNFL were 0.624 and 0.957 respectively (both  $P < 0.0001$ ).

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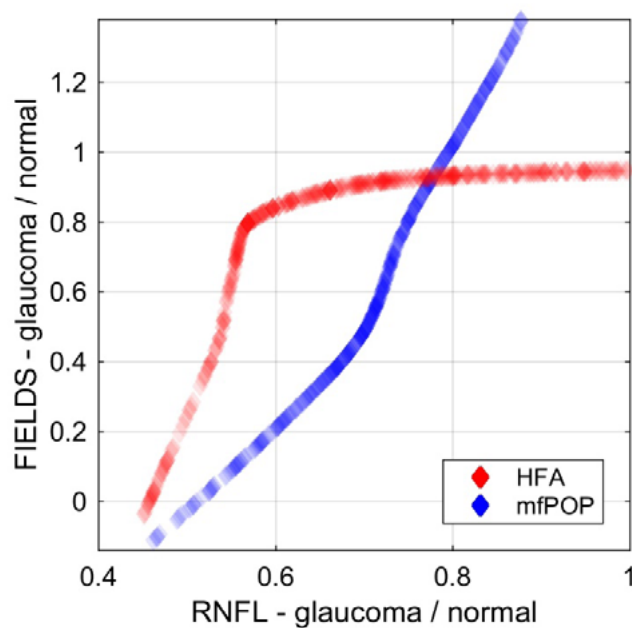
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## Conclusions

The mfPOP method reported cortical losses similar to HFA and Matrix. The nonlinear relationship between HFA and early RNFL damage is well known.<sup>4</sup> Taken together the results indicate that cortically mediated mfPOP sensitivities reflect a more linear relationship with RNFL loss.

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## P-FS-025

### DUAL SCHEIMPFLUG IMAGING AS A SCREENING METHOD FOR OCCLUDABLE ANGLES - A COMPARISON WITH GONIOSCOPY

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#### Purpose

To evaluate the Dual Scheimpflug analyzer as a screening method for detecting gonioscopically narrow anterior chamber angles.

#### Methods

In 40 eyes of 40 patients with various anterior chamber angle (ACA) widths, the ACA, anterior chamber depth (ACD), and anterior chamber volume (ACV) were measured using the Galilei G6 system. Correlations among these parameters and Shaffer's grade based on gonioscopy were studied. The efficacy of the Galilei system in screening for narrow angles was analyzed by using receiving operator characteristic (ROC) curves and partition analysis. Agreement (kappa statistics), sensitivity, and specificity for each eye according to Galilei measures were also assessed.

#### Results

Shaffer's classification (grade 0 to 4) significantly correlated with each of the measurements ( $P < 0.001$ ). In screening eyes with narrow angles with the Galilei, the area under the ROC curve was largest (0.95) when ACD was used as the reference, and partition analysis showed that those eyes were most effectively partitioned with an ACD of 2.86 mm with 100% sensitivity and 80% specificity.

#### Conclusions

The Galilei has potential for safe, noncontact and repeatable screening of narrow angles.

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## P-FS-026

# PROGRESSION OF VISUAL FIELD DEFECTS IN EYES WITH PRIMARY OPEN-ANGLE GLAUCOMA SHOWING FLOOR OF MACULA GANGLION CELL COMPLEX THINNING

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### Purpose

Structural changes due to glaucoma are usually accompanied by functional losses. Visual field defects (VFD) often deteriorate further after structural losses have reached a measurement floor observed by imaging devices. However, the speed of VFD progression remains unclear.

The purpose of this study was to evaluate the rate of VFD progression and the risk factors of progression in open-angle glaucoma eyes showing measurement floor on optical coherence tomography (OCT).

### Methods

We retrospectively analyzed 26 eyes (26 patients) treated by sustained medical therapy, comprising 6 eyes with primary open-angle glaucoma and 20 eyes with normal tension glaucoma. Eligible subjects had best-corrected visual acuity of 0.5 or better, and no history of intraocular surgery or other ocular diseases. All subjects showed measurement floor on spectral-domain OCT (RS-3000, Nidek Co., Ltd., Aichi). Floor was defined as red signal for macular ganglion cell complex (GCC) thickness in the whole area of the scanning program macula map. Humphrey Field Analyzer (HFA) program central 30-2 and/or 10-2 SITA standard (Carl Zeiss Meditec, Dublin, CA) were used to measure visual field. At the start of follow-up, age was 55.1  $\pm$  9.5 (mean  $\pm$  SD) years, spherical equivalent (SE) was -6.73  $\pm$  2.28 diopters, intraocular pressure (IOP) without medication was 17.6  $\pm$  3.2 mmHg, GCC thickness was 56.6  $\pm$  5.5  $\mu$ m in superior region and 54.0  $\pm$  5.4  $\mu$ m in inferior region, and mean deviation (MD) by HFA 30-2 and 10-2 was -11.48  $\pm$  5.14 dB and -12.39  $\pm$  6.70 dB, respectively. We performed regression analyses of the MD slope against IOP without medication, age, SE, and MD at the start of follow-up; and mean and maximum IOP during follow-up.

### Results

The follow-up duration was 4.0  $\pm$  0.7 years, IOP during follow-up was 13.7  $\pm$  2.2 mmHg, and maximum IOP was 15.8  $\pm$  2.4 mmHg. Twenty-one eyes were followed by HFA 30-2 and 13 eyes by 10-2 (with overlapping). The MD slopes during follow-up by HFA 30-2 and 10-2 were -0.42  $\pm$  0.87 (range: -2.16 to +0.74) and -0.30  $\pm$  0.96 (-2.52 to +0.73) dB/year, respectively. Regression analyses identified no correlation between MD slope and all the factors examined.

### Conclusions

The progression of VFD in open-angle glaucoma eyes under sustained medical therapy with measurement floor on OCT is not so fast, but there are some exceptional cases.

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## P-FS-027

### EFFECTS OF HEAD TILT ON VISUAL FIELD TESTING WITH A HEAD-MOUNTED PERIMETER IMO

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#### Purpose

When the head is tilted during perimetry, the VF rotates, and the measurement point might interfere with adjacent test areas. Two factors are involved in this VF rotation: 1) the head-tilt angle and 2) the amount of ocular counterroll (OCR) that is generated according to the head-tilt angle. A newly developed head-mounted perimeter termed “imo” enables visual field (VF) testing without a fixed head position. Because the positional relationship between the subject’s head and the imo is fixed, the effects of head position changes on the test results are small compared with those obtained using a stationary perimeter. However, only ocular counterroll (OCR) induced by head tilt might affect VF testing. To quantitatively reveal the effects of head tilt and OCR on the VF test results, we investigated the associations among the headtilt angle, OCR amplitude and VF testing results.

#### Methods

For 20 healthy subjects, we binocularly recorded static OCR (s-OCR) while tilting the subject’s head at an arbitrary angle ranging from 0° to 60° rightward or leftward in 10° increments. By monitoring iris patterns, we evaluated the s-OCR amplitude. We also performed blind spot detection while tilting the subject’s head by an arbitrary angle ranging from 0° to 50° rightward or leftward in 10° increments to calculate the angle by which the blind spot rotates because of head tilt.

#### Results

The association between s-OCR amplitude and head-tilt angle showed a sinusoidal relationship. In blind spot detection, the blind spot rotated to the opposite direction of the head tilt, and the association between the rotation angle of the blind spot and the head-tilt angle also showed a sinusoidal relationship. The rotation angle of the blind spot was strongly correlated with the s-OCR amplitude ( $R^2 \geq 0.94$ ,  $P < 0.0001$ ). A head tilt greater than 20° with imo causes interference between adjacent test areas.

#### Conclusions

Both the s-OCR amplitude and the rotation angle of the blind spot were correlated with the head-tilt angle by sinusoidal regression. The rotated VF was correlated with the s-OCR.

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## P-FS-028

### AUTOMATIC ANTERIOR CHAMBER ANGLE PIGMENTATION ANALYSES USING A 360-DEGREE GONIOSCOPE

Masato Matsuo<sup>\*1</sup>, Andrea De Giusti<sup>2</sup>, Simone Pajaro<sup>2</sup>, Masaki Tanito<sup>1</sup>

<sup>1</sup>Department of Ophthalmology, Shimane University Faculty of Medicine, Izumo, Japan, <sup>2</sup>R&D, NIDEK Technologies Srl, Albignasego, Italy

#### Purpose

To assess the pigmentation distribution of the irido-corneal angle, we performed automatic reduced Scheie's pigmentation grading (*i.e.* "0/I" = 0, "II" = 1, and "III/IV" = 2) of the Trabecular Meshwork (TM) using the established algorithm<sup>1</sup> in the pictures obtained by GS-1 gonioscope (Nidek Technologies, Srl., Italy).

#### Methods

All images were collected at the Matsue Red Cross Hospital in 2016. 75 eyes of 75 Japanese patients diagnosed normal (n = 21), primary open angle glaucoma (POAG) (n = 40) or pseudoexfoliation glaucoma (PEG) (n = 14) were included in the study. On each selected image from 16 sectors of the angle covering 360-degree, a region of interest (ROI) was defined in the TM area by means of the software. Using the algorithm, angle pigmentation was classified in ROIs from all sectors. The pigmentation density was statistically compared among four sectors (*i.e.*, inferior, superior, temporal, and nasal) and four quadrants, and among patient groups.

#### Results

The pigmentation grade was higher in the inferior sector (mean grade =  $1.43 \pm 0.84$ ) than the others (mean grade =  $0.48 \pm 0.58 \sim 0.76 \pm 0.65$ ,  $P < 0.05$ ), and it was also higher in the inferior quadrant (mean grade =  $3.56 \pm 1.76$ ) than the others (mean grade =  $1.64 \pm 1.29 \sim 2.24 \pm 1.42$ ,  $P < 0.05$ ). On the other hand, there was no statistical significance in the results of automatic pigmentation grading among normal, POAG and PEG patients.

#### Conclusions

By using the algorithm, whole distribution of anterior chamber angle pigmentation could be classified. Pigmentation grading score in the inferior position was higher than the others as previously reported<sup>2</sup>. Contrary to expectation<sup>3</sup>, there was no statistical significance in the results of automatic pigmentation grading among normal, POAG and PEG patients in our dataset probably due to the overestimation of grading by the software, the small number of subjects, and the inclusion of highly pigmented eyes in normal control group.

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**P-FS-029**

**RATE OF ANTERIOR CHAMBER DEPTH REDUCTION FOR EYES WITH ANGLE CLOSURE IN LATE MIDDLE AGE**

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**Purpose**

To assess the rate of longitudinal anterior chamber depth (ACD) reduction for eyes with angle closure in late middle age.

**Methods**

Eighteen eyes with primary angle closure suspect (PACS) and four with primary angle closure (PAC) were enrolled. ACD was longitudinally measured by means of anterior segment optical coherence tomography (AS-OCT, SS-1000, Tomey Corporation, Nagoya, Japan). ACD was defined as the distance from the corneal endothelium to the anterior surface of the lens. Participants underwent gonioscopy, performed by a single glaucoma specialist (Y.O.) after AS-OCT imaging. The female/male ratio for the subjects was 10/1 and their mean age was  $50.6 \pm 6.1$  (44-63) years old. Follow-up periods lasted  $1549.5 \pm 762.2$  (601-2660) days. The mean ACD at the first visit was  $2.032 \pm 0.228$  (1.607-2.431) mm, and the mean axial length was  $22.62 \pm 1.09$  (21.37-25.51) mm.

**Results**

The mean ACD at the last visit ( $1.895 \pm 0.172$  (1.593-2.255) mm) had significantly decreased in comparison with the first visit ( $P < 0.0001$ , paired *t*-test). The mean reduction in the slope of ACD was -0.0288 mm/year, while there was a negative correlation between ACD at the first visit and the decrease in the slope of ACD ( $r = -0.456$ ,  $p = 0.033$ , Pearson correlation). PACS had progressed to PAC at a rate of 55.6 (10/18) %, but there was no significant correlation between the reduction in the slope of ACD and peripheral anterior synechiae formation ( $p = 0.092$ , Mann-Whitney U test).

**Conclusions**

The reduction in the slope of ACD in late middle age is faster than previously reported (-0.0130mm/year,  $66.1 \pm 3.9$  years old). The greater ACD associated with eyes with angle closure is related to the faster reduction in the slope of ACD in late middle age.

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## P-FS-030

### GLAUCOMA HEMI-FIELD TEST IN EYE MOVEMENT PERIMETRY: COMPARISON OF SACCADIC REACTION TIME IN SUPERIOR AND INFERIOR HEMI-FIELD SECTORS

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#### Purpose

Eye Movement Perimetry (EMP) measures visual field responsiveness using Saccadic Reaction Time (SRT) to the 'seen' visual stimuli. Analogous to light sensitivity thresholds, SRT depends on age and stimulus eccentricity and intensity [1,2]. As SRT is also significantly delayed in glaucoma patients [3,4] we explored SRT behaviour in the Glaucoma Hemifield Test (GHT) sectors used in the Humphrey visual field (HVF) [5]. The aim of this study was 1) to compare SRT behaviour in the 5 superior and 5 mirror inferior GHT sectors and 2) to estimate the diagnostic ability of GHT in EMP.

#### Methods

From our database, we selected 90 healthy controls and 30 glaucoma patients within 20-70 years of age. Each subject had undergone two similar 54-point test protocols in random order: 1) EMP, participants were asked to fixate a central target and look towards detected peripheral targets (214 cd/m<sup>2</sup> stimuli against a 152 cd/m<sup>2</sup> background) and 2) Humphrey Visual Field analyzer (HVF) using the 24-2 SITA standard testing. 60 controls were grouped in 10-years age bins to create a normative dataset. Probability scores (PS) were assigned to probabilities for SRT at the level of 5% (PS = 1), 2.5% (PS = 2), 1% (PS = 5) and 0.5% (PS = 10). The PS values within each of the 10 sectors were added and the two horizontal hemi-field sector pair difference was calculated for each control. Per sector, a Probability Score Limit (PSL) was calculated at the level of 97.5<sup>th</sup> percentile. These PSL values were applied in another subset of 30 controls and 30 mild and moderate glaucoma patients to categorize them as 'within or outside normal limits'. Finally, the diagnostic ability of GHT in EMP and HVF was calculated along with the inter-method agreement.

#### Results

Mean (SD) age of 30 healthy subjects and glaucoma patients was 45 (13) and 50 (11) years respectively. No statistically significant difference was found in SRTs between the mirror sectors of GHT in healthy individuals. The GHT in EMP and HVF had a high specificity of 100% and sensitivity of 64% and 80%, respectively with mirrors inter-method agreement ( $k = 0.8$ ,  $P < 0.001$ ).

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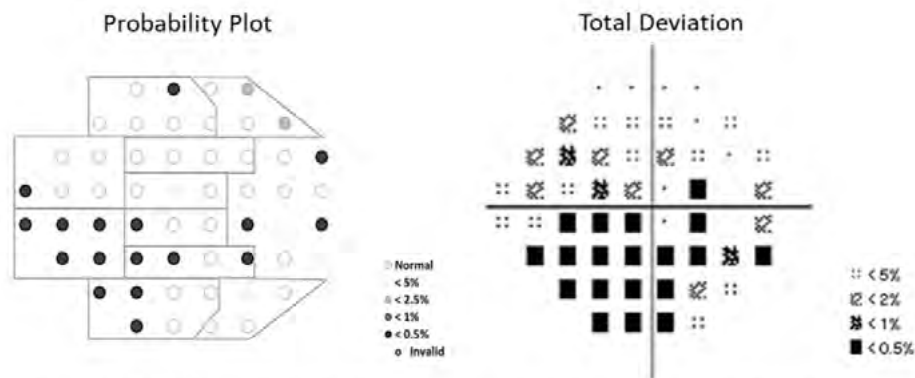
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## Image



Left panel- EMP: SRT Probability plot for a glaucoma patient demarcated into 10 Hemi-field sectors

Right Panel- HVF: Total deviation plot for the same patient

Both the plots illustrate comparable inferior visual field defects with evident asymmetry between the mirrored sectors across the hemifield

## Conclusions

Data suggest that the PSLs derived in the 5 GHT sectors refine the diagnostic ability of EMP. The moderate sensitivity of GHT in EMP might relate to 'reduced responsiveness' prior to 'declined sensitivity thresholds' in glaucomatous visual fields.

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## P-FS-031

### EFFECT OF PERIPAPILLARY RETINOSCHISIS ON RETINAL LAYER THICKNESS MEASUREMENT IN GLAUCOMA AND GLAUCOMA SUSPECT

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#### Purpose

Recently, high prevalence of PRS detected by optical coherent tomography (OCT) in patient with glaucoma (Grewal *et al.* 2017) and PRS correlates with visual field progression (Fortune *et al.* 2018) were reported.

To investigate the prevalence of PRS in glaucoma and glaucoma suspect and the effect of PRS on retinal layer thickness measurement using spectral domain (SD-OCT).

#### Methods

We retrospectively reviewed 1360 eyes of 681 glaucoma or glaucoma suspect who underwent optic nerve head circle and radial scans and macular volume scan using SD-OCT (Spectralis, Heidelberg) with GMPE software. Definition of PRS was existence of retinal splitting in ONH radial and circle scans. We estimated accuracy of auto retinal segmentation with GMPE software in all radial scans.

#### Results

Finally 12 eyes of 10 glaucoma patient or glaucoma suspect with PRS were included to this study (prevalence 0.9%, female: male = 3 eyes of 3 patients: 9 eyes of 7 patients, mean age = 61.5 ranged 54-71 ).

We found 285 radial slices with splitting retinal layers (9.9%) of total 2880 retinal layers (12 eyes by 24 radial scan by 10 retinal layers). Rate of PRS in each layers were 23% in Nerve Fiber Layer (NFL), 17% in Ganglion Cell Layer (GCL), 2% in Inner Plexiform Layer (IPL), 6% in Inner Nuclear Layer (INL), 15% in Outer Plexiform Layer (OPL), and 37% Outer Nuclear Layer, respectively. 81% of radial scan with splitting retinal layer had segmentation errors by GMPE software.

#### Conclusions

PRS caused errors of retinal layer thickness measurement at the high rate of 81%. Clinicians should be aware of retinal layer thickness measurement with PRS.

#### References

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## P-FS-032

### DETECTION RATE OF DISC HAEMORRHAGES IN NORMAL CLINICAL PRACTICE. COMPARISON BETWEEN CLINICAL EXAMINATION AND HEIDELBERG RETINA TOMOGRAPH IMAGES

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#### Purpose

Disc haemorrhages (DH) are an important sign that has been associated with visual field progression and has the potential to be used for risk stratification of glaucoma patients.<sup>1</sup> Unfortunately, the short time they are visible makes the detection very difficult. Moreover, when DH appear, up to 84% of cases confirmed by fundus photography are missed by clinical examination.<sup>2</sup> We compared the detection between clinical examinations and a method designed to detect DH using Heidelberg retina tomograph (HRT) images.<sup>3</sup>

#### Methods

The notes from all consecutive patients that underwent trabeculectomy between May 2007 and September 2013 in the normal-tension glaucoma clinic at Moorfields eye hospital were reviewed as part of a clinical audit (CA15/GL/12). The presence of DH and the change in clinical care after a DH were recorded in all visits before and after trabeculectomy. Scanning laser ophthalmoscopy images acquired on the same day as clinical examination with HRT3 (Heidelberg Engineering, Germany; version 3.0.60) were reviewed by an ophthalmologist masked to the presence of DH on clinical examination. The reflectance images were analysed with Heyex (version 1.6.2.0) which automatically aligns all the images and offers the option to flicker the baseline with the follow-up scans.

#### Results

The 97 included patients had 3740 clinical examinations and 994 HRT scans on both eyes (Figure 1A). Mean (SD) number of visits was 38.6 (12.2) during a follow-up time of 16.5 years (5.2). Sixty-nine patients (101 eyes) had at least one DH detected by clinical examination or HRT. Among the 123 visits in which HRT or clinical examination detected a DH, 32 (27.6%) were identified by both methods, 7 (4.2%) only by clinical examination, and 84 (72.5%) only by HRT (Figure 1D). Among the 53 eyes (84 visits) in which clinical examination missed the DH, 10 had a DH identified by clinical examination later in the follow-up, 10 were never identified as DH+ by clinical examination, and 33 had a DH identified after the trabeculectomy was performed. There was a median (IQR) delay in the classification of eyes as DH+ of 2.2 years (0.4-3.3) and 2.9 years (1.9-3.9) between HRT detection of DH and glaucoma surgery.

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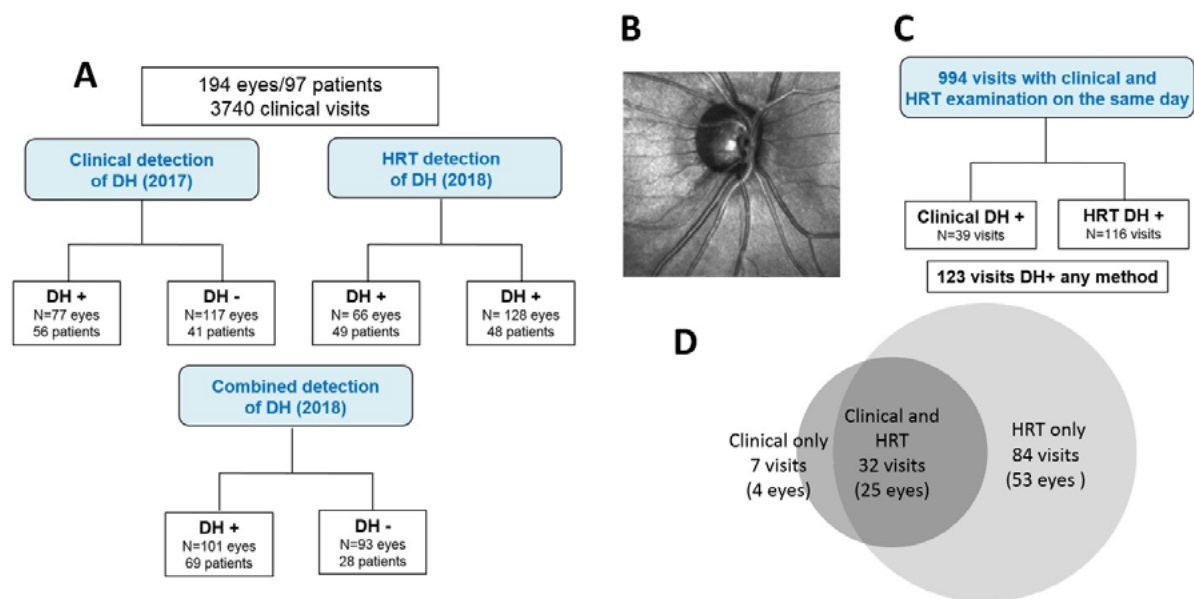
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## Image



**Figure 1.** A) Flowchart with details about patients, B) example of a DH detected by HRT and missed by clinical examination, C) Flowchart with details about visits, and D) Venn diagram comparing the detection rate.

## Conclusions

The assessment of HRT images for DH detection in normal clinical practice improves the detection rate of disc haemorrhages. The implementation of an image-based method to detect DH could speed up the classification of patients as DH+ and the decision to proceed with glaucoma surgery.

## References

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## P-FS-033

### EFFECTS OF FUNDUS TRACKING ON STRUCTURE-FUNCTION RELATIONSHIP IN GLAUCOMA

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#### Purpose

To investigate if fundus perimeter can improve the diagnostic precision of structurefunction (SF) metrics in glaucoma.

#### Methods

We analysed data from 1009 eyes of 244 healthy subjects and 329 with glaucoma from the validation study of the Compass fundus perimeter<sup>1</sup> (CMP, CenterVue). All subjects were tested with a 242 grid with CMP and with the Humphrey Field Analyzer (HFA, Zeiss Meditec) and underwent an OCT scan of the peripapillary Retinal Nerve Fibre Layer (RNFL). SF correlation was assessed between the mean deviation (MD) of six visual field clusters and the corresponding RNFL sector thickness using a multivariate mixed effect model.

For discrimination analysis, we used global MD, average RNFL thickness and a combined SF Index (SFI) obtained as the predicted logit from a logistic regression with the average RNFL thickness and the MD as predictors and the binary classification (Healthy/Glaucoma) as the response. A fixed effect accounted for systematic differences between the two SDOCT devices used in different centres, the Spectralis (Heidelberg Engineering) and the RTVue XR Avanti (Optovue). We balanced the Healthy:Glaucoma proportions to be 1:1 with each OCT device by random constrained sampling, leaving a total of 786 eyes. We calculated partial Receiver Operating Characteristic (pROC) curves (minimum specificity at 75%, Figure 1 A) and Areas Under the Curve (pAUCs). Confidence intervals (CIs) and pvalues were computed via paired bootstrap.

#### Results

The R of the SF model was the same (0.47) for HFA and for CMP (Figure 1 B). The pAUC was greater with MD from CMP than HFA ( $p < 0.001$ ). There was no statistically significant difference between the CMP SFI and the HFA SFI ( $p = 0.075$ ). The pAUC was significantly higher with both the CMP SFI ( $p = 0.002$ ) and HFA SFI ( $p = 0.017$ ) compared to the RNFL alone and MD alone ( $p < 0.001$ ).

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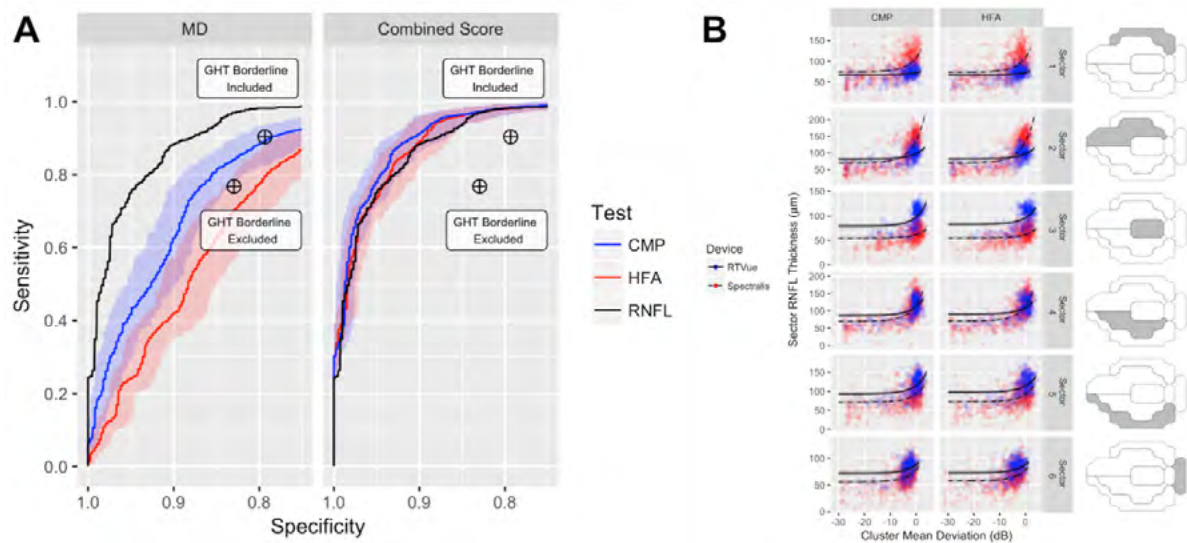


Figure 1. A) pROC curves and relative CIs. HFA Glaucoma Hemifield Test (GHT) is reported for reference; B) SF relationship with the CMP (left) and the HFA (right)

## Conclusions

Metrics from CMP and HFA have similar SF relationship. Functional data from perimetry can be integrated with structural information to significantly increase discrimination ability of structure and function alone. No evidence could be found that fixation stabilization significantly increased diagnostic precision.

## References

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## P-FS-034

# SWEPT-SOURCE OCT ANGIOGRAPHY OF THE MACULAR CAPILLARY NETWORK IN VARIOUS TYPES OF GLAUCOMA

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### Purpose

Swept-source optical coherence tomography angiography (OCTA) is an evolving technology. Its potential use for glaucoma diagnosis remains matter of debate.<sup>1</sup> Aim of this study was to analyse the macular capillary density of the superficial and deep retinal plexus by swept-source optical coherence tomography angiography (OCTA) in various types of glaucoma.

### Methods

In this prospective study 75 eyes from 75 patients underwent fovea centered 3×3 mm cube macular OCTA imaging by a swept-source OCTA device (Plex Elite, Zeiss, Jena, Germany). Quantitative analysis of the retinal vasculature at the superficial and deep plexus was performed by assessing the Perfusion Density (PD), defined as the total area of perfused vasculature per unit area in a region of measurement. We correlated the PD at the superficial and deep plexus with the circumpapillary retinal nerve fiber layer thickness (cpRNFL), the ganglion cell plus inner plexiform layer (GCIPL), and the mean deviation (MD) from standard automated perimetry (SAP).

### Results

We included 43 eyes with primary chronic open angle glaucoma (PCOWG; 57%), 21 eyes with normal tension glaucoma (NTG; 28%), 3 with pigment dispersion glaucoma (PDS; 4%) 3 with pseudoexfoliation glaucoma (PEX; 4%) and five eyes with ocular hypertension without signs of glaucomatous optic neuropathy (OHT; 7%). The GCIPL was significantly correlated with the RNFL ( $r = 9,472$ ;  $P < 0.001$ ) and the MD from SAP ( $r = 0,411$ ;  $p = 0,001$ ). The PD at the superficial plexus was significantly correlated with GCIPL ( $r = 0.393$ ;  $p = 0.001$ ) and the MD ( $r = 0,427$ ;  $P < 0.001$ ) but not with the RNFL. The PD of the deep plexus was significantly correlated with all parameters (GCIPL:  $r = 0,633$ ;  $P < 0,001$ ; RNFL:  $r = 0,255$ ;  $p = 0,027$ ; MD  $r = 0,315$ ;  $p = 0,011$ ).

### Conclusions

Glaucomatous loss of retinal ganglion cells is associated with reduction in retinal plexus density which can be detected with OCT angiography. It can be considered an additional diagnostic tool to detect glaucoma independently of the optic nerve.

### References

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## P-FS-035

### SPATIAL BIAS IN DETERMINING VISUAL FIELD SENSITIVITIES

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#### Purpose

Several perimeters seed visual field thresholding algorithms based on the sensitivity of neighbouring points (Growth Pattern (GP)).<sup>1</sup> This technique assumes that locations adjacent to others with normal sensitivity are likely to have normal sensitivity, and that abnormal locations also spatially cluster. Previous computer simulations demonstrate that the Starting Guess (SG) influences threshold estimation.<sup>2</sup> Such simulations predict that the GP technique may bias estimates in areas of focal sensitivity loss. Here we assess the influence of GP on threshold estimation by comparing patient performance using procedures with and without the GP in areas with sharp scotoma borders.

#### Methods

Visual fields were measured using Zippy Estimation by Sequential Testing (ZEST) with a 24-2 test pattern on 7 patients with glaucomatous visual field defects (MD range: -15.4 to -6.2dB). ZEST 24-2 with and without GP was performed using the Octopus 900 perimeter (Haag-Streit AG, Koeniz, Switzerland) in random order. Test algorithms were implemented using the Open Perimetry Interface.<sup>3</sup> As a separate reference, a Best Available Estimate (BAE) was obtained using ZEST with a uniform prior and no GP with a fundus stabilized automated perimeter (Compass, CentreVue, Padova, Italy). Only the locations adjacent to the primary points (9 deg location in each quadrant) were analyzed. Left eye visual fields were converted to right eye format for analysis. The difference between the SG and BAE (SG error) and the difference between final dB and BAE (dB error) of ZEST 24-2 with GP and without GP were statistically compared.

#### Results

The SG error was correlated with the dB error for the ZEST 24-2 with GP ( $r = 0.73$ ,  $P < 0.001$ ; 95% CI:  $r = 0.58-0.83$ ). If the SG was wrongly identified as defective, the final estimate was highly likely to be reported as defective. For the no GP condition, these measures were not significantly correlated ( $p > 0.05$ ).

#### Conclusions

Normal locations were identified as defective by the ZEST 24-2 with GP when the primary point was defective. Visual field thresholds are influenced by the test procedure, not just the underlying physiology. In areas of steep transition between normal and damaged fields, the use of a growth pattern can significantly bias the visual field threshold results.

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**P-FS-036**

**COMPARISON OF MACULA GANGLION CELL COMPLEX THICKNESS SLOPE BETWEEN PREPERIMETRIC GLAUCOMA AND EARLY NORMAL TENSION GLAUCOMA EYES**

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**Purpose**

Glaucoma is a neurodegenerative disease of the optic nerve, and patients present with various stages on a continuum characterized by accelerated retinal ganglion cell death, subsequent axonal loss and optic nerve damage, and eventually visual field loss. Although preperimetric glaucoma (PPG) and normal tension glaucoma (NTG) are regarded as the same pathology on the glaucoma continuum, the difference in rate of progression of these 2 types remains unclear.

The purpose of this study was to compare the speed of macula ganglion cell complex (GCC) thinning measured by optical coherence tomography (OCT) between PPG and early NTG eyes.

**Methods**

We retrospectively analyzed 52 eyes (52 patients) with PPG and 56 eyes (56 patients) with early stage NTG. We defined PPG by the presence of an optic disc with neuroretinal rim thinning, cupping, or suspected retinal nerve fiber layer defect, and the absence of any condition fulfilling Anderson's criteria of glaucomatous visual field defects (VFD) examined by the Humphry Field Analyzer (HFA) central 30-2 SITA standard program (Carl Zeiss Meditec, Dublin, CA). Early-stage VFD was defined as mean deviation (MD) <6 dB measured by HFA. Spectral-domain OCT (RS-3000, Nidek Co., Ltd., Aichi) was used to analyze GCC thickness by the scanning program 'macula map'. Exclusion criteria were previous intraocular surgery or other ocular diseases. At the start of follow-up, PPG group and NTG group were aged 52.0 +/- 11.4 (mean +/- SD) and 51.9 +/- 10.6 years, respectively ( $p = 0.90$ ), and had axial length of 25.3 +/- 1.5 and 24.7 +/- 3.3 mm ( $p = 0.61$ ), intraocular pressure (IOP) without medication of 15.2 +/- 2.1 and 15.6 +/- 2.4 mmHg ( $p = 0.35$ ), GCC thickness of 88.3 +/- 7.8 and 82.2 +/- 9.2  $\mu\text{m}$  ( $P < 0.01$ ), and MD by HFA of -0.3 +/- 0.8 and -2.6 +/- 2.2 dB ( $P < 0.01$ ). We compared the GCC thickness slope between the two groups.

**Results**

The follow-up duration was 4.3 +/- 1.0 years in PPG group, and 4.5 +/- 0.8 years in NTG group ( $p = 0.68$ ). In PPG group, 35% of the eyes developed glaucomatous VFD during the follow-up period. Comparing PPG group versus NTG group, IOP during follow-up was 13.3 +/- 2.1 versus 13.0 +/- 1.8 mmHg ( $p = 0.44$ ), and the GCC thickness slope was -0.7 +/- 0.6 versus -0.7 +/- 0.5  $\mu\text{m}/\text{year}$  ( $p = 0.76$ ).

**Conclusions**

There is no significant difference in GCC thickness slope between PPG and early NTG eyes.

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## P-FS-037

### SCREENING OF PROGRESSION IN PRIMARY OPEN ANGLE GLAUCOMA PATIENTS

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#### Purpose

Automated perimetry still represents the gold standard in long term glaucoma monitoring. Early detection of progression tendency in glaucoma patients is crucial. Purpose of this study was to assess an alternative fast and convenient method compared to GPA (Humphrey Perimeter, Carl Zeiss®) for detecting glaucoma progression shortly after diagnosis-24 months.

#### Methods

We studied in a longitudinal manner 87 eyes from 87 patients with early open angle glaucoma forms, followed in the first 24 months after diagnosis. Glaucoma was defined according to EGS criteria and a minimum of 5 valid visual fields were required from each patient. All specific glaucoma clinical data were recorded and progression was verified by two distinctive Methods.

Glaucoma Progression Analysis (GPA) software from Hymphrey Visual Field Analyzer and a semi-automated progression analysis based on the Groeningen Longitudinal Glaucoma Study protocol.

#### Results

In GPA analysis, a positive event (progression) was detected in 19/ 87 eyes, 21.83%. Semi-automated progression analysis confirmed progression in all GPA cases, but additionally detected 21 more progression cases (45.97% eyes). The concordance between tests was good ( $k = 0.596$ ,  $p = 0.000$ ), with positive correlation (Mc Nemar test  $r = 0.652$ ,  $p = 0.008$ ). In the first 2 years after diagnosis, GPA sensitivity was 26.82% and a specificity of 73.33%, whereas NPA sensitivity was 46.34% and comparable specificity 72.41% to GPA.

#### Conclusions

Semi-automated method was capable of selecting a "vulnerable" pool of patients with higher chances for progression. Its use is to alert and orient the clinician on glaucoma progression and add a supplementary evaluation to the GPA analysis, that can be inaccurate in the first two years after diagnosis. As such, by combining two methods with similar specificity might offer support for the glaucoma progression screening assessment.

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## P-FS-038

# A NOVEL VISUAL FIELD PREDICTION USING RECURRENT NEURAL NETWORK ARCHITECTURE

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## Purpose

To develop a reliable visual field prediction algorithm using a state-of-art deep learning algorithm, recurrent neural network (RNN), and evaluate its performance compared with conventional pointwise ordinary linear regression (OLR) method.

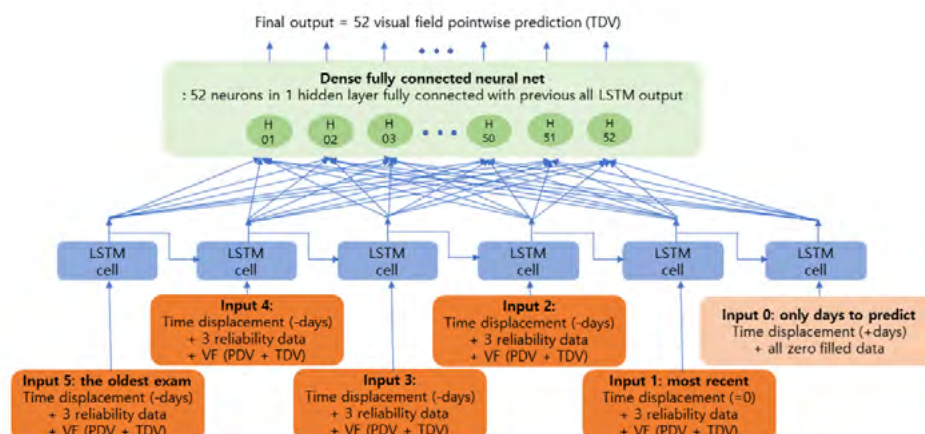
## Methods

An RNN architecture utilizing long short-term memory (LSTM) cells was constructed. 5 consecutive visual field tests were provided to the constructed RNN as input and the last 6<sup>th</sup> visual field test was compared with output of RNN. A total of 1408 eyes from 841 patients were used to training dataset. Another dataset, 281 eyes from 281 subjects, were used for the test dataset. The performance of RNN was compared with OLR by predicting 6<sup>th</sup> visual field in the test dataset. Root mean square error (RMSE) of every prediction was calculated to compare overall prediction accuracy. Pointwise mean absolute error (MAE) was also calculated to evaluate the spatial distribution of prediction accuracy.

## Results

The prediction RMSE was  $4.31 \pm 2.54$  dB /  $4.96 \pm 2.76$  dB (RNN / OLR respectively) and this was significantly different ( $P < 0.001$ ). Pointwise MAE of RNN was smaller than OLR in most areas and superotemporal, superonasal, inferotemporal, and inferonasal areas where is known to be vulnerable to glaucomatous damage were significantly different. Among the reliability indices of visual field, false negative rate (FNR) was significantly affected to the both RNN and OLR but RNN showed smaller and more slowly increasing RMSE as FNR increased.

## Image



## Conclusions

The RNN predicted future visual field more accurately than conventional linear regression method. RNN was more robust to the worsening of reliability of visual field examination.

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**P-FS-039**

**TOPOGRAPHIC RELATIONSHIP BETWEEN ANTERIOR SCLERA AND OPTIC NERVE HEAD DEFORMATION IN MYOPIC EYES**

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**Purpose**

To investigate topographic relationship between the anterior sclera and optic nerve head (ONH) deformation in myopic eyes.

**Methods**

This cross-sectional study included 65 normal myopic eyes. The ovality index was measured on the fundus photographs. The anterior sclera thickness (AST) was measured manually using anterior segment optical coherent tomography in 8 meridians: superior (S), inferior (I), nasal (N), temporal (T), superior-temporal (ST), superior-nasal (SN), inferior-temporal (IT) and inferior-nasal (IN). The AST was measured in 1mm posterior from the scleral spur. Intra- and inter-observer variability of AST was assessed. Linear regression analysis was used to investigate the association between the ocular variables and the AST.

**Results**

The mean axial length and ovality index of all myopic subjects were  $25.97 \pm 1.51$  mm and  $1.24 \pm 0.17$ . The ASTs at 1mm posterior from the scleral spur for all meridians (S, I, N, T, ST, SN, IT, IN) were  $0.77 \pm 0.06$   $\mu$ m,  $0.84 \pm 0.06$   $\mu$ m,  $0.77 \pm 0.06$   $\mu$ m,  $0.84 \pm 0.07$   $\mu$ m,  $0.78 \pm 0.08$   $\mu$ m,  $0.72 \pm 0.06$   $\mu$ m,  $0.83 \pm 0.06$   $\mu$ m and  $0.80 \pm 0.06$   $\mu$ m, respectively. AST of inferior meridian was found to be thicker than the AST of superior and superior-nasal meridians. AST of all meridians were not significantly associated with axial length in myopic eyes. A linear regression analysis showed that the ovality index was significantly associated with the inferior AST ( $R^2 = -0.161$ ,  $P = 0.029$ ).

**Conclusions**

Although, AST was not affected by axial elongation in otherwise normal myopic eyes, AST at inferior meridian was significantly associated with the ovality index. This finding may give hints for the development of ONH deformation in myopic eyes. The association between scleral morphology and ONH deformation have to be further elucidated.

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## **P-FS-040** **CHOROIDAL MICROVASCULAR DROPOUT IN PSEUDOEXFOLIATION** **GLAUCOMA**

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Sathidevi A V<sup>2</sup>

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### **Purpose**

To compare the prevalence of choroidal microvascular dropout (CMvD) in pseudoexfoliation glaucoma (PXG) and disease severity-matched primary open angle glaucoma (POAG) eyes.

### **Methods**

In a cross-sectional study, 29 PXG patients (34 eyes) and 29 glaucoma severity-matched POAG patients (34 eyes) underwent visual fields (VF), optical coherence tomography (OCT) and OCT angiography (OCTA) examination. Peripapillary and parafoveal superficial retinal vessel densities were evaluated on the radial peripapillary capillary and superficial retinal OCTA slabs respectively, and CMvD was evaluated on the choroidal slabs.

### **Results**

PXG and POAG eyes were matched with respect to the average mean deviation on VF (-12.2 vs -12.1 dB,  $p = 0.97$ ). Average peripapillary (48.7% vs 51.4%,  $p = 0.13$ ) and parafoveal (44.4% vs 45.7%,  $p = 0.20$ ) superficial vessel densities were similar between the PXG and POAG groups. CMvD was seen in 17 PXG and 27 POAG eyes (50.0% vs 79.4%,  $p = 0.01$ ). On multivariate analysis, that accounted for the severity of glaucoma, the odds of CMvD was significantly lesser in PXG compared to POAG (Odds ratio: 0.25-0.39,  $P < 0.05$ ).

### **Conclusions**

Prevalence of CMvD was significantly lower in PXG compared to POAG eyes. This suggests differences in the pathogenesis of PXG and POAG, with choroidal vascular changes playing a less important role in PXG.

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## P-FS-041

### DECREASED VISUAL FIELD RESPONSIVENESS IN AREAS WITH NORMAL SENSITIVITY THRESHOLDS IN MODERATE AND SEVERE GLAUCOMA

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<sup>1</sup>Neuroscience, Erasmus MC, <sup>2</sup>Rotterdam Eye Hospital, Rotterdam, <sup>3</sup>Royal Dutch Visio, Huizen, Netherlands

#### Purpose

Standard Automated Perimetry (SAP) plays a crucial role in glaucoma diagnosis and monitoring by assessing the visual field sensitivity (VFS). Alternative approaches, such as Eye Movement Perimetry (EMP), have been introduced to make the test less onerous to perform. Here, seen peripheral stimuli are confirmed by goal directed eye movements and the primary saccade's onset latency (SRT) is plotted as an index of visual field responsiveness (VFR). We showed on a group level that mean SRT was significantly delayed in patients with glaucoma [1,2]. Yet, it is still unclear what the impact is of local field defects, especially in intact visual fields of eyes with and without glaucomatous damage. Therefore, the aim of the present study was to investigate the relation between VFS and VFR in corresponding locations of the visual field in patients with mild, moderate and severe glaucoma compared to healthy controls.

#### Methods

34 healthy controls and 42 glaucoma patients aged 50 years and above were recruited. Each subject underwent a 54-point protocol in EMP and a 24-2 SITA standard protocol in Humphrey Visual Field analyzer (HVF). Each subject was allocated to one of 4 'glaucoma severity groups', i.e. healthy or mild, moderate, severe glaucoma. Next, depending on the threshold value of each tested point in SAP, the corresponding SRT was allocated to 1 of the 7 'SAP sensitivity bins'. These bins represent equal visual field sensitivity and were defined as: bin 1: >0 dB, bin 2: 0 to -3 dB, bin 3: -3 to -6 dB, bin 4: -6 to -12 dB, bin 5: -12 to -18 dB, bin 6: -18 to -24 dB and finally bin 7: <-24 dB. A generalized linear mixed model (GLMM) was applied to determine the influence of the different factors on the dependent variable: SRT. A Wilcoxon signed-ranks test was used to test for between group differences.

#### Results

Estimated mean SRTs significantly increased with higher SAP sensitivity bins. The largest difference in mean SRT was found between the healthy and severe glaucoma of 234 ms in bin 4. Interestingly, many of the differences between the glaucoma severity groups were statistically significant, including healthy versus moderate / severe glaucoma in bin 1 and 2.

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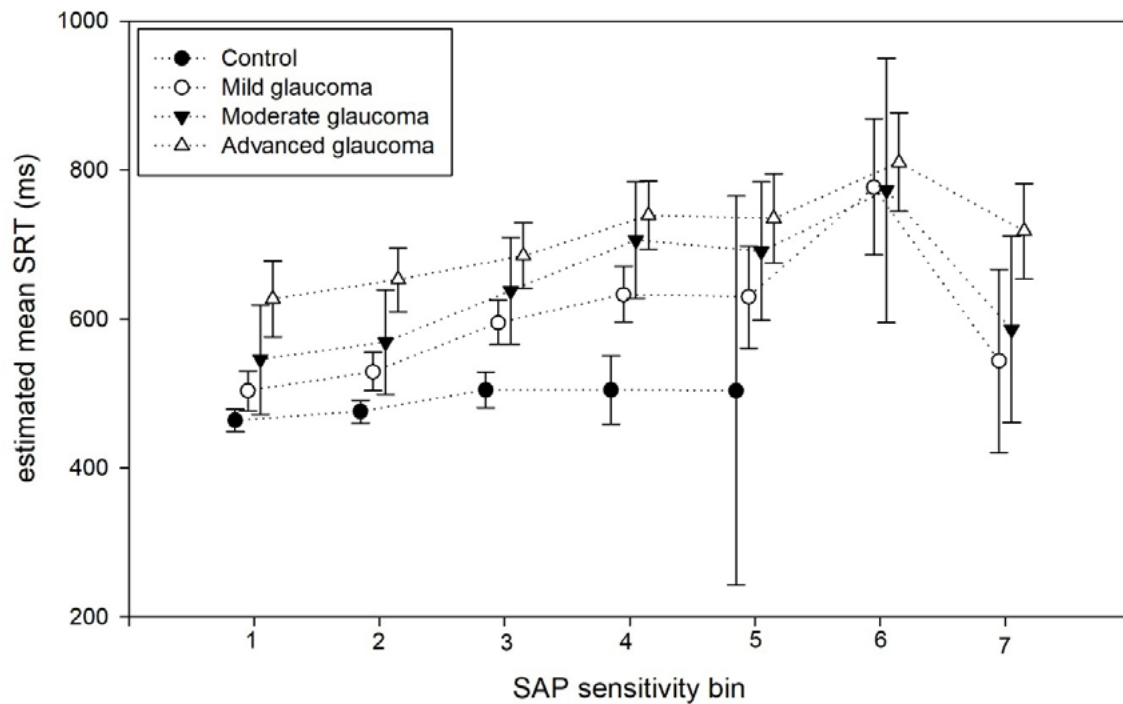
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## Conclusions

The data suggest that the effect of glaucomatous damage leads to reduced VFR in EMP prior to VFS loss in SAP. The underlying mechanisms need to be studied further. The results support our line of research to develop EMP into a screening tool for early identification of 'at risk' for glaucoma.

## References

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## P-FS-042

### PERIPAPILLARY PERFUSED CAPILLARY DENSITY IN ACUTE PRIMARY ANGLE CLOSURE VERSUS PRIMARY OPEN-ANGLE GLAUCOMA AND HEALTHY CONTROLS

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#### Purpose

To compare the peripapillary perfused capillary density (PCD) among eyes with acute primary angle closure (APAC), primary open-angle glaucoma (POAG), and controls.

#### Methods

4.5x4.5 mm optical coherence tomography angiography (OCTA) images of the optic nerve head were obtained using a commercial spectral domain OCTA system (AngioVue Avanti RTVue-XR, Optovue, Fremont, CA). From OCTA grayscale images, thresholding was used to create binary images. After the removal of large blood vessels, the capillary network located between the inner limiting membrane and the posterior boundary of the RNFL was included. Two concentric circles with 1.95-mm and 3.45-mm diameters were placed manually and whole image capillary density, PCD, and its four sectors were calculated. Continuous variables were assessed by analysis of variance and Tukey's test. Generalized estimating equation (GEE) analysis was performed to adjust for confounding factors.

#### Results

16 APAC eyes (mean duration of IOP elevation,  $34.5 \pm 90.4$  days), 62 POAG eyes (VF MD,  $-5.9 \pm 3.6$  dB), and 47 control eyes were included for analysis. Mean ages were  $60.8 \pm 9.7$ ,  $60.4 \pm 10.7$ , and  $62.6 \pm 11.3$  years in APAC, POAG, and controls, respectively ( $p = 0.565$ ).

PCD demonstrated a difference PCD among APAC, POAG, and controls ( $P < 0.001$ ). Pairwise comparisons revealed significant differences in PCD between APAC and controls ( $p = 0.007$ ), POAG and controls ( $P < 0.001$ ), but no difference in PCD between APAC and POAG ( $p = 0.998$ ). A GEE model adjusting for age showed non-significant difference in PCD in APAC compared to each POAG stage (All  $p = 873$ ). No effect of duration of IOP elevation was found on PCD ( $P = 0.724$ ).

#### Conclusions

PCD was significantly decreased in APAC eyes compared to control eyes. A single brief episode of acute angle-closure leads to a significantly decreased PCD comparable to that found in POAG eyes.

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## References

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## P-FS-043

### COMPARISON OF SITA-FASTER AND SITA-STANDARD IN A CLINICAL COHORT OF NORMAL SUBJECTS, GLAUCOMA SUSPECTS AND PATIENTS WITH GLAUCOMA

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#### Purpose

The use of adaptive algorithms in visual field tests assist in improving the efficiency of the test, and more rapid, but still accurate tests, play an important role in clinical workflow. We aimed to compare the standard automated perimetry results obtained in a clinical cohort of patients when undergoing testing using the Swedish Interactive Thresholding Algorithm (SITA) Standard (SS) and the SITA Faster (SFR) paradigms. We test the hypothesis that the SFR strategy takes a shorter amount of time to conduct compared to SS with clinical equivalence.

#### Methods

Patients seen at the Centre for Eye Health underwent visual field testing (24-2 on the Humphrey Field Analyzer) using the SS and SFR strategies. There were four diagnostic groups: 41 normal subjects, 68 glaucoma suspects, 22 patients with glaucoma and 5 patients with other retinal diseases. One eye and the order of testing (SS first or SFR first) was randomly chosen for each subject, with rest breaks between tests. Pointwise sensitivity, global indices, the false positive reliability index and test duration data were extracted directly from the instrument printout. As sensitivity changes may differ across visual field test location, we also extracted probability ( $p$ ) scores from the deviation maps, as per our recently published methods, to compare statistically significant changes in contrast sensitivity reduction.

#### Results

Across all subjects, the median reduction in time when using SFR compared to SS was 172 seconds (interquartile range, IQR: 156 – 192,  $p < 0.0001$ ). There was a statistically, but unlikely clinically, significant increase in false positive rate when using SFR compared to SS (2% increase,  $p = 0.004$ ). There was no significant difference in mean deviation (average  $p = 0.4388$ ) or pattern standard deviation (average  $p = 0.1139$ ) across all diagnostic groups. Although there was a slight bias towards increased sensitivity values and reduced  $p$  scores when using SFR, pointwise analysis revealed that the majority of locations (sensitivity: 69.2-94.2%;  $p$  scores: 90.4-100%) showed no significant difference between the algorithms (Figure 1).

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## Image

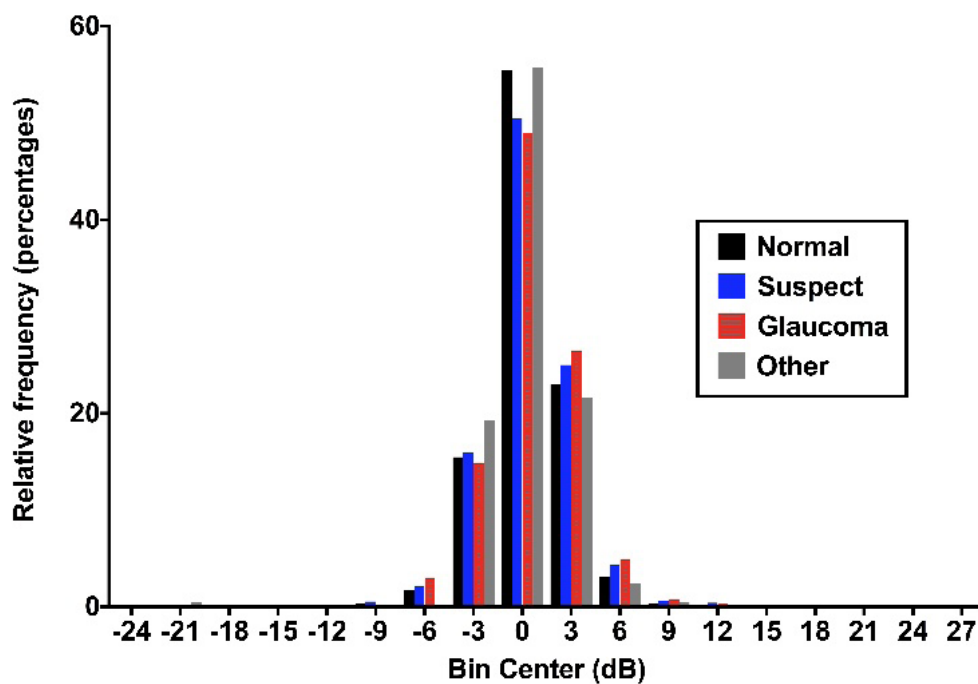


Figure 1: Frequency histogram of sensitivity differences (SFR - SS, in dB).

## Conclusions

Within this cohort of consecutive patients tested using both algorithms, there was overall no systematic difference in sensitivity or  $p$  scores, but SFR resulted in significantly reduced test time. A longitudinal study is required to further inform the application of SFR into clinical practice.

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**P-FS-044**

**DETERMINANTS OF MISCLASSIFICATION ERRORS BY SWEEP-SOURCE OPTICAL COHERENCE TOMOGRAPHY IN ANGLE CLOSURE ASSESSMENT**

Natalia Porporato<sup>1</sup>, Baskaran Mani<sup>1</sup>, Tin A Tun<sup>1</sup>, Rehena Sultana<sup>2</sup>, John Allen<sup>2</sup>, Ching-Yu Chen<sup>1</sup>, Aung Tin<sup>1</sup>

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**Purpose**

To determine factors associated with a false positive and false negative angle closure diagnosis (termed misclassification errors) assessed by swept source OCT (SS-OCT), with gonioscopy as the reference standard.

**Methods**

Cross-sectional study. A total of 2027 phakic subjects aged  $\geq 50$  years, with no previous history of glaucoma, laser, intraocular surgery or ocular trauma, were consecutively recruited from a community polyclinic in Singapore. Gonioscopy and SS-OCT (128 radial scans) for the entire circumference of the angle were performed. On SS-OCT images, angle closure was defined as contact between the iris and any part of the angle wall anterior to the scleral spur for  $\geq 35\%$  degree of the circumferential angle. A false positive or negative result was defined as having respectively a gonioscopic open or closed angle that was assessed inversely (closed or open) by SS-OCT.

**Results**

1857 subjects (91.6%) were included in the final analysis after excluding poor quality SS-OCT scans. Almost 90% of the subjects were Chinese, with a mean age of  $61.8 \pm 6.7$  years and 63.5% women. A total of 372 (20%) eyes were false positive. Compared to true positives patients, false positives had deeper (ACD 2.4 mm versus 2.2 mm,  $P < 0.001$ ) and wider (ACW 11.7 mm versus 11.6 mm,  $P < 0.001$ ) anterior chambers. Deeper ACD (adjusted OR 9.31, CI95% 1.45-59.71,  $P = 0.02$ ) and lower LV (adjusted OR 0.04, CI95% 0.004-0.31,  $P < 0.001$ ) were highly associated with a false positive result. Approximately 2% of the assessed eyes had a false negative result with SS-OCT and showed smaller anterior chamber characteristics –shallower ACD (2.2 mm versus 2.7 mm,  $P < 0.001$ ) and narrower ACW (11.6 mm versus 11.8 mm,  $P < 0.001$ ) – than true negatives.

**Conclusions**

In this large community-based study, we found that anterior chamber characteristics, determined by ACD and LV parameters, play an important role in SS-OCT misclassification errors of gonioscopic angle closure.

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## P-FS-045

# COMPARISON OF SPECTRAL DOMAIN AND SWEPT SOURCE OPTICAL COHERENCE TOMOGRAPHY FOR ANGLE ASSESSMENT OF CHINESE ELDERLY SUBJECTS

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### Purpose

To compare the differences between swept source OCT (SS-OCT) (1310nm) and spectral domain OCT (SD-OCT) (840nm) for the identification and measurement of anterior chamber angle (ACA) structures.

### Methods

This was a cross-sectional study. 67 eyes from 67 healthy subjects underwent ACA imaging at the nasal and temporal sides using SS-OCT and SD-OCT with different wavelength (Tomey, 1310nm and RTvue, 840nm). Images were evaluated for the ability to distinguish angle structures including the Schwalbe's line (SL), the Schlemm's canal (SC) and the scleral spur (SS). The length of trabecular meshwork (LTM), the angle-opening distance (AOD500 and AOD750) and the length of Schlemm's canal (LSC) were also measured.

### Results

The nasal/temporal identification rate for angle structures by SS-OCT and SD-OCT were 91.04%/86.57% (SL), 50.75%/68.66% (SC), 100.0%/100.0% (SS) and 89.55%/91.04% (SL), 40.30%/70.15% (SC), 74.63%/65.67% (SS), respectively. Differences between SS-OCT and SD-OCT were found in terms of the visualization of the SS. With respect to the measurements of angle, the evaluation of LTM at the nasal side, LSC at the temporal side and AOD500/750 at both sides showed significant difference between the two devices. However, there existed good correlation between the AOD500/750 measured by SS-OCT and SD-OCT (Spearman's rank correlation coefficient > 0.8,  $P < 0.000$ ).

### Conclusions

Thanks to longer wavelength, SS-OCT displayed a better performance in detecting deeper structures of the angle such as the SS. However, for discriminating structures lying in transparent or semi-transparent tissue such as the SL and the SC, the two devices showed good consistency. Although SS-OCT and SD-OCT demonstrated high correlation for angle measurement (AOD500/750), their agreement was poor.

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**P-FS-046**

**DETERMINANTS OF THE RETINAL NERVE FIBER LAYER PROFILE IN MYOPIC EYES: A SEPARATE ANALYSIS OF THE SUPERIOR AND INFERIOR HEMIRETINA**

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**Purpose**

The peripapillary retinal nerve fiber layer (RNFL) thickness profile differs between myopic and non-myopic eyes and may differ between the superior and inferior hemiretina. This hampers the use of OCT derived RNFL thickness measurements in glaucoma. This study was to investigate the RNFL thickness profile separately in the superior and inferior hemiretina in myopic eyes.

**Methods**

We imaged the peripapillary RNFL of 138 eyes from 138 healthy myopic subjects with the Cirrus HD OCT and determined the location (angle) of the superior and inferior peak of the RNFL thickness profile at the 3.46 mm OCT measurement circle. We determined associations between the superior and inferior RNFL peak thickness angle and the ocular factors axial length, the angles of the supratemporal and infratemporal retinal artery and vein, disc area, fovea-disc angle [FDA], disc ovality index, and disc torsion using multiple linear regression.

**Results**

In the superior hemiretina, the RNFL peak thickness angle was associated with the superior artery angle ( $P < 0.001$ ), superior vein angle ( $P < 0.001$ ), disc area ( $P = 0.003$ ), FDA ( $P = 0.012$ ), and disc torsion ( $P = 0.004$ ). In the inferior hemiretina, the RNFL peak thickness angle was associated with axial length ( $P = 0.025$ ), inferior artery angle ( $P < 0.001$ ), inferior vein angle ( $P = 0.010$ ), and FDA ( $P < 0.001$ ).

**Conclusions**

Our findings indicate that the myopic RNFL thickness profile is determined by different ocular parameters in the superior and inferior hemiretina. Analysis of RNFL thickness in myopic eyes should take into consideration of different ocular parameters in superior and inferior hemiretina.

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## P-FS-047

# RELATIONSHIP BETWEEN SWEEP-SOURCE OCT EN-FACE IMAGE AND THE FOVEAL THRESHOLD IN GLAUCOMA PATIENTS

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### Purpose

To investigate the relationship between swept-source optical coherence tomography (SS-OCT) enface image and the foveal threshold.

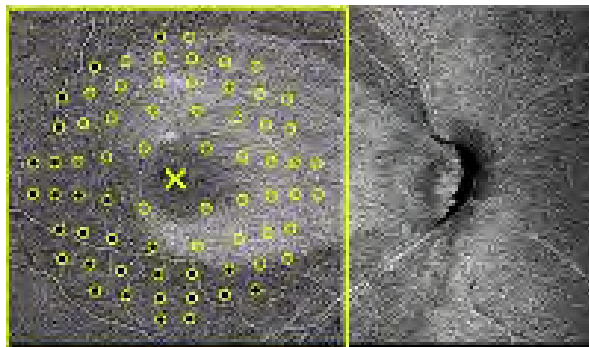
### Methods

58 eyes from 58 patients with POAG or NTG were examined using SS-OCT (Triton DRI-OCT, Topcon, Tokyo, Japan). The mean age was  $55.7 \pm 10.4$  years old and the mean spherical equivalent error was  $-4.7 \pm 3.9$  diopter. Three-dimensional 6×6 mm cube raster scans of the optic nerve head and the macular were obtained with SS-OCT. The nerve fiber bundles (NFB) were observed after flatten processing against inner limiting membrane. After overlaying the points corresponding to Humphrey 10-2 Visual Field test locations on acquired enface image, existence of NFB at each point along the papillomacular area were judged. Papillomacular NFB defect (PMBD) was defined as lacking NFB more than 10 out of 14 point which are located along papillomacular area. Then the foveal threshold was compared between the eyes with and without PMBD.

### Results

The mean foveal threshold of the eyes with and without PMBD was  $27.7 \pm 5.3$  dB and  $35.0 \pm 2.8$  dB, respectively. There was a significant difference between the two groups ( $P < 0.01$ ).

### Image



### Conclusions

The SS-OCT enface image may be useful to estimate whether the foveal threshold is kept.

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**P-FS-048**

**CHOROIDAL MICROVASCULAR DROPOUT IN PRIMARY OPEN-ANGLE GLAUCOMA EYES WITH DISC HEMORRHAGE**

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**Purpose**

To compare the prevalence of choroidal microvascular dropout (CMvD) in primary open angle glaucoma (POAG) eyes with and without disc hemorrhage (DH).

**Methods**

Forty-four eyes of 44 control subjects, 32 eyes of 32 POAG patients with DH and 41 eyes of 41 POAG patients without DH underwent visual fields (VF), optical coherence tomography (OCT) and OCT angiography (OCTA). Presence of CMvD was evaluated on the choroidal OCTA slab. VF defect in the glaucoma eyes were classified into initial nasal defect (IND), initial parafoveal scotoma (IPFS) and combined nasal and parafoveal defect.

**Results**

CMvD was detected in 17 POAG eyes with DH (53.1%) and 13 POAG eyes without DH (31.7%;  $p = 0.06$ ). On univariate analysis, CMvD in POAG eyes was associated with DH (Odds ratio, OR = 2.44,  $p = 0.06$ ) and measures of glaucoma severity; visual field mean deviation (VF MD, OR = 0.85,  $p = 0.02$ ), retinal nerve fiber layer thickness (OR = 0.95,  $p = 0.03$ ) and peripapillary vessel density (OR = 0.94,  $p = 0.09$ ). On multivariate models that accounted for the measures of glaucoma severity, CMvD in POAG eyes was statistically significantly associated with DH (OR  $\geq 3$ ,  $P < 0.05$ ). CMvD was more frequently seen in eyes with IPFS than IND both in POAG eyes with DH ( $p = 0.06$ ) and POAG eyes without DH ( $P < 0.001$ ).

**Conclusions**

Prevalence of CMvD was significantly greater in POAG eyes with DH compared to POAG eyes without DH. CMvD in POAG eyes was also significantly associated with central VF defects and greater severity of glaucomatous damage. This observation may help to explain pathogenesis of DH in glaucoma.

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## P-FS-049

### OBJECTIVE TESTING OF BOTH VISUAL FIELDS IN 80 SECONDS

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#### Purpose

We compare the signal-to-noise ratios of a higher-resolution multifocal pupillographic perimetry (mfPOP) method that assesses both eyes concurrently in 6 minutes, with two new 80-second tests. The study is in the context of an examination of the effects of sports-related concussion but the main outcome measure is the difference in the SNRs between the mfPOP methods. That being said RNFL losses have been reported in mild sports concussion,<sup>1</sup> and Matrix field defects in more serious cases.<sup>2</sup>

#### Methods

We enrolled 54 men, 36 of whom were rugby players with a history of concussion that was serious enough to warrant removal from the field. The 18 normal control subjects were aged  $22.3 \pm 2.38$  y and the concussed athletes  $21.6 \pm 2.11$  y (mean  $\pm$  SD). The concussed athletes were divided into 3 groups (12/group) that had mean periods since concussion of 16, 311, and 1443 days. All three stimulus arrays occupied the central 60 degrees of each eye. The high resolution test (P129) had 44 regions per eye and duration 6 minutes. The two 80-second methods (P137 and P138) tested 12 regions/eye (Figure) and had maximal luminances of 156 and 216 cd/m<sup>2</sup> respectively. The multifocal response estimation process provided a t-statistic based SNR (t-SNR) for each tested region. The input variable for analysis (Matlab 2016b) was the mean t-SNR for each subject (computed across test-regions, eyes, and pupils). Linear models estimated the differences in SNRs between mfPOP methods and the independent effects of concussion.

#### Results

The mean t-SNRs for P129, P137 and P138 were 4.01, 5.59, 5.87 (with SE of 0.18). The t-SNRs of P137 and P138 were significantly larger than those of P129 at  $p < 1e-13$  (t-stats 8.73 and 10.3 respectively). Across the tests the linear models indicated that the most recently concussed group had t-SNRs -0.56 lower than controls ( $p = 0.006$ ), those with concussion at about 311 days had greater t-SNRs by 0.47 ( $P < 0.021$ ), and those with concussion at about 1443 days were not different from controls ( $p = 0.93$ ).

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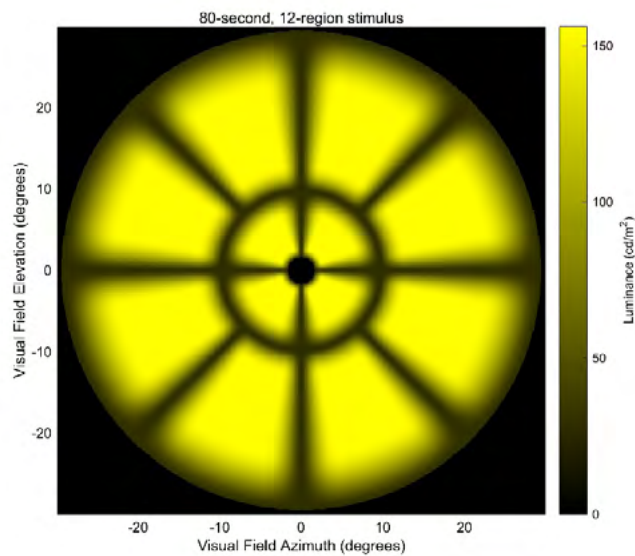
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## Image



## Conclusions

The coarser 80-second stimuli provided significantly higher signal-to-noise ratios than the higher resolution mfPOP test. This greater accuracy might balance the effects of coarser resolution. All the tests seemed to have some capacity to detect concussion occurring within 34 days.

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## P-FS-050

### ALTERED BRAIN ACTIVITY OF RESTING BRAIN MICROSTATES IN EARLY GLAUCOMA: AN EVIDENCE FROM HIGH DENSITY EEG STUDY

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<sup>1</sup>Physiology, <sup>2</sup>Dr. RP Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

#### Purpose

Glaucoma is a multifactorial neurodegenerative disease as indicated by functional neuroimaging studies<sup>1</sup>, caused due to damage to retinal ganglionic cells. EEG is a functional neuroimaging technique used to assess the neural activity with high temporal and spatial resolutions. EEG microstates can assess large-scale brain networks which are altered in neurodegenerative diseases. The current study aimed to assess the changes in neural activity in patients with primary angle closure glaucoma (PACG) using neural sources of resting EEG microstates.

#### Methods

High density EEG (128-channel) was recorded in 34 patients (18 males, 16 females) with newly diagnosed bilateral PACG (IOP (in mmHg): Mean±SD: Right eye (R): 17.1 ± 3.8; Left (L) eye: 17.3 ± 4.2; MD of visual fields (in dB) R: -4.2 ± 1.2, L: -4.5 ± 0.9) and 32 age-matched healthy controls (17 males, 15 females) during eyes close condition (EC). EEGLAB was used for pre-processing including independent component analysis. Cartool software was used for microstate analysis. Scalp maps of each subject were subjected to k-means cluster analysis. The spatially correlated maps were identified using cross validation criterion. sLORETA was used to localize the intracranial generators for microstate maps and their current source density (csd) were compared between the groups (at  $p$ -value < 0.05).

#### Results

Four microstate maps representing EC across the groups were identified. The csd of intracranial generators for map 4 was higher at middle occipital gyrus (Log Fmax = 0.239) in PACG compared to controls. Suprathreshold cortical voxels (Log F = 0.1955,  $p$  = 0.015) with higher activation was found at lingual gyrus and cuneus.

#### Conclusions

The current study reports higher activity in brain areas that are involved in visuo-spatial attention, inhibitory role and divergent thinking. This could possibly be a coping mechanism to combat degeneration in primary visual pathways in patients with early glaucoma<sup>2</sup>. These changes in EEG could be used to assess neurodegeneration in glaucoma.

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**P-FS-051**

**ASSESSMENT OF SPONTANEOUS RETINAL VENOUS PULSATIONS IN GLAUCOMA PATIENTS ON MEDICAL TREATMENT OVER TWO-YEARS**

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<sup>1</sup>Orthoptics, University of Technology Sydney, <sup>2</sup>Ophthalmology, Prince of Wales Hospital,

<sup>3</sup>Ophthalmology, University of New South Wales, <sup>4</sup>Marsden Eye Specialists, <sup>5</sup>University of Technology Sydney, Sydney, Australia

**Purpose**

Spontaneous venous pulsations (SVPs) are a potential biomarker for glaucoma onset and progression. Absent SVPs have been reported in up to 50% of glaucoma patients, however, a reduction in SVP amplitudes may mask subjective assessment of their presence in glaucoma. In this study, a novel tablet-based ophthalmoscope was used to objectively detect and quantify SVPs in glaucoma patients over two years.

**Methods**

A total of 45 eyes from 45 glaucoma patients ( $73 \pm 12$ ; 14 male) were included in this study. A subset of 12 patients had a follow-up visit in the subsequent year. All participants had an ophthalmic examination including intraocular pressure measurement (IOP; Goldman tonometry), 24-2 Humphrey visual field (VF) assessment, and a 10 second dilated videoscropy of the retinal circulation at the optic nerve head using a tablet-based ophthalmoscope. SVP traces were extracted using an in-house algorithm; the percentile change of central venous diameter was used to determine SVP amplitude. Differences in baseline vs follow-up results were assessed using a paired *t*-test.

**Results**

Mean IOP and VF mean deviation (MD) at baseline were  $14 \pm 4$  mmHg and  $-3.2 \pm 3.5$  dB, respectively. SVPs were quantifiable in all eyes, with a mean SVP percentile pulse of  $41 \pm 16\%$  at baseline. In the follow-up group, we observed a non-significant reduction in SVP percentile pulse and VF-MD from base-line to follow-up, respectively ( $52\%$  vs  $47\%$  ( $p = 0.4$ ) and  $-2.55$  dB vs  $-2.90$  dB ( $p = 0.5$ )).

**Conclusions**

SVPs were recorded and quantified in all patients. The non-significant change in SVP and VF from baseline to follow-up may be attributed to participants being on medical treatment. Further studies are required to determine whether progressive SVP loss is a marker of glaucoma onset and progression.

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**P-FS-052**

**COMPARISON OF CENTRAL VISUAL SENSITIVITY UNDER MONOCULAR AND BINOCULAR CONDITIONS IN GLAUCOMA PATIENTS USING NEW STATISTICAL PERIMETRY**

Takuhei Shoji\*, Tomoyuki Kumagai<sup>1</sup>, Yuji Yoshikawa<sup>1</sup>, Hirokazu Ishii<sup>1</sup>, Izumi Mine<sup>1</sup>, Itaru Kimura<sup>1</sup>, Kei Shinoda<sup>1</sup>

<sup>1</sup>Department of Ophthalmology, Saitama Medical University, Iruma, Japan

**Purpose**

To compare central visual sensitivity under monocular and binocular conditions in glaucoma patients using new statistical perimetry.

**Methods**

Thirty-five consecutive eyes of 35 patients with open-angle glaucoma who affected at least one significant points in the central 10° were examined in this prospective study. The monocular and binocular random single eye tests by “imo” and Humphrey Field Analyzer (HFA) test were performed. We divided the eyes in the better and worse eye categories based on the visual acuity and central visual thresholding. Central visual sensitivity results by the monocular and binocular random single eye tests were compared.

**Results**

The average mean deviation (MD) with HFA 24-2 was  $-8.8 \pm 8.5$  dB in the better eyes and  $-19.2 \pm 7.6$  dB in the worse eyes. The mean sensitivity in the central 4 points of the visual field of the worse eyes was deteriorated when measured under the binocular eye condition ( $15.0 \pm 10.9$  dB) than under the monocular condition ( $19.8 \pm 9.6$  dB) ( $p < .001$ , paired t test). Conversely, this value of the better eyes was improved when measured under the binocular eye condition ( $27.4 \pm 3.6$  dB) than under the monocular condition ( $25.7 \pm 6.0$  dB) ( $p < .001$ , paired t test).

**Conclusions**

The central sensitivity of the better eyes improved and that of the worse eyes deteriorated under the binocular condition. Caution should be needed that the mean sensitivity under monocular condition was different from binocular condition in glaucoma patients.

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**P-FS-053**

**DIAGNOSTIC PERFORMANCE OF OPTIC NERVE HEAD HEMOGLOBIN LEVELS MEASUREMENT IN EYES WITH EARLY PRIMARY OPEN ANGLE GLAUCOMA**

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<sup>1</sup>Ophthalmology, Federal University of São Paulo, <sup>2</sup>Ophthalmology, Hospital Medicina dos Olhos, São Paulo, <sup>3</sup>Ophthalmology, Instituto de Olhos e Ciências Médicas, Belo Horizonte, Brazil, <sup>4</sup>Ophthalmology, Mayo Clinic, Jacksonville, United States

**Purpose**

It has been suggested that patients with established glaucoma have lower levels of optic nerve head hemoglobin (ONH Hb). We sought to investigate the glaucoma discrimination ability of ONH Hb measurement as assessed by non-invasive automated colorimetric analysis (Retinalyze®; Retinalyze System A/S) in patients with early glaucoma.

**Methods**

A prospective, observational, cross-sectional study was carried-out, in which patients with early glaucoma (visual field mean deviation index [VFMD]  $\geq -6$  dB) and healthy participants were consecutively enrolled. After inclusion, nonmydriatic color fundus photographs and peripapillary retinal nerve fiber layer (pRNFL) thickness measurements (through spectral-domain optical coherence tomography) were obtained from all participants. The software initially delineated the ONH border and identified the central retinal vessels. On the basis of colorimetric analysis, Hb levels were determined in the neuroretinal rim, cup and vessels. Eyes were then classified in glaucoma or not by the software automated algorithm, and sensitivity, specificity, accuracy and predictive values were determined.

**Results**

A total of 46 eyes from 46 patients were included (23 patients with glaucoma and 23 controls). Mean age of glaucomatous patients and controls were 60.4 and 54.4 years, respectively. Mean VFMD index of glaucomatous eyes was  $-2.1 \pm 2.9$  dB. The program was unable to perform the analysis due to image-related issues in 2 eyes. Sensitivity and specificity values were 64% (95% CI, 40.7 – 82.8%) and 91% (95% CI, 70.8 – 98.9%), respectively. Positive and negative predictive values were 87.5% and 71.4%, respectively (considering a disease prevalence of 50% in the study site). Overall, the test yielded an accuracy of 77% (95 CI, 62 – 88%).

**Conclusions**

Our initial results suggest that although the software automated algorithm presents moderate sensitivity outcomes in this population with early stage glaucoma, it had a good diagnostic performance in the participants without the disease. Further analyses (larger sample) are warranted in order to confirm our initial findings and to investigate its applicability in a clinical setting.

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## P-FS-054

### COMPARISONS BETWEEN RETINAL VESSEL DIAMETERS AND VARIOUS OPTIC NERVE HEAD MORPHOLOGY PARAMETERS IN GLAUCOMA; THE GLACUOMA STEREO ANALYSIS STUDY (GSAS)

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#### Purpose

The Glaucoma Stereo Analysis Study (GSAS) is a multicenter collaborative study that uses a stereo fundus camera to assess various morphological parameters of the optic nerve head (ONH) in glaucoma patients. Using the GSAS dataset, we tested possible associations among retinal vessel diameters, various ONH parameters, and glaucoma severity.

#### Methods

Stereo pairs of ONH photographs recorded from 240 Japanese subjects with primary open angle glaucoma or normal tension glaucoma (male; female = 116:124, age 61.2 ± 9 years) using stereo fundus camera (Kowa nonmyd WX) were used. ONH morphological parameters were calculated with VK2-WX software. Retinal vessel diameters were calculated as the central retinal arteriolar equivalent (CRAE) and central retinal venular equivalent (CRVE) using IVAN software. According to the ONH appearances, eyes were further classified into four groups including focal ischemic (FI, n = 53), generalized enlargement (GE, n = 53), myopic glaucomatous (MY, n = 112), and senile sclerotic (SS, n = 22) for comparison.

#### Results

Significant correlations among CRAE and CRVE, multiple ONH parameters, and visual field mean deviation (MD) were found. Among 4 groups, CRVE was significantly smaller in SS group than other 3 groups, while CRAE was equivalent among 4 groups. The CRAE was significantly correlated with rim area in MY (r = 0.29, P = 0.001) and GE (r = 0.40, P = 0.004) groups, and CRVE was significantly correlated with rim area in FI (r = 0.37, P = 0.0006) and MY (r = 0.33, P = 0.0004) groups. CRAE was significantly correlated with visual field sensitivity in MY (r = 0.16, P = 0.0087) and GE (r = 0.31, P = 0.02) groups, whereas CRVE was significantly correlated with visual field sensitivity in MY (r = 0.17, P = 0.0078).

#### Conclusions

In entire dataset, both CRAE and CRVE were associated with severe visual field defects. The roles of retinal vessel diameters differ among different optic disc morphology types. In MY group, CRAE and CRVE were obviously associated with structural and functional glaucomatous changes.

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## P-FS-055

### INFLUENCING FACTORS OF THE PERIPAPILLARY CHOROIDAL VASCULARITY INDEX IN GLAUCOMA

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#### Purpose

To investigate factors associated with the choroidal vascularity index (CVI) and total choroidal area (TCA) determined by spectral-domain optical coherence tomography (SD-OCT) in glaucomatous eyes.

#### Methods

A total of 160 primary open-angle glaucoma (POAG) with  $\beta$ -zone parapapillary atrophy ( $\beta$ PPA) were included. TCA and CVI were measured by image binarization of SD-OCT B-scans in order to assess the choroidal vasculature outside  $\beta$ PPA at a 3.5 mm distance from the Bruch's membrane opening (BMO) center. The relationship of CVI with parameters including TCA, axial length (AXL), visual field (VF) mean deviation (MD), BMO area, juxtapapillary choroidal thickness (JPCT), width of  $\beta$ PPA<sub>+BM</sub> and  $\beta$ PPA<sub>-BM</sub>, focal lamina cribrosa (LC) defect, optic disc hemorrhage (DH), and OCT angiography-derived parapapillary deep-layer microvasculature dropout (MvD\_P) was evaluated.

#### Results

In the univariable regression analysis, CVI was significantly associated with age, BMO area,  $\beta$ PPA+BM width, JPCT, TCA, and MvD\_P ( $P < 0.05$ ). Meanwhile, AXL, VF MD, focal LC defect, and DH were not related with CVI ( $P > 0.05$ ). In the multivariable regression analysis, lower CVI was significantly associated with thinner JPCT, smaller TCA, and presence of the MvD\_P ( $P < 0.05$ ), while CVI was not associated with  $\beta$ PPA+BM width ( $P > 0.05$ ).

#### Conclusions

Reduced choroidal vascularity outside the  $\beta$ PPA was associated with smaller peripapillary choroidal area, thinner juxtapapillary choroidal thickness, and presence of the deep-layer microvasculature damage within the  $\beta$ PPA, but not with the  $\beta$ PPA<sub>+BM</sub> width.

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## P-FS-056

### THE CORRELATION BETWEEN THE PAPILLOMACULAR BUNDLE AND VISUAL ACUITY

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#### Purpose

We previously reported that glaucoma patients with central visual dysfunction show thinning in the papillomacular nerve fiber bundle (PMB). In this study, we explore methods to measure PMB thickness with swept-source optical coherence tomography.

#### Methods

This study included 224 eyes of 134 open-angle glaucoma (OAG) patients (male/female: 72/62, age:  $66.5 \pm 8.4$  years, mean deviation:  $-11.7 \pm 8.3$  dB). We measured the thickness of each retinal nerve fiber layer (RNFL) within the PMB, including the overall macular RNFL (mRNFL), the macular ganglion cell complex (mGCC), circumpapillary RNFL (cpRNFL) in each quadrant, the central RNFL (cRNFL), and the central GCC (cGCC). Measurements were made in the vertical B-scan midway between the disc center and the macula. We then analyzed the associations with visual acuity with Spearman's rank correlation coefficient. Cutoff values for the OCT measurements were calculated with a logistic regression analysis for LogMAR less than 0.

#### Results

The correlation coefficients with LogMAR were  $r = 0.34$  for the mRNFL, 0.40 for the mGCC, 0.31 for the temporal cpRNFL, 0.39 for the cpRNFL, and 0.52 for the cGCC (all  $P < 0.0001$ ). In the cGCC, the area under the curve (AUC) for decreased visual acuity was 0.81 and the cutoff value was  $87.1 \mu\text{m}$  ( $P < 0.001$ ).

#### Conclusions

There were strong associations between OCT parameters of the PMB and visual acuity in patients with OAG. The thickness of the PMB may be a valuable biomarker to predict visual acuity disturbance.

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**P-FS-057**

**ASSOCIATION BETWEEN THE CHANGES OF STRUCTURE AND BLOOD FLOW WAVEFORM BEFORE AND AFTER TRABECULECTOMY**

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**Purpose**

To investigate the association between the changes of structure and blood flow waveform in optic nerve head (ONH) before and after trabeculectomy (TLE) in open angle glaucoma.

**Methods**

A total of twenty-six eyes of 26 patients achieved a  $\geq 20\%$  reduction in IOP at three months after TLE were included. We measured Bruch's membrane Opening Minimum Rim Width (BMO-MRW) and retinal nerve fiber layer thickness (RNFLT) using SD-OCT (SPECTRALIS; version 6.5.2.0; Heidelberg Engineering, Heidelberg, Germany), axial length (IOLMaster 700, Carl Zeiss Meditec Inc., Dublin, CA, USA), and the mean the blur rate (MBR) as a relative measure of the blood flow and blood flow waveforms using LSFG (LSFG-NAVI version 3.1.39.2 software, Softcare Ltd., Fukuoka, Japan) before surgery and 3 months postoperatively. The Wilcoxon's signed-rank test was used to analyze the differences in these parameters before and after TLE, and linear and multiple regression analyses were used to determine factors related to the rates of change in the BMO-MRW and RNFLT.

**Results**

Axial length decreased and ocular perfusion pressure increased significantly at 3 months after TLE ( $p < 0.05$ ). BMO-MRW increased significantly ( $p < 0.001$ ), but RNFLT did not change ( $p = 0.319$ ). There was no significant change in MBR. In blood flow waveforms, fluctuation and flow acceleration index (FAI) decreased ( $p = 0.023$  and  $p = 0.006$ , respectively) and the falling rate increased significantly ( $p = 0.014$ ) after TLE. There was no related factor to BMO-MRW, but the rate of change in FAI was a significant related factor to that of RNFLT in multiple regression analyses ( $\beta = 0.39$ ,  $P = 0.046$ ).

**Conclusions**

BMO-MRW was not associated with microcirculation and blood flow waveform of ONH, however, the change in RNFLT was associated with that of blood flow waveform in part.

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**P-FS-058**

**THE SHORT-TERM EFFECT OF INTRAOCULAR PRESSURE REDUCTION ON THE PHOTOPIC NEGATIVE RESPONSE IN GLAUCOMA**

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**Purpose**

To evaluate the effect of intra-ocular pressure (IOP) reduction on retinal ganglion cell (RGC) function assessed by the photopic negative response (PhNR) in glaucoma suspect and glaucomatous eyes.

**Methods**

Fifty-one patients (mean age  $65 \pm 13$  years) with uncontrolled IOP were enrolled, of which 28 participants were commenced on new ocular hypotensive drops, 16 received selective laser trabeculoplasty and 7 received surgical filtration procedure. All participants had IOP, 24-2 Humphrey visual field and PhNR measured at baseline and 1 – 3 months after treatment. The PhNR was recorded in response to red-on-blue stimuli (range  $0.07 - 4.5 \text{ cd.s/m}^2$ ) using the RETeval® device. The Naka-Rushton function was fitted to the PhNR stimulus response data to obtain the maximum amplitude (Vmax).

**Results**

The mean IOP after treatment ( $16 \pm 5 \text{ mmHg}$ ) was significantly lower than baseline ( $22 \pm 6.7 \text{ mmHg}$ , Student's paired *t*-test,  $P < 0.0001$ ), with an average reduction of 28%. Improvement in PhNR Vmax beyond test-retest variability was observed in 5 (10%) participants. However, the majority remained unchanged with no significant difference between pre- and post-treatment Vmax ( $11.8 \pm 3.9 \mu\text{V}$  vs.  $12.4 \pm 4.4 \mu\text{V}$ ,  $p = 0.16$ ). No correlation was identified between change in IOP and change in PhNR ( $p = 0.82$ ). There was a trend for improved visual field mean linear sensitivity (1/Lambert) with IOP reduction, although this did not reach statistical significance ( $r^2 = 0.07$ ,  $p = 0.05$ ).

**Conclusions**

Short-term improvement in RGC function following IOP reduction was detected in only a small proportion of patients using the PhNR.

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**P-FS-059**

**PERIPAPILLARY PERFUSED CAPILLARY DENSITY IN TRUE EXFOLIATION SYNDROME VERSUS PSEUDOEXFOLIATION SYNDROME: AN OCTA STUDY**

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**Purpose**

To compare the peripapillary perfused capillary density (PCD) between eyes with true exfoliation syndrome (TEX) and pseudoexfoliation syndrome (PEX).

**Methods**

Eyes with TEX and PEX underwent optical coherence tomography angiography (OCTA) images covering a 4.5x4.5mm<sup>2</sup> area centered at the optic nerve head using a commercial spectral domain OCTA system (AngioVue Avanti RTVue-XR, OptoVue, Fremont, CA). To detect ONH perfusion imaging, quantify SSADA algorithm was used. Manually placement inner (1.95-mm) and outer (3.45-mm) concentric circles created an annulus of width 0.75 mm centered at optic disc. We used both eyes for analysis. Categorical variables were compared using the Fisher exact test. Continuous variables were compared by using *t-test*. Generalized estimation equation was used to adjust for age, gender, axial length and blood pressure.

**Results**

Twelve eyes with TEX and 10 eyes with PEX were included. There was no significant difference between two groups in terms of age, gender, and axial length (all  $p > 0.05$ ). There was no significant decrease in PCD between PEX and TEX in global and all sectors ( $p > 0.05$ ) except inferior sector ( $p = 0.04$ ). Mean PCD difference in PEX compared with TEX was  $-2.3 \pm 0.7$  (95%CI: -5.647, -0.979).

**Conclusions**

Although only the inferior sector exhibited greater PCD loss in PEX compared to TEX eyes, there was a trend toward greater loss of PCD in PEX in all sectors. Further research with larger sample size is warranted.

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## P-FS-060

# CORRELATION BETWEEN MELBOURNE RAPID FIELD (MRF) USING A PORTABLE DEVICE AND HUMPHREY VISUAL FIELD IN CHILEAN GLAUCOMA PATIENTS

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### Purpose

Primary Attention Ophthalmology Services in Chile do not count with reliable visual field devices for the diagnosis and followup of Glaucoma patients. The Melbourne Rapid Field (MRF) has been used in some studies as an option in this cases. The purpose of this study is to assess<sup>1</sup> the correlation between MRF and Humphrey Visual Field (HVF) and<sup>2</sup> the diagnostic ability of MRF for patients with moderate-severe glaucoma (Mean Deviation (MD)  $\leq$  -6 dB in HVF).

### Methods

Multicentric observational study. Patients with Glaucoma cared at a Primary Attention Ophthalmology Service in Santiago de Chile between June and August 2018 were invited to a visual field assessment. MRF was done using a portable device (iPad 3) and HVF was performed later in a tertiary Ophthalmology service in Hospital Sótero del Río in Santiago, with the medical technologist blinded to MRF results. Pearson Correlation Coefficient was calculated for MD and PSD obtained by the two devices. Sensitivity and specificity for glaucoma diagnosis were obtained considering two cut points of MRF: strict ( $\leq$  -2 dB) and sensitive ( $\leq$  -1 dB). All statistical analysis were performed using R Statistical Software (Foundation for Statistical Computing, Vienna, Austria).

### Results

Thirty nine eyes of 21 patients were included in the study. 48% of patients were female and the mean age was  $67 \pm 12$  years. A high positive correlation was obtained for the Mean Deviation (MD) reports by MRF and HVF ( $r = 0.90$ ,  $P < 0.001$ ). The correlation was less pronounced ( $r = 0.77$ ,  $P < 0.001$ ) for the pattern standard deviation (PSD). 36% of the eyes studied ( $n = 14/39$ ) were classified as moderate or severe glaucoma considering HVF. The sensitivity and specificity of MRF considering the strict cut point was 93% ( $n = 13/14$ ) and 80% ( $n = 20/25$ ) respectively. Considering the sensitive cut point, MRF was able to detect 100% of the glaucoma patients ( $n = 14/14$ ) with a specificity of 68% ( $n = 17/25$ ).

### Conclusions

Melbourne Rapid Field is a sensitive alternative for detection of glaucoma in patients with moderate and severe disease and can be used as a *priorization* method to determine which patients require a HVF in a low income setting where HVF is not readily available.

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## P-FS-061

### NON-PROGRESSIVE FIELD DEFECT IN UNTREATED POAG PATIENT- A CASE REPORT

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#### Purpose

To present a case of primary open angle glaucoma (POAG) where we found no disease progression despite discontinuation of anti- glaucoma medications by the patient himself.

#### Methods

Observational case report.

#### Results

A 62 years old male patient was diagnosed to have POAG (baseline IOP 24 mmHg in both eyes) with advanced glaucomatous optic neuropathy and severe visual field damage (Mean deviation value – 20.34 dB in right eye and – 27.05 dB in left eye) when he presented to us in November, 2013. Anti glaucoma medications were prescribed and patient was advised to come for follow up after 6 months. But he failed to turn up and came for review only in May, 2018. He had discontinued all anti glaucoma drugs since 2014. IOP was 22 and 20 mmHg in right and left eye). Perimetry was done which showed no significant progression (MD -20.88 dB in right eye and -27.08 dB in left eye). Earlier the Ocular Hypertension Treatment study had reported higher rate of disease progression in untreated patients (4.4% in the medication group and 9.5% in the observation group). Aptel *et al.* studied the rate of progression of POAG in treated patients and they found the rate of progression for severe glaucoma (MD less than -18 dB) was -0.45 dB per year. Advanced glaucoma intervention study (AGIS) has indicated higher risk of progression in eyes with worse MD values. AGIS and Canadian glaucoma study group have also found higher age to be a significant risk factor for glaucoma progression.

#### Conclusions

Here we present the case of a 62 years old patient with POAG with severe visual field defect who showed no deterioration after four years even without treatment although he had all the risk factors for progression like higher age, worse MD values as reported by studies earlier. It raises few questions regarding pathophysiology of glaucoma and risk factors for glaucoma progression. Our current knowledge about glaucoma progression fails to explain this particular case.

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## P-FS-062

# COMPARISON OF MICROPERIMETRY, OPTICAL COHERENCE TOMOGRAPHY AND HUMPHREY VISUAL FIELD ANALYZER IN OCULAR HYPERTENSION AND GLAUCOMA PATIENTS

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### Purpose

To evaluate the relationships between humphrey visual field, Macular Integrity Assessment (MAIA), and ganglion cell analysis (GCA) parameters in glaucoma and ocular hypertension.

### Methods

A total of 55 participants (20 PAAG, 17 OHT and 18 controls) were enrolled in this prospective study. All subjects underwent a complete ophthalmic examination including visual acuity measurement, applanation tonometry, and dilated fundus examination. Visual fields were measured with the MAIA and Humphrey Field Analyzer (HFA) using 10-2 pattern. All subjects underwent measurements for GCA thickness by Cirrus HD-OCT.

### Results

In glaucoma group, significant differences were detected in terms of GCA parameters and perimetry (MAIA and HFA) values ( $P < 0.05$ ). There was a moderate correlation between MAIA and SAP values. The majority of GCA parameters showed moderate correlation with perimetry (MAIA or HFA) values.

### Conclusions

Macular sensitivity evaluated by MAIA correlates significantly with standard automated perimetry and GCA. Three methods can be used for diagnosis and follow-up of glaucoma patients.

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**P-FS-063**

**COMPARISON BETWEEN LONG-TERM AND SHORT-TERM VARIABILITY ON STANDARD AUTOMATED PERIMETRY (SAP)**

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**Purpose**

To assess short- and long-term variability on standard automated perimetry (SAP) testing in glaucoma patients.

**Methods**

Ordinary least squares (OLS) linear regression models of SAP mean deviation (MD) were fit over time for tests conducted both over the long-term (annually) as well as for a sequence of tests conducted over a short period of time (within 4 weeks). Residuals were calculated by subtracting the predicted values from the actual values. The standard deviation (SD) of the residuals of each patient was used as a measure of variability. A paired *t*-test was performed to test the hypothesis of equality of test-retest variability between short- and long-term periods.

**Results**

Seventy-four eyes of 43 glaucoma patients were included in the study. Patients had a median of 5 (range: 3 to 6) tests conducted over an average of  $3.92 \pm 1.04$  weeks for assessment of short-term variability. The same patients also had a median of 5 additional tests over  $4.37 \pm 1.26$  years for assessment of long-term variability. The average SD of residuals was significantly higher in the long-term sequence of fields versus the short-term ( $1.81 \pm 0.10$  dB vs.  $1.42 \pm 0.07$  dB, respectively;  $P < 0.001$ ).

**Conclusions**

Long-term variability of visual fields is significantly greater than short-term variability. Approaches that use short-term test-retest to establish normative levels of variability for detection of glaucoma progression (e.g., the Guided Progression Analysis) may significantly underestimate the variability in the long-term, potentially overestimating progression in some cases.

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## P-FS-064

### CORRELATIONS BETWEEN MACULA VESSEL DENSITY AND MACULA THICKNESS IN EARLY STAGE OF PRIMARY OPEN-ANGLE GLAUCOMA

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#### Purpose

To assess the correlations between superficial and deep macula vessel density and the perifoveal inner and outer macula thicknesses in patients with early stage of Primary Open-angle Glaucoma (POAG) using the optovue optical coherence tomography Angiography (Angio- OCT).

#### Methods

Included in a cross-sectional study conducted at the 3<sup>rd</sup> City Hospital, Minsk, Belarus, were 60 eyes of 43 patients with early POAG, 44 eyes of 27 glaucoma suspects and 30 eyes of 15 control subjects with a respective mean age of  $65.47 \pm 9.59$ ,  $56.53 \pm 9.31$  and  $51.65 \pm 4.16$  who underwent vessel density and structural measurements of the 6 x 6 mm macula zone using Angio-OCT, RTVue-100. Parameters evaluated were the total, superior, inferior, nasal and temporal quadrants of the superficial and deep vessel density and the perifoveal inner and outer macula thicknesses. A Spearman Rank Order Correlations was use to compare between the vessel density and the structural changes.

#### Results

A significant decrease in parameters of both the macula vessel densities and the macula thicknesses were noticed in the early POAG group as compared to the control group ( $P < 0.05$ ). Most parameters of the vessel densities were positively correlated to the macula thicknesses but none was statistically significant ( $p > 0.05$ ). The highest correlation was noticed between temporal inner macula thickness and the deep vessel densities in the inferior macula quadrant ( $R = 0.35$ ).

#### Conclusions

The macular vessel density is a promising parameter for glaucoma diagnosis but there is no statistically significant correlation to the structural changes of the macula in early POAG using the angio-OCT, RTVue-100.

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## P-FS-065 IMPROVING OBJECTIVE PERIMETRY

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### Purpose

Multifocal pupillographic objective perimetry (mfPOP) is an evolving method. Our published cross-sectional study of early- to late-stage macular degeneration patients reported that a new mfPOP spatio-temporal sequence method, Clustered-Volleys, produced 46% better signal to noise ratios (SNRs) and concomitant improvements in sensitivity and specificity.<sup>1</sup> Here we analyse 440 pairs of head-to-head comparison tests of our previous best mfPOP test with newer Clustered-Volleys tests on 96 normal subjects to see if the SNR improvements are significant for a larger study group and several Clustered-Volleys variants.

### Methods

The 96 normal control subjects (47 males) were drawn from 6 experiments having the age groups:  $21.0 \pm 1.0$ ,  $25.9 \pm 12.0$ ,  $37.7 \pm 19.7$ ,  $45.8 \pm 13.9$ ,  $66.0 \pm 8.6$  and  $70.2 \pm 4.9$  years (mean  $\pm$  SD). Within each experiment the previous best sequence method, termed Continuous, and the new Clustered-Volleys sequence method, were compared in random order. The tests were otherwise identical in terms of luminance and spatial layout of the stimuli comprising 44 radially-scaled stimuli per eye. The oldest and youngest groups saw macular stimulus arrays spanning the central 30 degrees: termed Macular as in [1], and MacDim for an up to 4-times dimmer version. The other 4 experiments presented stimuli spanning the central 60 degrees, termed Wide1 to Wide3, and a dimmer variant termed WideDim. Both eyes were tested concurrently over 6 minutes, each eye seeing 22 independent stimuli per second. The multifocal response estimation process provided a t-statistic based SNR for each region of each eye (and pupil). The input variable for analysis (Matlab 2016b) was the mean t-statistic for each subject (computed across regions, eyes, pupils and any repeats).

### Results

The mean t-statistic for the Continuous stimuli was  $2.93 \pm 0.59$  and for Clustered-Volleys  $4.09 \pm 0.66$ , providing an improvement in SNR of  $41.1 \pm 8.36$  % (all mean  $\pm$  SD). Across the six experiments the improvements in SNR ranged from 35% to 57% (Figure). For each of the six experiments the improvements in SNR were significant at  $P < 0.0001$ .

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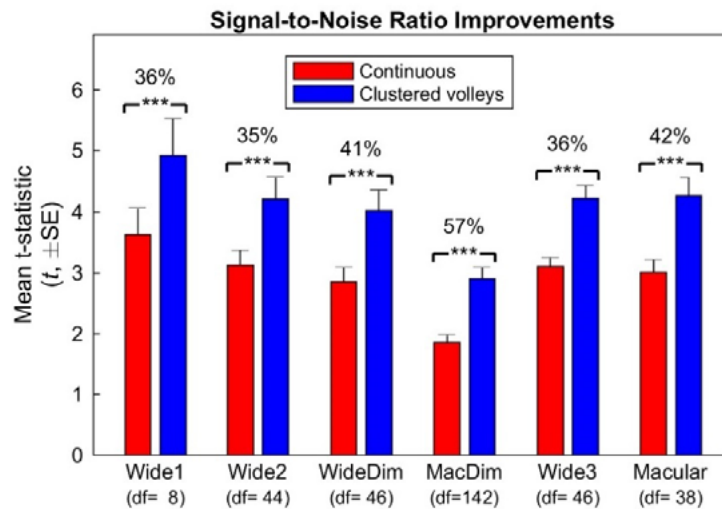
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## Image



## Conclusions

The newer Clustered-Volleys stimuli improved SNRs by 40% across all ages and a range of stimulus array sizes and luminance levels. Macular stimuli can provide responses that are as large and reliable as those of wide-field stimuli having the same relative spatial resolution of the fields.

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## P-FS-066

# INCREASING SPOT SIZE WITH ECCENTRICITY IMPROVES PERIMETRY OUTCOMES

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### Purpose

We consider whether spot-size scaling will return constant thresholds and variability across the visual field.

### Methods

Perimetric thresholds across the central visual field (1-27 deg) and Frequency-of-seeing (FOS) curves were measured in 5 normal eyes (ave age = 22). Spot scaling was determined from empirical data provided by Sloan (1961) to return constant thresholds. Perimetric testing was established on an Apple Ipad 3 using commercially available software (Melbourne Rapid Field, MRF) and a 5 cd/sq.m. background. The perimetry outcomes were retested 8 times to give mean and variability in threshold. The FOS curve was established at 6 locations along the 22 degree meridian from 1 to 27 degs on the same background using 40 presentations at each of 9-10 luminance steps (total 360-400 presentations: 10-12 mins); the transition was modelled with a cumulative normal function (mean = threshold, stdev = variability). Response reliability was determined by measuring false positive and false negative rates in both the perimetry and FOS tests. Thresholds are expressed as equipment specific decibels given the maximum light output of our tablet (360 cd/sq.m). FOS curves were also established for spots having a Goldman size 3 at 1 and 27 degs to determine the difference that size scaling has on performance.

### Results

Our observers gave reliable outcomes with an average false positive rate 0.025 and a false negative rate of 0.036. We find that spot-size scaling for our background luminance returns similar thresholds at 1 and 27 degrees in normal eyes (30.6 vs 30.1 dB). Despite the 0.5 dB difference in threshold (12% luminance increment), the standard deviation of the cumulative normal (FOS slope) was 44% flatter at the 27 degree location (slope 0.46) than at the central 1 degree location (slope 0.35) indicating that size scaling does not stabilise threshold variability. However, compared to a Goldman 3 spot, thresholds at 1 deg (30.3 dB) were similar but lower at 27 deg (23.9 dB) consistent with the hill of vision. The G3 spot gives increased variability at 27 degs (1.51 dB) compared to the size scaled target.

### Conclusions

Perimetric spots can be size-scaled to return constant thresholds across the visual field and to reduce variability in the periphery. Size scaling results in a better signal-to-noise for the detection of a 3 dB change at peripheral locations (eg 6.5 vs 2.0) and would be beneficial for monitoring glaucoma.

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## P-FS-067 GLAUCOMA PROGRESSION DETECTION IN ADVANCED DISEASE

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### Purpose

Sensitive methods for glaucoma progression detection are essential to ensure timely treatment for preservation of vision. Several studies demonstrated that in advanced glaucoma, structural measurements of the peripapillary retinal nerve fiber layer (RNFL) reach the minimal measurable level (floor effect) where no further changes are measurable while visual field (VF) still demonstrates worsening of the disease. In this study we evaluate the ability of macula and optic nerve head (ONH) measurements as alternative regions to detect disease progression when RNFL measurements reach the floor effect.

### Methods

Subjects with advanced structural glaucoma, defined as baseline Cirrus HD-OCT average RNFL  $\leq 60\mu\text{m}$ , with  $\geq 4$  visits with qualified perimetry and OCT scans of macula and ONH were enrolled. In phase 1 of the study we examined progression in the macula and ONH in 49 eyes (41 subjects). In phase 2, we further stratified a cohort of 44 eyes (37 subjects) to those with no change in the macula and those showing change in the macula and examined ONH progression.

### Results

In phase 1 of the study, the average age at baseline was 67 years (range 44-87) and the mean follow-up duration was 40.1 months. Baseline mean deviation (MD) and RNFL were  $-11.38 \pm 6.06\text{dB}$  and  $55.20 \pm 3.60\mu\text{m}$ , respectively. Longitudinal RNFL rate of change was not significant, while macula ONH and VF parameters demonstrated a statistically significant rate of change (ganglion cell inner plexiform layer (GCIPL), cup volume, rim area, vertical C/D ratio, average C/D ratio). In phase 2, the baseline age was similar to phase 1 with a slightly longer follow-up (49.0 months). The GCIPL change group had significantly thicker baseline GCIPLs compared to the no change group ( $60.30 \pm 7.81\mu\text{m}$  and  $53.36 \pm 4.90\mu\text{m}$ , respectively). In the no change group, there was no longitudinal change detected for GCIPL and RNFL whereas VF and ONH parameters (vertical and average C/D ratios and cup volume) showed significant change.

### Conclusions

Eyes with advanced structural glaucomatous damage show changes in macula and ONH when no changes are detected in the RNFL. When no further change is detected with macular parameter, there are still changes detected in the ONH. This highlights the potential role of macular and ONH parameters in monitoring glaucoma progression in advanced disease.

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**P-FS-068**

**COMPARISON OF DIFFERENCE IN PROGRESSION RATE OF NORMAL-TENSION GLAUCOMA GROUPS CLASSIFIED BY HIERARCHICAL CLUSTER ANALYSIS**

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Eun Woo Kim\*

**Purpose**

To investigate differences in progression patterns of normal-tension glaucoma patients in three clusters classified by Hierarchical cluster analysis.

**Methods**

Among 200 eyes of NTG patients classified by HCA in 2015 who were followed up until now, we evaluated the progression rate in SD-OCT and visual field test and compared characteristics of them.

**Results**

A total of 153 patients were followed up and the mean observation period was 5 years. In cluster 1, which showed early glaucomatous damage in the previous report, the mean retinal nerve fiber layer (RNFL) reduction rate was  $-0.83 \mu\text{m} / \text{year}$ . In cluster 2, which showed moderate glaucomatous damage,  $-0.45 \mu\text{m} / \text{year}$ , and In cluster 3, which showed young and myopic glaucomatous damage,  $-0.36 \mu\text{m} / \text{year}$ , respectively. However the frequency distribution of cluster 3 showed a double-peak pattern, the RNFL reduction rate was  $0.11 \mu\text{m} / \text{year}$  in non-progressive group while the RNFL reduction rate was the fastest as  $-1.07 \mu\text{m} / \text{year}$  in progressive group.

**Conclusions**

The progression rates may be different depending on the severity of glaucoma even in normal tension glaucoma. In particular, we found that two different progression characteristics were mixed in normal tension glaucoma associated with young and myopia.

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**P-FS-069**

**COMPARISON OF VISUAL FIELD PROGRESSION AFTER TRABECULECTOMY WITH PHACOEMULSIFICATION OR AGV WITH PHACOEMULSIFICATION IN ASIAN EYES WITH GLAUCOMA**

Yanlong Wu\*

**Purpose**

Comparing visual field (VF) progression post-surgery in trabeculectomy with phacoemulsification or AGV with phacoemulsification.

**Methods**

Inclusion criteria: glaucoma patients who underwent trabeculectomy with phacoemulsification (n = 60) or AGV with phacoemulsification (n = 9) once only, with no other surgery; follow-up with at least 5 static automated perimetry on Humphrey Field Analyzer (Carl Zeiss Meditec, Dublin, CA) with 24-2 SITA Standard algorithm; reliable fields (<20% fixation losses, <30% false-negatives, <30% false-positives).

VF progression was determined by linear regression analyses of Visual Field Index (VFI) and Mean Deviation (MD). Paired *t*-test was used for analysis.

**Results**

Subjects were aged  $76.3 \pm 8.58$  years. 40 (58%) had primary open angle glaucoma, 24 (35%) primary angle closure glaucoma and 5 (7%) secondary glaucoma. Duration of follow-up was  $8.26 \pm 4.21$  years post-surgery.

Post-surgically, mean reduction in VFI/year for trabeculectomy with phacoemulsification and AGV with phacoemulsification were -0.67% and -3.17% respectively ( $P < 0.01$ ). Mean reduction in MD/year for trabeculectomy with phacoemulsification and AGV with phacoemulsification were -0.15dB and -1.09dB respectively ( $P < 0.01$ ).

**Conclusions**

VFI/year and MD/year were significantly lower for patients who underwent AGV with phacoemulsification compared to trabeculectomy with phacoemulsification.

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## P-FS-071

### INTER-EYE ASYMMETRY OF OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY VESSEL DENSITY AND THICKNESS PARAMETERS IN UNILATERAL EXFOLIATION SYNDROME

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#### Purpose

To investigate inter-eye retinal vessel density and thickness asymmetry in unilateral exfoliation syndrome (XFs), and its potential utility for early detection of glaucomatous damage.

#### Methods

Fifteen subjects with unilateral XFs eyes enrolled in the study, vessel density was obtained from optical coherence tomography angiography (OCT-A) macular scans. Thickness parameters of peripapillary retinal nerve fiber layer (RNFL) and macular ganglion cell complex (mGCC) was measured with spectral-domain optical coherence tomography (SD-OCT) scans. Inter-eye asymmetry was calculated by taking the absolute value of difference in vessel density and thickness parameters between the XFs and normal eyes.

#### Results

Mean age was 64,20 (58-77) years in the study group. Inter-eye retinal vessel density were not significantly different between XFs and normal eyes ( $p = 0,3$ ). Also, no significant difference in peripapillary RNFL and mGCC thickness asymmetry were found ( $p = 0,2$  and  $p = 0,08$  respectively).

#### Conclusions

Vessel density can be quantified by OCT-A measurement. There were no inter-eye asymmetry in macular vessel density, peripapillary RNFL and mGCC thickness between unilateral XFs and control eyes. Longitudinal studies are needed to better characterize the relationship of vessel density and thickness asymmetry with the development and progression of glaucoma.

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## P-FS-072

# THERMAL AND MECHANICAL STRESS ENHANCE STEROID-INDUCED AUTOTAXIN EXPRESSION AND FIBROTIC RESPONSE IN THE HUMAN TRABECULAR MESHWORK CELLS

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### Purpose

To determine the autotoxin (ATX) levels and fibrotic changes induced by dexamethasone (Dex) treatment following either thermal or mechanical stress in the cultured human trabecular meshwork (HTM) cells.

### Methods

HTM cells were isolated from the human eyeballs, and then cultured in-vitro. Its then divided into several groups; Dex (100nM) group [Dex], Dex+thermal stress (100W diathermy) group [Dex+Heat], and Dex+mechanical stress (manual scratching) group [Dex+Scratch]. The regulation of ATX expression, and changes in the actin cytoskeleton, extracellular matrix (ECM), as well as  $\alpha$  smooth muscle actin (aSMA) were determined by immunofluorescence, immunoblot and real-time quantitative PCR (RT-qPCR) analyses. The effects of ROCK inhibitor (K115) were also investigated.

### Results

The level of ATX, an enzyme involved in the generation of lysophosphatidic acid (LPA), was significantly up-regulated in the Dex and Dex+Heat groups when compared to control group ( $p = 0.0343$  and  $p = 0.0212$ ); though the difference in raised ATX levels between these two groups were insignificant. Treatment with K115 significantly attenuated the up-regulation of ATX in the Dex+Heat group ( $p = 0.009$ ). However, K115 showed no significant effects on ATX expression in neither Dex nor Dex+Scratch groups. Among the fibrotic markers, the expression of fibronectin was significantly induced by thermal and mechanical stress without Dex, whilst col4 was significantly up-regulated in the Dex+Heat group. Interestingly, aSMA was significantly up-regulated in Dex, Dex+Scratch, and Dex+Heat groups when compared to control group ( $p = 0.0274$ ,  $0.0410$ , and  $0.0032$  respectively), and this raised level was noted to have significant difference between the Dex and Dex+Heat groups ( $p = 0.0069$ ). The up-regulation of aSMA in these three groups was significantly attenuated by K115 treatment.

### Conclusions

The results from this study showed raised ATX and aSMA levels were induced by Dex, and thermal stress can further enhance aSMA expression. All these collectively suggest the potential role of thermal stress in cellular and fibrotic changes within the HTM cells, more so when combined with Dex treatment. ROCK inhibitors may have the potential to withstand the influences of Dex and thermal stress, hence making it a promising treatment modality.

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5. Autotaxin–Lysophosphatidic Acid Pathway in Intraocular Pressure Regulation and Glaucoma Subtypes. Megumi Honjo; Nozomi Igarashi; Makoto Kurano; Yutaka Yatomi; Koji Igarashi; Kuniyuki Kano; Junken Aoki; Robert N. Weinreb; Makoto Aihara

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## P-FS-073

# RELIABILITY OF LOW FREQUENCY CONTACT B SCAN IN ASSESSMENT OF OPTIC NERVE HEAD CUPPING

Snober Yousuf\*

### Purpose

Optic disc analysis is a key step in glaucoma evaluation and clear media is a prerequisite for its visualisation. The purpose of study was to evaluate reliability of low frequency contact Bscan in detecting optic nerve head cupping and correlating it with clinical finding. Assessing the status of optic nerve head helps to devise an appropriate surgical plan and explain visual prognosis to patient.

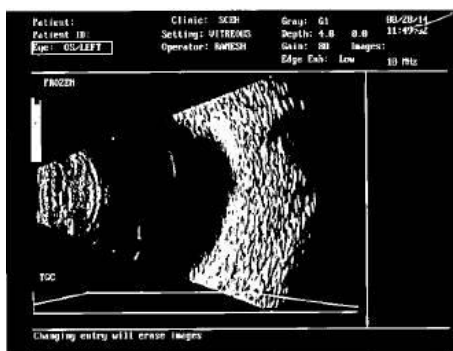
### Methods

A prospective, single blinded, cross sectional study was designed. The study included patients posted for surgery in whom the optic disc evaluation was not possible due to media opacity. Ultrasonography was performed by a single investigator using B scan of 10 MHZ frequency and findings documented as absence and presence of optic nerve head cupping and later on correlated with clinical findings. Best images were frozen and photographs taken.

### Results

A total of 371 subjects participated in the study. The average age was 60 years (Range 13-90 years). The sensitivity of Bscan in predicting optic nerve head cupping was found to be 82.60% (95%CI 0.80-0.90) with specificity of 100% (95%CI 0.97-1). In patients with cup:disc > 0.8 sensitivity was 100% while a decrease in cup:disc < 0.6 led to decrease in sensitivity to 41.4%.

### Image



### Conclusions

Our data suggests that even by low resolution contact B scanner, we can detect glaucomatous optic disc cupping in patients with cup:disc ratio  $\geq 0.8:1$  with high sensitivity and specificity. It is a cost effective method, beneficial in patients with opaque media and can help in taking timely intervention and subsequently explaining visual prognosis to patient.

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## P-FS-074

### PREDICTION PRECISION OF VISUAL FIELD BY RETINAL FIBER LAYER THICKNESS IN PANEL DATA

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#### Purpose

To investigate the spatio-temporal relationship between visual function and retinal structure; evaluate prediction precision of visual sensitivities by retinal fiber layer thickness (RNFL) and compare it against varies RNFL thickness parameters.

#### Methods

Multivariate partial least squares regression (PLS-R) with data decomposition from analysis of variance (ANOVA-PLS-R)<sup>1</sup> was adopted to model the spatio-temporal relationship between Cirrus OCT (Carl ZeissMeditec, Dublin, CA) optic nerve head (ONH) RNFL thickness maps and standard automated perimetry (SAP) visual sensitivities from 90 glaucoma subjects with at least 8 visits followed for at least 48 months. Between-subject PLS-R model, which modelled the time-invariant spatial relationship, was fitted; and prediction precision was evaluated by the percentage of variation explained.

#### Results

91.4% of total variation of visual sensitivities in the panel data was accounted for the between-subject variation. Among those, 76.7% of the between-subject variation was explained and summarized by 11 significant components ( $p \leq 0.030$ ) constructed based on the whole ONH RNFL thickness map using PLS-R (Fig. 1.) Whereas, only 3 significant components can be constructed based on the circular RNFL thickness profile, 1 significant component can be constructed based on the 12 clock-hour RNFL thicknesses, the 4 sectors RNFL thicknesses or the average RNFL thickness with 42.7%, 30.4%, 29.5% or 24.9% of the between-subject variation explained, respectively.

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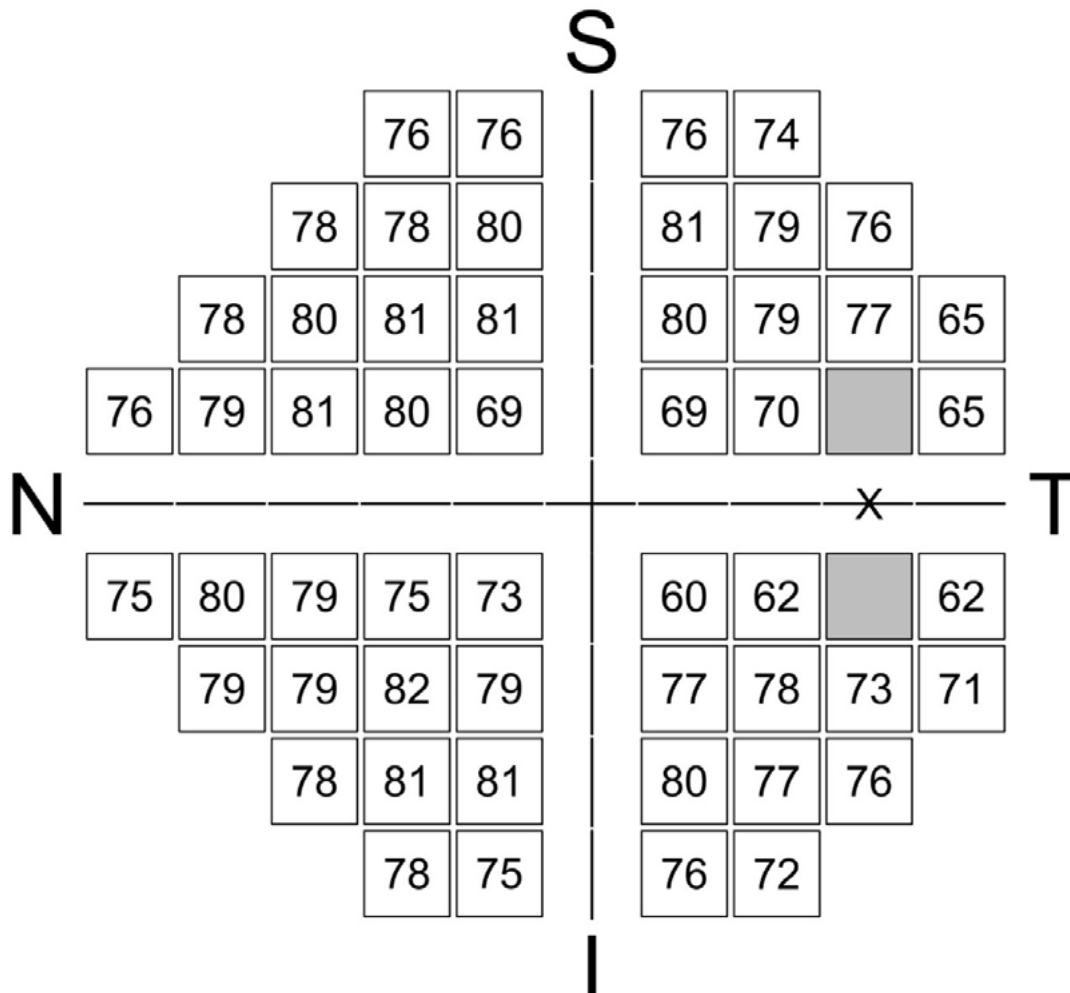
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## Image

Fig. 1 Percentage of between-subject variation explained by RNFL thickness map in the 52 visual field positions



## Conclusions

Most of the association between retinal structure and visual function can be explained through a time-invariant spatial relationship. Our findings reconfirmed that there exists only mild to moderate correlations between the visual sensitivities and the 12 clock-hour, the 4 sectors or average RNFL thicknesses.<sup>2</sup> While, prediction precision of visual sensitivities based on the whole ONH RNFL thickness map is significantly higher than that based on the circular RNFL thickness profile, the 12 clock-hour RNFL thicknesses, the 4 sectors RNFL thicknesses or the average RNFL thickness ( $p < 0.018$ ). The whole ONH RNFL thickness map can provide better insight for the prediction of visual function than just based on the evaluation of RNFL thickness parameters.

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## P-FS-075

### DETECTING VISUAL FIELD PROGRESSION BY CLUSTER-BASED VS GLOBAL-BASED TREND ANALYSIS AMONG GLAUCOMA PATIENTS

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#### Purpose

To compare glaucomatous visual field progression identified by cluster-based trend analysis versus global indices-based trend analysis.

#### Methods

This is a retrospective observational study of the visual fields of glaucoma eyes which had  $\geq 4$  reliable visual fields with a minimum follow up of 1 year. An Octopus perimeter was used with the G-standard dynamic strategy. Eyes which had cataract surgery within the follow-up period were excluded. Progression was defined at the  $p < 1\%$  or  $p < 5\%$  levels of significance for both global and cluster trend analysis at the end of the follow-up period of each patient. Progression in at least one cluster was flagged as a progressing eye.

#### Results

20 patients had eligible visual field tests. Mean patient age was  $61.7 \pm 13.54$  years and most patients were females, 14/20 (70%). Angle closure glaucoma was present in 10/20 (50%) of the eyes and primary open angle was present in 6/20 (30%) of the eyes. Mean baseline LogMar visual acuity was  $0.06 \pm 0.05$  and for the final visit was  $0.10 \pm 0.05$  ( $p = 0.09$ ). Mean baseline mean deviation (MD) was  $6.95 \pm 1.84$  decibels (dB) and for the final visit was  $8.64 \pm 1.89$  dB ( $p = 0.05$ ). At the end of follow-up, for global based trend analysis, progression was identified in 8/20 (40%) of the eyes at both the  $p < 5\%$  and  $p < 1\%$  levels of significance. At the end of follow-up with cluster-based trend analysis, progression was identified in 17/20 (85%) of the eyes at both the  $p < 5\%$  and  $p < 1\%$  levels of significance. Cluster 9 was the most frequently flagged cluster as progressing at both the  $p < 1\%$  and  $p < 5\%$  levels of significance. The mean global rate of progression was  $0.6 \pm 0.87$  dB/year. The mean cluster 9 rate of progression was  $0.9 \pm 1.46$  dB/year. At the end of follow-up, cluster-based trend analysis flagged significantly more progressing eyes versus global-based trend analysis both at the  $p < 5\%$  ( $p = 0.01$ ) and at  $p < 1\%$  levels of significance ( $p = 0.01$ ).

#### Conclusions

Cluster-based trend analysis may be more useful in detecting progression, and in monitoring glaucoma changes versus global-indices based trend analysis.

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**P-FS-076**

**RETINAL VASCULAR TOPOGRAPHY INFLUENCES THE SPECTRAL DOMAIN OCT DIAGNOSTIC GLAUCOMA CLASSIFICATION IN MYOPIC EYES**

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**Purpose**

To determine the influence of the retinal vascular topography on the diagnostic classification of peripapillary retinal nerve fiber layer thickness measurements by spectral-domain optical coherence tomography (OCT), in healthy myopic subjects.

**Methods**

A total of 137 eyes from 137 healthy myopic subjects were included in this cross-sectional observational study. Median (inter-quartile range) refractive error was -4.87 (-1.81 to -7.93) D. The peripapillary retinal nerve fiber layer (RNFL) in each eye was imaged with Cirrus HD OCT. We determined the locations of the major supratemporal and infratemporal retinal veins/arteries at the 3.46 mm OCT measurement circle and calculated an artery and vein angle. We recorded (1) the diagnostic classification (within normal limits, borderline, or outside normal limits) from the clock-hours map and (2) the color-coded (yellow or red) area from the deviation map provided by the device, based on the internal normative database. Factors associated with an abnormal diagnostic classification were evaluated with logistic regression; multiple linear regression analysis was performed to evaluate the factors associated with the color-coded area.

**Results**

Both the retinal artery angle and retinal vein angle were positively correlated with the RNFL peak thickness angle (correlation coefficient 0.69 and 0.51, respectively; both  $P < 0.001$ ). A smaller artery angle was significantly associated with an abnormal diagnostic classification (odds ratio 0.97 per degree,  $p = 0.006$ ) and the color-coded area ( $p = 0.008$ ).

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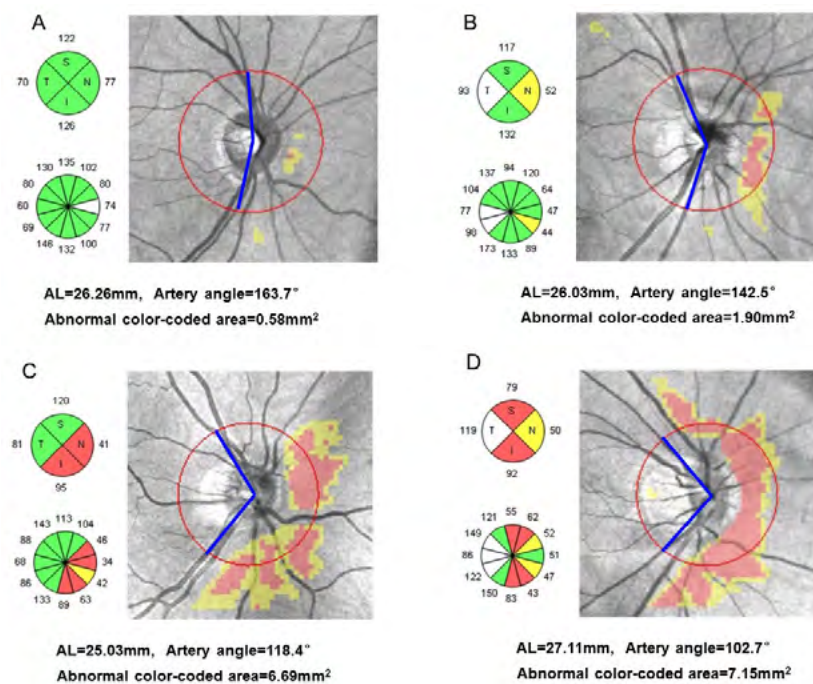
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## Conclusions

The retinal vascular pattern significantly affects the RNFL thickness profile. Eyes with a small artery angle are prone to false-positive glaucoma classification.

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## P-FS-077

# INFLUENCE OF MUSIC ON INTRAOCULAR PRESSURE AND MORPHOLOGY OF SCHLEMM'S CANAL: AN SS-OCT STUDY

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### Purpose

To study whether listening to music has an impact on intraocular pressure (IOP), and explore underlying mechanism of IOP variation using swept-source optical coherence tomography (SS-OCT).

### Methods

The study consisted of two parts. In part 1, three kinds of music, specifically soothing, positive and negative music were used respectively in 15 healthy subjects. IOP was measured before and after music intervention. The music that reduced IOP was utilized. In part 2, IOP at 6 time points of 7:30AM, 9:30AM, 11:30AM, 13:30PM, 15:30PM and 17:30PM was measured in 15 healthy subjects to determine when the individual's IOP peaked. On the second day, the subject listened to the aforementioned music for 15 minutes at his/ her IOP peak time. Blood pressure (BP), heart rate (HR) and IOP were measured, and the Schlemm's canal (SC) at nasal, temporal, superior, and inferior limbus were imaged by SS-OCT before and after listening to music. The diameter and the cross-sectional area of the SC were measured by ImageJ.

### Results

Mean IOP differences induced by soothing, positive and negative music were -1.66mmHg ( $p = 0.0157$ ), -0.20mmHg ( $p = 0.5661$ ), and 1.27mmHg ( $p = 0.0147$ ). Mean IOP at each time point was 12.12, 11.33, 11.98, 10.63, 11.38, and 12.35mmHg. In part 2, IOP was lowered significantly by 1.26mmHg ( $p = 0.0114$ ). The observable rate of SC was highest in the temporal region (96.7%) and lowest in the inferior region (67.7%). SC area in the nasal quadrant showed a significant enlargement (53.88 pixels,  $p = 0.0384$ ). SC area in the temporal region showed a tendency towards enlargement (26.64 pixels,  $p = 0.0742$ ). Change of SC diameter in the temporal region was positively correlated with IOP difference ( $r = 0.577$ ,  $p = 0.0309$ ). The differences of HR and BP were not significant.

### Conclusions

Listening to soothing music leads to expansion of SC, and ultimately reduces IOP. Nasal and temporal SC are most likely involved. The effect of music on SC needs to be further investigated.

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## P-FS-078

# ZINN-HALLER ARTERIAL CIRCLE BY OCT-ANGIOGRAPHY IN DIAGNOSIS OF GLAUCOMA ASSOCIATED WITH MYOPIA

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### Purpose

To evaluate the informative value of visual vessels assessment of Zinn-Haller peripapillary arterial circle in the complex diagnosis of glaucoma associated with myopia according to OCTA.

### Methods

26 eyes with severe POAG associated with high myopia were examined. Inclusion criteria: axial length 25 mm and above, the glaucoma diagnosis, compensated IOP. The control group consisted of 30 eyes with uncomplicated myopia.

### Results

Significant differences in the CH ( $8,56 \pm 1,11$  and  $11,1 \pm 1,8$ ,  $P = 0,01$ ), GCC ( $75,25 \pm 8,58$  and  $87,67 \pm 3,21$ ,  $P = 0,03$ ), rim area ( $1.03 \pm 0.36$  and  $1.6 \pm 0.42$ ,  $P = 0.05$ ) and PPA area ( $1.94 \pm 0.5$  and  $1.05 \pm 0.15$ ,  $P = 0.005$ ), choroid thickness in the lower ( $131.36 \pm 41.98$  and  $226.5 \pm 98.13$ ,  $P = 0.01$ ) and nasal ( $57.63 \pm 9.81$  and  $216 \pm 122.4$ ,  $P = 0.0006$ ) segments, different from those in the second group were revealed in the first group.

The presented results of the study and interpretation of the mechanisms of the formation of GON dictate the necessary to take into account changes in the vascular membrane, since choroid is the main and leading collector involved in the blood supply of the ONH. Choroidal thickness reduction in patients with glaucoma indicates the failure of trophic and metabolic processes. Undoubtedly, the cause of the formation of GON should be considered as optic disc ischemia, which occurs as a result of violation of peripapillary blood flow, having a choroidal source of blood supply.

Selection beta and gamma zones PPA determines the course and development of both myopic and glaucoma changes of optic disc. Both in myopia and glaucoma, the formation of PPA occurs in violation of blood flow in the choroidal peripapillary arteries. It is obvious that the increase in the area of PPA in glaucoma occurs due to the formation of the beta zone against the background of ophthalmotonus fluctuations.

The decrease in the density of small branches and the exposure of large vessels of the Zinn-Haller arterial circle with the formation of nonperfusion zones in the eyes of patients with glaucoma associated with axial myopia may be the result of a decrease in perfusion pressure and a decrease in the tolerance of optic disc.

### Conclusions

Thus, visualization and evaluation of dystrophic changes in the peripapillary retina and blood vessels of the peripapillary Zinn-Haller circle opens up prospects for the diagnosis of glaucoma in combined pathology.

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# Surgery & Wound Healing

## P-FS-079

### INCISIONLESS, MINIMALLY INVASIVE SUB-TENON'S ANAESTHESIA IN GLAUCOMA SURGERY: REAL WORLD OUTCOMES

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#### Purpose

To evaluate the benefits of incisionless sub-tenon's anaesthesia in glaucoma surgery.

#### Methods

A prospective audit evaluating subtenons block using 26 gauge (28mm) lacrimal cannula without conjunctival incision on patients undergoing glaucoma surgery over 12 months between 2017-18. We recorded demographics, axial length, anticoagulants or anti-platelets, glaucoma drops and surgical data.

Primary outcomes:

- Degree of pain during injection
- Number of quadrants of chemosis and subconjunctival haemorrhage
- Degree of akinesia and ptosis
- Pain during surgery

#### Results

A total of 55 patients were treated. Mean age was 70 years (range 46-89) with a 3:2 Male: Female ratio. 16% were on anticoagulant or anti-platelet therapy. 55% underwent trabeculectomy, 18% bleb needling, 16% Baerveldt tube implantation, 9% glaucoma surgery revision, 2% cyclodiode laser. 64% of eyes had had previous surgery, with 20% having undergone 2 or more previous operations. In our cohort, 47.3% experienced no pain during subtenons block and none had more than mild discomfort. Chemosis was absent in 44%, 44% had 1 quadrant of shallow chemosis, 10% had 2 quadrants, 2% had more than 2 quadrants. 11% experienced subconjunctival haemorrhage, of which one patient was on anticoagulants. 98% achieved excellent akinesia (complete or flicker) and 82% had complete ptosis. All patients were comfortable during surgery with only 18% requiring topical top-up anaesthesia.

#### Conclusions

Sub-tenons block is a popular anaesthetic choice for glaucoma surgery as it provides lasting analgesia and akinesia. However, the conventional technique requires conjunctival incision which is moderately/severely painful in 7% of patients and is reported to cause subconjunctival haemorrhage in 19-40% of patients. This incisionless technique produces excellent pain relief, lower rates of subconjunctival haemorrhage and avoids widespread chemosis. These qualities produce excellent surgical conditions and those particularly desirable in glaucoma surgery. Adoption of the technique requires specific training with special emphasis on the initial angle and depth of needle insertion.

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## P-FS-080

### OUTCOMES OF SURGICAL TREATMENT OF GLAUCOMA IN ANIRIDIA

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<sup>1</sup>Medical research foundation, <sup>2</sup>Glaucoma, Medical Research Foundation, Chennai, <sup>3</sup>Glaucoma, Medical Research Foundation, Kolkata, India

#### Purpose

To study the outcomes of surgical management of glaucoma in aniridia in terms of intraocular (IOP) control, visual acuity, complications and risk factors for failure.

#### Methods

Retrospective analysis of 50 eyes of 50 patients who underwent glaucoma surgery/laser treatment between 1986 to 2013 and were followed up until 2017.

#### Results

Mean age at surgery:  $152.9 \pm 153.5$  months. M:F: 27:23. Types of initial surgery performed: Trabeculectomy with Mitomycin C: 14 eyes (28%), Combined cataract surgery and trabeculectomy with Mitomycin C; 13 eyes (26%), Ahmed glaucoma valve implantation; 9 eyes (18%), External trabeculectomy; 8 eyes (16%), External trabeculectomy+trabeculectomy with Mitomycin C; 4 eyes (8%) and Diode Cyclophotocoagulation (CPC); 2 eyes (4%). 23 eyes (46%) required more than one surgery; median one and range 1-5. Mean follow-up period was  $9.6 \pm 7.7$  years. Successful outcome in terms of IOP ( $\leq 21$  mmHg with or without medications or loss of light perception with one or more surgeries) occurred in 7 (50%) eyes with initial trabeculectomy with MMC, 10 eyes with combined surgery (76.9%), 7 eyes with AGV (77.8%), 6 eyes with external trabeculectomy (75%), 2 eyes with external trabeculectomy+trabeculectomy (50%). Eyes which underwent primary Diode CPC failed (2 eyes, 100%). Complications following initial surgery included choroidal detachment in 4 eyes (8.0%), vitreous haemorrhage in one eye (2%), shallow retinal detachment in one eye (2%) and choroidal haemorrhage in one eye (2%); following the 2<sup>nd</sup> surgery; hyphema in one eye; following the 3<sup>rd</sup> surgery; choroidal detachment in one eye and following the fourth surgery, sclera perforation in one eye. Survival analysis showed successful outcome in 96%, 92%, 81% years and 69% at 1, 3, 4, 6 years and thereafter respectively. Reasons for loss of vision included phthisis in 4 eyes (8%), failed corneal graft in 3 eyes (6%), corneal decompensation in 4 eyes (8%), persistent hypotony in one eye (2%) and glaucomatous optic atrophy in one eye (2%). Risk factors analyzed for failure included age at surgery, gender, pre-operative visual acuity, IOP, pachymetry, corneal size, lens status and type of initial surgery. None were found to be significant.

#### Conclusions

Multiple surgeries were required in 46% to achieve a successful outcome in terms of IOP control. Poor visual outcomes were seen in 28% of eyes.

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**P-FS-081**

**MIGS IN THE AUSTRALIAN OUTBACK: THE CHALLENGE OF GLAUCOMA SURGERY IN ISOLATED AND REMOTE SETTINGS**

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**Purpose**

The favourable safety & post-operative-care profile of MIGS compared to conventional filtering procedures could enable wider availability of glaucoma surgery in outreach services. Especially in geographically remote areas such as the Australian outback, where accessibility can be a barrier. We investigate the utility of the Hydrus Microstent (Ivantis, Inc.) in meeting this special challenge in glaucoma surgery.

**Methods**

Surgeon confidence in new technology is critical in remote settings. After analyzing our 3-year metropolitan data we felt confident in the Hydrus's safety & efficacy. Engagement with stakeholders began: hospital administration, industry and prospective patients. A business and clinical case for MIGS was presented for use of this device in the remote desert mining city of Broken Hill.

**Results**

After several months discussion the proposal was accepted. MIGS surgery was conducted at Broken Hill Base Hospital in March 2018. Hydrus Microstents were donated by Ivantis. To date seven pseudophakic patients underwent device implantation; five standalone and two combined with cataract phacoemulsification. No significant complications were encountered. A cohort of four patients have reached 12 months; three standalone and one combined. In this group IOP was reduced from an average of 23 mmHg pre-operatively to 14 mmHg at 12 months, and medication reduced from an average of 4 to 2.5 at 12 months.

**Conclusions**

Australia's first remote area MIGS surgery was successfully performed in the mining city of Broken Hill. The Hydrus Microstent achieved an average 40% reduction of IOP with a 45% reduction in medications at 12 months. The procedure was safe, as standalone or with cataract surgery. MIGS may be a viable option for glaucoma patients where accessibility to outreach specialist surgical services is a challenge.

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## P-FS-083

### A FIRST-IN-HUMAN STUDY OF THE EFFICACY AND SAFETY OF MINIJECT IN PATIENTS WITH MEDICALLY-UNCONTROLLED OPEN ANGLE GLAUCOMA

Ike K Ahmed<sup>1</sup>, Christoph Hirneiß<sup>2</sup>, Philippe Denis<sup>3</sup>, Ernesto Calvo<sup>4</sup>, Kasu Prasad Reddy<sup>5</sup>, Anita Kamarthy<sup>5</sup>, Zubair Hussain<sup>6</sup>

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#### Purpose

To describe the initial safety and efficacy profile of a novel, supraciliary, micro-invasive glaucoma surgery (MIGS) drainage system, MINiject, in eyes with medically-uncontrolled primary open-angle glaucoma.

#### Methods

Using an *ab interno* approach, 25 eyes were implanted in a stand-alone procedure with a 5mm long device made of biocompatible STAR material, which is soft and flexible silicone in a micro-porous, network design. Implantation was successful in 25 eyes. Intraocular pressure (IOP), best-corrected visual acuity (BCVA), refractive status, and other ocular parameters were evaluated preoperatively and 1 day, 1 and 2 weeks, and 1, 3 and 6 months postoperatively. The primary outcome measure was IOP reduction at 6 months compared to baseline and was analyzed using a paired *t*-test. Safety evaluation entailed tabulation of the nature and frequency of adverse events.

#### Results

Mean baseline diurnal IOP was  $23.2 \pm 2.9$  mmHg using a mean of  $2.0 \pm 1.1$  medication classes. Postoperatively over the 6 month period, mean IOP ranged from 10.0–16.3 mmHg (mean reductions of 6.9–13.2 mmHg or 31.0–56.8%). At the month 6 primary endpoint, mean diurnal IOP was reduced to  $14.2 \pm 4.7$  mmHg, equivalent to a reduction of 9.0 mmHg or 39.1% ( $P < 0.0001$ ), and the mean number of IOP-lowering medications was  $0.3 \pm 0.7$ . Overall, 21 eyes (84%) at month 6 follow-up were medication-free. There were no serious adverse events related to the device or the procedure, and no additional glaucoma surgery was required. The most frequently reported ocular events in the study eye included iridocyclitis (30.8%), IOP elevation (23.1%), visual acuity reduction (11.5%) and hyphema (11.5%) – all of which were transient. There was no clinically-significant hypotony, and no clinically-relevant changes in mean refraction or visual field. No events were assessed as related to the study device.

#### Conclusions

The MINiject glaucoma drainage system lowered IOP by 39.1% and eliminated the need for medication in 84% of eyes at 6 months after surgery when implanted in a standalone procedure. In this small pilot study, there were no serious adverse events.

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## P-FS-084

# TOPICAL ANAESTHESIA VERSUS PERIBULBAR ANAESTHESIA IN PENETRATING TRABECULECTOMY

Bindu Ajith\*

## Purpose

To evaluate the efficacy and clinical practicability of topical anesthesia in comparison with peribulbar anesthesia for penetrating trabeculectomy.

## Methods

The prospective single-surgeon clinical interventional trial included 30 consecutive patients, who were randomly distributed into a topical anesthesia group and a peribulbar anesthesia group. In the topical anesthesia group, patients received preoperatively proparacaine 0.5% eye drops and intracameral lidocaine (1%). The patients of the peribulbar group received 5 ml bupivacaine (0.75%) and lignocaine (2%) along with hyaluronidase was injected into the peribulbar space. To assess intraoperative pain, each patient was asked immediately after surgery to quantitate his/her pain using visual analog scale (VAS) and modified Wong- Backer FACES Pain Rating Scale. . Pulse and blood pressure was monitored throughout the the procedure using multipara monitor by anaesthetic assistant. Surgeon satisfaction score was graded from 0 to 4 .Statistical tests using independent t test and pearson's chisquare test was done for analysis using SPSS 16.0.

## Results

Among the 50 eyes included in the study 25eyes were randomly given peribulbaranesthesia and 25eyes were included in topical anesthesia (0.5% proparacaine).The mean age in the topical group was 65.28 +/- 10.11years and the mean age in the peribulbar group was 66.6 +/- 8.63 years. 46 % females and 54 %males participated in the study. The mean VAS score in the topical group was 1.84 +/- .62 and in the peribulbar group was 3.76+/- 1.05 which was statically significant (P < 0.001) .IOP at 2 and 4 weeks was 13.88 +/-2,35 mmHg 15.30+/-2,76 in the peribulbar group and 14.56 +/- 2.84 and 14.08+/- 1.95in the topical group respectively which is not statistically significant.surgeons stress assessment score was 3.8 in topical and 3.6 in peribulbar on scale of 0 to 4 , which was not statistically significant (p 0.328).

## Conclusions

The topical anesthesia has acceptable patient and surgeon comfort and is safe in providing a painless surgical procedure in patients undergoing trabeculectomy and also avoids serious complications related to other methods.

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## P-FS-085

### UNDERSTANDING THE IMPACT OF AQUEOUS FLOW ON WOUND HEALING PROCESS FOLLOWING GLAUCOMA FILTERING SURGERY (GFS)

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#### Purpose

Wound healing after glaucoma surgery (GFS) is compounded by the presence of foreign body (conjunctival sutures, silicone tube) and flow of aqueous. To understand the effects of aqueous, foreign body and surgical trauma on wound healing we did a comparative study of commonly expressed cytokines in the three representative groups of Adult Sprague Dawley (SD) rats.

#### Methods

GFS model was established on 43 Adult SD rats by placing a silicone tube connecting the anterior chamber to sub-Tenon's space to maintain patent aqueous flow. This represented the combined effects of surgical trauma, foreign body and flow of aqueous. The natural healing process was represented by a simple conjunctival incision followed by closure using 10-0 nylon suture (baseline group, n = 14) and the effect of foreign body was studied by placing a subconjunctival silicone tube not connected to anterior chamber (control group, n = 44). Tissue from the surgical site was harvested at specific time-points (Day 1,2,3,5,7,14 and 21). Cytokine levels were assayed using flow cytometry. Statistical Analysis was conducted using GraphPad Prism Software Version 7.0.

#### Results

In the presence of aqueous (GFS) there was an increased expression of pro-inflammatory cytokines -IL-1 $\beta$  and IL-13 (at day 2). Pro fibrotic cytokine, TGF  $\beta$  showed sustained and elevated expression till day 7 as compared to the control and baseline group where levels were back to baseline in 2 days. Anti-inflammatory cytokines showed downregulation as shown by suppression of IL-10 levels after day 2 and a delayed rise in IFN- $\gamma$  levels seen at Day 14. IL-13 showed a biphasic expression. The presence of aqueous modified its expression significantly by shifting the timeline to the right by 1-2 days. The second rise was delayed, appearing at day 14 in the experimental group as compared to day 5-7 in the control and baseline groups. TNF  $\alpha$ , IL-1  $\alpha$ , IL-6 and CXCL-1 showed no significant difference among control and experimental groups.

#### Image



Final Post-operative picture showing in situ Silicone tube connecting Anterior chamber with Subconjunctival space (Solid arrow) and a Raised Diffuse Bleb (Dotted arrow) with closure of conjunctiva using interrupted 10-0 nylon suture.

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### Conclusions

Flow of aqueous alters the wound healing process (cytokines expression) significantly quantitatively as well as qualitatively, which is distinct from normal wound healing and healing compounded by foreign body, as seen by a much higher inflammatory load to begin with and a delayed onset of remodeling.

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**P-FS-086**

**AQUEOUS OUTFLOW RESISTANCE AND ITS RELEVANCE TO MICRO-INVASIVE GLAUCOMA SURGERY**

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**Purpose**

The regulation of aqueous humour outflow has clinical implications for the medical and surgical management of glaucoma. This is especially relevant in the era of micro-invasive glaucoma surgeries (MIGS) that are highly targeted to bypassing specific sites of outflow resistance. We re-examined the evidence regarding the anatomy and physiology of aqueous outflow resistance to provide a comprehensive summary with relevance to current and future MIGS.

**Methods**

Literature review.

**Results**

Elevated IOP occurs due to impaired aqueous humour outflow. Both a passive model and a dynamic model have been used to explain outflow resistance. The passive model posits that the trabecular meshwork acts as a filter that exerts stable and passive resistance to outflow. Several pieces of evidence argue against the passive model as being solely responsible for trabecular outflow resistance. Whereas, the dynamic model proposes that trabecular outflow requires a 'biomechanical pump' in which the flexible trabecular meshwork distends and recoils in sync with the cardiac cycle, actively moving aqueous into Schlemm's canal. Unlike the passive model, the dynamic model links trabecular structure and function. A unifying model to explain all of the observations on trabecular resistance must incorporate both the passive and the dynamic model.

**Conclusions**

Technological advances are enabling increasingly sophisticated surgical management; however, optimal outcomes will require an accurate understanding of aqueous outflow resistance and a targeted approach. The potential for post-operative titration and avoidance of complications, particularly hypotony, are additional considerations.

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## P-FS-087

### RISK FACTORS FOR GLAUCOMA DRAINAGE DEVICE EXPOSURE IN A MIDDLE-EASTERN POPULATION

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#### Purpose

Identification of potential risk factors for glaucoma drainage device (GDD) exposure may help to prevent this potentially blinding complication. The purpose of this study was to evaluate the possible risk factors for GDD exposure in a tertiary eye care center in the Middle-East.

#### Methods

A retrospective case-control study was undertaken for a seven-year period (2008-2015 inclusive). All patients who presented with a GDD incident exposure were identified and were matched to a similar number of controls (without exposure) identified during the same period. Demographic factors, past ocular history, treatment and surgical technique were recorded for both groups. Bivariate and multi-variable analyses were used to identify possible risk factors for GDD exposure.

#### Results

A total of 836 patients underwent GDD surgery during this time period and 53 patients were identified with GDD exposure, giving a cumulative incident exposure rate of 6.3% (0.9% per year). Bivariate analysis showed that the median age of cases (51 years) was similar to controls (53 years) ( $p = 0.95$ ), while there was a greater proportion of women with exposure (49%) compared to the control group (28%) with a statistically significant difference  $p = 0.028$ . In the multivariable regression, female gender ( $p = 0.006$ ) and older age ( $p = 0.025$ ) were significant risk factors and use of a scleral patch ( $p = 0.02$ ) graft potentially protective.

#### Conclusions

Female gender and older age are potential risk factors identified in our study. The use of scleral patch graft is potentially protective against GDD extrusion. Further study is needed to elucidate the reasons for these causative and protective factors.

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**P-FS-088**

**SPONTANEOUS GLAUCOMA DRAINAGE DEVICE EXTRUSION AFTER EARLY POSTOPERATIVE ORBITAL CELLULITIS – CASE REPORT AND LITERATURE REVIEW**

Abdulrahman Aldarrab\*

**Purpose**

We are reporting a glaucoma patient treated with Ahmed Glaucoma Valve (AGV) who developed spontaneous AGV extrusion secondary to orbital cellulitis (OC) following AGV implantation. To the best of our knowledge, there are only 10 previous cases reported in the literature of OC following glaucoma drainage device (GDD) implantation with no previous reports of spontaneous extrusion.

**Methods**

Case report and literature review.

**Results**

A 70-year-old glaucoma patient who underwent Ahmed Glaucoma Valve (AGV) implantation developed orbital cellulitis (OC) 5 days postoperatively. On presentation, the valve was not exposed and no intraocular involvement was noted. After successful treatment of OC with intravenous and oral antibiotics, the patient presented to the clinic with the AGV completely extruded from the eye. There are only 10 previous cases of OC reported in the literature following glaucoma drainage device (GDD) implantation and no previous reports of spontaneous AVG extrusion.

**Conclusions**

In conclusion, we observed a glaucomatous patient who underwent GDD implantation and then developed the rare complication of postoperative OC. During the acute phase, the GDD was not exposed and intraocular inflammation was not present and a good outcome was achieved with medical management. However, he presented later with spontaneous GDD extrusion.

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**P-FS-089**

**OUTCOMES OF CANALOPLASTY VERSUS NON-PENETRATING DEEP SCLERECTOMY IN UNCONTROLLED OPEN ANGLE GLAUCOMA**

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**Purpose**

To evaluate the outcomes of canaloplasty and non-penetrating deep sclerectomy in uncontrolled open angle glaucoma.

**Methods**

A retrospective cohort study included patients with uncontrolled open angle glaucoma who underwent canaloplasty and non-penetrating deep sclerectomy at King Abdul Aziz University Hospital, Riyadh, Saudi Arabia between 2008 and 2016. The main outcome measures were: the intraocular pressure (IOP), the number of antiglaucoma medications, the presence of vision threatening complications, survival and success of both procedures and the need for further surgeries to control the IOP.

**Results**

Seventy-five patients were included in the deep sclerectomy and 70 patients were included in the canaloplasty group. The mean follow-up was 36.25 ( $\pm 6.6$ ) and 32.90 ( $\pm 5.9$ ) months in both groups ( $p = 0.25$ ). The mean surgical time was 42.4 ( $\pm 7.9$ ) minutes compared with 56.7 ( $\pm 10.2$ ) minutes in the canaloplasty group ( $p = 0.045$ ). The IOP and number of antiglaucoma medications decreased significantly during the whole follow up period ( $P < 0.01$ ) in both groups. There were no differences in success and survival rates between both groups ( $p = 0.50$  and  $p = 0.17$ , Log Rank respectively). More patients in the deep sclerectomy group required postoperative manipulations, mainly laser goniotomy. More eyes in the deep sclerectomy group developed postoperative leak and hypotony. But more eyes in the canaloplasty group developed intraoperative and postoperative hyphema and hemorrhagic Descemet membrane detachment.

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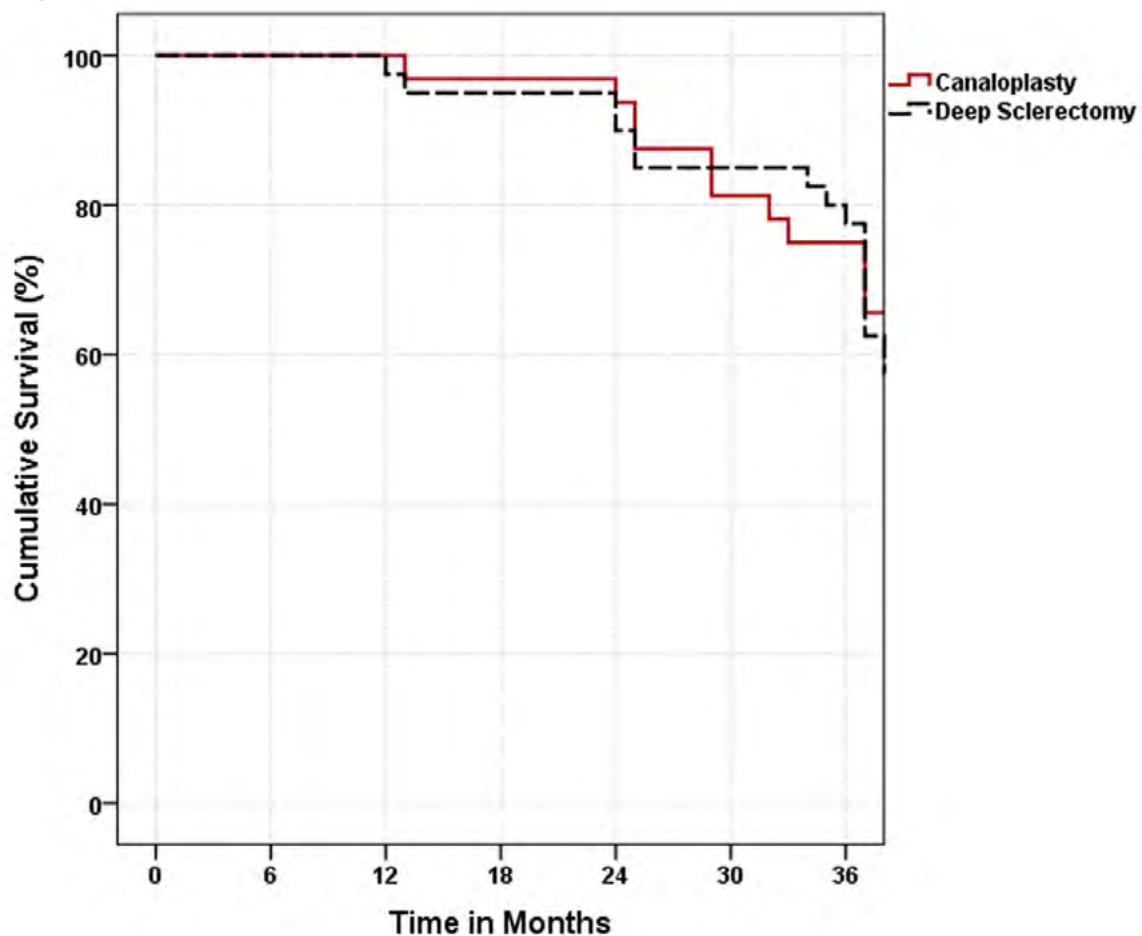
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## Conclusions

The efficacy profile of both NPDS and canaloplasty seems to be comparable in terms of IOP control and reduction of the burden of antiglaucoma medications. The surgical time needed in the NPDS group was less and the surgical cost is obviously less but more postoperative manipulations were needed for the NPDS group, mainly Nd:YAG laser goniopuncture, compared with canaloplasty. On the other hand, more corneal related complications occurred in the learning curve of canaloplasty which can be managed once detected intraoperatively. Further studies are needed to assess the efficacy and safety of both procedures according to the age group and glaucoma subtypes.

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**P-FS-090**

**COMPARISON OF SURGICAL OUTCOMES BETWEEN SULCUS AND ANTERIOR CHAMBER IMPLANTED GLAUCOMA DRAINAGE DEVICES**

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Ibrahim Alobaida\*

**Purpose**

Our goal is to evaluate the outcome of sulcus placement of tubes compared to traditional anterior chamber (AC) placement especially in primary and secondary angle closure glaucomas.

**Methods**

This is a retrospective cross-sectional case-control study where 45 patients were included in the sulcus group and 60 patients in the anterior chamber group from 2014-2017. Data were collected in pre-intra- and post-operative phases and analyzed using Excel and SPSS.

**Results**

The sulcus group showed significantly less overall complications compared to anterior chamber group with comparable intraocular (IOP) lowering in both groups. There were significantly lower rates of hyphema in sulcus compared to anterior chamber with, 3 and 17 respectively ( $P < 0.05$ ). Furthermore, the use of medications was decreased in the sulcus compared to anterior chamber.

**Conclusions**

We describe a novel technique for sulcus implantation of glaucoma tube shunts. There were less postoperative hyphema and devastating complications compared to AC implantation. This held true for primary and secondary angle closure glaucoma including patients with uveitis, which has not been previously reported in the literature. Our findings are in agreement with other studies that sulcus implant is effective and safe in term of controlling IOP in various types of glaucoma.

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## **P-FS-091** **COMPLICATIONS OF AHMED GLAUCOMA VALVE IMPLANT IN JORDANIAN PATIENTS**

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### **Purpose**

To compare the rate of complications of Ahmed Glaucoma Valve implant in Jordanian glaucoma patients to Caucasian people.

### **Methods**

We report 56 eyes of 53 patients with follow-up time of at least 6 months. The database included the indication for surgery, the intraocular pressure preoperatively, and postoperatively at different time visits, and the complications at each post-operative visit. The type and proportion of complications were documented and compared to historical data found in previous studies (n = 57 eyes) of Caucasian people using nonparametric statistical tests.

### **Results**

Bleb encapsulation was found in twenty-four eyes (42.8%) undergoing Ahmed Glaucoma Valve implant, which is higher than the rate of encapsulation in Caucasian people (23%, P: 0.02). Hypotony (IOP of less than 5 mmHg) was encountered in 2 eyes (3.5%), eye motility defects persistent for six months post-operatively was documented in one eye (1.7%), and tube related complications were found in one eye (1.7%). Tube erosion was encountered in only one eye (1.7%), a rate that is significantly lower than the rate encountered in different studies in Caucasians (5-14.3%, P < 0.05).

### **Conclusions**

Bleb encapsulation is the most common complication for Ahmed Glaucoma Valve implant in Jordanian patients, its rate is higher than the rate of encapsulation in Caucasians. Tube erosions have significantly lower rate in Jordanian people than in Caucasians. Whether these differences are related to genetic and racial differences in conjunctival and Tenon's capsule thickness need to be further investigated.

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**P-FS-092**

**COMPARISON OF LONG-TERM OUTCOMES OF TRABECULECTOMY WITH POLYVINYLPYRROLIDONE COLLAGEN VERSUS TRABECULECTOMY WITH MITOMYCIN C. 36-MONTH FOLLOW-UP**

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**Purpose**

Describe and compare the effects of intraoperative application of Polyvinylpyrrolidone Collagen (PVP) versus Mitomycin C (MMC) on the pattern of change in mean IOP reduction and mean number of medications over 36-months follow-up in patients with primary open angle glaucoma (POAG) undergoing trabeculectomy.

**Methods**

Prospective, randomized, comparative study. Twenty-eight eyes of 28 patients with POAG and no previous incisional glaucoma surgery underwent trabeculectomy and were randomized to PVP or MMC and completed a 36-month follow-up. Main outcome measures were IOP and number of glaucoma medications. Multivariate longitudinal analysis was performed by fitting a linear trend model adjusting for baseline response for the IOP outcome and a log-linear regression model with within-subject associations for the number of hypotensive medications outcome. Sensitivity analysis was performed to assess lower and higher order polynomial trends over time in IOP.

**Results**

The univariate analysis revealed that the mean IOP reduction from baseline to 36 months was 7.62 mmHg (3.05, 12.18) in the MMC group and 8.15 mmHg (-0.64, 16.95) in the PVP group. Mean percentage IOP reduction from baseline was 37.09% (15.93, 58.17) and 36.08% (5.16, 67.20) in the PVP group. Mean change in number of medications from baseline to 36 months was -0.92 medications (-3.38, +1.54) for the MMC group and -1 medication (-3.12, +1.12). Both groups had a statistically significant decline in mean IOP over the follow-up period ( $P < 0.001$ ) but there was no discernible difference between the two exposure groups in the rate of change in IOP ( $p = 0.5975$ ). Sensitivity analysis showed that a linear trend model is adequate to describe the IOP reduction over the follow-up period. Both groups had a statistically significant change in the number of hypotensive medications used between baseline and month 36 ( $P < 0.05$ ) but there was no discernible difference between exposure groups ( $p = 0.2917$ ). Both the PVP and MMC groups showed an initial reduction in number of medications until month 12 and a relatively linear increase towards month 36. A longer follow-up may be warranted to reveal differences in the number of medications between the two exposure groups.

**Conclusions**

The use of PVP during trabeculectomy achieves and maintains a statistically significant IOP reduction from baseline to 36 months and decreases the number of glaucoma medications. Secondary outcome measures showed a lower incidence of adverse events in the PVP group.

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**P-FS-093**

**PROSPECTIVE EVALUATION OF A SCHLEMM'S CANAL MICROSTENT FOR TREATMENT OF PRIMARY ANGLE CLOSURE GLAUCOMA IN COMBINATION WITH PHACOEMULSIFICATION**

Robert Edward Ang<sup>\*1</sup>

<sup>1</sup>*Glaucoma, Asian Eye Institute, Makati City, Philippines*

**Purpose**

Phacoemulsification has been shown to be effective in reducing IOP and medications in primary angle closure glaucoma (PACG) in eyes without cataracts. This study was designed to assess the preliminary safety and effectiveness of combined MIGS and phacoemulsification for treatment of cataract and PACG.

**Methods**

21 eyes from 21 subjects with cataract and PACG with IOP > 21 mmHg on at least 1 glaucoma medication or > 24 mmHg on no medications were treated with phacoemulsification and Hydrus Microstent (Ivantis, Irvine CA). Goniosynechiolysis (1-2 clock hours) was performed in the nasal hemisphere if needed to expose the trabecular meshwork (TM) prior to microstent insertion. Follow-up was conducted for 1 year postoperative.

**Results**

Study patients were 100% Asian, 75% female and mean age was 66.8+/-7.2 years. Gonioscopy showed 82% of the angle was closed prior to surgery. Mean preoperative IOP was 25.5+/-6.2 and 1.4+/-1.3 medications. Device implant was successful in 20/21 subjects, 65% required goniosynechiolysis to expose the TM prior to microstent insertion. At 6 months, mean IOP was 14.4+/-3.4 mmHg and there were 0 medications in use ( $P < 0.001$  vs. baseline for IOP and medications). The device inlet remained visible and patent despite narrow or closed angle. There were no serious adverse events or complications.

**Conclusions**

The Hydrus Microstent was associated with clinically and statistically significant reduction IOP and medication when implanted during cataract surgery in PACG. Through 6 months follow-up, the inlet remained open to the anterior chamber. There were no significant safety findings.

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**P-FS-095**

## CHANGES IN INTRAOCULAR PRESSURE AND ANGLE STATUS POST PHACO IN PRIMARY ANGLE CLOSURE HYPERTENSION

Dewang Angmo\*, Harathy Selvan<sup>1</sup><sup>1</sup>Ophthalmology, Dr Rp Centre for Ophthalmic Sciences, AIIMS, Delhi, India

## Purpose

To study the change in intraocular pressure (IOP) and angle status post cataract surgery in a cohort of primary angle closure hypertension (PACHT) patients.

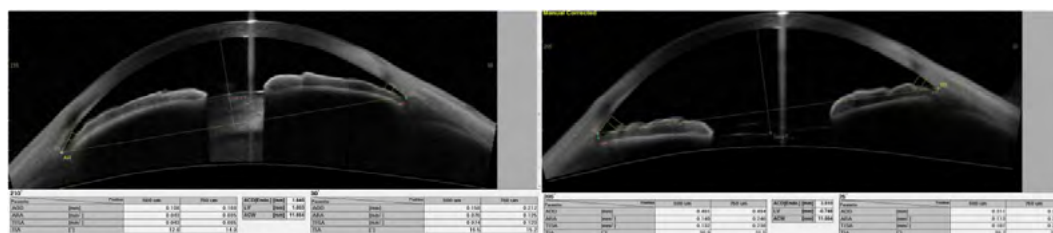
## Methods

A prospective interventional study involving 13 eyes of 13 patients. Pre-operative biometry including axial length (AL), anterior chamber depth (ACD), lens thickness (LT), and central corneal thickness (CCT) were studied. Pre- and post-operative IOP and angle swept source optical coherence tomography (SS-OCT) parameters such as nasal and temporal angle opening distance (AOD), trabecular iris space area (TISA), scleral spur angle (SSA), lens vault (LV) and iridotrabecular contact (ITC) were studied and their differences calculated.

## Results

The mean pre-operative IOP,  $32.46 \pm 3.92\text{mmHg}$ , decreased to  $14.46 \pm 1.45\text{mmHg}$  at 6-months post-operative period, a fall by  $54.89 \pm 6.60\%$ ,  $P < 0.001$  and the number of medications reduced from 4(3-5) to 2(1-3),  $P < 0.001$ . The median pre-operative lens vault was 0.71(0.16 to 1.18) while the post-operative IOL vault was -0.74(-0.87 to 1.00),  $p = 0.001$ . The ITC had reduced from 66(4-100) to 19(0-97),  $p = 0.027$ . The pre-operative ITC showed moderate correlation with pre-operative nasal AOD750 and TISA750 and excellent correlation with all temporal angle parameters (all  $P < 0.05$ ). It also showed moderate correlation with the % fall in IOP at 6 months post-operative period ( $\rho = 0.59$ ,  $p = 0.03$ ).

**Image**



## Conclusions

PACHT patients benefit significantly from cataract surgery with marked angle widening, IOP reduction and decrease in number of glaucoma medications. The pre-operative circumferential iridotrabecular contact can be used as the single best parameter to predict the percentage fall in IOP post-surgery, as against the numerous single section angle measurements.

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## P-FS-096

### IMPACT OF PREOPERATIVE TOPICAL STEROIDS ON TRABECULECTOMY OUTCOMES: A RANDOMIZED CONTROLLED TRIAL

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#### Purpose

To evaluate the efficacy of pre-operative topical steroid (0.05 % difluprednate) treatment in preventing bleb failure: A randomized controlled trial.

#### Methods

60 eyes having primary glaucoma (Primary open angle glaucoma, Primary angle closure glaucoma), age > 40 years, not controlled on maximum topical medical therapy ( $\geq 3$  topical drugs) for over 6 months were randomized into two groups. Group 1 received pre-operative 0.05% difluprednate eye drops 4 times per day for 2 weeks and Group 2 received 0.5% Carboxymethylcellulose eye drops. Patients with history of previous glaucoma surgery or selective laser trabeculoplasty, cataract surgery within past 12 months or any other chronic illness requiring anti-inflammatory therapy were excluded. All trabeculectomies were performed with 0.2 mg/ml solution of Mitomycin-C applied for 1 minute by single surgeon. Intraocular pressure (IOP) and bleb characteristics were assessed on Anterior Segment Optical Coherence Tomography (ASOCT) over 6 months.

#### Results

60 eyes of 51 patients with a mean age of  $54.12 \pm 8.26$  years were included. Mean baseline IOP was comparable in both groups (Group 1:  $22.5 \pm 3.24$  mmHg, Group 2:  $21.53 \pm 4.28$ ,  $p = 0.1372$ ). Mean deviation on Humphrey visual field showed advanced glaucomatous field defects with no significant difference between two groups (Group 1:  $-24.08 \pm 4.52$  dB, Group 2:  $-25.35 \pm 3.51$  dB,  $p = 0.367$ ). At 6 months mean IOP in Group 1 was  $11 \pm 2.94$  mmHg and Group 2 was  $13.14 \pm 3.05$  mmHg with a significant difference between the two groups ( $p = 0.0029$ ). On ASOCT there was significant difference in bleb height in two groups (Group 1  $0.556 \pm 0.369$  mm, Group 2  $0.378 \pm 0.078$  mm,  $p = 0.0034$ ) however there was no significant difference in bleb radial width. Absolute success (defined as IOP less than 14 mmHg at 6 months without any intervention or medication) was seen in 90 % eyes in Group 1 and 83.33 % eyes in Group 2 ( $p = 0.460$ ). Anti-glaucoma medications were required in 1 eye in Group 1 and 4 eyes in group 2 ( $p = 0.353$ ). Needling was required in 1 eye in group 1 and 2 eyes in group 2 with no statistically significant difference.

#### Conclusions

Pre-operative use of topical difluprednate was found have improved trabeculectomy outcomes and better bleb morphology.

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**P-FS-097**

**A NOVEL GLAUCOMA SURGICAL TECHNIQUE: INTRASCLERAL CILIARY SULCUS-SUPRACHOROIDAL MICROTUBE**

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**Purpose**

The suprachoroidal space (SCS) has been a successful target to lower intraocular pressure (IOP) in glaucoma patients.<sup>1</sup> We present the results of 4 patients who underwent a novel glaucoma surgical procedure to lower IOP: Intrasccleral Ciliary Sulcus-Suprachoroidal Microtube.

**Methods**

A sterile medical grade silicone microtube (harvested from the Ahmed valve, New World Medical) was surgically placed to drain aqueous from the posterior chamber ciliary sulcus of the eye to the SCS. The internal diameter of the tube was 300 um and the length varied from 7-10mm. After informed consent was obtained and witnessed, this procedure was performed in glaucoma patients with pseudophakia. The tube was placed intrasclerally beneath an inferotemporal sclera flap (50% thickness approximately 4mm x 7mm). The anterior end of the tube was inserted into the ciliary sulcus approximately 2mm from the limbus and the posterior end was placed into the SCS approximately 6mm from the limbus. The microtube was sutured to the sclera with a 10-0 nylon suture. 8-0 vicryl sutures were used to close the sclera flap and the conjunctiva inferotemporally.

**Results**

All 4 patients had lower IOP. The average reduction of IOP was 36% at 3 months. The amount of glaucoma medications per patient at 3 months dropped from an average of 3 to 0.25. Our patients had no ocular adverse events such as iritis, corneal edema, persistent hypotony or persistent IOP elevation. The majority of these events were transient and did not negatively affect functional outcomes such as visual acuity. This procedure significantly lowers IOP without the risk of managing a lifelong bleb or increased long term risk of endophthalmitis due to a thin bleb. No anti-metabolite was used. The risks are similar to traditional glaucoma incisional surgery.

**Image**



**Conclusions**

This new technique of Intrasccleral Ciliary Sulcus-Suprachoroidal Microtube in all four patients with mild, moderate, and advanced glaucoma demonstrated a significant lowering of IOP (36%) and a significant decrease in the number of medications at 3 months. Further research is required to assess long term efficacy and safety.

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## P-FS-098

### A NEW METHOD OF AB INTERNO TRABECULOTOMY WITH GONIOSYNECHIALYSIS NEEDLE: A SHORT-TERM, PRELIMINARY STUDY

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#### Purpose

To evaluate the postoperative results and safety profile of a new method of *ab interno* trabeculotomy with goniosynechialysis needle (nLOT).

#### Methods

This retrospective observational case series included 27 consecutive glaucomatous eyes of 21 Japanese patients (10 men, 11 women; mean age  $\pm$  standard deviation,  $69.5 \pm 9.2$  years) who underwent nLOT. At least one third of trabecular meshwork at nasal part was incised using Nagata's goniosynechia needle (Inami, Tokyo, Japan) across the small corneal incision at temporal. The preoperative intraocular pressure (IOP), postoperative IOP and numbers of antiglaucoma medications, postoperative complications and additional glaucoma surgeries during follow-up were reviewed from the medical records. The mean observation period was  $8.5 \pm 2.6$  (3-15) months.

#### Results

Preoperative IOP ( $22.3 \pm 7.4$  mmHg) decreased significantly to  $13.3 \pm 2.8$ ,  $14.1 \pm 3.4$ ,  $13.4 \pm 2.6$  mmHg at the 1, 3 months and final visit after surgeries (all  $P < 0.01$ ), respectively. The preoperative number of glaucoma medications of  $3.1 \pm 1.6$  decreased significantly to  $2.4 \pm 1.6$ ,  $2.3 \pm 1.6$  and  $2.2 \pm 1.6$  at the 1, 3 months and final visit ( $P > 0.05$ ,  $P < 0.05$  and  $P < 0.01$ ), respectively. Mean of maximum elevation of IOP after surgery was  $19.2 \pm 6.7$  mmHg. Hyphema was observed in 7 eyes (25.9 %) and transitional IOP rise more than 30 mmHg were recorded in 1 eyes (3.7 %) after operation. At the final visit, 22 eyes (81.5%) achieved successful IOP control of 18mmHg or less and a 20% reduction or greater.

#### Conclusions

A new method, nLOT was safe and effective in short term. Further study in a prospective and long-term follow up is necessary to assess this modality and to compare to other types of *ab interno* Trabeculotomy<sup>1-3</sup>.

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## P-FS-099

### LONG-TERM EFFECTS OF TOPICAL BEVACIZUMAB ON SUTURELESS SCLERAL TUNNEL TRABECULECTOMY

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#### Purpose

This study was designed to compare the short and long term results of sutureless scleral tunnel trabeculectomy with and without topical bevacizumab in patients with primary open-angle glaucoma(POAG).

#### Methods

A prospective randomized clinical trial. Patients with POAG and IOP above 21mmHg, despite maximum tolerated medication and poor compliance were included. Exclusion criteria were: having history of ocular surgery, congenital glaucoma, ocular inflammation, secondary open angle glaucoma and collagen vascular diseases. 100 eyes of 100 patients undergoing sutureless scleral tunnel trabeculectomy were randomly assigned into receiving intraoperative topical bevacizumab 1.25 mg/0.05 ml for 1 minute on the scleral incision (n = 54) and a control group (n = 46). The primary outcome measure was surgical success defined as intraocular pressure (IOP) less than 18 mmHg without medication or with maximum two antiglaucoma eye drops. Prior to the surgical procedure, all patients signed an informed consent and underwent detailed slit-lamp microscopy, gonioscopy and dilated fundus examination. The IOP measured by Goldman Applanation Tonometer and number of glaucoma medications were assessed by an examiner blind to the randomization before, 1, 3, 6, 12 and 24 months after surgery.

#### Results

Gender, mean age and initial IOP of the patients was similar in both groups (study = 54.1y, 31.3mmHg, 26M, 28F, control = 56.5y, 32.6mmHg, 22M, 24F). At all follow-up visits the mean IOP with or without medication was significantly lower compared to baseline in both groups ( $P < 0.01$ ). Post-surgical IOP did not show a significant difference between the study and control group in follow up visits of month 1, 3 and 6 ( $P > 0.01$ ). However, the post-surgical IOP was significantly lower at follow-up visits of 12 & 24 months after surgery in the study group (17.6 and 17.3 mmHg) compared to the control group (15.7 and 14.4 mmHg) ( $P < 0.000$ ). At the end of the follow up (24 months), 89% (n = 41) of the study and 94.5% (n = 51) of the control group had surgical success ( $p > 0.01$ ). The mean number of glaucoma medications decreased after surgery ( $P < 0.01$ ) and no significant difference was observed in complication rates between two groups.

#### Conclusions

Sutureless scleral tunnel trabeculectomy has favorable surgical success rates in terms of IOP control in short and long term. Additionally, adjuvant use of topical bevacizumab was shown to have a significant positive impact on long term IOP control and reduction.

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## P-FS-100

### OMNI-AN INITIAL EXPERIENCE WITH A NEW SURGICAL GLAUCOMA TREATMENT DEVICE

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#### Purpose

In the Interventional Glaucoma era, management of glaucoma is experiencing a shift toward surgery in an earlier anatomical and functional damage stage. The OMNI surgical technique is defined as a 360-degree viscodilation of Schlemm's canal, followed by a 360-degree trabeculotomy. This procedure aims to improve the aqueous humor drainage through its physiological outflow pathway. Our aim was to provide an initial evaluation of the OMNI procedure in a prospective study of 20 eyes with open angle glaucoma.

#### Methods

A prospective study was conducted on 20 eyes with primary open angle glaucoma. In 13 eyes, the OMNI procedure was combined with cataract surgery. Intraocular pressure changes, number of medications, and complications were recorded. Anterior Segment Optic Coherence Tomography (AS-OCT) images of the angle and particularly trabecular morphology were performed at 6 weeks. Success was defined as intraocular pressure (IOP) lowered at least 20% from a baseline over six months. A follow-up is in progress, with intervals up to 12 months expected by May 2019.

#### Results

The mean pre-operative IOP was 24,15mmHg(+6,34mmHg) and the mean number of preoperative anti-glaucoma drugs used by patients was 2,7(+1,03). At six months, the mean IOP registered was 15.9mmHg, which represents a decrease of 8,25mmHg (available data for 11 patients). There was a mean decrease of post-operative medications reduced to 1,61 drugs. 45% of patients did not need additional antiglaucoma medication.

AS-OCT at the supero nasal quadrant at 6 weeks revealed an identifiable trabeculotomy that measured 0,236micronsx0,315micronsx0,2 microns (height, depth and aperture to the anterior chamber). Main postoperative complications were transient. There was one case of toxic anterior segment syndrome (TASS), one case of hyphema, and two cases of macular oedema.

#### Conclusions

Follow-up data with the OMNI surgical procedure is showing a reduction of IOP, with medication reduction, in treatment of moderate glaucoma in adults. Although the upcoming incremental follow-ups will offer further insight, an IOP reduction of 34% was achieved at six months.

#### References

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## P-FS-101

### COMPARING PHACO AND PHACOTRAB IN THE MANAGEMENT OF PRIMARY ANGLE CLOSURE GLAUCOMA

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#### Purpose

Clear lens extraction is believed as an alternative approach for the management of PACG. The coexistence of glaucoma and cataract is commonly seen in the aging population; then a Combined Phaco-trab is a chosen treatment or phacoemulsification only. Our aim study was to compare the outcome of phaco vs phaco-trab in PACG eyes.

#### Methods

A comparative retrospective case series study was conducted at Cipto Mangunkusumo Hospital and JEC Hospital, Indonesia, from June 2015 to June 2017. All PACG patients who underwent Phaco and Phaco-trab were enrolled in this study. The visual acuity, intraocular pressure (IOP) before and followed up in 1,3,6 months post operatively were reviewed and anterior OCT results were appraised before and one year followed up. A comparison between the two groups was then analyzed.

#### Results

This study included a total of 58 eyes, of which 33 and 40 received the phaco and phaco-trab, respectively. The pre-operation IOP between the two groups was found to be significantly different ( $p = 0.22$ ), but no significant difference ( $p = 0.24$ ) was observed after surgery. Both groups showed a declining IOP, increasing anterior chamber deep, visual acuity, AOD500, AOD750, TISA500, TISA750 and reduction number of glaucoma medication given.

#### Conclusions

Both the phaco and phaco-trab groups demonstrated similar success treatment in PACG management with phaco-trab get more reduction of the IOP, however more eye drops were needed in phaco-trab group.

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## P-FS-102

### OUTCOMES OF SUTURELESS PCIOI IN PATIENTS WITH SURGICALLY CONTROLLED GLAUCOMA

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#### Purpose

To review the outcomes of sutureless scleral fixated posterior chamber intraocular lens (SSPCIOI) implantation in patients with surgically controlled glaucoma.

#### Methods

Retrospective chart review of all patients who underwent sutureless scleral fixated posterior chamber intraocular lens by a single surgeon from 10-2015 to 6-2018. A subset of patients was analyzed who had prior or concurrent incisional glaucoma surgery.

#### Results

57 eyes of 55 patients who underwent SSPCIOI were reviewed. 7 of the patients had surgically controlled glaucoma. Of these 7, there were 3 female and 4 male patients with an average age of 52 years (range 28-68 years). There were 2 patients with previous trabeculectomies, 3 patients with previously placed Ahmed glaucoma drainage device and 2 patients with concurrently placed Baerveldt glaucoma drainage devices. The preoperative visual acuity of the 7 patients with surgically controlled glaucoma was 1.0 logMAR (roughly 20/200 Snellen) ranging from 0 to 2.8. The final visual acuity of the 7 patients with surgically controlled glaucoma was 0.35 logMAR (roughly 20/40 Snellen) ranging from 0 to 1.1. Visual acuity improvement was statistically significant ( $p = 0.02$ ). The preoperative IOP was 13.4 mmHg (range 7-22 mmHg) on 1.5 topical glaucoma medications (range 0-4 medications). The IOP at last follow up was a mean of 14.2 mmHg with a range of 10-21 mmHg taking 0.85 medications (range of 0-4 medications). The difference in preoperative IOP to postoperative IOP was not statistically significant ( $p = 0.76$ ). Complications included one exposed haptic through the conjunctiva which required a surgical procedure to repair (with a scleral patch graft) and one patient where the haptic optic junction broke and the patient's lens was removed and replaced and one patient corneal edema in the existing penetrating keratoplasty and one patient who had cystoid macular edema which resolved with topical medications.

#### Conclusions

SSPCIOI is becoming a more common surgery over other techniques. We show that it is safe and effective in patients who have surgically controlled glaucoma. Intraocular pressure remained controlled. No patient needed advancement of glaucoma management. Visual acuity improved significantly. We also demonstrate SSPCIOI surgery can be successfully performed in eyes without disruption of a glaucoma drainage device or trabeculectomy. While the glued IOL technique can be performed successfully.

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## P-FS-103 XEN IMPLANTATION IN REFRACTORY GLAUCOMA

Esin F. Baser\*

### Purpose

XEN45 is a minimally invasive subconjunctival gel stent that is implanted through an *ab interno* approach to provide intraocular pressure (IOP) lowering. The aim of this study is to present the experiences of a glaucoma surgeon after implantation of XEN45 gel in refractory glaucoma.

### Methods

A total of 25 eyes of 19 patients were implanted with XEN45. Patients had either primary open angle glaucoma or pseudoexfoliation glaucoma. None of the patients had prior glaucoma surgery. XEN45 implantation was performed under local anesthesia, with either 5-fluorouracil or MMC as an anti-fibrotic agent. Five eyes were operated in combination with cataract surgery. IOP lowering medications use were recorded preoperatively and postoperatively. All implantations except one were deemed technically successful with the examination of bleb formation during the procedure. Patients were followed at postoperative 1 day, 1 week, 1, 3, 6 months and every 6 months thereafter. IOP and slit lamp findings and complications were recorded.

### Results

Mean age of patients were 64.4 (39-82) years. Mean preoperative IOP was 23.33mmHg (12-45). Patients were using 2.91 (1-4) glaucoma medications preoperatively. Patients were followed 13.9 (3-27) months postoperatively. Mean postoperative IOP was 15.58 (10-26) mmHg. Two eyes had hyphema postoperatively, and one required anterior chamber lavage. Four (16%) eyes developed bleb fibrosis and underwent needling procedure. One eye was implanted with two XEN45 implants, after nonresolving fibrosis around the first implant. Three eyes (12%) developed localized choroidal detachment with persistent hypotony and resolved between 3-4 weeks. Tenon cyst around the implant occurred in one eye and was managed conservatively. Postoperatively mean number of glaucoma medications was 0.58 (0-3); 7 eyes required glaucoma medications, and one eye underwent trabeculectomy in order to obtain target IOP values. The rest of the eyes (72 %) were medication free after XEN45 implantation.

### Conclusions

XEN45 gel stent reduced IOP and medication use without raising safety concerns in a group of refractory glaucoma patients. This *ab interno* gel stent offers a minimally invasive surgical alternative for lowering IOP in open-angle glaucoma patients who are unresponsive to or who cannot tolerate glaucoma medications.

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## P-FS-104

### OUTCOME OF AHMED GLAUCOMA VALVE SURGERY AS PRIMARY TREATMENT

Arpita Basia\*

#### Purpose

To report outcome of Ahmed glaucoma valve surgery as Primary treatment.

#### Methods

Patients refractory to medical management underwent primary Ahmed glaucoma valve surgery. These patients were 5 in number and were on maximal medical therapy with mean IOP cut off > 21mmHg. AGV implanted by a single surgeon and the Surgical technique consisted of limbal-based conjunctival incision to create a conjunctival flap between 2 recti muscles, in the superotemporal quadrant. Body implant was positioned 8–10 mm from the limbus. The plate was then sutured to the sclera with a 10.0 nylon suture. The drainage tube was trimmed to permit a 2–3 mm insertion in the AC and was bevel cut to an angle of 30°, to facilitate AC entering. The AC was then entered 1–3 mm posteriorly to the corneoscleral limbus with a 22–23G needle. The needle tract was anterior and parallel to the plane of the iris. The tube was covered by sclera patch graft. Longest follow up of 6 month available.

#### Results

Mean IOP after 3 months after hypertensive phase was 15+2 mmHg and there was no further progression on visual fields. One of the patient was steroid responder and IOP off treatment was 25 mmHg but IOP is under control on one Antiglaucoma medication. One of the patient sclera graft melt with tube exposure developed for which regraft with conjunctival autograft was done.

#### Conclusions

Ahmed Glaucoma valve surgery as primary treatment is very effective with good control of IOP and almost nil complications and progression.

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## P-FS-105

### PRE-TRABECULECTOMY INTRACAMERAL BEVACIZUMAB FOR RUBEOTIC GLAUCOMA

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#### Purpose

To evaluate the efficacy of pre-trabeculectomy intracameral bevacizumab in the management of secondary neo-vascular glaucoma.

#### Methods

This study was conducted at a tertiary care centre, under the tenets of Declaration of Helsinki and with applicable Institutional Review Board regulations. Patients for the study were included from those attending the Glaucoma clinic of the institute. All had rubeosis iridis for varied etiology. Intra-ocular pressure (IOP) was also raised in the patients.

Incisional paracentesis of anterior chamber was done with a side port entry blade. Slow release of intraocular pressure was assured. Following this 1.25mg (0.05ml) of bevacizumab was administered intracamerally with 26G needle on tuberculin 1ml syringe. Patients were followed up for 2 weeks before trabeculectomy was performed. They were monitored for IOP, anterior chamber reaction and rubeosis. After trabeculectomy patients were followed at day 1 and day 15. Further follow up was at 1 month 3 months and 6 months.

#### Results

Nine eyes of 9 patients (male 6, females 3) were included for evaluation. Their age ranged from 45 years to 62 years. Mean pre- paracentesis IOP was  $36.89 \pm 4.6$  mm of Hg. It reduced to  $17.56 \pm 1.67$  and  $14.89 \pm 1.76$  mm of Hg at day 1 and day 7 respectively. Along with this rubeosis also regressed in extent.

Trabeculectomy was performed after 2 weeks of paracentesis. Patients were followed on day 1, day 7, day 15, month 1, months 3 and months 6. Intra ocular pressure was  $11.33 \pm 1.41$ ,  $10.89 \pm 1.05$  and  $10.44 \pm 1.33$  mm of Hg on day 1, day 7 and day 15 respectively. These low IOP continued in further follow ups also. It was  $11.56 \pm 1.67$  mm of Hg at 1st month,  $11.11 \pm 1.45$  mm of Hg at 3<sup>rd</sup> month and  $11.33 \pm 1.73$  mm of Hg at 6<sup>th</sup> month. Lowering of IOP also relieved the head ache, ocular pain and redness of eyes of the patients.

#### Conclusions

Therefore pre trabeculectomy paracentesis along with intracameral bevacizumab is beneficial to patients with secondary glaucoma due to neovascularisation.

Limitation of the study was that of short duration of 6 months and small sample size. Long term effects of intracameral bevacizumab are yet to be evaluated.

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## P-FS-106

### BLEB MORPHOLOGY RESULTING FROM NOVEL CONJUNCTIVAL FRILL INCISION (SMILE) TRABECULECTOMY

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#### Purpose

To evaluate bleb morphology after novel Conjunctival frill “Smile” incision trabeculectomy vs conventional flap surgery.

#### Methods

Sixty patients scheduled for trabeculectomy were randomised to either conjunctival frill incision (Study group), made 1.5 -2.0 mm from limbus, sutured with running, horizontal mattress suturing vs conventional fornix based flap (Control group). Bleb evolution was studied over 6-months period by IBAGS & AS-OCT.

#### Results

Bleb morphology was similar regarding extent (E), vascularity (V) in two groups with moderate bleb height (H2) being more frequent in study group. Bleb maturation in control group resulted in a slight flattening, documented by *statistically significant decrease in bleb height* ( $P < 0.04$ , friedman test), whereas for conjunctival frill incision (study group) moderate bleb height was maintained at 6 months.

Quantitative bleb assessment by AS-OCT documented bleb wall thickness as 115-127  $\mu$  and 114-121  $\mu$  in study vs control, bleb height reduced from 242 to 230  $\mu$  after attaining bleb maturity in control group, with more number of microcysts (15 vs 13 out of 30) in study group. Our study documented a positive correlation between *bleb wall thickness, internal reflectivity, presence of microcysts* and IOP control and a negative correlation between *bleb height* and IOP.

#### Conclusions

Conjunctival frill incision generates a functional healthy bleb with better wall thickness, increased internal reflectivity at an intermediate follow up of 6 months.

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## P-FS-107

### TRABECULECTOMY MODIFIED WITH COLLAGEN MATRIX IMPLANT IN CONGENITAL / JUVENILE GLAUCOMA - A PRELIMINARY STUDY

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#### Purpose

To evaluate the safety and efficacy of post trabeculectomy collagen matrix implant in management of congenital / juvenile glaucoma.

#### Methods

This research study was conducted under the tenets of Declaration of Helsinki and with applicable Institutional Review Board regulations. Patients for the study were enrolled from those attending the Glaucoma clinic at a tertiary care centre.

Trabeculectomy of selected eye was performed, as per standard protocol, with fornix based conjunctival flap. A square partial thickness scleral flap (4mmx 4mm) was raised, followed by sclerostomy, removal of a deep scleral piece (2mm x 2mm). This was followed by peripheral iridectomy, size larger than the ostium. Superficial scleral flap sutured at two corners. A disc of Collagen implant (ologen) kept over the superficial scleral flap (under the conjunctiva). Finally the conjunctival flap was sutured at the limbus. All surgeries were performed by a single surgeon. Patients were followed up on day one, day 15, 1 month, 3 month and 6months. Visual acuity, bleb morphology and intra ocular pressure were evaluated.

#### Results

A total eleven eyes of seven patients were included in the study, age ranging from 1 year to 22 year (males 2, females 5). Mean pre operative intraocular pressure was  $24.36 \pm 7.51$  mm of Hg. It dropped to  $9.82 \pm 2.27$  mm of Hg. post operatively on day 1 and it was significant. Intra ocular pressure remained low throughout the study period of six months. Mean IOP was  $9.82 \pm 2.09$ ,  $9.82 \pm 1.4$ ,  $9.45 \pm 1.29$  and  $10 \pm 1.5$  and the end of 2 week, 1 month, 3 months and 6 months respectively. A low functional filtering bleb was present in all patients throughout the study. There was no further deterioration in visual acuity.

#### Conclusions

Collagen implant can modulate trabeculectomy in pediatric and juvenile glaucoma safely. Though the study had successful results it had its limitations of small sample size and short follow up of 6 months.

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## P-FS-108

### COMPARISON OF OLOGEN® AND INTRAOPERATIVE MITOMYCIN C IN PHACOTRABECULECTOMY OVER 5 YEARS: A RANDOMISED STUDY

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#### Purpose

To compare the safety and efficacy of intra-operative sub-conjunctival collagen matrix implantation (Ologen®) versus Mitomycin-C (MMC) in phacotrabeculectomy.

#### Methods

63 patients, randomized to undergo phacotrabeculectomy with sub-conjunctival Ologen® implantation or MMC in one eye in 2011, were followed up for 5 years. The primary objectives were to compare short (3 months) and long-term intraocular pressure (IOP) control and bleb morphology between the two groups using clinical photographs by Moorfield's Bleb Grading System (MBGS) and anterior segment optical coherence tomography (ASOCT). Individual target IOP was defined preoperatively. Sample size calculated to show 4 mmHg difference in IOP was 60 and 0.26µm difference in bleb height with ASOCT was 28, with 80% power and 5% significance.

#### Results

Of 62 patients at 3 months success was 89.29% in the Ologen® group and 87.1% in the MMC group ( $p = 0.795$ ). All patients achieved IOP reduction (Ologen:  $10.8 \pm 9.8$ ; MMC:  $8 \pm 6.5$ ). Although hypotony, conjunctival edge leak and choroidal effusion were higher in the MMC group there was no statistical difference in the complication rate. Of the 35 patients reporting for follow up at 5 years, 30 (16 Ologen®, 14 MMC) achieved target IOP. There was no significant difference in IOP reduction between the two groups ( $p = 0.815$ ). Using MBGS, bleb height was  $1.533 \pm 0.516$  in the Ologen® group and  $1.571 \pm 0.646$  in the MMC group ( $p = 0.862$ ). Central bleb area was  $1.60 \pm 0.507$  and  $1.571 \pm 0.513$  respectively ( $p = 0.881$ ). Bleb vascularity was  $1.866 \pm 0.516$  in the Ologen® group and  $1.714 \pm 0.468$  in the MMC group ( $p = 0.414$ ). The total bleb height in µm using ASOCT was  $991.88 \pm 179.66$  and  $986.43 \pm 270.12$  respectively ( $p = 0.946$ ). The conjunctival thickness was also similar in both the groups ( $p = 0.318$ ). No patients had blebitis or bleb sweat. However, 3 patients in the MMC group had thin-walled, polycystic blebs.

#### Conclusions

Ologen® is as effective and safe as MMC in long term success of phacotrabeculectomy. The bleb morphology using MBGS and ASOCT were similar in the long term.

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## P-FS-109

### XEN-AUGMENTED BAERVELDT IN REFRACTORY GLAUCOMA: ONE YEAR OUTCOMES

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#### Purpose

To evaluate the outcome of Xen-augmented Baerveldt in refractory glaucoma and the factors predicting surgical success.

#### Methods

Retrospective study, at a tertiary glaucoma center. Intraocular pressure (IOP), best corrected visual acuity (BCVA), number of antiglaucomatous medications, and post-operative complications were analysed post-operatively at 1 week, 1 month, 3 months, 6 months, 9 months, and 1 year, and compared to the pre-operative baseline. Surgical success was defined as achieving an IOP  $\leq$  18 mmHg without need of subsequent surgery.

#### Results

Six-month and 12-month data were available from 41 eyes. Mean age was  $61.4 \pm 23.2$  (53.7% men). Following surgery, IOP decreased significantly from  $29.9 \pm 13.2$  mmHg to  $18.3 \pm 9.0$  mmHg (38.8%;  $P < 0.0001$ ) at 6-month and to  $15.2 \pm 6.5$  mmHg (49.2%;  $P < 0.0001$ ) at 12-month. Medications dropped from  $3.0 \pm 1.5$  to  $1.4 \pm 1.2$  and  $1.3 \pm 0.9$ , respectively. The success rate was 53.7% at 6 months and 51.2% at 12 months. Success rate at 6 months and 12 months was higher in patients who had more than 2 glaucoma surgeries before the baseline (72.7% and 54.5%). At 6 months, adverse effects were observed in 45.7% (high IOP = 14; hypotony = 1; flat bleb = 1; XEN blockage = 1) and in 26.9% at 12 months (high IOP = 5; hypotony = 1; flat bleb = 3). The success rate was higher at 6 and 12 months in patients who presented an IOP  $\leq$  10 mmHg at 1 week after the Xen-Baerveldt procedure (58.6%). Overall, 29.3% of patients required reoperation at 6 months, and 41.5% at 12 months (52.9% revision of the surgery; 47.1% transcleral cyclodestruction).

#### Conclusions

Xen-augmented Baerveldt is a safe method to effectively reduce IOP and antiglaucomatous therapy in refractory glaucoma, especially in eyes with multiple previous surgeries. IOP at 1 week seems to be a predictor for surgical success. Nevertheless, a high proportion of patients required reoperation.

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**P-FS-110**

**NOVEL MIGS PROCEDURE COMBINING KAHOOK DUAL BLADE GONIOTOMY AND DIRECT VISCODILATION OF THE COLLECTOR CHANNELS WITH CATARACT SURGERY: ONE YEAR RESULTS**

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**Purpose**

The effects of a novel MIGS procedure using the Kahook Dual Blade and direct viscodilation of the collector channels with cataract surgery in the reduction of intraocular pressure (IOP) and of dependence of glaucoma drops in mild, moderate, and advanced glaucoma in a predominantly African-American population. One year results will be presented for this technique dubbed “clean the gutter and powerwash the downspouts”.

**Methods**

Following cataract surgery, the Kahook Dual Blade removed the inferior 180 degrees of trabecular meshwork. Viscoelastic was injected, as the perpendicular cannula was held against the outer wall and dragged through the gutted canal. Elimination of drops and an IOP of less than 20mmHg was considered a success. Glaucoma drops were added as needed and steroid response was monitored.

**Results**

Moderate to advanced glaucoma accounted for 50%. 80% were African American. 60% were diabetics. 50% were on anticoagulants. 30% had previous glaucoma surgery. Initial IOP was 19.9mmHg. At one month IOP was 16mmHg and remained between 16 and 17 mmHg throughout the first year. About 90% were without drops. Hypotony, choroidal detachments, and cyclodialysis were not seen. Less than 10% had visible hyphemas. Glaucoma drops were adjusted as needed.

**Conclusions**

The synergy of this new Goniotomy-Viscodilation technique is responsible for the marked reduction of glaucoma drops. Unlike the GATT procedure and viscocanaloplasty, this “clean the gutter and powerwash the downspouts” actually removes leaflets that may subsequently collapse into the canal and dilates the collector channels. This unique combined Goniotomy Viscodilation-Cataract surgery is a safe and effective approach to reduce compliance issues and the financial burden of glaucoma medical treatment.

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## P-FS-111

### LONG-TERM OUTCOMES OF MITOMYCIN-C TRABECULECTOMY OF PHAKIC EYES VERSUS PSEUDOPHAKIC EYES IN EXFOLIATIVE GLAUCOMA

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#### Purpose

The successful long-term management of exfoliative glaucoma (XFG) patients with cataract remains a clinical challenge. One prospective study reported the ocular hypotensive effect of phacoemulsification was greater in patients with exfoliation syndrome (XFS) following phacoemulsification compared to control eyes without XFS, in particular in XFG. The objective of this study is to determine whether previous modern cataract surgery affects surgical prognosis of primary trabeculectomy with mitomycin-C (MMC) for XFG.

#### Methods

This retrospective, consecutive study included 51 phakic eyes and 40 pseudophakic eyes (that had previously undergone phacoemulsification with temporal clear cornea incision) of XFG undergoing primary trabeculectomy with MMC. Surgical success was defined according to 3 different criteria: (A) intraocular pressure (IOP) < 18mmHg and IOP reduction  $\geq$  20% without medication; (B) IOP < 15mmHg and IOP reduction  $\geq$  25% without medication; and (C) IOP < 18mmHg and IOP reduction  $\geq$  20% with or without medication. Cumulative probabilities of success were compared using Kaplan-Meier survival analysis, and risk factors of surgical failure were analyzed.

#### Results

The mean follow-up period was  $44.7 \pm 28.0$  months. IOP decreased by 4.5 mmHg in phakic eyes versus 11.1 mmHg in pseudophakic eyes at last visits after surgery ( $p = 0.005$ ). Cumulative success rates were 78.4% at 1 year and 15.0% at 5 years for phakic eyes, and 85.0% and 31.5%, respectively, for pseudophakic eyes by criterion A. Complete success rates tended to be low for phakic eyes than for pseudophakic eyes by criterion A and B ( $p = 0.068, 0.065$ ). And, qualified success, as determined by criterion C, did not show a statistically significant difference ( $p = 0.553$ ). The risk factors associated with surgical failure were early postoperative hypotony (hazard ratio = 2.81,  $p = 0.016$ , criterion A) and phakic status (hazard ratio = 1.97,  $p = 0.040$ , criterion A).

#### Conclusions

Long-term outcomes of primary trabeculectomy with MMC for XFG in eyes with prior phacoemulsification are comparable to or even better than those in phakic eyes. The later performing cataract surgery in trabeculectomized eyes seems to have had adverse effects on long-term outcomes of primary trabeculectomy. Therefore, this study suggests that performing phacoemulsification first and later trabeculectomy may be a better option if trabeculectomy is required on XFG patients with cataract.

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## P-FS-112

# OUTCOMES OF COMBINED GONIOSCOPY-ASSISTED TRANSLUMINAL TRABECULOTOMY AND GONIOSYNECHIALYSIS IN PRIMARY ANGLE CLOSURE: A RETROSPECTIVE CASE SERIES

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### Purpose

To evaluate the addition intraocular pressure (IOP) lowering effect of gonio-assisted transluminal trabeculotomy (GATT) to contemporary goniosynechialysis (GSL) in endeavouring to abolish subsequent occlusion after chronic iricotrabeular contact<sup>1</sup> in primary angle closure (PAC) patients.

### Methods

A retrospective case series of all PAC eyes underwent GATT+GSL with or without phacoemulsification and intraocular lens implantation (PEA+IOL) from December 2016 to May 2018 were recruited. IOP, number of anti-glaucoma medications were compared pre and postoperatively by Wilcoxon signed-rank test. Repeated measure ANOVA was used to evaluate the difference in IOP change after the operation between subgroup of operations (GATT+GSL+PEA+IOL and GATT+GSL) and arc of cutting of trabeculotomy.

### Results

39 eyes of 30 patients, 37 chronic angle closure glaucoma (CACG), 1 acute primary angle closure (APAC), and 1 plateau iris syndrome were recruited. Mean preoperative IOP was  $21.8 \pm 5.4$  mmHg. Mean postoperative IOP was lowered to  $15.1 \pm 3.8$  mmHg at 1 month,  $14.4 \pm 1.2$  mmHg at 3 months,  $14.8 \pm 2.1$  mmHg at 6 months,  $14.5 \pm 0.8$  mmHg at 1 year, and 15 at 2 years ( $P < 0.001$ ,  $P = 0.0012$ ,  $P = 0.001$ ,  $P = 0.028$ , and  $P = 0.317$  ( $n = 1$ ), consecutively). Mean of overall postoperative IOP at the last follow-up was  $15.1 \pm 4.4$  mmHg ( $P < 0.001$ ). Mean preoperative number of anti-glaucoma medications was  $3.5 \pm 1.4$ . Mean postoperative number of anti-glaucoma medications were reduced to  $1.5 \pm 1.4$  at 1 month,  $0.9 \pm 0.9$  at 3 months,  $1.4 \pm 1.4$  at 6 months,  $1.5 \pm 0.5$  at 1 year, and 2 at 2 years ( $P < 0.001$ ,  $P = 0.01$ ,  $P = 0.002$ ,  $P = 0.028$ , and  $P = 0.317$  ( $n = 1$ ), respectively). Mean of overall postoperative number of anti-glaucoma medications was  $1.1 \pm 1.2$  ( $P < 0.001$ ). There was no significant difference found between IOP lowering effect in subgroup analysis.

### Conclusions

GATT with or without PEA+IOL could significantly reduced IOP and number of anti-glaucoma medications from baseline comparing to the last follow-up, however, there seemed not to be any superiority to the effects found in previous studies reported about GSL+PEA or PEA alone in PAC patients. The well-designed comparative analytical study is needed to establish the further robust result in order to elucidate the additional effect of GATT in PAC patients.

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## P-FS-113

# TOO BIG OR TOO SMALL, DOES IT MATTER? DETERMINING ANTERIOR SEGMENT DIMENSION CHANGE BY THE LASER IRIDOTOMY SIZE IN ANGLE CLOSURE EYES

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### Purpose

The purpose of this study was to compare the changes of anterior segment dimensions by the laser iridotomy size with swept source anterior segment optical coherence tomography (AS-OCT) in angle closure eyes.

### Methods

Among the patients diagnosed with primary angle closure or primary angle closure glaucoma in our department from January 2015 to May 2018, 41 patients who underwent swept source AS-OCT before and after laser iridotomy was enrolled. The results were compared before and 1 month after laser iridotomy treatment. To measure the iridotomy size, diameter of the top, center, lowest iridotomy site and area of longitudinal section of the iridotomy site was measured with AS-OCT. Then we compared the change of anterior chamber(A/C) depth, A/C volume, iridotrabecular contact(ITC), AOD, ARA, TISA, TIA and intraocular pressure(IOP) by laser iridotomy size.

### Results

The smallest iridotomy site diameter was 0.061mm and the largest was 0.89mm.

A/C depth, A/C volume, ITC, AOD, ARA, TISA and TIA increased significantly after laser iridotomy. However, anterior segment dimensions and diameter of iridotomy site nor area of longitudinal section of the iridotomy site had no statistically significant relationship. Also, IOP change was not significant by the laser iridotomy size.

### Conclusions

In the treatment of laser iridotomy, anterior segment dimensions increased significantly. However, laser iridotomy size did not significantly differed the change of anterior segment dimensions nor IOP. As so, the size of laser iridotomy site may not be an important factor to affect treatment result of laser iridotomy in angle closure eyes.

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## P-FS-114

# RETROSPECTIVE STUDY EVALUATING SAFETY AND EFFICACY OF AN ABINTERNO CILIARY SULCUS IMPLANTATION OF BAERVELDT TUBES IN PATIENTS WITH GLAUCOMA

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### Purpose

To evaluate safety and efficacy of an ab-interno technique of implanting Baerveldt glaucoma drainage devices into the ciliary sulcus.

### Methods

A retrospective consecutive case series at Sydney Eye Hospital of patients with insertion of a Baerveldt 350-101 in the ciliary sulcus (CS) compared to the anterior chamber (AC). Only patients with a minimum one year follow-up were included and primary outcome measures were change in intraocular pressure (IOP), number of glaucoma medications, visual acuity and success reported as per the World Glaucoma Association guidelines.

### Results

49 eyes of 43 patients were included. Mean age was 64.4 years and 31 (72%) of patients were male. Mean follow up was 13.5 months. 41 tubes were placed in the AC and 8 in the CS. Baseline mean IOP in the AC group was 21.4 mmHg and the CS group 24.1 mmHg. Post-operatively, mean IOP at one year was 13.6 mmHg and 13.1 mmHg in AC and CS group respectively ( $p = 0.35$  between groups). Mean visual acuity at baseline was not different between groups and did not change significantly from baseline in either group (AC:  $p = 0.23$ , CS:  $p = 0.40$ ). Unqualified and qualified success was not different between groups - for the AC tubes 22.0% and 53.7%, and for the sulcus tubes 25.0% and 62.5% respectively.

9 tubes had adverse effects at one year follow-up (18.4%), but there was no difference between the AC and CS groups. There were 3 episodes of spontaneously recovering hyphaema in the AC group and 1 in the CS group, 3 episodes of spontaneously recovering choroidal effusions in the AC group, and 1 episode each of macular oedema and device exposure both in the AC group.

### Conclusions

There was no difference in IOP lowering effect or complications between tubes placed in the AC or CS. Ab-interno placement of Baerveldt tubes in the ciliary sulcus appears safe and effective. Longer term outcomes, especially regarding corneal decompensation, will help to further identify any longer term benefits or complications of sulcus tube implantation.

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## P-FS-115

### OUTCOMES WITH SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IN PATIENTS WITH GLAUCOMA

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#### Purpose

This retrospective case study evaluates 2 second-generation trabecular micro-bypass stents (iStent *inject*®) implanted in combination with cataract surgery in patients with glaucoma.

#### Methods

Data from 5 surgeons in Australia was pooled. The majority of patients had OAG; however, other glaucoma types were included. Standard assessments included IOP and medication use in addition to standard safety evaluations.

#### Results

Three-hundred twenty-nine (329) eyes in 215 patients were implanted with the iStent *inject* without surgical complications. Although long-term follow-up is planned, this report only includes outcome data of the 192 eyes that completed 1-year follow-up. Mean pre-op IOP was  $18.0 \pm 5.2$  mmHg on  $1.7 \pm 1.2$  medications. At 1-year post-op, mean IOP was  $14.1 \pm 3.0$  mmHg on  $0.6 \pm 1.0$  medications, representing a 22% and 67% reduction in IOP and medications, respectively. In 98% of eyes, medication was maintained or reduced. No medications were required in 70% of eyes at 1 year, an improvement from 16% at pre-op. Overall the high safety profile observed was consistent with routine stand-alone cataract surgery. Three eyes underwent additional glaucoma surgery post-implantation which were not related to the stents. There were no reports of hypotony, PAS, stent obstruction or microhyphema.

#### Conclusions

Implantation of the iStent *inject* in combination with cataract surgery resulted in meaningful IOP reduction and reduced medication burden out to 1 year. An overall favorable safety profile was observed. This report of real world experience from surgeons in Australia augments the existing safety and efficacy evidence for the iStent *inject*, a promising treatment option for glaucoma.

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## P-FS-116

### HIGH INTENSITY FOCUSED ULTRASOUND FOR GLAUCOMA: 1-YEAR RESULTS FROM A PROSPECTIVE PRAGMATIC STUDY

David Cordeiro Sousa<sup>\*</sup>, Nuno Pinto Ferreira<sup>1</sup>, Raquel Marques<sup>1</sup>, André Barata<sup>1</sup>, Paula Sens<sup>1</sup>, Luís Abegão Pinto<sup>1</sup>

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#### Purpose

High-Intensity Focused Ultrasound (HIFU) technology acts through the selective coagulation of the ciliary body. Our aim was to evaluate the safety and efficacy profiles of 8-second probe HIFU cyclocoagulation using the EyeOP1 device.

#### Methods

Prospective pragmatic trial in a tertiary healthcare centre. Inclusion criteria: adult glaucoma patients with uncontrolled IOP despite optimized medical therapy. Primary outcome: surgical success defined as IOP reduction from baseline > 20% without adding any IOP-lowering drugs; or decreased use of IOP-lowering drugs with stable/decreased IOP. Secondary outcomes: mean IOP, intra and postoperative complications, best-corrected visual acuity (BCVA), and number of IOP-lowering drugs at each visit. Outcome data were collected pre-operatively and at postoperative days 1 and 7, and months 1, 3, 6 and 12.

#### Results

Fifty-one patients (28 male) with a mean age of  $70 \pm 14$  years were enrolled. Pre-operative IOP was  $26.7 \pm 7.7$  mmHg under  $2.8 \pm 0.9$  medications, decreasing to  $18 \pm 6.2$  mmHg under  $2.3 \pm 1$  drugs at 12 months ( $P < 0.01$ ). One-year surgical success was achieved in 80% of patients (IOP-reduction criteria in 68.6%; decreased use of IOP-lowering drugs in 66.7%). Eight patients were submitted to other glaucoma surgical interventions. In the remaining, surgery was delayed by up to 7 months. One serious adverse event (hypotony) was registered.

#### Conclusions

This innovative non-invasive technology seems to be safe and effective in decreasing glaucoma patients' IOP and the number of administered drops. It seems a valuable tool to delay or preclude the need for filtering procedures in the majority of the patients.

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## **P-FS-117**

### **FP8 AHMED VALVES IN PATIENTS OLDER THAN 85**

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#### **Purpose**

To evaluate the efficacy and safety of the FP8 (pediatric) Ahmed Valve in patients over the age of 85.

#### **Methods**

Retrospective chart analysis of all individuals greater than age 85 who underwent implantation of the FP8 Ahmed Valve by a single surgeon between 2011 and 2017.

#### **Results**

55 eyes of 53 patients had implantation of which 32 patients were female and 21 male. The age range for implantation was between 85 and 97 years of age. Mean pre-operative intraocular pressure was 25.98 mmHg and the mean number of glaucoma medications was 3.33. At 3 months post procedure (n = 52) the mean intraocular pressure was 17.21 mmHg and the mean number of glaucoma medications was 1.45. At 6 months (n = 49) the mean intraocular pressure was 16.69 mmHg and the mean number of glaucoma medications was 1.87. At 2 years (n = 30) the mean intraocular pressure was 14.23 and the mean number of glaucoma medications was 2.

#### **Conclusions**

The FP8 Ahmed Valve is effective in reducing the intraocular pressure and number of glaucoma medications in the majority of patients over the age of 85.

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## P-FS-118

# A COMPARISON OF SURGICAL OUTCOMES OF TUBE SHUNT SURGERY, BLEB NEEDLE REVISION AND REVISION TRABECULECTOMY FOLLOWING FAILED TRABECULECTOMY

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### Purpose

To assess the management options for trabeculectomy failure by comparing the outcomes of three surgical procedures in a tertiary referral glaucoma unit.

### Methods

A retrospective chart review of 121 patients (135 cases) who underwent: (1) tube shunt surgery (31 cases), (2) bleb needle revision (79 cases) or (3) revision trabeculectomy (25 cases) between November 2010 and June 2016 at the Royal Victorian Eye and Ear Hospital. Surgical outcomes based on guidelines from the World Glaucoma Association.

### Results

Mean follow-up was  $13.8 \pm 9.0$  months. Complete success rates at 2-years for the tube, needling and revision groups were 12.9%, 29.1% and 32.0%, respectively ( $P = 0.151$ ), while qualified success rates were 74.2%, 59.5% and 48.0%, respectively ( $P = 0.197$ ). Mean IOP reduction from baseline at 2-years was similar for the tube, needling and revision groups at 38.6%, 41.5%, and 43.2% respectively ( $P = 0.941$ ). Early postoperative hypotony was higher in the needling and revision groups compared to the tube group (53.2% and 52.0% respectively, vs. 38.6%) ( $P = 0.067$ ). However, endophthalmitis was more frequent in the tube group compared to the needling or revision groups (9.7% vs. 1.3% and 4.0% respectively) ( $P = 0.083$ ). Higher preoperative IOP ( $P = 0.029$ ) and increased number of previous needlings were associated with failure in the needling group ( $P = 0.009$ ).

### Conclusions

Tube shunt surgery demonstrated a trend towards a lower failure rate than bleb needle revision and revision trabeculectomy. Higher preoperative IOP and increased number of previous needlings are risk factors for failure in eyes undergoing bleb needle revision.

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## P-FS-119

### EFFICACY AND SECURITY OF TRABECULECTOMY WITH SUBCONJUNCTIVAL BIODEGRADABLE COLLAGEN MATRIX IMPLANT: LONG-TERM FOLLOW-UP

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#### Purpose

The purpose of the study is to report and evaluate outcomes of trabeculectomy with use of a subconjunctival biodegradable collagen matrix implant (Ologen<sup>®</sup>) without use of mitomycin.

#### Methods

Retrospective review of trabeculectomy with subconjunctival biodegradable collagen matrix implant (Ologen<sup>®</sup>) of 20 eyes of 18 patients by the same surgeon from November, 2010 to July, 2018. Demographic characteristics of the study population, visual acuity, intraocular pressure (IOP), glaucoma medications, visual fields, bleb characteristics and early and late postoperative complications were recorded. Qualified IOP control success was defined as  $\leq 18$  mmHg and  $> 30\%$  IOP reduction. Cairns trabeculectomy was performed and two types of Ologen were placed in subconjunctival space, over and beyond the scleral flap: 12 mmx1 mm and 6 mmx2 mm.

#### Results

The mean age of the patients in the study was 43 years old. In only 4 eyes it was a primary procedure and most of the eyes had more than two previous surgeries. Forty percent were juvenile glaucoma, 30% primary open angle glaucoma, 15% primary congenital glaucoma and 15% secondary glaucoma. All eyes were with three or more medications (20% with oral acetazolamide). In first post-operative day IOP was reduced from a mean of  $25.8 \pm 5.0$  to  $7.1 \pm 3.2$  mmHg and at 36 and 60 months of follow-up the mean IOP were  $15.0 \pm 3.0$  and  $14.7 \pm 5.0$ , respectively. The number of IOP-lowering medications per eye was reduced from a mean of 3.8 preoperatively to 2.0 at 60 months of follow-up. At 36 and 60 months of follow-up the IOP reduction was more than 35% and reduction of the intraocular pressure below 18 mmHg was achieved in 100% and 75%, respectively. Only three eyes were reoperated (all of them before 1 year of follow-up). No differences were observed between the two types of implant. The rate of postoperative complications was very low: 2 keratitis which were resolved with hydration drops, one choroidal detachment which was resolved medically and one severe hypotony which was resolved with revised surgery and Ologen explant. No allergic cases or thin or/and avascular blebs were reported. The majority of blebs are flat, without cyst.

#### Conclusions

We conclude that the Ologen<sup>®</sup> implant may be a safe and effective alternative to MMC for improving the long-term success rate of trabeculectomy surgery and may avoid the side effects associated with the use of adjunctive therapy, such as MMC.

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## P-FS-120

### KDB-ASSISTED GONIOTOMY COMBINED WITH CATARACT SURGERY: A PROSPECTIVE ANALYSIS OF SURGICAL OUTCOMES AND SUCCESS PREDICTORS

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#### Purpose

To investigate the success rates, safety profile and success predictors of Kahook Dual Blade assisted goniotomy (KDB) combined with cataract extraction (PHACO) in eyes with medically treated open angle glaucoma (OAG).

#### Methods

A multicenter, prospective, interventional case series was carried out. Consecutive patients with medically treated OAG and coexistent visually significant cataract underwent PHACO and KDB surgery. Post-operative visits were scheduled at days 1, 7, and at months 1, 3 and 6. Preoperative and postoperative intraocular pressure (IOP), the number of antiglaucoma medications, surgical complications, and any subsequent related events or procedures were recorded in the follow-up visits. Success was defined as IOP reduction > 20% and/or  $\geq 1$  medication reduction from baseline (as long as post-operative IOP values were kept within 2 mmHg from baseline).

#### Results

Amongst 34 patients (mean age,  $67.3 \pm 16.2$  years) undergoing surgery, mean IOP was significantly reduced from  $17.5 \pm 4.2$  mmHg at baseline to  $13.3 \pm 4.2$  mmHg at month 6 ( $p < 0.001$ ). The mean number of topical IOP-lowering medications was reduced from  $2.1 \pm 0.9$  to  $0.7 \pm 0.7$  ( $P < 0.001$ ). Overall, the success rate at 6 months was 82%. Age, visual field mean deviation index, type of glaucoma and the preoperative number of medications were not significant success predictors ( $p \geq 0.51$ ). One eye had postoperative hypotony. No serious complications were reported.

#### Conclusions

KDB-assisted goniotomy combined with cataract surgery significantly lowers both IOP and dependence on IOP-lowering medications in eyes with medically-treated open angle glaucoma. Sight-threatening adverse events were uncommon. Further follow-up data might reveal possible success predictors that were not determined in these initial results.

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## P-FS-121 EXPRESS SHUNT RESULTS

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### Purpose

To report the efficacy, safety and predictability of filtering surgery with an Ex-press implant in patients with glaucoma. We want to share our follow-up experience in a third level hospital.

### Methods

A retrospective study, series of cases was conducted, including patients between July 2011 to July 2016. Patients with glaucoma surgery with an Ex-press implant with follow-up longer than 3 months were included. Efficacy (intraocular pressure (IOP), number of drugs, total and partial success rate) and safety (visual acuity, frequency and type of complications) were evaluated.

### Results

96 eyes of 71 patients were included. The mean intraocular pressure decreased from  $21.92 \pm 7.07$  preoperatively to  $12.10 \pm 3.15$  at one year and  $11.80 \pm 2.16$  at 5 years of follow-up, with a 45% reduction in IOP. The total success rate (IOP 5-18 mmHg without medication) was 78% at one year and 40% at 5 years. The partial success rate (IOP 5-18 mmHg with medication) was 100% at one year and 96% at 5 years. The number of instilled drugs fell from  $3.48 \pm 0.85$  preoperatively to  $0.58 \pm 0.97$  at one year and  $1.6 \pm 1.14$  at 5 years, showing significant differences ( $p < 0.001$ ). Visual acuity reached its preoperative value 7 days after surgery, both in the group that underwent surgery combined with phacoemulsification and in which only Ex-press was performed. Among the complications described: 3 cases of hypotonia with hypothermia, 3 cases of delayed fibrosis of the blister, 1 case with blebitis and 3 cases with iris retraction.

### Conclusions

Ex-press implantation is an effective technique to reduce IOP, with a rapid recovery of visual acuity, a low number of complications and predictable results. The results are comparable with other published series. Multicenter, prospective, long-term studies are necessary.

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## P-FS-122

### OUTCOME OF SURGICAL BLEB REVISION USING SCLERAL PATCH GRAFT FOR BLEB RELATED COMPLICATIONS FOLLOWING TRABECULECTOMY

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#### Purpose

To describe the results of surgical bleb revision with scleral patch graft with posterior tamponading suture for complications following Trabeculectomy.

#### Methods

Medical records of patients who had undergone bleb revision with scleral patch graft between August 2007–October 2013 were reviewed. Twenty-six eyes of 26 patients were found to be eligible and were included in this study. Success was defined as complete when there was resolution of the bleb leak or hypotony, with IOP of 6 mmHg or more and 18 mmHg or less, without need for further glaucoma surgery or glaucoma medications. Qualified success met the same criteria, but with medications. A failure was defined as a persistent bleb leak, an IOP less than 6 mmHg or more than 18 mmHg despite medical treatment, re-surgery for bleb leaks, or the occurrence of blebitis or endophthalmitis.

#### Results

Mean (SD) age of the patients was 60 (17.4) years, range of 19–80 years. 61% patients were male. The diagnosis was POAG in 42.31%, PACG in 23.08%, Congenital and developmental glaucoma in 15.4%, secondary glaucoma in 7.7% of patients. In 11.55% of patients diagnosis was not known. The indications were, cystic bleb with (i) leak in 6 (23.07%) (ii) blebitis in 5 (19.23%) (iii) hypotony in 6 (23.07%) (iv) dysesthetic bleb in 1 (3.84%) and (v) traumatic rupture of bleb in 3 (11.53%) patients.

The median follow-up was 30 weeks. Visual acuity improved in 10 (38%), remained same in 11 (42.3%) and decreased in 5 (19.2%) of patients. The mean ( $\pm$ SD) IOP prior to the procedure and on last follow-up was  $9.03 \pm 5.12$  mmHg and  $14.75 \pm 5.41$  mmHg respectively ( $P < 0.0005$ ). Absolute success was achieved in 13 (50%) patients, qualified success in 8 (30.76%) patients, and failure in 4 (15.38%) patients. In 2 (7.69%) patients post revision IOP could not be measured due to irregular mires.

#### Conclusions

Bleb revision with scleral patch graft is a successful method of treating bleb related complications.

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## P-FS-124

# FIXING TECHNIQUE OF THE TENON IMPROVES BLEB CHARACTERISTICS AND PROGNOSIS OF THE SURGERY

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### Purpose

To evaluate the correlation between the morphological characteristics of the filtering bleb and the long-term intraocular pressure (IOP) in patients undergoing trabeculectomy with preservation of the tenon through.

### Methods

This is a prospective cohort study, in a single center, in 73 eyes undergoing trabeculectomy with MMC with previous fixation of tenon-conjunctiva suture with nylon 10/0. The bleb morphological characteristics were graded using the Modified Indian Bleb Appearance Grading Scale (IBAGS), based on serial photos at week, month and 6 months after surgery. Success was defined as IOP  $\leq$  16 mmHg at 6 months. These findings were correlated with IOP and surgical success by linear Logistic regression analysis.

### Results

Using the IBAGS scale, the filtering bleb at 6 months was graded as follows: H0 was observed in 3 eyes, H1 in 18 eyes, and H2 in 22 eyes; in relation to the horizontal extension E0 was observed in 3 eyes, E1 in 9 eyes, and E2 in 31 eyes; and for vascularity, V2 in 35 eyes and V3 in 8 eyes. No leak was observed in this series (S0: 43 eyes). The average IOP value at 6 months was  $13.34 \pm 4.30$  mmHg. The area under the curve (AUC) for success at week, 1 month and 6 months was 0.5911, 0.7841 and 0.7307 respectively; with direct relation to the best bleb appearance (H2, E2, V2), the AUC of 0.9895 (95% CI).

### Conclusions

Ideal characteristics of the filtering bleb, obtained with previous fixation of tenon-conjunctiva suture, can be considered as predictors of long-term IOP control and associated with a high success rate of filtering surgery.

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## P-FS-125

### TRANSSCLERAL CYCLOPHOTOCOAGULATION VERSUS TRABECULECTOMY – SAFETY IN POST-KERATOPLASTY PATIENTS

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#### Purpose

To compare outcomes of transscleral cyclophotocoagulation (TSCP) and trabeculectomy (TRAB) performed in eyes after keratoplasty.

#### Methods

59 patients at mean age 63.5 years were diagnosed secondary glaucoma after corneal transplantation (51 eyes after the penetrating keratoplasty (PK), 6 eyes after deep anterior lamellar keratoplasty (DALK) and 2 eyes after Descemet stripping automated endothelial keratoplasty (DSAEK)). 30 patients were qualified for TRAB as the first-line procedure, next 29 patients underwent TSCP. Mean IOP was  $33,3 \pm 4,5$  mmHg in TSCP group,  $32,6 \pm 6,0$  mmHg in TRAB group. Patients were treated with at least 2 anti-glaucoma agents. Decrease of IOP and safety for the cornea were evaluated.

#### Results

Decrease of IOP after 12 months to an average value of  $14.8 \pm 3.8$  mmHg in TRAB group and  $19.5 \pm 5.7$  mmHg in the TSCP group – it means 53% and 41 % respectively ( $P < 0,05$ ). TRAB group patients required a maximum of 1 topical (mean  $0.68 \pm 0.6$ ), while TSCP patients required 2 local drugs (mean  $2.1 \pm 0.9$ ) ( $p < 0.01$ , U-Mann Whitney test). Endothelial cell loss was  $10,0 \pm 4,0\%$  in TRAB group and  $3,7 \pm 3,0\%$  in TSCP group ( $P < 0.01$ , U-Mann Whitney test).

#### Conclusions

TSCP significantly decreases IOP as well as number of required drugs, whereas endothelial cell loss is lower if compared with TRAB procedure.

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## P-FS-126

### TRANSLERAL MICROPULSE DIODE LASER SCHLEMMMS-TRABECULOPLASTY FOR PRIMARY OPEN ANGLE GLAUCOMA: A PILOT STUDY

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#### Purpose

To determine the short term effectiveness of a novel translateral micropulse diode schlemms-trabeculoplasty (S-T Plasty) in lowering intraocular pressure (IOP) for patients with primary open angle glaucoma (POAG).

#### Methods

This was a prospective, pilot case series comprising of patients with primary open angle glaucoma with IOP  $\geq 22$  mmHg. Demographics and baseline clinical characteristics were noted. Micropulse diode laser was applied to the schlemms-trabecular meshwork complex through the corneoscleral junction using MP3 probe under topical anaesthesia with the following laser setting: 1.6 Watt power, 0.6 milliseconds (laser ON), interval of 1.4 milliseconds (laser OFF) with a duty cycle of 30%. Both the superior (30 seconds) and inferior quadrants (30 seconds) were treated avoiding the 3 & 9 o'clock meridians with a total treatment duration of 60 seconds. Follow-up examinations were performed at intervals of 1 day, 1 month and 6 months. Visual acuity, IOP, slit-lamp biomicroscopy and ocular fundus examination findings were recorded.

#### Results

Four patients with POAG were treated. Mean IOP pre-treatment was 25.75 mmHg. Post laser, IOP decreased to an average of 15.5 mmHg after 6 months of follow-up. Per cent IOP reduction was 25.7% after 6 months with 50% reduction in the number of anti-glaucoma eye drops without any significant complications. There was no change in visual acuity before and after laser treatment during the entire follow-up period.

#### Conclusions

Translateral micropulse diode laser treatment of the schlemms-trabecular meshwork resulted in intraocular pressure reduction without significant complications.

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## P-FS-127

# GONIOTOMY WITH TM EXCISION VS TRABECULAR BYPASS DEVICE IMPLANTATION IN GLAUCOMA PATIENTS UNDERGOING CATARACT EXTRACTION: 12 MO SUBGROUP ANALYSIS

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### Purpose

To characterize the efficacy and safety of goniotomy with the Kahook Dual Blade (KDB) and iStent trabecular bypass procedures in eyes with mild to moderate glaucoma also undergoing cataract extraction (CE), specifically evaluating outcomes among high and low IOP baseline (BL) subgroups.

### Methods

A retrospective analysis was conducted across 13 centers in the United States and Mexico. Efficacy (intraocular pressure [IOP], visual acuity [VA]), and safety were assessed in 317 eyes undergoing CE+goniotomy (n = 192) or CE+iStent (n = 125) in high and low baseline IOP subgroups.

### Results

At 12-month follow-up, among eyes with higher BL IOP (>18 mmHg), mean IOP decreased 39.6% to 13.1 mmHg in the CE+goniotomy group and 30.1% to 14.5 mmHg in the CE+iStent group (P < 0.001). Among eyes with lower BL IOP (<18 mmHg), mean IOP decreased 9.2% to 13.3 mmHg in the CE+goniotomy group and 0.1% to 14.3 mmHg in the CE+iStent group (p = 0.016). No significant sight-threatening adverse events were observed in either of the treatment groups.

### Conclusions

CE+goniotomy with KDB yields significantly greater reductions in IOP through 12-month follow-up in both high and low BL subgroups compared to CE+iStent.

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## P-FS-128 AHMED GLAUCOMA VALVE EXPLANTATION

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### Purpose

To evaluate the prevalence and the conditions necessitating an Ahmed glaucoma valve (AGV) explantation.

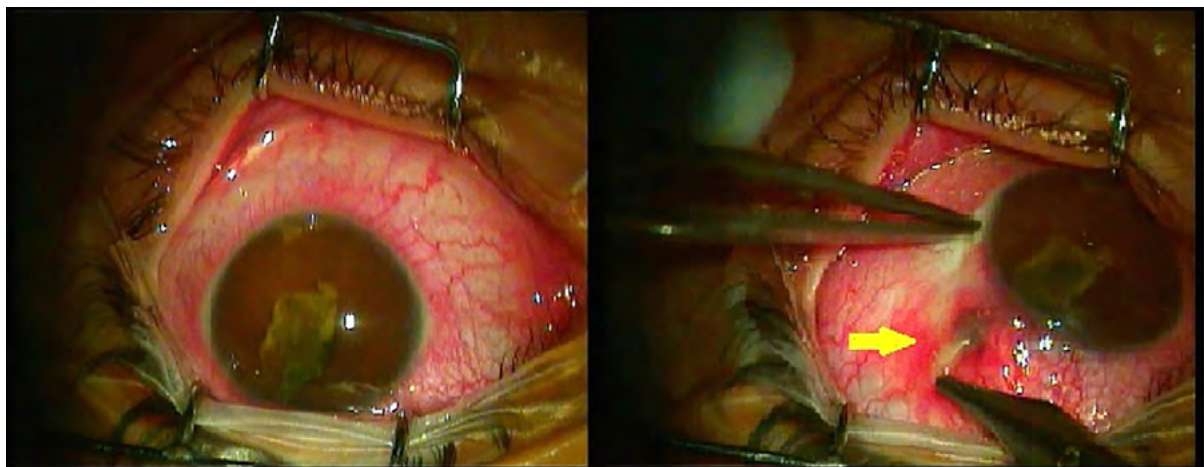
### Methods

This retrospective, noncomparative study includes the medical records of one eye of each 13 patients who underwent an AGV removal.

### Results

A total of 324 eyes received an AGV between April 2002 and March 2017 and 21 (6.48%) of them had tube exposure. Eight eyes of the 21 were successfully repaired by different methods but 13 of them underwent an implant explantation. For the 13 patients, average  $2.2 \pm 0.4$  (2 or 3 times) repairing procedures were performed for each patient which include conjunctival pedicle flaps or double layer amniotic membrane graft with/without pericardial patch graft but they required an explantation within 2 months after the last attempt because of recurrent tube erosion. The mean time with the AGV was  $38.30 \pm 36.94$  (range; 4-114) months. The mean intraocular pressure (IOP) value was  $13 \pm 7$  (range; 3-30) mmHg just before the explantation, and  $26 \pm 1$  (range; 3-50) mmHg at the first postoperative morning following the explantation without antiglaucomatous therapy. The mean follow-up period after the removal was  $22 \pm 14$  (range; 6-57) months. The mean IOP value was  $22 \pm 10$  (range; 5-42) mmHg with/without medical treatment at the last visit.

### Image



### Conclusions

A tube exposure, which can be considered as both an early and a late complication, is the main reason for an explantation. In this series, uveitis is the most common diagnosis for the valve implantation; hence, it is correct to say that uveitic cases are the most common groups of patients, who not only have a risk of exposure, but also have encountered failure in primary repair of exposure. AGV explantation is a safe and saviour procedure in all tube exposure patients when other surgical maneuvers were not adequate.

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## P-FS-129

### PHACOTRABECULECTOMY WITH RELEASABLE SUTURES IN PRIMARY ANGLE CLOSURE GLAUCOMA: A RANDOMIZED CONTROLLED STUDY

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#### Purpose

To compare the results of combined phacotrabeculectomy with releasable sutures to phacoemulsification alone in primary angle closure glaucoma (PACG).

#### Methods

Sixty-three eyes of 63 patients with PACG were randomized to undergo phacotrabeculectomy with mitomycin C (31 eyes); or phacoemulsification alone (32 eyes). In the phacotrabeculectomy group, water-tight closure of the scleral flap was achieved using at least 4 releasable sutures. Postoperative results were compared at 1, 3, 6 and 12 months. The main outcome measures were: intraocular pressure (IOP), number of medications, and complications in both groups as well as surgical failure defined as IOP  $\geq 21$ mmHg and/or IOP reduction  $< 20\%$  at 12 months, or the need for another glaucoma surgery.

#### Results

There was a significant reduction in IOP and glaucoma medications in both groups at all postoperative follow ups ( $P$ -value= $<0.001$ ). There was no statistically significant difference in IOP or glaucoma medications between both groups preoperatively, while postoperatively the number of medications was significantly higher in the phacoemulsification group at 1 and 3 months ( $P$ -value = 0.03 and 0.04, respectively). The percent IOP reduction was higher in the phacotrabeculectomy group at all follow up visits, but the difference did not reach statistical significance. In the phacotrabeculectomy group, 25 eyes (80.6%) required removal of at least one releasable suture to titrate the IOP. More eyes were classified as failures in the phacoemulsification group (10 eyes) compared to the phacotrabeculectomy group (5 eyes), but the difference was not statistically significant ( $P$ -value = 0.16). The rate of complications in both groups was comparable, but more eyes required surgical interventions in the phacotrabeculectomy group, mostly to manage hypotony. Two eyes in each group required another glaucoma procedure to control the IOP.

#### Conclusions

Phacotrabeculectomy with postoperative titration of the IOP using releasable sutures is a safe and effective procedure to manage PACG and was associated with more surgical success than phacoemulsification alone, but at the expense of more hypotony-related complications. Most eyes in the phacotrabeculectomy group required removal of releasable sutures, indicating that phacoemulsification alone was not going to be sufficient for these cases.

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## P-FS-130

### EFFICACY AND SAFETY OF THE CYPASS SUPRACHOROIDAL SHUNT – A CASE SERIES

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#### Purpose

To describe the outcomes and 12-month safety profile of the Cypass suprachoroidal shunt implant at a teaching hospital in London, UK.

#### Methods

We identified patients that underwent Cypass implantation either as a standalone procedure or combined with cataract surgery. We collected data on initial diagnosis, intraocular pressure (IOP), number of medications and complications. We examined changes in IOP and number of glaucoma medications using the paired *t*-test.

#### Results

74 eyes of 66 patients were identified. The population was ethnically diverse (45% Caucasian, 30% Asian and 25% of African/Afro-Caribbean descent). 53% of patients were men. Mean age was 71 years (range 37-90). 75% of patients had a diagnosis of primary open-angle glaucoma. 26% of cases had previous glaucoma surgery to the operated eye. The device was not implanted successfully in 7 patients due to intra-operative difficulties.

Mean IOP (mmHg) reduced from 19.8 preop to 15.7 at 3 months, 16.8 at 6 months and 14.7 at 12 months (all  $P < 0.001$ ). There was reduction in the number of glaucoma medications from 2.5 preop to 0.9 at 3 months, 1.4 at 6 months and 1.6 at 12 months (all  $P < 0.005$ ). Immediate post operative complications were observed in 18% of cases and consisted mainly of hyphema. None of the patients developed corneal decompensation.

#### Conclusions

Our 12-month results support existing evidence that the Cypass is effective at lowering IOP and reducing glaucoma medication burden. While we did not observe any major complications, and specifically no instances of corneal decompensation, longer term follow-up is required to determine this.

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## P-FS-131

### CO2 LASER-ASSISTED SCLERECTOMY VERSUS TRABECULECTOMY

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#### Purpose

This study aimed to compare the efficacy and safety of glaucoma surgery using CO2 laser assisted sclerectomy surgery (CLASS) and trabeculectomy (TRAB).

#### Methods

Retrospective case series including patients with primary and pseudoexfoliative open angle glaucoma, elected for filtration surgery. Demographic data such as age, gender and date of surgery was registered. The best corrected visual acuity (BCVA), intraocular pressure (IOP) and number of anti-glaucoma medications were documented at baseline and at all postoperative clinic visits. All intra- and postoperative complications were registered. Complete success was defined as an IOP < 21 mmHg, with no medications or reoperations. Qualified success was defined as IOP < 21 mmHg with medications and/or reoperations. Exclusion criteria included combined surgery with Phaco or other types of glaucoma surgery and ocular pathology such as retinal detachment.

#### Results

Seventy-two eyes from 72 patients (52.78% female, median age 70.8 years) were submitted to CLASS (n = 29) or TRAB (n = 43). 65% of patients had primary open angle glaucoma (POAG) and 35% pseudoexfoliative (PEX) glaucoma. At the time of surgery 35.21% of eyes had an IOL. Mean sample BCVA at baseline was  $0.65 \pm 0.28$  with IOP  $24.08 \pm 5.28$  mmHg and a cup-to-disc ratio  $0.7 \pm 0.20$ . When comparing 3<sup>rd</sup> month visit with baseline there was a combined BCVA difference  $-0.137 \pm 0.24$  with no statistical significance between CLASS vs EPNP  $p = 0.94$ . However, IOP reduction with CLASS was  $-6.3 \pm 8.99$  and with TRAB  $-11.19 \pm 6.10$   $p = 0.009$  favouring TRAB. Complete success at 3 months occurred in 55.81% of patients with TRAB compared to 34.48% in CLASS vs a qualified success of 95.35% in TRAB compared to 75.86% of CLASS. At 12<sup>th</sup> month visit there was a combined BCVA difference  $-0.11 \pm 0.23$  ( $p = 0.55$ ) and IOP reduction with CLASS was  $-7.04 \pm 5.45$  compared to  $-10.75 \pm 5.86$  with TRAB ( $p = 0.01$ ). Complete success at 12 months occurred in 53.66% of patients with TRAB compared to 31.82% in CLASS vs a qualified success of 97.56% in TRAB compared to 90.91% of CLASS. At 12 months there was reoperation in 25% of patients with CLASS against 23.26% with TRAB. Finally, overall complications were significantly greater in TRAB 37.21% vs CLASS 6.9%.

#### Conclusions

We present a study comparing glaucoma CO2 laser-assisted sclerectomy vs. trabeculectomy. The results provide evidence of a similar BCVA between procedures. TRAB has better IOP reduction, complete and qualified success however overall complications were significantly greater.

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## P-FS-132

# 2-YEAR RESULTS OF A PROSPECTIVE, MULTICENTER, RANDOMIZED COMPARISON OF HYDRUS VERSUS TWO ISTENTS IN STANDALONE SURGERY FOR OPEN ANGLE GLAUCOMA

Antonio Fea\*

## Purpose

The effectiveness of at least 3 different MIGS devices for reducing intraocular pressure (IOP) and medications when used in conjunction with cataract surgery has been demonstrated in large scale randomized studies [1, 2, 3]. However, these studies also demonstrate that cataract surgery alone is effective in reducing IOP and medications compared to baseline. The purpose of this study was to compare the safety and effectiveness of 2 MIGS devices for IOP and hypotensive medication reduction without the confounding effect of cataract surgery.

## Methods

The study included 152 phakic and pseudophakic open angle glaucoma eyes controlled with  $\geq 2$  hypotensive medications, no prior incisional surgery, and washed out IOP 23-39 mmHg from 12 investigative centers located in Europe, Canada, South America, and Asia. On the day of surgery, eyes were randomized 1:1 for standalone surgery with either single Hydrus Microstent (Ivantis, Irvine, CA) or two GTS100 iStent Trabecular Micro-Bypass Stents (Glaukos Inc., San Clemente, CA). Comprehensive follow up ocular examinations were conducted at 1, 3, 6, 12, 18 and 24 months postoperative, including tonometry and medication assessment.

## Results

Hydrus Microstent (HMS) and two iStent (2IS) groups were well matched for demographics, lens status, visual acuity, cup to disk ratio and visual field loss. Prior to surgery, mean IOP was  $19.0 \pm 3.9$  and  $19.1 \pm 3.6$  mmHg and mean medication count was  $2.5 \pm 0.7$  and  $2.7 \pm 0.8$  in the HMS and 2IS groups, respectively. At 24 months, IOP in the HMS group was  $17.5 \pm 3.5$  ( $p = 0.026$  vs. preop) and  $18.8 \pm 4.0$  ( $p = \text{ns}$  vs. preop) in the 2IS group. The mean number of medications was  $1.2 \pm 1.2$  in the HMS group and  $1.9 \pm 1.4$  (difference in change = 0.6, 95%CI 0.2–0.9 meds,  $p = 0.006$ ). The proportion of medication free eyes was 38% (HMS) and 18% (2IS), ( $p = 0.010$ ). There were no secondary glaucoma surgeries in the HMS group 0/75 (0%) and 7/77 (11%) in the 2IS group ( $p = 0.013$ ).

## Conclusions

At 24 months, MIGS surgery with HMS resulted in significant reduction in IOP compared to preoperative. Compared to 2IS treatment, HMS eyes used significantly fewer medications, reached 0 medications more often. In addition, HMS eyes were associated with less secondary filtration surgery.

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## P-FS-133

### A 2-YEAR POOLED ANALYSIS OF THE MICROSHUNT IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA (POAG): 0.2 VERSUS 0.4 MG/ML MITOMYCIN C (MMC) OUTCOMES

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#### Purpose

The MicroShunt is an 8.5 mm-long plateless drainage device made from a highly biocompatible and bioinert material called poly(styrene-*block*-isobutylene-*block*-styrene), or SIBS. Pooled data from three studies evaluating the 2-year efficacy and safety outcomes of the MicroShunt in patients with POAG have previously been reported.<sup>1</sup> Herein, we report a comparison of 0.2 versus 0.4 mg/mL MMC outcomes from this pooled analysis.

#### Methods

The MicroShunt was implanted *ab externo*, alone or in combination with cataract surgery, with application of MMC for 2–3 minutes. The outcomes recorded were intraocular pressure (IOP), number of glaucoma medications per patient and all device- and/or procedure-related adverse events (AEs). Success was defined as IOP < 21 mmHg and ≥ 20% reduction from baseline with/without medication and no reoperation for glaucoma. Data collected after reoperation were excluded from IOP and glaucoma medication analyses.

#### Results

In total, 124 patients with mild-to-severe POAG and baseline-medicated IOP ≥ 18 mmHg underwent the procedure; 58 received 0.2 mg/mL MMC and 66 received 0.4 mg/mL MMC. In the 0.2 mg/mL MMC group, IOP ± SD decreased from 22.7 ± 4.4 mmHg at baseline to 14.8 ± 4.5 mmHg at Year 2 (–34%) and glaucoma medications per patient decreased from 2.4 ± 1.3 to 0.8 ± 1.1; in the 0.4 mg/mL MMC group, IOP decreased from 22.3 ± 4.0 mmHg to 13.1 ± 3.4 mmHg (–41%) and glaucoma medications per patient decreased from 2.1 ± 1.2 to 0.2 ± 0.6. Success rate at Year 2 was 78% in the 0.2 mg/mL MMC group and 77% in the 0.4 mg/mL MMC group. There were four patients (7%) in the 0.2 mg/mL MMC group and ten patients (15%) in the 0.4 mg/mL MMC group who required reoperation for glaucoma. In the 0.2 mg/mL MMC group, the most common device- and/or procedure-related AEs were increased IOP requiring glaucoma medications and/or selective laser trabeculoplasty (SLT) (33%) and numerical hypotony (12%); in the 0.4 mg/mL MMC group, the most common AEs were increased IOP requiring glaucoma medications and/or SLT (18%) and numerical hypotony (14%). There were no reports of long-term sight-threatening AEs in either group.

#### Conclusions

MicroShunt implantation with 0.4 mg/mL MMC demonstrated greater reductions in IOP and medications, as well as lower incidence of increased IOP, when compared with 0.2 mg/mL MMC in these study patients.

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**P-FS-134**

**COMPARATIVE ANALYSIS OF ENRICHMENT OF TWO BIODEGRADABLE GLAUCOMA DRAINAGE MODELS WITH CYCLOSPORINE A FOR WOUND HEALING MODULATION**

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**Purpose**

To perform comparative analysis of ability of 2 biodegradable glaucoma drainage (GD) models to cumulate and desorb cyclosporine A (CsA) - a potential antiproliferative agent in glaucoma surgery.

**Methods**

We analyzed the ability of 2 models of poly(lactic-co-glycolic) acid GD (DDA and SDA) to cumulate CsA from solutions with decreasing drug concentrations from 50,0 to 1,0 mg/ml for 15 minutes. In order to study the dynamics of CsA desorption *in vitro* drainage samples enriched with CsA were placed in containers with 9 ml balanced salt solution and kept at constant temperature 37 C° in a shaker (50-100 rpm). At specific times from 12 hours to 10 days drainage samples were removed from the solutions and residual CsA content was evaluated by means of chromatography-mass spectrometry.

**Results**

Drainage samples enriched in solutions with CsA concentrations exceeding 2 mg/ml released potentially toxic concentrations of CsA (more than 5,0 mg/ml [1]) during first hours. SDA enriched in CsA solution with drug concentration 6,25 mg/ml cumulated  $3,2 \pm 0,26 \mu\text{g}$  and DDA cumulated  $3,87 \pm 0,29 \mu\text{g}$  after exposure in solution with CsA concentration 1,6 mg/ml. Therapeutic concentration of CsA (0,05-0,1  $\mu\text{g/ml}$  [2]) in SDA was maintained for  $3 \pm 0,4$  days, while DDA released therapeutic concentrations of CsA for  $8 \pm 0,5$  days.

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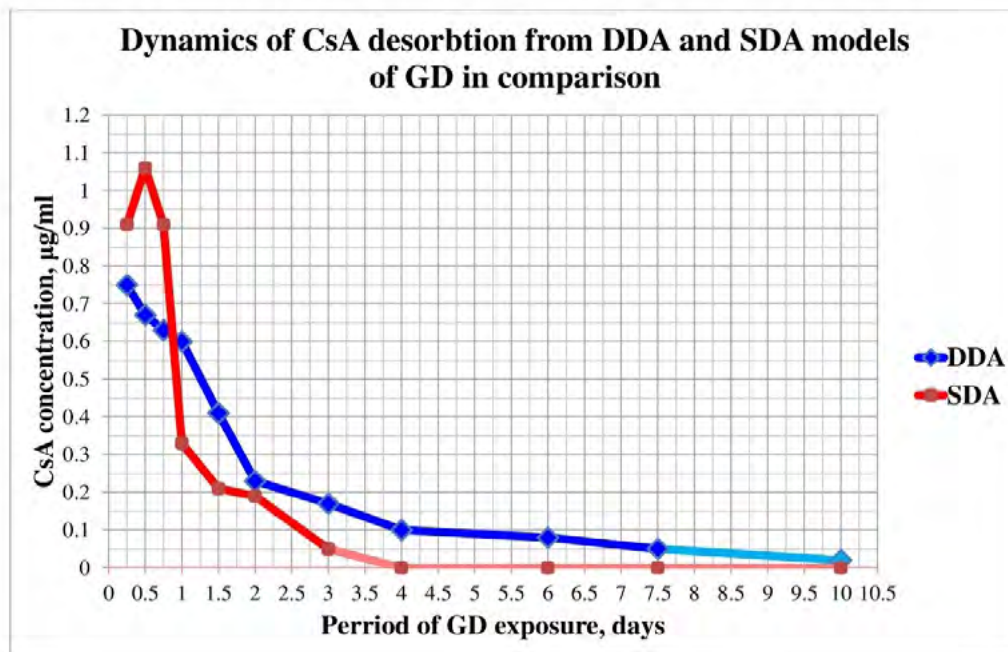
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## Conclusions

DDA model of poly(lactic-co-glycolic) acid GD turned out to be a better candidate for CsA enrichment as CD4+ cells which are a target for this drug [2] peak on the 5<sup>th</sup> day after operation injury [3]. We developed a safe and simple method to maintain therapeutic concentration of CsA *in vitro* for a period of time essential in terms of fibroblast proliferation [3]. This method is easily displayable in operation room and can potentially reduce scarring intensity in glaucoma surgery.

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**P-FS-135**

**PROSPECTIVE STUDY OF ISTENT INJECT® MICROSTENT IMPLANTATION COMBINED WITH CATARACT SURGERY IN OPEN-ANGLE GLAUCOMA PATIENTS: 6-MONTH RESULTS**

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<sup>2</sup>*Department of Ophthalmology, University of Denver, Denver, United States*

**Purpose**

To determine the safety profile and intraocular pressure (IOP)-lowering capacity of 2 iStent inject® microstents implanted in combination with cataract surgery in patients with mild-to-moderate open-angle glaucoma.

**Methods**

30 eyes of 28 patients diagnosed with mild-to-moderate open-angle glaucoma and presenting an indication for cataract surgery were enrolled in this prospective study. Best-corrected visual acuity (BCVA), IOP, number of anti-glaucomatous medications, visual field mean defect (MD), and endothelial cell count were collected at baseline. Two iStent inject® microstents were implanted through the trabecular meshwork at the end of routine cataract surgery. Patients were followed up at 1 day, 1 week, 1 month, 3 months and 6 months, with longer term follow-up out to 2 years. Surgical success was defined as either 1) achieving a reduction in anti-glaucomatous medications with an IOP lower or equal to baseline, or 2) achieving an intraocular pressure reduction  $\geq 20\%$  from baseline under the same number of medications.

**Results**

Out of the 28 patients included, the average age was 73.7 years. In all, 21 had primary open-angle glaucoma, the remainder had pseudo-exfoliative glaucoma, with an overall MD of 6.3 ( $\pm 2.4$ ) dB. Mean baseline IOP was 17.1 ( $\pm 3.5$ ) mmHg under an average of 2.0 ( $\pm 0.9$ ) medications. At the last follow-up, the mean IOP was 14.7 ( $\pm 3.1$ ) mmHg (a 14% IOP reduction) on an average of 0.8 medications ( $\pm 0.9$ ). The overall surgical success rate was 84.6%, with 46% of patients achieving IOP  $\leq 18$  mmHg without any medications. In this group, the average age was statistically significantly lower than in patients who required re-introduction of medications (69.3 vs. 79.0 years,  $P < 0.05$ ). Glaucoma diagnosis, baseline IOP, medications and MD, and number of visible stents did not appear to have a significant impact on success ( $p > 0.05$ ). No peri-operative or post-operative complications were noted.

**Conclusions**

iStent inject microstents combined with routine cataract surgery can present a safe method to effectively reduce IOP and antiglaucomatous medications in mild-to-moderate glaucoma. Further research is still required to evaluate long-term outcomes and the stand-alone potential of such microstents.

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## P-FS-136

### RETROSPECTIVE SURGICAL OUTCOME ANALYSIS OF TRABECULAR MICRO-BYPASS STENT, 180-DEGREE AND 360-DEGREE GONIOSCOPY ASSISTED TRANSLUMINAL TRABECULOTOMY

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#### Purpose

To compare surgical outcomes of patients who have undergone trabecular micro-bypass stent (iStent, Glaukos), 360-degree gonioscopy assisted transluminal trabeculotomy (GATT), or a novel 180-degree gonioscopy assisted transluminal trabeculotomy (hemi-GATT).

#### Methods

A retrospective chart review was performed on patients who had received either a trabecular micro-bypass stent, GATT or hemi-GATT procedure. The hemispheric approach of targeting 180-degrees of Schlemm's canal with a hemi-GATT was performed in adherence to the Declaration of Helsinki and Health Research Ethics Board approval. The primary outcome measure included patients who did not require further surgery and have attained intraocular pressure (IOP) lowering of  $\geq 20\%$  or  $< 21\text{mmHg}$  at the 6 month postop visit. The secondary outcome measure was IOP lowering and glaucoma medication burden at the 1, 3 and 6 month postop visits.

#### Results

221 patients were included, with 89 having received trabecular micro-bypass stent, 57 with GATT, and 77 with hemi-GATT. Concurrent surgeries mostly included cataract extraction, though some cases had concurrent intraocular lens exchange, and anterior vitrectomy. The mean preop IOP in trabecular micro-bypass stent patients was  $19.3 \pm 5.5\text{mmHg}$  and decreased to  $13.8 \pm 3.8\text{mmHg}$ ,  $13.7 \pm 3.3\text{mmHg}$ , and  $13.2 \pm 0.9\text{mmHg}$  at 1, 3, and 6 months respectively. Glaucoma medications decreased from  $1.1 \pm 1.2$  to  $0.9 \pm 1.1$  at 6 months. GATT patients had a mean preop IOP of  $22.8 \pm 9.3\text{mmHg}$  and decreased to  $13.0 \pm 4.4\text{mmHg}$ ,  $13.0 \pm 9.3\text{mmHg}$ , and  $13.2 \pm 4.9\text{mmHg}$  at 1, 3, and 6 months respectively. The amount of glaucoma medications for GATT patients decreased from  $2.1 \pm 1.5$  to  $1.4 \pm 1.2$  at 6 months. For those who underwent a hemi-GATT mean preop IOP was  $31 \pm 10.3\text{mmHg}$  and decreased to  $15.7 \pm 6.8\text{mmHg}$ ,  $14.9 \pm 4.6\text{mmHg}$ , and  $14.4 \pm 4.4\text{mmHg}$  at 1, 3, and 6 months respectively. These patients decreased their glaucoma medications from  $3.6 \pm 1.2$  to  $1.7 \pm 1.4$  at 6 months. There was no significant difference between IOP changes at 6 months among the 3 groups. The success rate was 52% for trabecular micro-bypass stent, 74% for GATT, and 70% for hemi-GATT.

#### Conclusions

The mean IOP and number of glaucoma medications at 6 months postop for all three procedures have shown significant decreases. GATT and hemi-GATT procedures done with a suture is an accessible and cost-effective substitute at \$10-30 USD additional case cost compared to other MIGS devices. As there was no significant difference between GATT and hemi-GATT procedures, hemi-GATT is promising addition to the MIGS arsenal.

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## P-FS-137

### OMNI™ IN OPEN-ANGLE GLAUCOMA TREATMENT: A 1-YEAR FOLLOW-UP

Iwona Grabska-Liberek<sup>\*1</sup>, Julita Majczyk-Ionescu<sup>1</sup>, Patrycja Duda<sup>1</sup>, Monika Rogowska<sup>1</sup>, Agnieszka Skowrya<sup>1</sup>, Ingrid Kane<sup>2</sup>

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#### Purpose

To analyze the safety and efficacy of OMNI™ procedure in reducing intraocular pressure (IOP) and number of glaucoma medications in adult subjects with open-angle glaucoma (OAG).

#### Methods

A single-surgeon prospective clinical study. 19 eyes of 17 OAG patients underwent OMNI™ surgery. 12 eyes of 11 patients underwent OMNI™ alone and 7 eyes of 7 patients underwent OMNI™ combined with cataract surgery. All patients will be followed up for 1 year. Changes in intraocular pressure (IOP) and postoperative complications will be examined. Success is defined as post-operative IOP reduction  $\geq 20\%$  without glaucoma medication ("complete success") or with topical treatment ("qualified success"). The number of medications before and after surgery will be considered.

#### Results

2 males and 15 females with a mean age of 72,16 years (range 63–86 years), underwent OMNI™. Pre-operative mean IOP was  $22,00 \pm 6,39$  mmHg (min IOP = 13 mmHg, max IOP = 38 mmHg). Postoperative IOP decreased to a mean of  $13,87 \pm 4,32$ ,  $15,32 \pm 4,36$ ,  $14,06 \pm 3,05$ ,  $13,79 \pm 3,26$  and  $14,38 \pm 4,10$  mmHg at 1 week, 1 month, 3 months, 6 months and 1 year (in eyes which achieve checkpoint), respectively. The number of anti-glaucoma medications dropped from a mean of 3,00 preoperatively to 0,11, 0,21, 0,65, 1,42 and 1,88 at 1 week, 1 month, 3 months, 6 months and 1 year, respectively. Complications were limited to IOP-spikes (ten eyes), hyphema (sixteen eyes) and fibrin in the anterior chamber (four cases) that resolved in the first week after surgery.

#### Conclusions

The OMNI™ is a promising approach for the treatment of open-angle glaucoma. The procedure achieves reduction of the intraocular pressure and number of glaucoma medications. It also demonstrates good safety profile. The main advantages of the procedure are: short surgical learning curve, fast to perform, implant free and sutureless, can be combined with cataract surgery, sparing of the conjunctiva and sclera of incisions. Further studies are needed.

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**P-FS-138**

**UBM IMAGING PATTERNS IN SUCCESSFUL TRABECULECTOMY WITH SUPRACHOROIDAL DERIVATION. A LONG TERM ANALYSIS**

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**Purpose**

to describe common imaging patterns at surgical area of operated glaucomatous eyes with a successful result at 24 months' follow-up or more. The surgical technique (trabeculectomy with suprachoroidal derivation -TREC w/ SCD-) has been previously described.<sup>1</sup>

**Methods**

This prospective, observational series of consecutive cases was conducted at the Cataract and Glaucoma Institute of Lima, Peru. A VuMax (Sonomed Escalon, NY, USA) UBM device was used to obtain radial scans through the central axis of the surgical area. Inclusion criteria: every successful TREC w/ SCD performed at the clinic between January 2012 and December 2015 and reaching the required follow-up time. Success was defined as an IOP of 18mmHg or less and an IOP reduction of 20% or more at the final control. Exclusion criteria: eyes that failed to reach the mentioned aim, an IOP of 5mmHg or less, reoperation, devastating complications, loss of light perception, patients not complying with follow-up controls, studies with low quality images. Every scan was taken by the same observer (RPG). Presence / absence of a conjunctival filtering bleb, presence and size of a suprachoroidal chamber (size classified according to radial diameter as none (0mm), limited (1-4mm) and extensive (>4mm), presence of choroidal detachments, and any additional sign were analyzed by an independent observer (DG). Only images obtained at the last control were considered.

**Results**

Eighteen eyes of 14 patients were included. At the last control the follow-up time had been 42,94 months (median 47 months), the average IOP  $12.66 \pm 2.49$ mmHg (median 13mmHg), and the reduction from basal value had been  $42.60\% \pm 22\%$  (median 45.8%). UBM findings: a) one third of the eyes (6) had no ultrasonographic evidence of an external bleb<sup>2</sup>, b) eighty eight percent (16) had an evident suprachoroidal anechoic space. In 63.5% of these, the space was classified as extensive c) an additional sign was found in five eyes (27%): a hypoechoic ciliochoroidal area inside the ciliochoroidal complex. No choroidal detachments or other signs that may also influence IOP levels were found.

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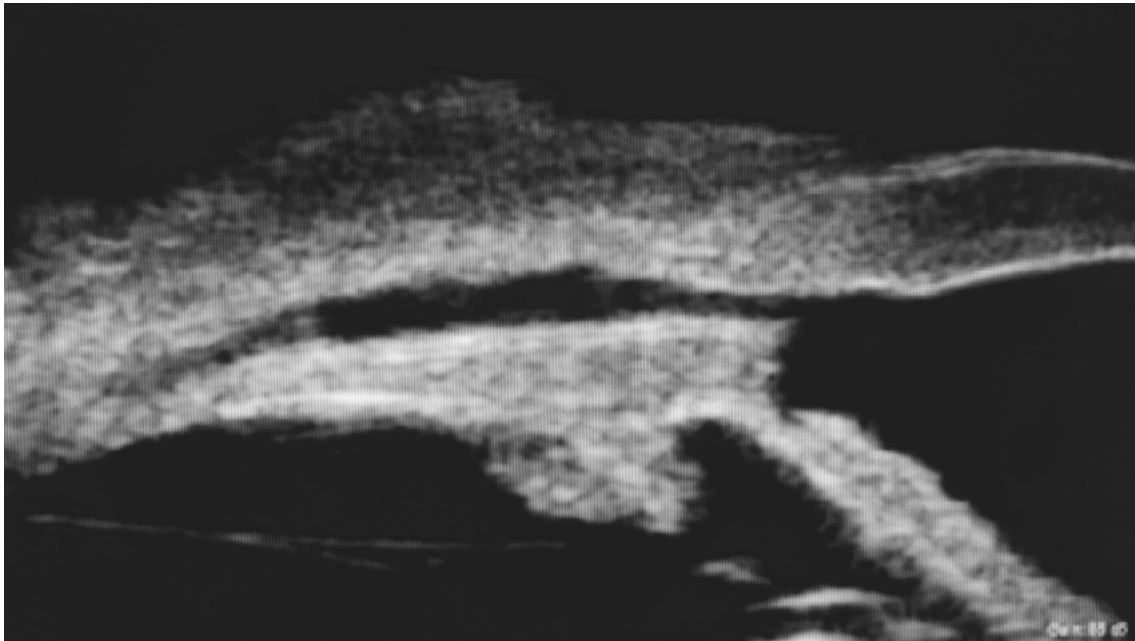
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## Conclusions

Eyes with TREC w/ SCD achieving success at a long term maintain UBM patterns compatible with different aqueous exit routes.

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**P-FS-139**

**SUCCESS RATE AND SAFETY OF MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION WITH VARIABLE TREATMENT DURATIONS IN GLAUCOMA**

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**Purpose**

To evaluate the effectiveness and safety of Micropulse Transscleral Cyclophotocoagulation (MP-TSCPC, Iridex Corp, Mountain View, CA) in adults at 6 months based on variable treatment duration while keeping other parameters fixed.

**Methods**

Retrospective observational study. All patients who underwent a MP-TSCPC in three different glaucoma centers in the 2016-2017 period, with at least 6 months of follow-up were included. We used 3 different treatment durations (100, 160 and 180 seconds to treat whole eye – 360 degrees) and kept laser power at 2 watts and ON cycle at 0.5ms (31.3%).

Success was defined as a reduction in preoperative IOP of at least 20% and an IOP  $\leq$  21 mmHg in the last visit compared to baseline, with no additional surgical treatment. Wilcoxon signed-rank test was used to test the mean IOP reduction in successful patients.

**Results**

A total of 22 eyes of 17 patients with complex glaucoma were treated with MP-TSCPC. Mean follow-up time was 7.9 months. Diagnosis were congenital glaucoma: 7 (32%), pseudoexfoliation glaucoma: 5 (23%), aphakic glaucoma: 3 (14%) and miscellaneous glaucoma 7 (32%). Mean age was 46.2 years (range 11-79) and 8 (47%) were female. Total treatment duration was 100 seconds (s) in 4 eyes, 160s in 14 eyes and 180s in 4 eyes. Laser power was fixed at 2 Watts. Treatment location was throughout 360 degrees with an ON cycle of 0.5ms (31.3%).

Success rate was 25% in the 100s group, 50% in the 160s group and 100% in the 180s group at 4 months; 0%, 42.9% and 75% at 6 months; and 0%, 21.4% and 75% in the last visit (7.45 months), respectively.

Mean IOP reduction was 36% (9.7 mmHg, SD 4.58; p = 0.028) at final follow-up. No complications were reported.

**Conclusions**

Overall success of single-session of Micropulse is low in the mid-term with single-session treatment (27.3%). There is a trend towards better success rates (75%) with equally good safety when applying longer treatment durations (180s).

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## P-FS-140

### TRABECULECTOMY WITH SUPRACHOROIDAL DERIVATION: 2 YEARS FOLLOW-UP

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#### Purpose

To evaluate the effectiveness of a novel glaucoma surgery in patients with refractory glaucoma.

#### Methods

Prior approval from our institutional review board has been granted and informed consent has been obtained from each patient. The study included 31 eyes of 27 patients who underwent trabeculectomy with Mitomycin C and suprachoroidal derivation with 2 autologous scleral flaps.

#### Results

The mean pre-operative intraocular pressure was  $23.23 \pm 8.61$  mmHg and the mean number of pre-operative glaucoma medications was  $3.13 \pm 1.31$ . At one day post-operatively, intraocular pressure had decreased a mean of 13.48 mmHg, at 1 month 11.27 mmHg, at 3 months 11.97 mmHg, at 6 months 11.58 mmHg, at 12 months 11.45 mmHg, at 18 months 11.16 mmHg and at 24 months 11.29 mmHg. The mean number of post-operative medications was  $0.42 \pm 0.96$ . No severe complications were found.

#### Conclusions

This novel procedure achieved a statistically significant reduction of the intraocular pressure after 24 months of follow-up. It is an effective and safe surgical technique.

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## P-FS-141

# TWO YEARS RESULT OF AHMED GLAUCOMA VALVE IMPLANTATION IN THE TREATMENT OF REFRACTORY GLAUCOMA IN A TERTIARY EYE CARE CENTER IN BANGLADESH

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### Purpose

To evaluate the clinical outcomes of Ahmed valve implant in patients with medically uncontrolled glaucoma in a tertiary eye care center ( Ispahani Islamia Eye Institute and Hospital ) in Bangladesh.

### Methods

Retrospective chart review of all patients that underwent Ahmed valve implantation for glaucoma refractory to maximum tolerated therapy and/or prior surgery failure since January of 2016. Cases with less than 6 months of follow-up were excluded. Demographic data, type of glaucoma, prior ocular surgeries, intraocular pressure (IOP) value and the number of drops needed were evaluated before and after surgery, during follow-up visits at first week, first, third and sixth months, first year and yearly thereafter. Postoperative complications were also recorded. Success of the Ahmed valve surgery was defined as IOP  $\geq 6$  and  $\leq 21$  mmHg or 20% reduction in IOP in relation to preoperative values, in the last visit, with or without medication. Absolute success was achieved when these IOP values were obtained without medication.

### Results

27 eyes of 27 patients were analysed. The mean age was  $36.37 \pm 23.27$  years. Mean follow-up of was  $9.7 \pm 2.5$  months; 15 patients completed one year follow-up. 14 patients (51.58%) had undergone glaucoma filtration surgery previously. The mean IOP decreased from  $26.78 \pm 10.71$  mmHg pre-operatively to  $13.22 \pm 4.37$  mmHg at 6 months and  $14.80 \pm 5.38$  mmHg at 1 year. Absolute success was seen in 22/27 patients (81.5%) at 6 months, and 11 of 15 patients (73.33%) at one year. Mean number of topical medications decreased from  $3.1 \pm 0.9$  preoperatively to  $1.01 \pm .2$  at 6 months and  $1.04 \pm .1$  at 1 year respectively. There was no change in visual acuity from pre-operative levels. There was no vision-threatening complication at any time in the post-operative period. In the first three months, there was transient hypotony in 3 patients, shallow anterior chamber in 3, and serous choroidal detachment in 2 patients, all of which resolved on conservative treatment.

### Conclusions

The Ahmed valve Glaucoma Filtration Device is a safe and effective option for patients with uncontrolled glaucoma, providing a significant and sustained drop in IOP and it was not associated with any serious vision-threatening complication in our study.

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## P-FS-142

# TRABECULAR MICRO-BYPASS AS A STAND-ALONE PROCEDURE FOR PATIENTS WITH GLAUCOMA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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### Purpose

Whilst there is a relatively large body of evidence supporting the implantation of minimally invasive glaucoma surgery (MIGS) devices during phacoemulsification in patients with open-angle glaucoma (OAG), its efficacy as a stand-alone (SA) procedure is less widely studied. This study aims to systematically identify and quantitatively evaluate the efficacy of iStent Trabecular Micro-Bypass device implantation performed as a SA procedure in patients with OAG. The analysis synthesises available data for iStent in the published literature and provides support for randomised controlled trial (RCT) evidence through the inclusion of non-RCTs and real-world studies.

### Methods

A systematic review of the literature was undertaken in August 2018 to identify RCTs and non-RCTs of iStent and iStent Inject (Glaukos Corporation, San Clemente, CA) implantation as a SA procedure in patients with OAG. There were no exclusion criteria for RCTs. Non-RCTs with at least 6 months follow up and greater than 10 patients were included. Weighted mean differences (WMDs) for changes in intraocular pressure IOP were calculated using the mean change between pre- and post-stent implantation measurements (baseline values were used as controls). Meta-analyses were performed using a random-effects model in Review Manager 5.3 to obtain WMDs and 95% confidence intervals (CIs). Various treatment success measures, including the proportion of patients that were medication free and the proportion of patients with IOP  $\leq 18$  mmHg at study endpoint, were meta-analysed using MetaXL (v.5.3) to produce weighted summaries of proportions using a random effects model.

### Results

Three RCTs and eight non-RCTs with up to five years follow-up and 648 eyes were identified. Mean pre-operative (medicated) IOP ranged between 20-22 mmHg across the majority of studies. In studies examining two iStent devices, IOP was significantly reduced at 12 months; WMD (95%CI): -7.23 mmHg (-8.14, -6.33) and final follow-up (6-60 months); WMD (95%CI): -6.83 mmHg (-8.07, -5.59). The proportion of patients free of medication at 12-18 months follow-up was 92.8% (95%CI: 86.0-97.6). At 60 months, 83.1% (95%CI: 75.0-89.9) of patients maintained an IOP  $\leq 18$  mmHg.

### Conclusions

The results from these studies support the independent effect of iStent on IOP, medication burden and treatment success, without the potential for confounding from cataract surgery.

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## P-FS-144

### COMPARISON OF AB-INTERNO 360-DEGREE TRABECULOTOMY AND AB-INTERNO TRABECULECTOMY USING DUAL BLADE OUTCOMES

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#### Purpose

To compare outcomes of two ab-interno Schlemm's canal procedures, 360° trabeculotomy using Trab360 system or GATT (gonioscopy-assisted transluminal trabeculotomy) technique, and 90° trabeculectomy using Kahook Dual Blades (KDB) at 6 months to assess if degree of incision or excision of trabecular meshwork affect IOP/medication lowering or complication rate.

#### Methods

27 Trab360/GATT and 78 KDB-treated eyes in open-angle, combined mechanism, traumatic, normal tension, and pseudoexfoliation glaucoma patients were retrospectively reviewed. Trab360/GATT resulted in 360° and KDB trabeculectomy resulted in 90° of trabecular meshwork (TM) incision. We defined surgical success as  $\geq 20\%$  IOP reduction or  $\geq 1$  medication reduction without additional IOP lowering procedure. We recorded demographic data, baseline and postoperative IOP and medication, additional procedures, and complications within 6 months.

#### Results

At 6 months, 81.5% of Trab360/GATT and 78.4% of KDB cases were successful. This difference was not statistically significant ( $p = 0.737$ ). Mean IOP reduction was  $2.23 \pm 1.14$  mmHg for Trab360/GATT and  $2.31 \pm 0.547$  mmHg for KDB. The IOP reduction between the two groups was not statistically significant ( $p = 0.946$ ). The amount of IOP reduction at 6 months from baseline was statistically significant in KDB patients ( $p = 0.002$ ) but not in Trab360/GATT patients ( $p = 0.072$ ). Trab360/GATT and KDB significantly reduced medications at 6 months (44.0% reduction,  $p = 0.006$  and 40.0% reduction,  $P < 0.0002$ ). Medication reduction was similar ( $p = 0.737$ ). 61.5% ( $n = 16$ ) of eyes treated with Trab360/GATT and 80.3% ( $n = 57$ ) treated with KDB achieved 6 month IOP  $\leq 18$  mmHg without the need for additional IOP lowering procedures. 26.9% ( $n = 7$ ) of eyes treated with Trab360/GATT and 60.6% ( $n = 43$ ) treated with KDB achieved 6 month IOP  $\leq 15$  mmHg without the need for additional IOP lowering surgeries. Complication rates were similar ( $p = 0.351$ ). The most common complications for both groups were Cystoid Macular Edema (11.1% in Trab360/GATT, 4.05% in KDB) and steroid response/IOP spike (11.1% in Trab360/GATT, 8.11% in KDB).

#### Conclusions

Ab-interno trabeculectomy using KDB resulted in significantly more cases reaching 6-month IOP  $\leq 18$  mmHg (80.3% vs 61.5%,  $p = 0.024$ ) and  $\leq 15$  mmHg (60.6% vs 26.9%,  $p = 0.003$ ) than ab-interno trabeculotomy using Trab360/GATT. Final medication number and medication reduction did not differ ( $p = 0.34$ ). While they resulted in comparable IOP and medication reduction, this was only statistically significant in the KDB group.

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## P-FS-145

### OUTCOME OF PHACOEMULSIFICATION WITH KAHOOK DUAL BLADE GONIOTOMY IN SEVERE GLAUCOMA AT 6 MONTHS

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#### Purpose

To describe 6 month outcome of goniotomy using Kahook Dual Blade combined with phacoemulsification (Phaco-KDB) in patients with severe stage glaucoma.

#### Methods

A retrospective review of 42 eyes from 36 patients with severe stage glaucoma who received Phaco-KDB procedure was performed to determine efficacy and safety at 6 months follow-up. Primary open and combined-mechanism, low-tension, pseudoexfoliation, and traumatic glaucoma was included. We defined success as  $\geq 20\%$  IOP reduction or  $\geq 1$  medication reduction without an additional IOP lowering procedure, including laser trabeculoplasty. We recorded information on demographic data, baseline and postoperative IOP, number of glaucoma medications, additional glaucoma procedures performed, and any adverse events.

#### Results

69% of eyes (n = 29) had successful outcomes at 6 months. Mean IOP reduction was  $2.07 \pm 0.721$  mmHg, which decreased mean baseline IOP of  $17.0 \pm 0.740$  mmHg to  $15.0 \pm 0.460$  mmHg. This was statistically significant (p = 0.020). The mean number of medication baseline was  $2.40 \pm 0.196$  compared to  $1.24 \pm 0.212$  postoperatively. This difference was also statistically significant (P < 0.0002). 85.7% of all eyes (n = 36) achieved IOP  $\leq 18$  mmHg, and 61.9% (n = 26) were able to reach this goal while reducing medication number. 64.3% (n = 27) of eyes achieved IOP  $\leq 15$  mmHg at 6 months and 45.2% (n = 19) reached this while also reducing medications. 31.0% (n = 13) achieved 6 month IOP  $\leq 15$  mmHg off of all medications. Three patients in our study took no drops for glaucoma pre-operatively and all of them maintained IOP  $\leq 18$  mmHg while not adding medication. 19.0% (n = 8) of eyes experienced a visually significant complications during the 6 months consisting of new or recurrent CME (4.8%), steroid response (4.8%), epiretinal membrane (2.4%), vitreous detachment (2.4%), maculopathy (2.4%), and iris prolapse (2.4%). 19.0% (n = 8) of eyes required additional IOP lowering procedures to reach target IOP with 5 paracenteses, 1 laser trabeculoplasty, 1 Xen, and 1 Ahmed valve.

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## Image

Figure 1. Percentage of Successful Cases after Phaco-KDB in Severe Glaucoma Patients



## Conclusions

Patients with severe stage glaucoma achieved significant IOP and medication reduction following KDB goniotomy combined with cataract surgery. 85.7% eyes achieved IOP of 18 or lower, and 64.3% achieved IOP of 15 or lower at 6 months without need for additional procedures. Complication and need for additional glaucoma procedure were rare. Phaco-KDB may be an effective and safe alternative to more invasive filtering surgery in many patients with severe glaucoma.

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## P-FS-146

### 2-YEAR EXPERIENCE WITH THE XEN45 GEL STENT IN PSEUDOEXFOLIATION AND PRIMARY OPEN ANGLE GLAUCOMA

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#### Purpose

To evaluate the efficacy, postoperative interventions and complications of the XEN gel implant (Allergan Inc., Irvine) as a stand-alone procedure in pseudoexfoliation glaucoma (PEXG) and primary open-angle glaucoma (POAG).

#### Methods

In total, sixty-six patients (39 eyes with PEXG and 27 eyes with POAG) with insufficiently controlled intraocular pressure (IOP) underwent XEN micro-stent surgery and completed the one-year follow-up period with weekly controls in the first postoperative month. The primary outcome was a postoperative IOP of 15 mmHg or lower without medication (complete success) or with medication (qualified success). Secondary outcome measures included IOP threshold of 18, number of medications, and the incidence of interventions, complications and reoperations. The follow-up period was up to 24 months.

#### Results

At baseline, the mean age was 79 years (range 56 – 94y) and 75 years (range 48 – 93y) in the PEXG and POAG group, respectively. The mean medicated IOP was  $23.3 \pm 6.0$  mmHg for PEXG and  $21.6 \pm 5.2$  mmHg for POAG and the mean number of medications was  $3.7 \pm 1.1$  for PEXG and  $3.0 \pm 1.3$  for POAG. One-year results showed a reduction of the mean IOP to  $14.9 \pm 3.5$  mmHg and  $15.1 \pm 4.6$  mmHg and the number of medications to  $0.9 \pm 1.1$  and  $1.2 \pm 1.2$  in the PEXG and POAG group, respectively. Complete and qualified success with IOP  $\leq 15$  mmHg was achieved by 33% and 53% of PEXG and 42% and 68% of POAG patients, respectively. A needling procedure with 5-Fluorouracil was performed in 37% and 41% of the PEXG and POAG patients, respectively. The mean timepoint of needling was 3-4 weeks after surgery.

#### Conclusions

In patients with pseudoexfoliation or primary open-angle glaucoma the XEN gel implant showed a safe and significant IOP reduction. However, the success rates were lower in PEXG than in POAG<sup>1</sup>.

#### References

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## P-FS-147

### MANAGEMENT OF PSEUDOEXFOLIATIVE GLAUCOMA WITH 2ND GENERATION TRABECULAR MICRO-BYPASS STENTS (iStent INJECT®)

David Holmes<sup>1</sup>, Colin Clement<sup>1</sup>, Frank Howes<sup>2</sup>, Alex Ioannidis<sup>3</sup>, Michael Shui<sup>4</sup>, David Manning<sup>5</sup>

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#### Purpose

The most common form of secondary open-angle glaucoma is pseudoexfoliative glaucoma (PXF). The iStent®, 1<sup>st</sup> generation trabecular microbypass stent, has been shown to safely and effectively lower IOP and medication use in patients with mild to severe PXF.<sup>1</sup> This study aims to assess the safety and performance of the 2<sup>nd</sup> generation trabecular micro-bypass stents (iStent *inject*®) implanted in conjunction with cataract surgery.

#### Methods

This is a retrospective analysis of PXF cases implanted with 2 iStent *inject* devices in combination with cataract surgery across several practices in Australia. IOP and medication was tracked over time as well as safety observations. Although 21 PXF eyes have been successfully implanted, this analysis comprised of cases that have been followed out to 1 year postoperative. Ongoing follow-up of additional cases is planned with the intention of sharing an updated analysis at the time of the conference.

#### Results

Twelve eyes from 7 patients were included in the analysis; all were Caucasian with a mean age of 73 years. Baseline mean C/D ratio was 0.7, VF MD was -3.9 dB, and 4 eyes had prior glaucoma surgical interventions. Mean preoperative IOP was  $18.7 \pm 5.7$  mmHg on an average of 1.9 medications. Post-operative IOP at 1 year was  $14.9 \pm 3.3$  mmHg on 0.5 medications. This represents an 18% reduction in IOP and 74% reduction in the number of medications used. IOP  $\leq 18$  mmHg was observed in 75% of eyes and IOP  $\leq 15$  mmHg was observed in 67% of eyes after stent implantation. Post-surgery, 58% of eyes were medication-free at year 1 as compared to 83% of eyes on 1-2 meds prior to surgery. There was reduced medication burden noted in 83% of the eyes.

All eyes were successfully implanted with the iStent *inject* devices. A favorable safety profile was observed and was similar to that of cataract surgery alone.

#### Conclusions

In this cohort of eyes with pseudoexfoliative glaucoma, iStent *inject* implanted in conjunction with cataract surgery was safe and resulted in clinically meaningful IOP and medication reduction out to 1 year. Although the sample size is small, this work provides an initial assessment of the iStent *inject* in a glaucoma subtype where the clinical evidence is currently sparse.

#### References

1. Ferguson TJ, Swan R, Ibach M, Schweitzer J, Sudhagoni R, Berdahl JP. Trabecular microbypass stent implantation with cataract extraction in pseudoexfoliation glaucoma. J Cataract Refract Surg 2017 May;43(5):622-626

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## P-FS-148

### EARLY EXPERIENCE WITH COMBINED PHACOEMULSIFICATION AND ISTENT INJECT IMPLANTATION IN ASIAN EYES WITH GLAUCOMA

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#### Purpose

To evaluate the safety and efficacy of the iStent inject device combined with phacoemulsification in Asian eyes with glaucoma.

#### Methods

A retrospective study of combined phacoemulsification and iStent inject surgeries performed in a single institution from April 2017 to June 2018. Outcome measures included intraocular pressure (IOP), number of glaucoma eyedrop medications and surgical complications.

#### Results

Data from 81 eyes of 81 subjects were collected. Majority of subjects were male (54, 66.7%) and Chinese (76, 93.8%). Mean age was  $73.1 \pm 9.1$  years. Mean follow-up was  $112 \pm 90$  days. Majority had primary open-angle glaucoma (43, 53.1%) and normal-tension glaucoma (30, 37.0%). Pre-operatively, mean IOP was  $16.06 \pm 3.89$  mmHg and number of medications was  $1.60 \pm 0.86$ . Significant post-operative reduction in mean IOP was observed at all timepoints – post-operative month (POM)1:  $2.51 \pm 4.02$  mmHg reduction ( $n = 75$ ); POM3:  $2.87 \pm 3.21$  mmHg ( $n = 40$ ); POM6:  $3.00 \pm 4.09$  mmHg ( $n = 23$ ) (all  $P < 0.01$ ). The number of glaucoma medications was also reduced from a median of 1 medication pre-operatively to none at all the above post-operative timepoints (all  $P < 0.01$ ). 20 subjects had complete post-operative data up to POM6 and demonstrated sustained reduction of both IOP and number of medications at all timepoints (all  $P < 0.05$ ). Implant obstruction by iris was observed in 4 eyes post-operatively. Gross hyphema occurred in 2 eyes but resolved by POM2. Follow-up is ongoing with intention to present longer-term data.

#### Conclusions

Asian eyes undergoing combined phacoemulsification and iStent inject surgery demonstrate a significant and sustained reduction in both IOP and number of glaucoma medications up to 6 months post-operatively.

#### References

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2. Prospective unmasked randomized evaluation of the iStent inject® versus two ocular hypotensive agents in patients with primary open-angle glaucoma. Fea AM, et al. Clin Ophthalmol. 2014 May 7;8:875-82.
3. Glaukos iStent inject® Trabecular Micro-Bypass Implantation Associated with Cataract Surgery in Patients with Coexisting Cataract and Open-Angle Glaucoma or Ocular Hypertension: A Long-Term Study. Arriola-Villalobos P, et al. J Ophthalmol. 2016;2016:1056573.
4. iStent inject as a reasonable alternative procedure following failed trabeculectomy? Davids AM, et al. Eur J Ophthalmol. 2018 Mar 1;1120672117747010.

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**P-FS-149**

**REPAIR OF EXPOSED AHMED GLAUCOMA VALVE TUBE WITH SCLERAL PATCH GRAFTING AND CONJUNCTIVAL GRAFTING**

Chi-Hsin Hsu\*

**Purpose**

To report a patient with exposed Ahmed Glaucoma Valve tube, and repaired with scleral patch grafting and conjunctival grafting.

**Methods**

An interventional case report.

**Results**

A 47-year-old male patient with a past medical history of uveitic glaucoma for 20 years and received two trabeculectomy surgeries five years ago in his right eye. However, both of the surgeries failed within one year. During the patient's initial consultation, his IOP was 25 mmHg under Travoprost, brimonidine, timolol, brinzolamide and oral acetazolamide. His cup-to-disc ratio was about 90%, MD was 10.6 in VF test, and OCT showed average RNFL thickness value of 69.30. Due to poor IOP control, an Ahmed valve implantation was arranged for the patient. During the surgery, the valve was inserted at the nasal upper side due to very poor conjunctiva and sclera condition on the temporal upper side. However, the very thin sclera and not enough conjunctiva were also noted on the operation site following the usage of Mitomycin-C for trabeculectomy surgery. Postoperative IOP was stable, all around 10 mmHg without any anti-glaucoma medication. But two months postoperatively, an exposed tube with scleral and conjunctival erosion occurred. A scleral patch grafting was performed along with conjunctival graft taken from the inferior part of the eye. Postoperatively, the epithelium grew over the whole patch graft and gradual conjunctivalization from the nasal side of the graft was observed. However, there was no conjunctivalization noted from the temporal edge, where Mitomycin-C was used in the previous trabeculectomy surgery. After a period of two months, the conjunctivalized epithelium now covers 2/3 of the scleral graft from the nasal side.

**Conclusions**

Scleral patch grafting with conjunctival grafting is a viable surgical strategy for exposed Ahmed Glaucoma Valve tube. However, poor conjunctivalization may occur on the site where Mitomycin-C was used previously.

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## P-FS-150

### EFFECT OF MITOMYCIN C APPLICATION VIA SPONGE VERSUS INJECTION WITH DEEP SCLERECTOMY IN OPEN-ANGLE GLAUCOMA

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#### Purpose

To evaluate the efficacy of deep sclerectomy (DS) with Mitomycin C (MMC) applied via sponge versus injection methods for open-angle glaucoma patients.

#### Methods

A retrospective study of 99 patients with open-angle glaucoma who underwent DS were recruited into the study between June 2012 to November 2015 following informed consent. Intraocular pressure (IOP) was collected post operation over a period of 60 months. Eyes were divided into two groups based on the method of MMC application a) MMC (0.02%) soaked sponge placed sub-tenon's for 30-60 seconds, or b) MMC injected into the Tenon's capsule (0.02% 0.1ml). Efficacy was evaluated using success criteria as complete success (CS) or qualified success (QS) with a reduction of IOP more than 20% from baseline IOP levels. This was analysed for IOP values of less than 21, 18 and 15 mmHg. CS requires no other medications or surgery post-DS, while QS includes additional medication or surgery post-DS.

#### Results

For DSMMC via sponge, the probability of CS for IOP less than 21, 18 and 15 mmHg are 61.8%, 45.2%, 40.1%, respectively. The probability of QS for IOP less than 21, 18 and 15 mmHg are 80.2%, 74%, 56.8%, respectively.

For DSMMC via injection, the probability of CS for IOP less than 21, 18 and 15 mmHg are 51.9%, 38.3%, 39.2%, respectively. The probability of QS for IOP less than 21, 18 and 15 mmHg are 53%, 40.6%, 43.9%, respectively.

Comparing the method of MMC administration, patients who had MMC via sponge have a significantly higher complete and qualified success at 21 mmHg, 18 mmHg and 15 mmHg target IOP compared to patients who had MMC via injection ( $p < 0.05$ ). No MMC-related complications found in the study.

#### Conclusions

Both methods of MMC application for DS have favourable safety profile intra- and post-operatively. However, for the doses reported, MMC applied via sponge was associated with significantly better IOP control based on specified IOP targets.

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## P-FS-151

### SHORT TERM OUTCOMES IN ASIAN EYES OF TWO SECOND GENERATION TRABECULAR BYPASS MICROSTENT INSERTIONS IN SUBJECTS WITH OPEN ANGLE GLAUCOMA

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#### Purpose

The purpose of this study was to evaluate the safety and intraocular pressure (IOP) lowering ability of two second-generation trabecular micro-bypass stents (iStent inject®, Glaukos Corporation, Laguna Hills, CA) implanted in patients with OAG who were undergoing phacoemulsification and intraocular lens implant.

#### Methods

A prospective, uncontrolled, nonrandomized, interventional case series study enrolled 40 subjects with both mild or moderate OAG who were undergoing cataract surgery. Outcome measures were IOP, ocular hypotensive usage, and adverse events.

All subjects underwent uncomplicated implantation of 2 iStent inject trabecular stents after phacoemulsification and intraocular lens implant. Post operatively, ocular hypotensive medications were added in a cumulative manner if the IOP was uncontrolled.

#### Results

All 40 subjects completed 6 months of follow-up. Preoperative medicated mean IOP was 17.0 mmHg and mean number of ocular hypotensive medications was 1.63. Postoperatively, mean IOP was 13.2mmHg. However, 41.7% had to be restarted on ocular hypotensive medication and the mean number of ocular hypotensive medications used (overall) was 0.71.

There were no documented intraocular complications. However, postoperatively, one patient developed a transient IOP rise which resolved after cessation of topical steroids (and therefore assumed to be a steroid responder) and another had IOP spike presumed to be due to blockage of the stents by blood.

#### Conclusions

Outcomes from this study demonstrate safe and sustained reduction of IOP in eyes with OAG following implantation of two iStent inject stents.

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## P-FS-152

# REFRACTIVE OUTCOMES AFTER COMBINED CATARACT AND ISTENT INJECT SURGERY

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### Purpose

Optical independence following cataract surgery is increasingly important for patients. Glaucoma represents a significant co-morbidity that can impact refractive and visual success following surgery. Traditional surgical treatment for glaucoma has been shown to impact refractive outcomes; in particular astigmatism.<sup>1</sup> The introduction of minimally invasive glaucoma surgery (MIGS) provides a potentially refractive neutral option for patients undergoing concurrent cataract surgery. The purpose of our study was to describe the astigmatic outcomes of patients undergoing combined cataract extraction and MIGS procedures to determine the impact of additive surgery on refractive outcomes.

### Methods

A retrospective audit of consecutive patients undergoing combined cataract removal, toric intraocular lens insertion and iStent implantation by a single surgeon was undertaken. Demographic, visual, biometric and refractive parameters were collated. Refractive errors were expressed as power vectors for astigmatic analysis.<sup>2</sup> Intraocular pressure and safety outcomes were recorded also.

### Results

68 eyes of 48 patients were included. 59.5% of patients were male with mean age of 73.1 years. Mean axial length was  $23.61 \pm 1.18$ mm. The mean absolute spherical equivalent (SE) difference from intended target was  $0.37 \pm 0.25$ D. 84.9% of eyes achieved 0.5D refractive astigmatism following surgery. Mean J0 changed from  $-0.01 \pm 0.46$  to  $0.02 \pm 0.16$  and J45 from  $-0.03 \pm 0.42$  to  $0.02 \pm 0.17$ . Neither result was statistically significant. Mean blur strength was reduced from  $2.06 \pm 2.15$  to  $0.45 \pm 0.39$  following surgery ( $p = 0.000$ ). 56.9% of eyes achieved uncorrected distance vision of 6/6 or better with 94.1% achieving 6/12 without glasses. 93.8% of eyes did not require topical glaucoma medication at final follow up post-surgery. No adverse safety events recorded.

### Conclusions

Combined cataract removal and MIGS appears to be safe and effective across refractive, IOP and safety endpoints. The majority of eyes achieved astigmatic outcomes equal or less than 0.5D suggesting that MIGS appears to represent a refractively neutral procedure not impacting overall refractive outcomes.

### References

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**P-FS-153**

**SURGICAL REPAIR OF SEVERE TRAUMATIC CYCLODIALYSIS BY A CIRCUMFERENTIALLY INSERTED 5-0 PROLINE THREAD ALONG THE CILIARY SULCUS**

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<sup>1</sup>Akita University, Akita, Japan

**Purpose**

Rationale: Cyclodialysis cleft is a relatively rare but severe condition with persistent ocular hypotony, which can cause morphologic changes and visual loss. Here we report a case of a traumatic cyclodialysis cleft that was successfully managed by a two-step circumferentially inserted 5-0 proline thread along the ciliary sulcus.

**Methods**

Patient concerns: A 3x-year-old man was treated for severe blunt ocular trauma of the left eye and a resultant cyclodialysis cleft, lens subluxation, choroidal detachment and a hypotony maculopathy. His intraocular pressure was 2 mmHg, he presented with a shallow anterior chamber, phacodonesis, iridodonesis, 360° ciliary body detachment, and a suspicious cyclodialysis cleft in the 12 to 3 o'clock position. The corrected visual acuity was 0.02 in his left eye.

Interventions: At first, 5-0 proline thread was inserted along the 12 to 3 o'clock position of the ciliary sulcus, and tangentially attached with 10-0 proline threads. However, ciliary body detachment and hypotony were sustained, and further gonioscopic examination confirmed angle recession in the 6 to 11 o'clock position. For additional repairmen, 5-0 proline thread was inserted again along the 4 to 11 o'clock position of the ciliary sulcus. Lens was preserved intact.

**Results**

Outcomes: After circumferential insertion of 5-0 proline thread along wide range of the ciliary sulcus, intraocular pressure gradually increased to 12 mmHg, and stabilized between 8 to 10 mmHg. Complete closure of the cyclodialysis cleft and disappearance of ciliary body detachment was confirmed with ultrasound biomicroscopy. The corrected visual acuity increased to (0.3) in his left eye.

**Conclusions**

Lessons: A circumferential insertion of 5-0 proline thread along wide range of the ciliary sulcus for patients with cyclodialysis cleft is a simple, safe, and efficient technique that ensures a successful surgery.

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## P-FS-154

### EFFECT OF AHMED GLAUCOMA VALVE IMPLANTATION ON UNCONTROLLED INTRAOCULAR PRESSURE IN POST- VITRECTOMY PATIENTS- A RETROSPECTIVE ANALYSIS

Kalaivani J\*, Kiran Chandra Kedariseti<sup>1</sup>, Natasha Gautam Seth<sup>1</sup>, Simar Rajan Singh<sup>2</sup>, Faisal Thattaruthody<sup>2</sup>, Surinder Singh Pandav<sup>2</sup>

<sup>1</sup>Ophthalmology, <sup>2</sup>Advanced Eye Centre PGIMER, Chandigarh, India

#### Purpose

Glaucoma drainage devices are the preferred procedure of choice in refractory glaucomas in post vitrectomised eyes, which have a higher failure rate with the standard filtration surgery. In this study we evaluated the long-term outcome of Ahmed Glaucoma valve (AGV) implantation in patients of uncontrolled glaucoma after pars plana vitrectomy (PPV).

#### Methods

Retrospective analysis of patient records who underwent AGV implantation post PPV between January 2006 to June 2018. Intraocular pressure, requirement of Antiglaucoma medication (AGM)/ resurgery and complications at 1 day, 1 month, 6 months, 1 year, 3 years, 5 years and final follow up were noted. Surgical success was defined as intraocular pressures (IOP) of  $\geq 5$  mmHg and  $\leq 21$  mmHg, on 2 or lesser topical anti-glaucoma medications and no additional IOP lowering procedures at the last follow-up.

#### Results

We analysed 43 eyes of 43 patients (35 M: 8 F) with mean age of  $33.42 \pm 17.17$  years. The mean follow-up duration was 5.42 (range 0.5 – 11) years. The mean IOP before the AGV implantation was  $28.19 \pm 8.2$  mmHg with an average of 3.7 drugs. 35 patients were on systemic anti-glaucoma agents. At 5.42  $\pm 3.1$  years mean follow up, the mean IOP was  $15.28 \pm 5.4$  mmHg on 2 or less AGM. Surgical success was seen in 70.2% patients during the 5.42 years mean follow up. Post-op complications encountered were tube retraction in 5, valve failure in 1, tube blockage in 1, ciliochoroidal detachment in 3, tube corneal touch in 3 and hyphaema in 2. Additional surgical procedures were required in 13 patients: tube repositioning/tube trimming in 7, fibrous capsule excision in 2, re-AGV in 1 and DLCP in 3.

#### Conclusions

AGV implantation effectively controlled IOP in vitrectomised eyes over 5 years follow-up. Associated complications can be effectively managed through medical or surgical interventions.

#### References

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## **P-FS-155** **SUCCESS RATE OF SECOND FILTERING SURGERY**

Piyush Jansari\*

### **Purpose**

To study the success rate and complications of second trabeculectomy.

### **Methods**

Over a period of five years, twenty seven eyes of twenty seven patients were studied retrospectively who underwent second trabeculectomy after failure of first trabeculectomy except one eye who had undergone primary tube implant.

Twenty two eyes were referred by other ophthalmologists, and five eyes were operated by same surgeon. Inclusion criteria: Failed first trabeculectomy, failed primary tube shunt implant, trabeculectomy with or without phacoemulsification.

Exclusion criteria: Patients under 40 years. Neovascular glaucoma. Any other ocular surgery performed after first trabeculectomy.

### **Results**

Out of twenty seven eyes, twenty eyes (74%) eyes obtained intra ocular pressure below 22 mmHg with or without drugs ( absolute and qualified success ). Out of remaining seven eyes, five eyes ((18%) required post operative bleb needling with anti metabolites. One eye (3.4%) needed glaucoma shunt procedure and one eye (3.4%) needed cyclo destructive procedure to control the IOP below 22 mmHg.

Six eyes(22%) developed postoperative hyphema, out of them one needed anterior chamber wash, and five resolved conservatively. One eye(3.4%) developed blebitis which was treated medically. There were no sight threatening complications.

### **Conclusions**

Second trabeculectomy performed is effective and safe intervention after a failed primary filtering surgery.

### **References**

1. Comparison of the Outcome of Repeat Trabeculectomy with Adjunctive Mitomycin C and Initial Trabeculectomy Ali Bulent Cankaya and Ufuk Elgin Korean J Ophthalmol. 2011 Dec; 25(6): 401–408. Published online 2011 Nov 22. doi: 10.3341/kjo.2011.25.6.401
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## P-FS-156

### EXPERIENCES OF HIGH-STAKES 'ONLY-EYE' SURGERY: PATIENT AND SURGEON PERSPECTIVES

Lee Jones<sup>\*</sup>, Deanna Taylor<sup>1</sup>, Freda Sii<sup>2</sup>, Imran Masood<sup>3</sup>, David Crabb<sup>1</sup>, Peter Shah<sup>2</sup>

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#### Purpose

Operating on patients with only one seeing-eye is high-stakes surgery with the potential for catastrophic loss of vision. This study investigates the behaviours and opinions of patients and surgeons with experience of performing/undergoing only-eye surgery. The aim was to explore perceptions of the current practice and also to learn how best to optimise safety and improve the only-eye patient surgical journey.

#### Methods

Using purposive sampling, 11 patients (Female = 4) and 10 surgeons (Female = 3) were invited to take part in a semi-structured interview about their experiences of only-eye surgery. Interviews were conducted by a health psychologist and a senior ophthalmic surgeon, and qualitative analysis of the transcripts was carried out using a thematic analysis approach.

#### Results

The interviews yielded several recurring themes pertinent to the study aims. For the patient perspectives, key themes included the emotional impact of undergoing only-eye surgery, such as concerns about surgical outcomes and post-operative anxiety, strategies to help cope with surgery, and recommendations for improving the only-eye surgical experience. For surgeons, key themes related to discussion of material risk in only-eye surgery, such as rigour during the consent process, issues with current training policy, optimising surgery outcomes, and the emotional impact of negative surgical events. Both patients and surgeons described their concerns over current practice in only-eye surgery, such as a perceived lack of support in the event of devastating surgical outcomes.

#### Conclusions

This multinational study highlights the advice and concerns of patients and surgeons with experience of only-eye surgery. Our results help to understand how patients cope when faced with the prospect of undergoing surgery on their only-eye, and how surgeons manage the complexities that are inherent with these surgeries. The findings of this study offer important insight into only-eye surgery which has not previously been explored. Moreover, our results may be used to help inform patients, their carers, and those working in the hospital eye services about the realities of only-eye surgery, the challenges to overcome, potential strategies for effective coping, and to help improve service delivery.

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## P-FS-157

# SHORT TERM SURGICAL OUTCOME OF COMBINED PROCEDURE IN PATIENTS WITH SECONDARY GLAUCOMA AND CATARACT IN PEDIATRIC AGE GROUP IN BANGLADESH

Jahangir Kabir\*, Sazzad iftekhar<sup>1</sup>, Bipul Kumer De Sarker<sup>1</sup>, Zafrul Hassan<sup>1</sup>

<sup>1</sup>Ispahani Islamia Eye Institute and hospital, Bangladesh, dhaka, Bangladesh

### Purpose

To evaluate the short term surgical outcome of combined trabeculectomy with phacoemulsification in paediatric patients associated with secondary glaucoma and cataract in a tertiary eye center in Bangladesh.

### Methods

It was a Prospective, non-comparative, interventional case series. Children < 16 years with uncontrolled intraocular pressure (IOP) refractory to medical treatment associated with visually significant cataract were included in the study. All eligible children were undergone combined phacoemulsification and conventional trabeculectomy at the same time. Main outcome measure was comparison of visual acuity and IOP reduction from pre-operative values and post-operative complications.

### Results

A total of 15 eyes of 12 patients met the inclusion criteria. Mean age at surgery was 8.5 years (range 4.5 years –15 years). Steroid induced secondary glaucoma (50%) due to vernal keratoconjunctivitis was the main cause. Median duration of follow-up was 6 months (range 3 months–2yrs). Mean pre-operative and postoperative intraocular pressures were  $28.65 \pm 9.98$  (range-10-59) and  $12.13 \pm 2.62$  (range-5-15) mmHg respectively ( $P < 0.001$ , *t-test*). Mean pre operative and post operative medications were  $2.48 \pm 0.5$  (1-4 range) and  $1.01 \pm 0.45$  (range 0-2) respectively, ( $p = 0.5$  Wilcoxon signed rank test). The mean preoperative BCVA was 0.95 (SD 0.3) logMAR, improving to a mean of 0.19 (SD 0.1) logMAR postoperatively ( $p < 0.0001$ ). There was no sight threatening intraoperative or postoperative complications.

### Conclusions

Combined phacoemulsification and trabeculectomy surgery in eyes with coexisting cataract with secondary glaucoma resulted in a stable IOP and a significantly improved BCVA. So pediatric patients with progressive cataract and glaucoma can benefit from combined surgery.

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## P-FS-158

### COMPARATIVE STUDY OF INJECTION MITOMYCIN-C VERSUS SPONGES IN PHACOTRABECULECTOMY

Mohideen Kader\*

#### Purpose

To compare the effectiveness and safety of injectable Mitomycin-C versus sponge soaked Mitomycin-C in phacotrabeculectomy cases.

#### Methods

Prospective, randomized, open-label, interventional study.

The study participants were randomized into two groups. Participants in the sponge group received augmentation of their phacotrabeculectomies with sponges soaked in a mixture of 0.04% MMC and 2% preservative-free Lignocaine in a 1:1 ratio, kept on the bare sclera after peritomy for 4 minutes. Participants in the injection group received the same mixture as a subconjunctival injection 4 minutes before peritomy. A twin-site phacotrabeculectomy was done in all cases. A fornix based peritomy was done. An equilateral triangular scleral flap of 4 mm side was made and apposition of the flap was done with 1 releasable and 2 fixed 10-0 monofilament nylon sutures. All patients were followed up at 12 months. A p value less than 0.05 was considered statistically significant.

#### Results

The mean IOP, at 12 months, was significantly lower ( $p = 0.0210$ ) in the injection group ( $14.77 \pm 3.7$  mmHg) than in the sponge group ( $17.06 \pm 6.4$  mmHg). More diffuse blebs were produced in the injection group. The mean number of blebs with a normal vascularity in the sponge group was 19.16 whereas that in the injection group was 25.33. The average number of antiglaucoma medicines used at 12 months by a study participant in the sponge group was 0.56 and that in the injection group was 0.29 ( $p = 0.041$ ). There was no statistically significant difference in the total number of complications seen ( $p = 0.646$ ) or the total number of interventions required in either group ( $p = 0.691$ ).

#### Conclusions

Injections of MMC are more effective when compared to subconjunctival application of MMC soaked sponges in twin-site phacotrabeculectomies.

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## P-FS-159

### POST KERATOPLASTY GLAUCOMA IN PERFORATED FUNGAL KERATITIS

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#### Purpose

To report our experience of management of post penetrating keratoplasty glaucoma where therapeutic keratoplasty was done for perforated fungal keratitis.

#### Methods

This was a retrospective study of 76 eyes (76 patients) that had undergone therapeutic penetrating keratoplasty (TPK) for perforated fungal keratitis from January 2015 till December 2016 in a tertiary eye care center in central India. Minimum follow-up period was 1 year. Indication of starting topical anti-glaucoma medication (AGM) was intraocular pressure (IOP) of 21 mmHg or more. Uncontrolled IOP on 3 medications was considered as an indication for trabeculectomy. Ahmed Glaucoma Valve implant (AGV) was done in failed Trabeculectomy cases.

#### Results

Out of 76 eyes, 51 (67%) developed glaucoma during the follow-up period. Medical management was successful in 11 eyes (21.6%). 40 eyes underwent trabeculectomy out of which 12 eyes (23.5%) required AGV implantation.

42% eyes with AGV developed graft failure while 18% eyes, which had undergone only trabeculectomy, had graft failure. 1 eye had graft rejection after AGV implantation. None of the eyes required cyclodestructive procedures for IOP control.

Incidence of PTKG is high in cases with perforated corneal ulcers due to presence of wide peripheral anterior synechiae with secondary angle closure. Other factors contributing to the high incidence in our study were concomitant anterior vitrectomy and lens extraction with PK. Majority of eyes required surgical management. Failure of trabeculectomy was seen in nearly 1/4<sup>th</sup> of the cases. Similar to previous studies, AGV implantation was associated with high risk of graft failure.

#### Conclusions

Post keratoplasty glaucoma in perforated fungal keratitis is a major cause of vision loss due to graft failure. Higher incidence of PTKG in these patients entails regular IOP monitoring in all such cases. Failure of medical management is high with more cases requiring surgical intervention.

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## P-FS-160

### CLINICAL RESULTS OF TRABECULAR MICRO-BYPASS STENT IMPLANTATION COMBINED WITH CATARACT SURGERY

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#### Purpose

To evaluate the efficacy and safety of trabecular micro-bypass stent (iStent®) implantation combined with cataract surgery.

#### Methods

We retrospectively investigated 42 eyes of 30 consecutive patients with glaucoma who had undergone trabecular micro-bypass stent implantation between May 2017 and July 2018, and followed up for at least 1 month after surgery. Those subjects included 30 eyes with primary open-angle glaucoma, 7 eyes with normal tension glaucoma, and 5 eyes with exfoliation glaucoma. The mean age of the 30 patients was  $71.2 \pm 7.9$  (49 - 85) years old. We evaluated the efficacy of this procedure based on their intraocular pressure (IOP), medication score, and intraoperative and postoperative complications.

#### Results

Preoperative IOP was  $17.0 \pm 2.7$  mmHg and IOP at 1 day, 1 week, 2 weeks, 1 month, 3 months, and 6 months after surgery was  $17.2 \pm 6.5$  mmHg (n.s.),  $19.0 \pm 6.6$  mmHg (n.s.),  $18.7 \pm 5.6$  mmHg (n.s.),  $15.7 \pm 2.8$  mmHg ( $P < 0.05$ ),  $14.8 \pm 2.2$  mmHg ( $P < 0.01$ ), and  $15.6 \pm 1.8$  mmHg ( $P < 0.01$ ), respectively. The preoperative medication score was  $3.2 \pm 1.0$  and the medication score at the time of each IOP examination was  $0.0 \pm 0.0$  ( $P < 0.01$ ),  $0.3 \pm 0.7$  ( $P < 0.01$ ),  $0.8 \pm 0.9$  ( $P < 0.01$ ),  $1.0 \pm 0.9$  ( $P < 0.01$ ),  $1.2 \pm 1.0$  ( $P < 0.01$ ), and  $1.3 \pm 1.3$  ( $P < 0.01$ ), respectively. The rate of eyes with either a  $\geq 20\%$  decrease in IOP or a  $\geq 2$  decrease in medication score at 1 month and 3 months after surgery was 76.2% and 72.7%, respectively. During the operation 14 eyes (33.3%) required re-insertion of the stent because of its instability, but there were no other severe intraoperative complications. Seven eyes (16.7%) developed a transient increase in IOP  $\geq 30$  mmHg within 1 month after surgery and required additional medication. There were no cases of hyphema, fibrin formation, or dislocation of the stent after surgery, and there were no cases with a decrease in visual acuity by  $\geq 2$  lines on the Landolt C chart after surgery.

#### Conclusions

Our results indicate that trabecular micro-bypass stent implantation has somewhat limited efficacy because it reduces IOP by only about 12%, yet it does reduce the medication score by about 2 at 3 months after surgery and is a safe procedure without any severe complications.

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## P-FS-161

### EFFECTIVENESS OF THE TRABECTOMY AB INTERNO IN PATIENTS WITH VARIOUS STAGES OF OPEN-ANGLE GLAUCOMA

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#### Purpose

Determine the efficiency of *ab interno* trabectomy lowering effect in patients with different stages of open-angle glaucoma.

#### Methods

The study group included 30 patients (31 eyes) with open-angle glaucoma. According to their stages of glaucoma, the patients were divided as follows: I st - 5 eyes, II nd - 15 eyes, III rd - 11 eyes. The baseline IOP level with hypotensive therapy was  $25.4 \pm 4.3$  mmHg. For the surgical treatment of patients with glaucoma, we used the procedure of the electrosurgical ablation of the trabecular meshwork - *ab interno* trabectomy, performed in the Trabectom machine (Neomedix, USA). In 12 cases, this operation was performed simultaneously with the cataract extraction and IOL implantation; in 4 cases, the operated eye was pseudophakic. In the postoperative period, the patients received antibacterial, nonsteroidal anti-inflammatory drops and pilocarpine.

#### Results

As a result, on the 1st day after the surgery, the IOP was  $16.1 \pm 7.9$  mmHg, so it had decreased by 41.4% from the baseline. After 1 week the decrease amounted to 36.4% and was equal to  $15.6 \pm 3.1$  mmHg. After 1 month, the average IOP value of the studied group of patients was  $17.1 \pm 3.5$  mmHg, which is 31.5% less than the baseline. After 6 months, the IOP was  $17.5 \pm 2.7$  mmHg which is 29.5% lower than the initial IOP level. After 1 year, the mean IOP was  $18.8 \pm 3.1$  which is 27.4% lower than initial. Thus, throughout the observation period, a statistically significant difference ( $P < 0.0001$ ) was noted between the IOP level in patients with open-angle glaucoma before and in different periods after the *ab interno* trabectomy.

#### Conclusions

So, trabectomy *ab interno* provides a stable intraocular pressure level reduction within 6 months after the surgery and has several advantages over the filtering operations due to its selective ability of the ablation of the trabecular zone and the inner wall of the Schlemm's canal, which ensures a better physiological effect of the procedure, the absence of cosmetic defects, a lower traumatic effect, prevents a future fibrosis of the postoperative region, ensures a fast recovery and reduces the duration of the rehabilitation period, reduces a number of postoperative complications, and effectively helps stabilize the glaucomatous process.

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## P-FS-162

### MANAGEMENT OF APPOSITIONAL ANGLE-CLOSURE GLAUCOMA WITH SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS (iSTENT INJECT®)

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#### Purpose

There is a lack of evidence for the management of appositional angle-closure glaucoma (ACG) with micro-invasive glaucoma surgery (MIGS). This study evaluates the safety and performance of two second-generation trabecular micro-bypass stents (iStent *inject*®, Glaukos Corporation, San Clemente, CA) implanted in conjunction with cataract surgery.

#### Methods

This is a retrospective analysis of ACG cases implanted with 2 iStent *inject* devices in combination with cataract surgery across several practices in Australia. IOP and medication was tracked over time as well as safety observations. Reported are cases that have been followed out to 1 year postoperative. Ongoing follow-up of additional cases is planned with the intention of sharing an updated analysis at the time of the conference.

#### Results

Twenty eyes from 11 patients were included; the majority were Caucasian with a mean age of 66 years. Baseline mean C/D ratio was 0.7, VF MD was -3.8 dB, and 65% of eyes had prior glaucoma surgical interventions. Mean preoperative IOP was  $20.9 \pm 5.9$  mmHg on an average of 2.3 medications. Postoperative IOP at 1 year was  $15.5 \pm 1.9$  mmHg on 1.3 medications. This represents a 26% reduction in IOP and 43% reduction in the number of medications used. IOP  $\leq 18$  mmHg was observed in 45% of eyes preoperative and after stenting 95% of eyes met this target. There was reduced medication burden noted in 70% of the eyes out to 1 year post-stenting.

All eyes were successfully implanted with the iStent *inject* devices. No significant intraoperative or postoperative complications were noted. The safety profile was similar to that of cataract surgery alone.

#### Conclusions

In this cohort of eyes with appositional angle-closure glaucoma, iStent *inject* implanted in conjunction with cataract surgery was safe and resulted in clinically meaningful IOP and medication reduction out to 1 year. Although the sample size is small, this work provides an initial assessment of the iStent *inject* in a glaucoma subtype where the clinical evidence is currently sparse.

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## P-FS-163

### MID-TERM OUTCOMES OF SUTURE TRABECULOTOMY *AB INTERNO* FOR AMYLOIDOTIC GLAUCOMA

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#### Purpose

Transthyretin-familial amyloidotic polyneuropathy (TTR-FAP), which is characterized by systemic accumulation of mutant amyloidogenic TTR in several organs and peripheral nerves, has several ocular manifestations and secondary glaucoma, especially, is a serious complication. We previously reported that trabeculectomy with mitomycin C might not have a sufficient effect on secondary glaucoma associated with TTR-FAP and that this method has several significant bleb-related complications due to amyloid deposition. Therefore, we assessed the outcomes of suture trabeculotomy (S-LOT) *ab interno* for amyloidotic glaucoma.

#### Methods

This retrospective study included 8 eyes of 7 patients with secondary glaucoma associated with TTR-FAP underwent S-LOT *ab interno* procedure. The entire circumference of Schlemm's canal was incised in all cases. The median follow-up period was 27.8 months (range, 13–40 months). The intraocular pressure (IOP), number of anti-glaucoma medications and operative complications were assessed.

#### Results

The mean preoperative IOP ( $28.8 \pm 5.8$  mmHg) and number of anti-glaucoma medications ( $5.0 \pm 0.7$ ) decreased significantly to  $13.3 \pm 4.8$  mmHg and  $1.8 \pm 1.5$  at 12-month ( $n = 8$ ) and then  $17.2 \pm 5.2$  mmHg and  $3.0 \pm 1.0$  at 24-month ( $n = 7$ ) after surgery ( $P < 0.01$  at each time point, respectively). Additional S-LOT *ab interno* was performed in 3 eyes at postoperative 12-, 16- and 26-month. Moreover, 2 eyes of these 3 eyes needed Ahmed glaucoma valve procedure. No other serious complications was seen.

#### Conclusions

S-LOT *ab interno* seemed to be effective procedure to treat amyloidotic glaucoma associated with TTR-FAP as first-line therapy.

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## P-FS-165

### COMPARISON OF THE EFFECT OF TRABECULECTOMY WITH MITOMYCIN C ON MACULAR THICKNESS IN PRIMARY OPEN-ANGLE GLAUCOMA AND PSEUDOEXFOLIATIVE GLAUCOMA

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#### Purpose

To compare the effect of trabeculectomy with mitomycin C (mit C) on central macular thickness (CMT) in primary openangle glaucoma (POAG) and pseudoexfoliative glaucoma (PXG).

#### Methods

16 eyes with PXG and 13 eyes with POAG, which had undergone trabeculectomy with mit C, were included to our study. Cases with histories of any systemic vascular diseases and previous ocular surgeries were not included. The CMT was measured by spectral-domain optical coherence tomography (SD-OCT) before the surgery and at the first postoperative week and month. Pre-and postoperative values of both groups and the differences between the two groups were compared statistically by Mann-Whitney U and Wilcoxon signed rank tests.

#### Results

The means of CMT at the first postoperative week and month were statistically significantly higher than the preoperative values in both POAG and PXG groups (POAG: 1st week  $p = 0.0085$ , 1st month  $p = 0.0084$ ; PXG: 1st week  $p = 0.0025$ , 1st month  $p = 0.0046$ ). However, no statistically significant differences were found between the changes of preoperative and postoperative mean CMT values between the two groups (1st week  $p = 0.4293$ , 1st month  $p = 0.5216$ ).

#### Conclusions

In spite of the increases in CMT at the 1st week and month of trabeculectomy with mit C in POAG and PXG, no significant differences were detected between the changes of CMT between the two groups. Based on the fact that more inflammation and higher decrease in intraocular pressure might be seen in PXG than POAG postoperatively, further investigations with great number of cases are planned.

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## P-FS-168

### TWENTY-FOUR MONTH ABIC RESULTS IN PATIENTS WITH POAG

Mahmoud Khaimi\*

#### Purpose

To investigate the efficacy and safety of ab-interno Canaloplasty, ABiC (using the iTrack catheter) in reducing IOP and medication use in mild-to-moderate primary open-angle glaucoma (POAG).

#### Methods

This single-center, retrospective, nonrandomized study explored the effect of ABiC or combined cataract surgery-ABiC in adult patients with mild-to-moderate POAG. The primary endpoints included mean IOP and mean number of glaucoma medications over a 24-month period. Secondary endpoints included surgical/postsurgical complications.

#### Results

The study included 83 patients (mean age  $71.0 \pm 10.2$  years) with a baseline mean IOP of  $18.8 \pm 5.5$  mmHg on  $1.98 \pm 0.94$  medications. At 18 and 24 months postoperative, mean IOP was reduced to  $15.90 \pm 3.60$  mmHg ( $P < 0.05$ ), and  $16.10 \pm 2.70$  mmHg ( $P < 0.05$ ) with a 68.5% and 70.6% reduction in medication use respectively ( $P < 0.05$ ), as compared to baseline. In 26 patients, who underwent standalone ABiC, mean IOP was reduced from  $20.70 \pm 5.90$  mmHg preoperatively to  $16.30 \pm 3.50$  mmHg at 18 months postoperative ( $P < 0.05$ ), and  $16.90 \pm 3.30$  mmHg at 24 months postoperative ( $P < 0.05$ ); with a 44.90% and 47.70% reduction in medication respectively ( $P < 0.001$ ). At 18 and 24 months postoperative, 44.9% and 47.7% of patients had  $0.0 \pm 0.0$  medications and recorded an average IOP of  $16.30 \pm 3.50$  mmHg and  $16.90 \pm 3.30$  mmHg respectively. There were no intra- or post-operative complications.

#### Conclusions

ABiC is a versatile treatment option for early stage POAG that can be performed in conjunction with cataract surgery or as a standalone procedure. Findings show that ABiC was safe and effective in reducing IOP. The procedure also reduces the need for anti-glaucoma medications, with approximately half of patients requiring no medications at the 2-year-follow-up.

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## P-FS-169

### NATURAL HISTORY OF CONJUNCTIVAL BLEB FOLLOWING BIODEGRADABLE COLLAGEN IMPLANT – ANTERIOR SEGMENT OCT (AS-OCT) MORPHOLOGICAL STUD

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<sup>1</sup>Glaucoma, <sup>2</sup>Cataract, Raghudeep eye Hospital, Ahmedabad, India

#### Purpose

To document natural history of bleb following biodegradable collagen implant (BCI - Ologen) augmented trabeculectomy using AS-OCT.

The application collagen-glycosaminoglycan copolymers can lead to random and relatively loose reorganization of regenerating myofibroblasts, fibroblasts, and the secreted extracellular matrix (*i.e.*, collagen), reducing scar formation.

#### Methods

It is a prospective non randomized case series of 10 eyes of primary glaucoma undergoing trabeculectomy with biodegradable collagen matrix (Cylindrical implant of 6mm diameter X 2mm in height - Ologen) and followed up for 12 months. Detailed ocular examination was done on day 1, 1 week, 1, 3, 6 & 12 month. Subjective evaluation of bleb status was done clinically as well as with AS OCT (Visante). Anechoic & echoic areas, bleb height, wall thickness were measured.

#### Results

At 1 week BC was in apposition with sclera and conjunctiva as revealed by echoic (homogenous) pattern. Over time anechoic space (aqueous) is created in a suprascleral space with large echogenic area above it. Later on echogenic mass area reduced in size creating irregular anechoic space. There are also areas of multiple layers and microcysts in subconjunctival region away from homogenous mass. Suprascleral echoic mass assumes irregular shape before disappearing.

#### Conclusions

Findings suggest absorption of BC creates aqueous pockets below it with microcystic areas away from BC. Complete absorption of Ologen is associated with shrinkage of bleb. Ologen implant could be safe, and effective alternative to MMC.

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## P-FS-170

### PROSPECTIVE STUDY OF TWO TRABECULAR MICRO-BYPASS STENTS COMPARED TO PROSTAGLANDIN AS TREATMENT IN NEWLY DIAGNOSED OPEN-ANGLE GLAUCOMA: 5-YEAR OUTCOMES

Albert Khouri\*

#### Purpose

This study aimed to evaluate long-term safety and effectiveness of two trabecular micro-bypass stents (iStent®) as an initial standalone surgical procedure compared to initial medical therapy (travoprost) in subjects with newly diagnosed OAG.

#### Methods

This 5-year prospective, randomized, unmasked study enrolled subjects with OAG naïve to medical and surgical treatment. Enrolled eyes were phakic with normal angle anatomy having IOP 21-40 mmHg and vertical C/D ratio  $\leq 0.9$ . One-hundred one subjects were randomized (1:1) to implantation of 2 iStent devices (n = 54) or travoprost (n = 47). Ninety subjects completed 5-year follow-ups. Efficacy (IOP and medication usage) and safety measures were evaluated.

#### Results

Mean pretreatment IOP was  $25.5 \pm 2.5$  mmHg (iStent group) and  $25.1 \pm 4.6$  mmHg (travoprost group). Mean IOP through 5 years ranged between 13.5 to 16.5 mmHg in both groups ( $P < 0.01$ ). At 5 years postoperative, IOP  $\leq 18$  mmHg without additional therapy was observed in 77% of iStent versus 53% of travoprost eyes ( $p = 0.04$ ). An excellent safety profile was observed in both groups. The most common event occurring over the 5-year period was progression of pre-existing cataract (~30% incidence in either group). Additional outcomes will be presented.

#### Conclusions

In this study, both groups showed long-term IOP reduction with favorable safety over 5 years. IOP  $\leq 18$  mmHg was achieved in more iStent eyes. The study supports efficacy of 2 iStent implantations as an initial therapy for patients newly diagnosed with OAG.

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## P-FS-171

### CLINICAL OUTCOMES OF AHMED GLAUCOMA VALVE IMPLANTATION WITHOUT FIXATION OF PLATE: THE FREE PLATE TECHNIQUE

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#### Purpose

Fixation of plate onto posterior sclera in Ahmed glaucoma valve implantation surgery is a time consuming procedure, and requires experienced skill. Also, it can be associated with complication such as bleeding and perforation of the globe. We performed Ahmed glaucoma valve implantation without fixation of the plate to the refractory glaucoma cases and its efficacy and safety were compared to the conventional method.

#### Methods

The medical records of 36 eyes of 36 patients who underwent Ahmed glaucoma valve implantation without plate fixation (fpAGV) and 74 eyes of 74 patients who underwent conventional Ahmed glaucoma valve implantation (cAGV) were reviewed retrospectively. All surgeries were performed between January 2013 and June 2017 by an experienced glaucoma specialist (CSK). Intraocular pressure and number of anti-glaucoma medication before and after surgery, time consumed for the surgery, and complications after surgery were collected and compared between fpAGV and cAGV groups. Success of the surgery is defined as the intraocular pressure decreased more than 20% from baseline and is between 6 and 21 mmHg after surgery, and it was compared between 2 groups.

#### Results

Intraocular pressure and number of anti-glaucoma medication before surgery are not significantly different between fpAGV and cAGV group ( $31.8 \pm 7.8$  mmHg vs.  $31.7 \pm 9.4$  mmHg, and  $3.7 \pm 0.4$  vs.  $3.8 \pm 0.4$  mmHg, respectively.  $p = 0.984$  and  $p = 0.497$ ). Time consumed for the fpAGV surgery (including preparation procedure) was  $51.1 \pm 5.0$  minutes and it was shorter than cAGV surgery ( $56.2 \pm 10.4$  minutes,  $p = 0.003$ ). The intraocular pressure was  $15.8 \pm 3.8$  mmHg in fpAGV group and  $16.5 \pm 3.4$  mmHg in cAGV group ( $p = 0.320$ ) and the number of medication was  $2.0 \pm 1.2$  and  $2.1 \pm 1.1$  in 2 groups respectively ( $p = 0.488$ ) at 1 year after surgery. Success rate at 1 year after surgery was 86.1% in fpAGV group and 73.0% in cAGV group ( $p = 0.139$ ). There was no difference in the frequency of surgery associated complications between 2 groups.

#### Conclusions

The free plate Ahmed glaucoma valve implantation procedure was shorter than conventional method, and there was no difference in clinical outcome and safety. Therefore this procedure can be considered as a good substitute of the conventional Ahmed glaucoma valve surgery in treating refractory glaucoma.

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## P-FS-172

# SURGICAL OUTCOMES OF AB-INTERNO SCHLEMM'S CANAL PROCEDURES IN OPEN-ANGLE GLAUCOMA PATIENTS WITH PREVIOUS SELECTIVE LASER TRABECULOPLASTY

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### Purpose

To determine if outcome of ab-interno Schlemm's canal procedures is associated with outcome of selective laser trabeculoplasty (SLT) as a predictor of trabecular outflow function.<sup>1</sup>

### Methods

A retrospective chart review of 46 eyes in 41 patients from March 2016-December 2017 was performed. Patients with open-angle glaucoma with previous SLT followed by an ab-interno Schlemm's canal surgery (iStent implantation, goniotomy with Kahook Dual Blade, or trabeculotomy with Trab360) who had completed minimum 6 months follow up were included. Outcomes of laser and surgery was assessed by reduction of intraocular pressure (IOP) and number of glaucoma medications at 6 months compared to baseline. Success was defined as a reduction of  $\geq 20\%$  IOP or  $\geq 1$  glaucoma medication from baseline. Any adverse events and need for additional IOP lowering procedures were collected. Type and severity of glaucoma and other demographic factors were analyzed as possible variables affecting the outcomes of each procedure. *T-tests* were performed for continuous variables and *chi-square* for categorical variables.

### Results

Glaucoma type, severity and other demographic factors were comparable between patients with successful and unsuccessful SLT. There was no statistically significant correlation between outcomes of any ab-interno Schlemm's canal procedures and that of SLT ( $p = 0.143$ ). A Schlemm's canal procedure resulted in mean IOP reduction of  $3.12 \pm 1.89$  mmHg in patients who had successful prior SLT, compared to  $3.00 \pm 0.832$  mmHg in those who had unsuccessful SLT ( $p = 0.947$ ). There was no significant difference in mean medication reduction following surgery for either group ( $0.750 \pm 0.335$  in successful SLT versus  $1.00 \pm 0.260$  in unsuccessful SLT,  $p = 0.598$ ).

### Conclusions

Patients' response to SLT does not appear to determine their surgical outcome of ab-interno Schlemm's canal procedures. Patients with open-angle glaucoma who have a minimal response to SLT may still benefit from various Schlemm's canal surgeries.

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## P-FS-173

### LONG-TERM EVALUATION OF TRABECTOME SURGERY PERFORMED ON JAPANESE PATIENTS

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#### Purpose

To evaluate the long-term results of Trabectome surgery performed on Japanese patients.

#### Methods

This was a retrospective nonrandomized observational study. Trabectome surgery was performed on 181 eyes from 142 patients (mean age  $69.7 \pm 13.2$ , range 16-92, 78 males and 64 females) in Yamanashi University from March 2016 to September 2017.

#### Results

Primary open-angle glaucoma was observed in 108 eyes, secondary glaucoma in 29 eyes, pseudo-exfoliation glaucoma in 26 eyes, neovascular glaucoma in 2 eyes, primary angle-closure glaucoma in 7 eyes, mixed type glaucoma in 8 eyes and developmental glaucoma in 1 eyes. Trabectome surgery alone was performed on 70 eyes and Trabectome surgery combined with phacoemulsification was performed on 111 eyes. Mean preoperative IOP of  $21.4 \pm 7.4$ mmHg decreased to  $15.3 \pm 5.4$ mmHg at 1 months,  $15.0 \pm 3.9$ mmHg at 3 months,  $14.9 \pm 4.0$ mmHg at 6 months,  $15.1 \pm 3.5$ mmHg at 12 months,  $16.5 \pm 4.6$ mmHg at 18 months, respectively ( $P < 0.001$ ). Adjunctive medication decreased from  $4.0 \pm 1.2$  to  $1.5 \pm 1.6$  at 12 months, respectively ( $P < 0.001$ ). BCVA was significantly improved from  $0.22 \pm 0.39$  to  $-0.005 \pm 0.09$  at 12 months ( $P < 0.001$ ). 19 eyes occurred short-term IOP elevation. 4 eyes received additional trabeculectomy.

#### Conclusions

Trabectome surgery is safe and effective for Japanese patients.

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## P-FS-174

### EFFECT OF GLAUCOMA DRAINAGE IMPLANT SURGERY ON CORNEAL TOPOGRAPHY AND ENDOTHELIAL CELL DENSITY

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#### Purpose

Glaucoma drainage implant (GDI) surgery is an effective treatment for uncontrolled glaucoma. However, decreased endothelial cell density (ECD) has been reported after GDI procedure (1,2). The effect of GDI surgery on corneal topography has not been previously investigated. This pilot study, the first of its type, was conducted to determine the effect of GDI surgery on corneal topography parameters. In addition, ECD was measured.

#### Methods

A total of 22 patients (9 primary open angle, 9 pseudoexfoliative, 3 uveitic and 1 neovascular glaucoma) requiring GDI surgery were recruited in this study. The patients received either a Molteno3 or a Baerveldt glaucoma implant. Corneal topography (Galilei V5.2.1) and ECD measurements (Nidek CEM-530) were obtained preoperatively and at 6 and 12 months postoperatively (at present, 13 patients have not yet reached 12 months of follow up). Opposite eyes served as controls.

#### Results

The mean ( $\pm$  SD) intraocular pressure (IOP) was 32 mmHg ( $\pm$  7.8) preoperatively, 15 mmHg ( $\pm$  3.9) at 6 months and 12 mmHg ( $\pm$  5.4) at 12 months postoperatively; both pressure drops were statistically significant ( $p = 0.000$  and  $0.000$  respectively). Compared to preoperative values there was a statistically significant corneal thickening at 12 (but not 6) months after surgery. Mean central corneal thickness increased from 524 to 531  $\mu\text{m}$  ( $p = 0.044$ ), while tube-quadrant peripheral corneal thickness increased from 556 to 579  $\mu\text{m}$  ( $p = 0.007$ ). Control eyes remained unchanged. Both posterior and SimK corneal astigmatism remained statistically unchanged throughout follow up. The mean central ECD was 2374 cells/ $\text{mm}^2$  preoperatively, 2309 cells/ $\text{mm}^2$  at 6 months and 1941 cells/ $\text{mm}^2$  at 12 months postoperatively. However, the downward trend was not statistically significant ( $p = 0.438$  and  $0.145$ , respectively).

#### Conclusions

Corneal thickness increased after GDI surgery, both centrally and especially in the tube-quadrant. GDI surgery did not affect anterior or posterior corneal astigmatism. ECD was rather stable until 6 months postoperatively, after which a downward trend was observed.

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## P-FS-175

### OUTCOME OF GLAUCOMA SURGERY IN ONE-CHAMBER EYES

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#### Purpose

Glaucoma in patients with aphakia, transscleral sutured intraocular lens (IOL), and intrascleral fixed IOL, so-called “one-chamber eyes” is difficult to treat and sometimes refractory to medical treatment. Although glaucoma surgery is used to reduce intraocular pressure (IOP) in medically refractory cases, serious intra- and post-operative complications may occur. The efficacy and safety of glaucoma surgeries in one-chamber eyes remain unclear. The purpose of this study was to investigate the outcome of glaucoma surgery in one-chamber eyes.

#### Methods

We retrospectively analyzed 30 cases with medically uncontrolled glaucoma patients with aphakia, transscleral sutured IOL, or intrascleral IOL fixation. Seven eyes were treated with trabeculectomy (trab group), 14 eyes with EX-PRESS implantation (EX-PRESS group), and 9 eyes with Baerveldt glaucoma device or Ahmed glaucoma valve (tube group). All subjects were followed at least 12 months after surgery. Preoperative IOP of trab versus EX-PRESS versus tube groups was 29.4 versus 26.7 versus 39.4 mmHg, and follow-up period was 52.7 versus 29.7 versus 20.7 months, respectively. EX-PRESS glaucoma filtration device model P-50 (Alcon Japan Laboratories) was placed under a partial-thickness scleral flap. Mitomycin C was applied intraoperatively in trab and EX-PRESS groups. In tube group, Baerveldt glaucoma device model BG 101-350 (Abbott Medical Optics) or Ahmed glaucoma valve model FP7 (New World Medical Inc.) was positioned in the superior or inferior temporal quadrant, then the tube was inserted into the anterior chamber. Success rate and incidence of complications were compared between three groups. Surgical success was defined as an IOP between 4 and 18 mmHg.

#### Results

At 12 months after surgery, the success rate was 85% versus 77% versus 33% in trab versus EX-PRESS versus tube groups, respectively (Kaplan-Meier survival analysis, log-rank test,  $p = 0.03$ ). Needling revision was performed to control IOP in 4 eyes of trab group and 8 eyes of EX-PRESS group. There were no significant differences between 3 groups in excess filtration, hyphema, vitreous hemorrhage, and reoperation for glaucoma. Corneal transplantation was performed in 1 eye in trab group. Bleb-related infection occurred in EX-PRESS group. Expulsive hemorrhage and loss of light perception were observed in tube group.

#### Conclusions

IOP control may be achieved by glaucoma surgery in one-chamber eyes, but severe complications may occur.

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## P-FS-176

### EARLY EFFICACY AND SAFETY OF CYPASS MICROSTENT IMPLANTATION IN AN AUSTRALIAN TERTIARY HOSPITAL

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#### Purpose

To evaluate the early clinical outcomes and safety in a series of cases of CyPass microstent implantation either alone or in combination with cataract surgery.

#### Methods

Six eyes (n = 6) of five patients with open-angle glaucoma and cataract or previous cataract surgery underwent either combined cataract surgery with CyPass microstent implantation (n = 4) or CyPass microstent implantation alone into a pseudophakic eye (n = 2). All patients were on glaucoma medication preoperatively. Glaucoma medications were discontinued after surgery or restarted at surgeon discretion. Follow-up examinations were conducted at postoperative days 1 and 7 and one month. The main postoperative outcome measures were intraocular pressure (IOP), number of glaucoma medications and adverse outcomes.

#### Results

Preoperative baseline mean IOP was  $16.0 \pm 6.2$  mmHg. Mean number of preoperative glaucoma medications was  $3.2 \pm 1.2$ . Postoperative mean IOP was  $8.5 \pm 1.4$  mmHg and  $7.2 \pm 4.4$  mmHg, representing a 46.9% and 55.0% reduction in mean IOP at days 1 and 7, respectively. Postoperative number of glaucoma medications was  $0.7 \pm 1.0$ , representing a 78.1% reduction in mean number of medications used. No serious or sight-threatening adverse events occurred in the intra- or postoperative period. One subject developed a transient microhyphaema and an anteriorly malpositioned microstent that required repositioning in theatre. 100% of subjects achieved postoperative 6/12 best corrected visual acuity or better.

#### Conclusions

CyPass microstent implantation results in effective reduction in IOP and medication burden in patients with open-angle glaucoma and is associated with minimal complications. Further follow-up is planned to assess longer-term outcomes.

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**P-FS-177**

**KAHOOK DUAL BLADE:AB INTERNOTRABECULECTOMY - TECHNIQUE AND FIRST RESULTS**

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**Purpose**

To evaluate the intraocular pressure (IOP)-lowering efficacy and safety of the *ab interno* trabeculectomy with a single-use dual blade (Kahook) in patients with mild to end stage glaucoma.

**Methods**

6 consecutive patients with glaucoma and cataract who had phacoemulsification combined with partial trabeculectomy via internal approach using the Kahook Dual Blade(KDB) were enrolled in this study. We collected clinical data, including preoperative and postoperative IOP, medication use, adverse events, and whether additional surgery was required during a 6-month follow up.

**Results**

This study included data from 6 eyes of patients. There were patients with primary and secondary open-angle glaucoma. They were classified as patients with mild, moderate and severe stage of glaucoma. We collected clinical data showing the proportion of the patients who had reduction in IOP of 20% or more from baseline, the mean medication use and the adverse events over the period of the study.

**Conclusions**

Ab interno trabeculectomy done with single-use KDB combined with phacoemulsification in glaucoma patients with cataract is safe and effective procedure compared with phacoemulsification alone. We observed sustained reduction in IOP and a decrease in glaucoma medications after 6 months of follow-up. We believe that sparing the conjunctiva if eventual TE is needed and the absence of a stent in the eye which could lead to loss of endothelial cells of the cornea in predisposed patients, are the main advantages of this procedure.

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## P-FS-178

# A SYSTEMATIC REVIEW AND META-ANALYSIS OF OUTCOME IN MINIMALLY-INVASIVE GLAUCOMA SURGERIES

Marion Luise Kvasnicka\*

## Purpose

We have investigated the cumulative reported change in intraocular pressure (IOP) and glaucoma medications using different subconjunctival and suprachoroideal minimally-invasive glaucoma surgeries (MIGS) devices (XEN, InnFocus, Cypass, iStent supra, STARflo, SOLX) as a solo procedure or in association with phacoemulsification.

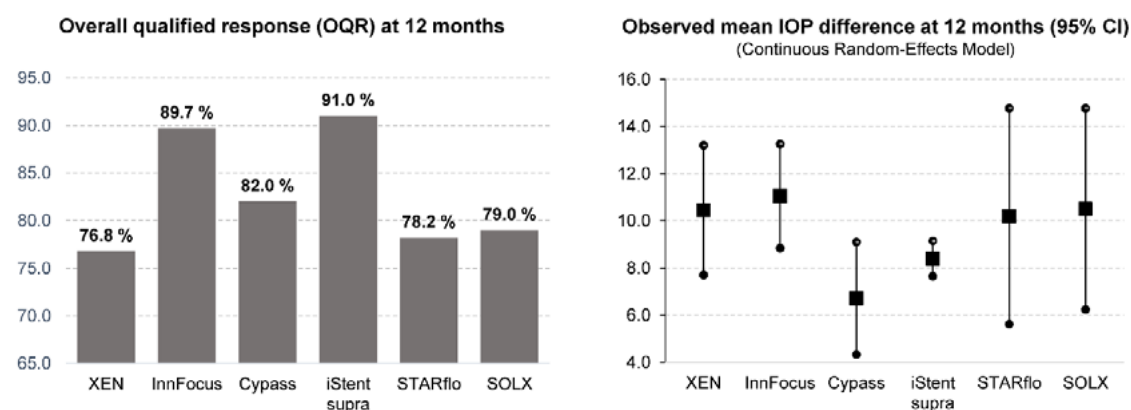
## Methods

A systematic literature search was performed to identify randomized control trials (RCT) and non-RCT (non randomized comparative studies, NRS, and before-after studies) with at least 12 months of follow-up in patients affected by primary open angle glaucoma, pseudoexfoliative glaucoma or pigmentary glaucoma. Outcome data regarding overall qualified response (OQR), IOP, and number of glaucoma medications at 12 months were extracted from the published sources and compared across all devices to baseline characteristics.

## Results

A total of 30 studies were identified (2 RCT and 27 NRS) which included 2.289 eyes. Main concerns about risk of bias comprised lack of appropriate control arms and small numbers of analyzed eyes. Only 6 series have reported outcome data for more than 100 eyes (median 54 eyes, range 7-374). However, MIGS surgery seemed effective in lowering both IOP and glaucoma drug use at 12 months with a reported OQR ranging between 76.8% and 91.0%. MIGS showed a good safety profile: IOP spikes were the most frequent complications and no cases of infection or BCVA loss due to glaucoma were reported. Stratified meta-analysis of observed mean IOP difference at 12 months revealed the highest mean IOP reduction at 12 months for the Innfocus device (11.049), followed by the SOLX (10.545) and XEN device (10.464). Efficacy of the STARflo device was in a similar range (10.269), whereas iStent supra and Cypass showed much lower IOP reduction at 12 months (8.400 and 6.718). The change in the number of glaucoma medication was highest in the studies which used the XEN and InnFocus device (2.449 and 2.190 contrasting the suprachoroideal devices).

## Image



### Conclusions

MIGS show in general a good safety profile and effective reduction of IOP and glaucoma medication, however, the evidence on the efficacy of MIGS compared to other therapies is still limited and is based on few RCTs of acceptable quality and a larger number of NRS and uncontrolled before/after series. The remarkable heterogeneity of the analyzed series suggests the need for additional research to understand how to maximize the utility of these new procedures, in particular by performing more RCTs.

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## P-FS-179

### EFFICACY AND SAFETY OF CROSSLINKING ON LEAKING CYSTIC BLEB: A PROSPECTIVE STUDY

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#### Purpose

To evaluate the long-term efficacy and safety of collagen crosslinking (CXL) in patients with late onset cystic bleb leak.

#### Methods

The patients underwent CXL with riboflavin application to the bleb surface, followed by ultraviolet irradiation for 30 minutes. The patients were evaluated at baseline and at 1 week to 6 months post treatment, and then every 6 months afterwards.

#### Results

Eleven eyes of eleven consecutive patients were recruited. The mean follow-up was  $17.7 \pm 11.5$  months. Ten out of 11 (91%) patients' bleb leak subsided after a single session of CXL, ranging from 1 to 4 weeks after treatment (median 2 weeks). One patient required repeated CXL for recurrent leak from the limbal edge, after which the leak subsided. The time to leak cessation following CXL was significantly correlated with the number of prior filtration surgeries ( $r = 0.61$ ,  $P = 0.048$ ), and the total number of interventions ( $r = 0.71$ ,  $P = 0.014$ ). Bleb wall at 3 months was significantly thicker than at baseline ( $0.70 \pm 0.67$  vs.  $0.81 \pm 0.62$  mm,  $P = 0.008$ ). The visual acuity and intraocular pressure remained stable throughout the follow-up. None of the patients had any complications.

#### Conclusions

A single session of CXL achieves resolution of late onset cystic bleb leak for at least 6 months, without the need of subsequent surgical interventions. In some cases with multiple prior glaucoma interventions, bleb leak took longer to resolve. CXL is a simple, non-invasive treatment in cystic bleb leak. It aims to restore the integrity of conjunctiva, which is particularly important in patients with scarred and fragile conjunctiva.

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## P-FS-180

# A PROSPECTIVE, RANDOMIZED TRIAL COMPARING THE USE OF POST-OPERATIVE ADJUNCTIVE BEVACIZUMAB VS PLACEBO IN PRIMARY TRABECULECTOMY SURGERY FOR GLAUCOMA

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### Purpose

To compare the effectiveness of postoperative adjunctive use of subconjunctival Bevacizumab in altering the outcome of primary trabeculectomy in terms of sustained lowering of intraocular pressure (IOP), reduction in postoperative bleb vascularization and fibrosis, and need for glaucoma medications and 5-fluorouracil (5-FU) needling.

### Methods

A single centre, prospective, randomized control trial for patients with uncontrolled IOP under maximal medical treatment. A primary trabeculectomy with mitomycin-C (MMC) was done and the patients were randomized to either post operative subconjunctival injection of Bevacizumab (1.25mg/0.05ml) or balanced salt solution (BSS). A minimum follow up period of one year was included.

### Results

Of the fifty-nine patients (59 eyes), 47 (80%) completed at least one year of follow up, where there was no significant difference between the two groups for IOP ( $p = 0.65$ ), bleb morphology ( $p = 0.65$ ), need for glaucoma medications ( $p = 0.65$ ) or 5-FU needling ( $p = 0.11$ ).

### Conclusions

No statistically significant differences in IOP were found at one year between the 2 groups. The bleb morphology was optimal in more patients in the Bevacizumab group; however it was not statistically significant and not related to a lower IOP. The Bevacizumab group had a higher rate of success results and a lower use of glaucoma medications after surgery; however it required more 5-FU needling procedures. None of these differences were statistically significant.

A larger sample size is needed to determine whether the differences found between the treatment groups are statistically significant and to investigate potential optimal dose and frequency responses for this possible addition to our armamentarium in glaucoma surgery.

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**P-FS-181**

**SURGICAL OUTCOMES OF SILICONE OIL-INDUCED GLAUCOMA IN CIPTO MANGUNKUSUMO HOSPITAL: 4-YEAR DESCRIPTIVE STUDY**

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**Purpose**

This study aims to evaluate surgical outcomes of this disease in Cipto Mangunkusumo hospital, thus helps clinician to decide best surgical management in treating silicone oil-induced glaucoma.

**Methods**

**Retrospective study.** Subject with silicone oil-induced glaucoma that had undergone glaucoma surgical treatment and followed up for 3 months was included. Analyzed variables include subject characteristics, visual acuity, onset of disease, retinal surgery properties, pre and post-operative IOP and complications.

**Results**

Mean pre-operative IOP from 33 eyes included in study was  $48.9 \pm 9.8$  mmHg. With or without scleral buckle, there's no significant difference of mean pre-operative IOP ( $p = 0.549$ ). History of silicone oil evacuation related to lower pre-operative IOP ( $p = 0.01$ ). Valved-GDD implantation showed a greater IOP reduction and better success rate (88.9%) than trabeculectomy (33.3%). It also showed good result, even as a second procedure when previous trabeculectomy has failed. Overall success rate of all surgeries was 63.6%. Complication rate was 12%, including exposed implant tube, bleb encapsulated and bleb leakage.

**Conclusions**

In managing silicone oil-induced glaucoma, GDD implantation may be preferred as first-line surgery, with success rate above eighty percent. It is also an option in refractory cases and the complication rate was relatively low.

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## P-FS-182

### CYPASS PERFORMANCE IN POST KERATOPLASTY GLAUCOMA

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#### Purpose

To report the outcomes of patients with secondary glaucoma after keratoplasty treated with the implantation of suprachoroidal micro-stent.

#### Methods

Prospective study of consecutive clinical cases who underwent Cypass Micro-Stent (Alcon Laboratories, Inc.) as standalone procedure for the treatment of glaucoma due to keratoplasty. Microstenting via an *ab interno* approach to the supraciliary space were performed in all cases. STATA 8.0 and SPSS software were used for statistical analysis.

#### Results

Seven eyes of seven patients with a mean age of 33.83 ( $\pm 17.26$ ). A total of 83.33% were male and 16.66% were female. 6 cases after penetrating keratoplasty and 1 following deep anterior lamellar keratoplasty, 6 cases were phakic and 1 pseudophakic. Mean preoperative intraocular pressure was 28.83 ( $\pm 17.26$ ) mmHg with maximal medical therapy decreasing to a mean postoperatively to 13.33 ( $\pm 6.30$ ) mmHg [ $P = 0.001$ ]. Mean follow-up was 11 ( $\pm 1.15$ ) months. Visual acuity preoperatively was 1.23 ( $\pm 0.91$ ) logMAR and posoperatively 0.98 ( $\pm 0.79$ ).

#### Conclusions

Supraciliary micro-stent is not an adequate alternative in the management of secondary glaucoma after following keratoplasty. Six patients (85%) required an additional procedure to control intraocular pressure.

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## P-FS-183

# COMBINED PHACOEMULSIFICATION AND MICROINVASIVE GLAUCOMA SURGERY (MIGS) IN COMPARISON TO PHACOEMULSIFICATION ALONE FOR OPEN ANGLE GLAUCOMA

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## Purpose

To describe the postoperative outcomes of combined phacoemulsification and iStent (Glaukos, San Clemente, CA) or Hydrus (Ivantis, Irvine, CA) for open angle glaucoma.

## Methods

Retrospective single surgeon comparative case series in a private practice setting. 299 eyes in 190 patients (M:F = 84:106) were included consecutively from March 2011 to June 2017 with the data analysed using linear mixed models.

Main outcome measures were intraocular pressure and number of medications.

## Results

By six months, all groups showed a reduction in IOP, with the combined iStent group by 5.0 mmHg and the combined Hydrus group by 4.4 mmHg, and this trend was sustained with follow-up to three years. At six months, all groups showed a reduction in number of medications, with the phacoemulsification alone cases by 0.3, the combined iStent group by 0.7 and the combined Hydrus group by 1.1 medications. Both the combined surgeries had sustained reduction of number of medications with follow-up to three years. Postoperative complications from MIGS device insertion were uncommon and all resolved by one month.

## Conclusions

The combination of phacoemulsification and a MIGS device in open angle glaucoma patients reduced the intraocular pressure and the number of medications by the first postoperative month and had longer term effects at three years followup. If the device is inserted without intraoperative complication, the rate of significant short-term risks are low.

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**P-FS-184**

**A CASE OF UVEITIS-GLAUCOMA-HYPHEMA (UGH) SYNDROME TREATED BY SUTURELESS SCLERAL FIXATION POSTERIOR CHAMBER INTRAOCULAR LENS**

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**Purpose**

To report a case of a patient with recurrent hyphema in the setting of uveitis-glaucoma-hyphema (UGH) syndrome now in complete remission after sutureless scleral fixation of her posterior chamber intraocular lens.

**Methods**

Chart review of a single patient.

**Results**

A 64 year-old female with history of cataract extraction and intraocular lens (IOL) placement 8 years prior to presentation, anterior and intermediate uveitis on immunomodulatory therapy, bilateral retinal detachments status post repair who presented with persistent hyphemas in both eyes. Prior cataract surgery performed elsewhere placed a single-piece lens in the sulcus of both eyes. The patient then underwent intraocular lens exchange with 3-piece sulcus lenses (MA60AC) with subsequent resolution of hyphemas. The patient re-presented 2 years later with glare symptoms and decrease in vision from 20/20 to 20/50 in the right eye. She was found to have hyphema and IOL subluxation. An ultrasound biomicroscopy noted anterior tilt of the optic and one haptic with probable iris chaffing. She underwent reposition of IOL with scleral (glued) posterior chamber lens fixation of the right eye. The axial length was 25.3 mm with a white-to-white distance of 12.1 mm. Twenty months after surgery, the visual acuity is 20/20, the lens subluxation has resolved and remained centered with no hyphema or uveitis.

**Conclusions**

Uveitis-glaucoma-hyphema is a disease caused by malpositioned IOLs leading to chaffing of the iris or ciliary body. While a properly positioned 3-piece IOL in the sulcus frequently does not lead to UGH, our patient likely developed UGH due to a large eye allowing the IOL to move in the sulcus and subluxate. We sclerally fixated the haptics in a sutureless method, which stabilized the haptics and optic and successfully resolved the patient's UGH. With almost 2 years of follow up, the patient's eye has remained quiet. We believe this technique (or a flanged technique) should be considered in cases of 3-piece sulcus IOLs in the setting of UGH.

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**P-FS-185**

**RISK FACTORS FOR CONJUNCTIVAL TUBE EROSION IN EYES IMPLANTED WITH AHMED GLAUCOMA VALVE IN A PRIVATE EYE INSTITUTION IN THE PHILIPPINES**

Jovell Ian Peregrino, Edgar Leuenberger<sup>\*1</sup>, Maria Imelda Veloso<sup>1</sup>

<sup>1</sup>Asian Eye Institute, Manila, Philippines

**Purpose**

To identify the risk factors for conjunctival tube erosion (CTE) in eyes implanted with Ahmed Glaucoma Valve (AGV) device.

**Methods**

This is a retrospective study conducted in a private eye institution. Records of patients who underwent AGV implantation surgery from January 2004 to December 2013 were reviewed. Eyes with at least 24 months of follow-up with complete records were included. The primary outcome was development of CTE after AGV surgery. Univariable logistic regression and multivariable analysis were used.

**Results**

Forty-six (46) of 45 patients were included in the study. The mean follow-up was 50.2 months (range: 24-140 months). Eight (8) eyes developed CTE (17.4%). Univariable logistic regression analysis identified female gender (p-value = 0.064), diabetes (p-value = 0.083), use of antiglaucoma medications post-operatively (p-value = 0.086), and prior intraocular surgeries (p-value = 0.09) as marginally significant risk factors for CTE. On multivariable analysis, only female gender (OR = 15.4, p-value = 0.033) and diabetes (OR = 14.1, p-value = 0.031) were found to be significantly associated with CTE.

**Conclusions**

Risk factors for CTE following AGV implantation include female gender and presence of diabetes.

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**P-FS-186**

**CLINICAL OUTCOMES OF TRABECULAR MICROBYPASS STENT (ISTENT®) IMPLANTATION IN MEDICALLY CONTROLLED OPEN-ANGLE GLAUCOMA: 6 MONTHS FOLLOW-UP**

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**Purpose**

To evaluate the safety and efficacy (intraocular pressure [IOP] lowering effect and medication use) of a single trabecular microbypass stent (iStent®) for medically controlled open-angle glaucoma,

**Methods**

This retrospective case-series included 23 eyes of 18 patients with medically controlled open-angle glaucoma with IOP less than 18 mmHg. Clinical outcomes analyzed IOP, medication use, corrected distance visual acuity (CDVA), and surgical complications. Surgical success was defined according to 3 different criteria: (1) IOP < 21 mmHg without medication; (2) IOP < 18mmHg without medication; and (3) IOP < 18 mmHg with or without medication. Patients were followed for 6 months postoperatively.

**Results**

At 6 months, mean IOP was reduced from  $15.0 \pm 1.3$  mmHg to  $13.2 \pm 1.2$  mmHg. Mean number of medication decreased from  $2.17 \pm 1.07$  to  $0.52 \pm 0.9$  ( $P < 0.001$ ). Surgical success rates were 87.0%, 73.9%, and 100% by Criteria 1, 2, and 3. And 73.9% of patients were medication-free at 6 months. Relative risk of surgical failure (Criteria 2, IOP < 18 mmHg without med) was 5.56 times greater for the higher-medication group (preoperative No of med  $\geq 3$ ). CDVA was significantly improved from  $0.44 \pm 0.10$  to  $0.09 \pm 0.06$  LogMAR in combined phacoemulsification and iStent® implantation group ( $P < 0.001$ ). There was no vision threatening or severe complication.

**Conclusions**

Single trabecular microbypass stent implantation was effective in reducing IOP and medication in OAG with a low preoperative IOP. Further studies are needed to evaluate long-term outcomes in Korea.

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**P-FS-188**

**AB-INTERNO CANALOPLASTY TO REDUCE IOP, TOPICAL MEDICATIONS AND SYMPTOMATIC OCULAR SURFACE DISEASE IN PATIENTS WITH PREVIOUS MICRO STENT IMPLANTATION**

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David Lubeck\*

**Purpose**

To evaluate if ab-interno canaloplasty (ABiC with iTrac™) can effectively lower intraocular pressure, reduce topical medications and diminish symptomatic ocular surface disease in two patients who had undergone microtrabecular bypass surgery (iStent™).

**Methods**

This case study reviews two patients (4 eyes) with POAG who had undergone MIGS with a single stent combined with cataract surgery. The four eyes required two to three topical glaucoma medications to maintain control of intraocular pressure at between 16 and 30 months postoperative. All had symptomatic ocular surface disease that did not respond to treatment. Ab-interno canaloplasty (ABiC with iTrac™) was performed to lower intraocular pressure, reduce the need for topical medications and reduce symptomatic ocular surface disease. Visual acuity, slit lamp findings, IOP and gonioscopic findings were noted preoperatively, and postoperatively to 1 year.

**Results**

Preoperative mean intraocular pressure was 17.5 mm/Hg on 2 to 3 topical medications. Patients complained of decreased vision and irritation and were found to have  $\geq 2+$  conjunctival injection, and  $\geq 2+$  corneal epitheliopathy. Postoperative mean unmedicated intraocular pressure was 16.8 mm/Hg. One eye required one topical glaucoma medication. The patients reported improved vision and elimination of symptoms. Slit lamp findings showed  $\leq 1+$  injection and epitheliopathy.

**Conclusions**

The use of ABiC appears to be an effective option to achieve a satisfactory reduction in IOP in patients who have had previous MIGS surgery and require reduction of anti-glaucoma medication to lessen topical medication related ocular surface disease.

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**P-FS-189**

**MIGS WITH SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS AND TOPICAL PROSTAGLANDIN IN EYES WITH OAG ON TWO PREOP MEDICATIONS: 42-MONTH OUTCOMES**

David Lubeck\*

**Purpose**

To evaluate long-term effectiveness and safety of second-generation trabecular micro-bypass stents (iStentinject®) implanted as a standalone procedure combined with prostaglandin in open-angle glaucoma (OAG) patients on 2 preoperative topical glaucoma medications.

**Methods**

This was a prospective study enrolling subjects with OAG on 2 medications with baseline IOP of 18-30 mmHg (medicated) and 22-38 mmHg (following washout). Two iStent injecttrabecular micro-bypass stents were implanted as a standalone procedure, and travoprost QD was started on postoperative Day 1. Assessments performed over the course of the study included IOP, medication usage, and standard safety assessments. Annual medication washouts were performed. Postoperative safety and efficacy evaluation through 5 years is ongoing.

**Results**

All 53 enrolled subjects completed follow-up out to 42 months. Mean medicated IOP at M42 is 12.4 mmHg compared to 19.7 preoperative on 2 meds (37% reduction) and 24.9 preoperative post-washout (50% reduction). At M36, 91% of eyes achieved IOP of  $\leq 18$  mmHg and 88% achieved  $\geq 20\%$  reduction in mean IOP on travoprost compared to preoperative mean IOP on 2 meds. All eyes underwent uncomplicated implantation of iStent inject. Best-corrected VA, C/D ratio, and VF mean deviation remained stable throughout the study. Other than two reports of progression of pre-existing cataract, no other AEs have been reported.

**Conclusions**

In this cohort of eyes with OAG not controlled on 2 medications, treatment with iStentinjectstents performed as a standalone procedure combined with postoperative travoprost resulted in safe and long-lasting clinically meaningful IOP and medication reduction through 42 months.

**References**

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## P-FS-190

### INTRAOPERATIVE INJECTION VS SPONGE-APPLIED MITOMYCIN C DURING TRABECULECTOMY: ONE-YEAR STUDY

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#### Purpose

To determine the safety and efficacy of MitomycinC (MMC) injection vs sponge during trabeculectomy.

#### Methods

It's a prospective analysis of patients who underwent Trabeculectomy with Mitomycin C & followed for 1 year, divided in 2 groups: group1- injection (n = 21), group2 - sponge (n = 21). Same concentration of Mitomycin C was used for both groups. Inclusion criteria were Trabeculectomies with Mitomycin C for Intraocular pressure control in eyes with glaucoma (primary + secondary) with a follow up of 1 year.

#### Results

Mean preoperative intraocular pressure in group1 was  $29.00 \pm 11.92$  mmHg & group 2 was  $25.87 \pm 11.09$  mmHg which reduced to  $12.19 \pm 4.03$  &  $15.56 \pm 10.72$  mmHg at final visit with P value of 0.0002 & 0.001 respectively. Mean preoperative number of anti-glaucoma medications was  $2.4 \pm 0.87$  in group 1 &  $2.3 \pm 0.96$  in group 2 which reduced to  $0.38 \pm 0.5$  &  $0.91 \pm 0.85$  with P value of 0.001 & 0.0003 respectively. Overall, success rate was 90.5% & 87% in group1 & group 2 at final visit. All complications were encountered in sponge group. 11.1 % developed Choroidal detachment, Malignant glaucoma which underwent medical management. 33.3% had encapsulated bleb which received bleb needling. 44.4% underwent Argon laser suturelysis postoperatively. There is a significant difference between baseline and final visual acuity in Sponge group (p-value - 0.024) compared to injection group.

#### Conclusions

MMC injection may be as safe and as effective as conventional sponge application with comparable estimated complete treatment success.

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## P-FS-191

### THE TENON'S REPOSITIONING APPROACH OF TRABECULECTOMY – A LONGITUDINAL CASE SERIES

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<sup>1</sup>Department of Ophthalmology and Visual Science, Chinese University of Hong Kong, Hong Kong, Hong Kong

#### Purpose

To investigate the effectiveness and safety of a Tenon's repositioning approach of trabeculectomy.

#### Methods

All eyes with glaucoma underwent the modified trabeculectomy at either the supra-temporal or supra-nasal region in the usual manner (*i.e.* peritomy, blunt dissection to separate conjunctiva and sclera, application of Mitomycin C, creation of a 3x4mm partial-thickness scleral flap, inner sclerotomy and peripheral iridectomy, followed by closure of the scleral flap with releasable sutures). During the conjunctival closure, the Tenon's layer was gently dissected away from the superficial conjunctiva and was separated anchored on to the sclera at the site just behind the limbus at the 12 o'clock and at the site beyond the inferior edge of the scleral flap. The conjunctiva is then closed using a combination of two purse-string sutures and matrix sutures at the limbus. Patients are followed up for at least 1 year.

#### Results

Twenty eyes of 20 patients underwent the surgery. The average age was  $65.7 \pm 10.8$  with a male to female ratio of 12:8. Different types of glaucoma were involved (12 primary open angle, 5 uveitic, 2 primary angle closure and 1 glaucoma developed after retinal detachment surgery). 5 of these eyes had been previously operated for trabeculectomy but failed to control the IOP. Preoperatively, the mean IOP, best corrected visual acuity (BCVA), median deviation (MD), pattern standard deviation (PSD) and Visual field index (VFI) were  $6.3 \pm 9.1$  (range 13 – 38) mmHg,  $0.62 \pm 0.23$ ,  $-16.2 \pm 10.1$  dB,  $7.44 \pm 3.52$  dB and  $52.6 \pm 34.3\%$ , respectively. These patients were on  $4.65 \pm 0.81$  medications on average; 9 out of 20 patients required maximum medication and systemic oral acetazolamide. No leakage was noted during any of the follow-up visits. IOP were significantly reduced [ $14.5 \pm 3.1$  mmHg at 6 month and  $15.7 \pm 3.4$  mmHg at 1 year ( $p = 0.001$ )] and reduction of medication used [ $0.7 \pm 1.1$  bottles at 6 months and  $0.8 \pm 1.28$  bottles ( $P = 0.001$ ) at 1 year]. 3 eyes required needling with 5-FU subconjunctival injection at the 4th week, 6th week and 12<sup>th</sup> week of postoperative follow-up. At the end of the study, there was no significant reduction of BCVA or any of the visual field parameters.

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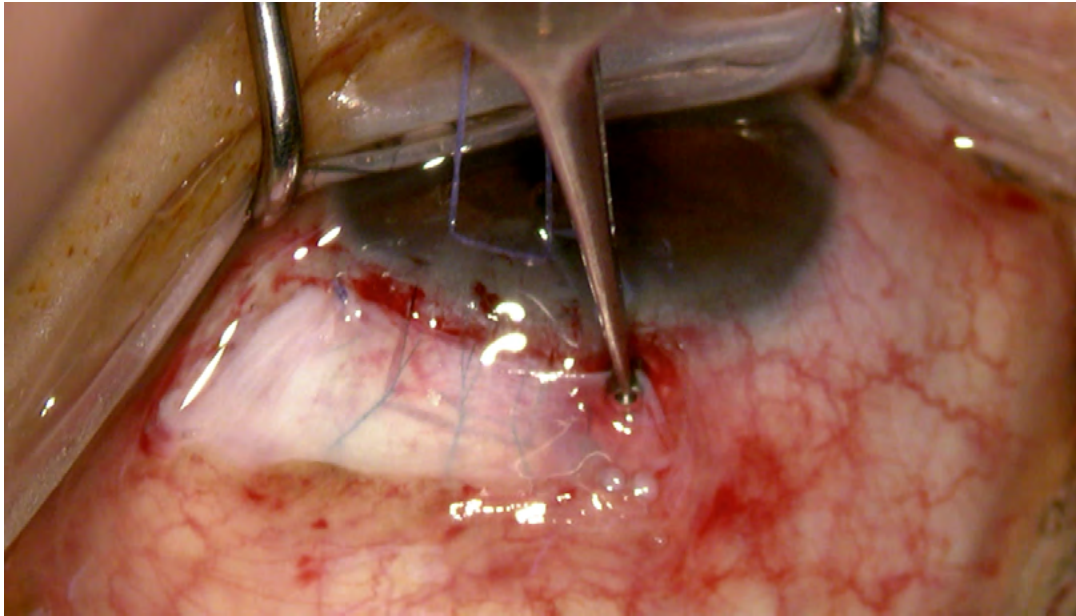
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## Conclusions

The Tenon's layer should be respected and treated as a separate layer during trabeculectomy. This is a potentially safer surgical approach without compromising the outcome. Further study is required to assess the long-term benefit of this approach.

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## **P-FS-192** **DYSAESTHETIC BLEB REVISION WITH FIBRIN GLUE**

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<sup>1</sup>Hunter New England Health Service, Newcastle, Australia

### **Purpose**

This pilot study aims to evaluate the safety and efficacy of a novel surgical technique to treat post trabeculectomy bleb dysaesthesia due to intrapalpebral belb extension with the use of fibrin tissue glue.

### **Methods**

This is a retrospective case series of patients undergoing bleb dissection with scleral cutdown and conjunctival closure with fibrin tissue glue (Artiss). Reported cases have been followed up for six months. Outcome assessments include IOP, medication usage, complications, subjective pain score, Visual field Md, and C:D ratio.

### **Results**

Four Patient with six eyes were included in the study. All were female and of caucasian descent with a mean age of 66.2 years. All patients had previously undergone 5FU enhanced trabeculectomy, with a mean duration to intervention after initial surgery of 18 months. Mean pre operative IOP was  $11.25 \pm 1.0\text{mmHg}$ ; IOP at six months was  $12.0 \pm 0.5\text{mmHg}$ . No patients were on medication pre operatively, and all remained off medication at 6 months. Mean Visual field preoperatively was  $-3.2 \pm 0.5\text{dB}$ , and at six months remained the same at  $-3.2 \pm 0.5\text{dB}$ . C:D ratio also remained unchanged at six months. Mean subjective pain score preoperatively was  $7 \pm 1$ : at six months this had reduced significantly to  $3 \pm 0.4$  ( $p < 0.01$ ). No intra or post operative complications were reported.

### **Conclusions**

This small pilot series demonstrated that patients suffering from bleb dysasthesia due to intrapalpebral bleb extension can be successfully treated with a novel surgical approach by combining conjunctival dissection to sclera with fibrin tissue glue closure. This study demonstated no significant effect on trabeculectomy bleb function and did not contribute to glaucoma progression over a six month period. importantly, there was a significant reduction in patient discomfort with no new surgical complications noted.

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## P-FS-193

# REAL-WORLD CLINICAL OUTCOMES OF SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS (iStent INJECT®) IN OPEN ANGLE GLAUCOMA: 2 YEAR OUTCOMES

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## Purpose

This study aims to evaluate the safety, and IOP and medication reducing ability of two 2<sup>nd</sup> generation trabecular micro-bypass stents (iStent *inject*®, Glaukos Corporation, San Clemente, CA) implanted in conjunction with cataract surgery in eyes with mild to moderate open-angle glaucoma (OAG).

## Methods

This is a retrospective analysis of OAG cases implanted with 2 iStent *inject* devices in combination with cataract surgery from a single practice in Australia. Reported are cases that have been followed out to 2 years postoperative. Assessments included IOP, medication usage, and complications. Ongoing follow-up of additional cases is planned with the intention of sharing an updated analysis at the time of the conference.

## Results

Thirty-five eyes from 22 patients were included; all were Caucasian with a mean age of 71 years. Baseline mean C/D ratio was 0.7, VF MD was -4.4 dB, and 26% of eyes had prior glaucoma surgical interventions. Mean preoperative IOP was  $19.5 \pm 4.6$  mmHg; IOP 2 years postoperatively was  $16.1 \pm 3.3$  mmHg (17% reduction). Preoperative mean number of medications used was  $1.7 \pm 0.9$ ; postoperatively that dropped to  $0.2 \pm 0.4$  (88% reduction). By 2 years, 80% of eyes were medication-free compared to only 9% pre-surgery. A reduced medication burden was observed in 80% of eyes.

All eyes were successfully implanted with the iStent *inject* devices. No significant intraoperative or postoperative complications were noted. The safety profile was similar to that of cataract surgery alone.

## Conclusions

This study adds to the existing clinical evidence supporting the safe and effective use of trabecular micro-bypass stents (iStent and iStent *inject*) to manage glaucoma. In this cohort of Australian eyes with mild to moderate OAG, iStent *inject* implanted in conjunction with cataract surgery was safe and resulted in clinically meaningful IOP and medication reduction out to 2 years. The vast majority of eyes were medication-free at 2 years postoperative.

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## P-FS-194

### TRABECULECTOMY INCREASES OPTIC NERVE HEAD NEURORETINAL RIM TISSUE

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#### Purpose

To determine the stability and changes in the optic nerve head after incisional glaucoma surgery using ocular coherence tomography.

#### Methods

We identified 19 eyes (15 subjects) with primary open angle glaucoma who had undergone a trabeculectomy. We calculated the change in OCT parameters (minimum rim area (MRA), minimum rim width (MRW), and retinal nerve fiber layer thickness (RNFLT)) as well as parameters thought to be stable in progressive glaucoma (e.g. basement membrane opening (BMO) area) from the visit before the surgery to the visit after the surgery, an interval of approximately 6-months. We also calculated changes in the same eyes over two different 6-month intervals that did not contain trabeculectomy to serve as control. We compared these intervals using a generalized linear model (with compound symmetry correlation structure), accounting for the correlation between time intervals for the same eye.

#### Results

IOP and RNFLT decreased ( $P < 0.01$ ) during the intervals that included trabeculectomy with non-significant increases in MRA and MRW. MRA and MRW both decreased ( $p < .01$ ) during the intervals that did not contain trabeculectomy, consistent with aging and/or glaucomatous optic disc progression. When comparing the trabeculectomy and control intervals, only RNFL thickness and BMO area remained stable ( $p > .05$ ), while IOP decreased ( $p < .001$ ) and all other neuroretinal rim parameters increased significantly (all  $p < .05$ ). Similarly, trabeculectomy increased the angle above the reference plane for MRA and MRW ( $P < .05$ ), consistent with a shallowing of the neuroretinal rim profile.

#### Conclusions

Glaucoma surgery increased MRA and MRW, which suggests improved anatomical changes to the ONH associated with glaucomatous cupping. The RNFL thickness was unaffected and may be a more stable measure of disease progression that clinicians can use to monitor across time intervals containing glaucoma surgery. Future studies will determine the amount of MRA/MRW increase that is associated with stable glaucoma after glaucoma interventions.

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## P-FS-195

### SURGICAL OUTCOMES OF BAERVELDT TUBE SHUNT SURGERY FOR EXFOLIATION GLAUCOMA

Tomoyo Matsumura<sup>1</sup>, Toshihiro Inoue<sup>1</sup>, Kei-ichi Nakashima<sup>1</sup>, Eri Takahashi<sup>1</sup>, Hitomi Yonemura<sup>1</sup>, Akiko Futakuchi<sup>1</sup>, Hidenobu Tanihara<sup>1</sup>

<sup>1</sup>Department of Ophthalmology, Kumamoto University, Kumamoto, Japan

#### Purpose

To assess the results of Baerveldt tube shunt surgery for exfoliation glaucoma.

#### Methods

This retrospective study included patients with exfoliative glaucoma who underwent Baerveldt tube shunt surgery at Kumamoto University Hospital from 2012 to 2017. Intraocular pressure (IOP), the number of glaucoma medications, and complications were assessed. The subjects were 16 eyes of 14 males, 8 eyes of 8 females. The average follow-up period was  $28.5 \pm 17.7$  months. The preoperative IOP was  $28.9 \pm 7.2$  mmHg. The mean number of preoperative glaucoma medication is  $4.0 \pm 0.5$ . Seventeen eyes had history of cataract surgery, and all patients had history of filtration surgery. Two eyes underwent cataract surgery combined with Baerveldt tube shunt surgery. Paired t test was used to compare IOP between before and after surgery. Success rate of IOP control was evaluated by calculating Kaplan-Meier survival curve. A p value of less than 0.05 was considered statistically significant.

#### Results

Postoperative IOP were 14.5, 13.6, 13.3, and 12.4 mmHg at 12, 24, 36, and 48 months after surgery, respectively. Corresponding values of glaucoma medication number were 1.2, 1.3, 0.6, and 0.3, respectively. Cumulative success rate was 87.1% at 1 year postoperatively. The causes of failure were hypertony in 2 eyes and hypotony in 1 eye. Choroidal detachment, hypotony, intraocular hemorrhage, diplopia, bullous keratopathy, bleb leak, and dislocation of implant, were observed in 50, 46, 42, 17, 13, 13, and 4% of patients, respectively. Additional surgery for complication were underwent in 29% of patients.

#### Conclusions

Baerveldt tube shunt surgery was effective to lower IOP. Care should be taken for complications.

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## P-FS-197

### BIOMETRIC AND ANTERIOR SEGMENT PARAMETERS CHANGES AFTER UNEVENTFUL AHMED GLAUCOMA VALVE IMPLANTATION

Arezoo Miraftebi<sup>1</sup>, Mahboubeh Lotfi<sup>1</sup>, Naveed Nilfourosan<sup>1</sup>, Parya Abdolalizadeh<sup>1</sup>

<sup>1</sup>Eye research center, Rasoul Akram Hospital, Iran University Of Medical Sciences, Tehran, Iran, Islamic Republic Of

#### Purpose

To investigate changes in anterior chamber parameters as well as axial length, keratometry and refraction after uneventful Ahmed Glaucoma Valve implantation.

#### Methods

In a prospective study patients with refractory glaucoma who were candidate for Ahmed valve surgery were included in this study. Patients with history of any corneal surgery were excluded. Refractive status, intraocular pressure, axial length, anterior chamber parameters including corneal anterior and posterior mean keratometry, K flat, K steep, central cornea thicknesses, and anterior chamber depth, volume and angle were evaluated at baseline and one and three months after surgery.

#### Results

20 patients were included. Mean IOP at baseline was  $33.4 \pm 12.3$  mmHg that significantly decreased to  $14.6 \pm 6.2$  mmHg at one month ( $P < 0.001$ ) and  $13.5 \pm 4.3$  mmHg at 3 months after AGV implantation. ( $P < 0.001$ ).

Mean number of medications was  $3.6 \pm 1.3$  at baseline which significantly decreased to  $0.8 \pm 0.8$  at one month ( $P < 0.001$ ) and  $1.0 \pm 1.3$  at 3 months after AGV implantation. ( $P < 0.001$ ).

Axial length decreased significantly from  $23.69 \pm 1.95$  mm to  $23.47 \pm 1.91$  mm ( $P < 0.001$ ) at third month. Mean spherical equivalent was  $-0.62 \pm 2.72$  at baseline, which changed to  $-0.52 \pm 3.03$  at 3 months. ( $P < 0.813$ ) Anterior mean-K changed from  $44.20 \pm 2.21$  to  $44.45 \pm 2.39$  at one month ( $P < 0.05$ ) and  $43.61 \pm 1.95$  at 3 months. ( $P < 0.81$ ) There was no significant change in central corneal thickness, anterior chamber volume and posterior keratometry at 3 months after Ahmed glaucoma valve implantation.

#### Conclusions

Ahmed glaucoma valve implantation had a significant effect on axial length at 3 months after surgery but its effect on keratometry and other anterior chamber parameters was not significant.

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## P-FS-198

# LONG-TERM OUTCOMES OF VISUAL FUNCTION IN PATIENTS WITH OPEN-ANGLE GLAUCOMA FOLLOWING PRIMARY TRABECULOTOMY OR TRABECTOME

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### Purpose

We examined long-term postoperative outcomes (number of reoperations, visual functions) in patients who underwent trabeculotomy or trabectome as a primary surgical treatment for primary open-angle glaucoma (POAG) and exfoliation glaucoma (EXG).

### Methods

Patients were included if they were diagnosed with POAG or EXG, underwent trabeculotomy or trabectome as a primary surgical treatment, and were followed up for more than 5 years postoperatively. Analysis was performed for one eye per patient; if both eyes were affected, the eye with poorer visual field defects was selected. Blindness was diagnosed if one of the following criteria was met: mean deviation (MD) of Humphrey central 24-2 visual fields < -22dB, Kozaki's Goldmann perimetric grading  $\geq 5$ , and visual acuity < 0.05.

### Results

A total of 34 POAG patients (mean age: 66.1 years, mean observation period: 9.5 years) and 65 EXG patients (mean age: 78.2 years, mean observation period: 10.6 years) were included. Preoperative MD was -13.44 dB and -11.77 dB for POAG and EXG, respectively ( $p = 0.33$ ). There was no significant difference in the rate of reoperations including filtration surgery, with 32.4% ( $n = 11$ ) and 41.5% ( $n = 27$ ) in POAG and EXG patients, respectively ( $p = 0.37$ ). Kaplan-Meier probability for blindness 20 years after the primary surgery was significantly higher in EXG patients, with 0% and 31.3%, respectively ( $p = 0.007$ ). Visual field deterioration was defined based on three classification of MD (level 1: -12 dB, level 2: -12 to -18 dB, level 3: -18 dB) or worsening visual field according to Kozaki's Goldmann perimetric grading. Based on this definition, the proportion of patients with visual field deterioration was significantly higher in EXG patients, with 17.6% ( $n = 6$ ) and 38.5% ( $n = 25$ ) in POAG and EXG patients, respectively ( $p = 0.034$ ). Multivariate logistic regression analysis further demonstrated that preoperative MD ( $p = 0.017$ ) and the number of reoperations ( $p = 0.040$ ) were significantly associated with postoperative visual field deterioration. While not statistically significant, EXG was also associated with deterioration ( $p = 0.059$ ).

### Conclusions

EXG is associated with higher probability of blindness and visual field deterioration compared with POAG. Thus, surgical approach should be selected for patients with EXG.

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**P-FS-199**

**A COMPARISON OF ONE-YEAR SURGICAL OUTCOME BETWEEN TRABECULOTOMY AB EXTERNO AND MICROHOOK AB INTERNO TRABECULOTOMY USING THE PROPENSITY SCORE ANALYSIS**

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**Purpose**

To compare one-year outcomes of trabeculotomy ab externo (eTLO) with microhook *ab interno* trabeculotomy (miTLO) in Japanese eyes with glaucoma using the propensity score.

**Methods**

This retrospective observational consecutive case series included 30 eyes of 30 patients who underwent eTLO between January 2014 and December 2014, and 23 eyes of 23 patients who underwent miTLO between February 2017 and September 2017. We excluded patients under 20 years old, a history of glaucoma surgery and second eyes, when both eyes underwent these surgeries. We used the propensity score matched (1:1) analysis to reduce confounding factors, whereby a logistic regression analysis was conducted to calculate the propensity score that accounted for the likelihood of surgical success at 1 year. We set the outcome-related covariates as age, disease type, the combined cataract surgery, mean deviation of Humphrey visual field test, pre-operation intraocular pressure (IOP), a history of cataract surgery, and the number of pre-operation glaucoma eye drops. We defined the surgical success as postoperative IOP between 5 and 21mmHg, more than 20% IOP reduction from baseline and no history of glaucoma re-operation.

**Results**

Twenty three eyes per group each that matched background factors were further analyzed. Mean preoperative IOPs (SD) were 31.1(10.9) mmHg in the eTLO group and 30.9(7.4) mmHg in the miTLO group. Mean postoperative IOPs at 1 year were 18.1(7.4) mmHg in the eTLO group and 19.2(9.7) mmHg in the miTLO group ( $p = 0.90$ ). The preoperative number of glaucoma medications were 4.0(1.6) in the eTLO group and 5.3(1.4) in the miTLO group ( $p = 0.01$ ). The postoperatively decreased number of glaucoma medications were 1.3(2.0) in the eTLO group and 1.2(2.2) in the miTLO group ( $p = 0.87$ ). The success rates at 12 months were 82.6% in the eTLO group and 65.2% in the miTLO group ( $p = 0.66$ ).

**Conclusions**

The success rate one year after surgery is not significantly different between eTLO and miTLO when confounding factors were adjusted.

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## P-FS-200

# YAG GONIOPUNCTURE AUGMENTATION OF CATHETER-BASED SCHLEMM'S CANAL SURGERY

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### Purpose

To evaluate YAG goniopuncture (GP) augmentation after catheter-based Schlemm's canal surgery in patients at different stages of glaucoma severity.

### Methods

A retrospective consecutive case series study of patients, who had canaloplasty, combined phacoemulsification-intraocular lens implantation and canaloplasty, or catheter-based trabeculotomy. Inclusion criteria were 1-year follow-up and enrollment in an IRBMED protocol. Exclusion criterion was less than 1-year follow-up. The primary outcome measure was the rate of GP. Secondary outcome measures were standard glaucoma surgery results. Analyses included demographics, diagnoses, severity, medications, prior interventions, pre-operative intraocular pressure (IOP), catheter surgery type, post-operative IOP, interventions, and complications. Analysis aimed to relate GP and achieving target IOP.

### Results

From 12/2011 through 10/2016, 80 eyes met study criteria. Sixty-two eyes had canaloplasty; 18 eyes had trabeculotomy. Mean pre-operative IOP was 19 mmHg for canaloplasty eyes and 24 mmHg for trabeculotomy eyes. Twenty of 63 canaloplasty eyes (32%) had GP. Six of 18 trabeculotomy eyes (22%) had GP. When stratifying by glaucoma severity, 33% with mild stage, 40% with moderate stage, and 29% with severe stage had GP.

### Conclusions

Preliminary results showed 30-44% of eyes were augmented with GP after catheter-based Schlemm's canal surgeries. This is similar to a study reporting 37% during 5-year viscocanalostomy follow-up[1], but slightly higher than 26% during a minimum 6-month viscocanalostomy follow-up[2] and 22% during 2-year combined phacocanaloplasty follow-up[3]. There is a need to understand the difference between eyes that maintain goal IOP after canal-based surgeries and those that need GP augmentation or more surgery.

We speculate this variability is due to wound healing, scleral tissue biology, and limited knowledge of aqueous outflow distal to Schlemm's canal.

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## P-FS-201 EFFICACY AND SAFETY OF THE AADI FILTERING DEVICE

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### Purpose

To assess the efficacy and safety profile of the Aurolab Aqueous Drainage Implant (AADI).

### Methods

AADI was designed as a low cost alternative to the Baerveldt Glaucoma Implant (BGI) for developing countries.

We retrospectively reviewed cases operated in the 2 participating centers (2,3) over the 2016-2018 period. During the studied period one of the centers (3) was using AADI on all cases that required tube-shunts, while the other was still using valved implants on some of the cases.

### Results

66 AADI implantation surgeries were performed during the studied period. Average age at the time of surgery was 59 years (SD: 17), 53% of patients were male. Diagnostic distribution was 27% neovascular glaucoma, 23% POAG, 18% silicone oil glaucoma, 9% exfoliation glaucoma and 23% other.

Previous surgeries recorded were 33% trabeculectomy, 6% drainage implants and 6% cyclophotocoagulation.

Mean follow-up time was 8 months (SD: 7). Intraocular pressure (IOP) was significantly reduced from 31.9 mmHg (SD: 9.6) to 13.4 mmHg (SD: 4.8) at the last visit ( $p < 0.01$ ). Glaucoma medications were also significantly reduced from 3.1 drugs (SD: 0.8) to 1.5 drugs (SD: 1.2) at the last visit ( $P < 0.001$ ).

Five patients had early ( $< 3$  months) hypotony, 2 of which required intervention. No other complications or reinterventions were needed to last followup visit.

No eye lost vision to no light perception during followup.

### Conclusions

AADI implant led to a significant reduction in IOP and glaucoma medication, comparable to what has been reported in the literature for BGI. Longer follow-up is required to assess the consistency of these results in the long term.

### References

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## P-FS-203

### EFFECTS OF EYELID PRESSURE ON THE OUTCOME OF FILTRATION SURGERY

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#### Purpose

Filtration surgery is the most popular glaucoma surgery that lowers IOP by creating a fistula from the anterior chamber to the sub-Tenon space. While the most of the cases are succeeded, in some cases reoperation is necessary. In the present study, to determine whether the eyelid pressure affect the outcome of the filtration surgery, we measured the eyelid pressure in the patients undergoing the filtration surgery.

#### Methods

The subjects were glaucoma patients who underwent the filtration surgery(trabeculectomy and Ex-PRESS shunt) by the same surgeon at Ehime University Hospital from 2015 to 2016. All subjects were measured the eyelid pressure before the surgery and the eyelid pressures were compared with the postoperative success rates at 24 months of surgery. Surgical failure was defined Intraocular pressure (IOP)  $\geq 21$  mmHg (Definition 1),  $\geq 17$  mmHg (Definition 2),  $\geq 15$  mmHg (Definition 3) or received an additional glaucoma surgery. Using the ROC analysis, the cut-off value was set at upper eyelid pressure 35.1 mmHg and lower eyelid pressure 42.7 mmHg and successful rates were compared.

#### Results

The subjects were 19 eyes of 18 patients (14 males and 4 females), the mean age was  $68.9 \pm 10.3$  years, and the mean follow-up period was  $26.3 \pm 2.6$  months. The clinical entity was primary open angle glaucoma in 9 eyes, exfoliation glaucoma in 7 eyes, and secondary glaucoma in 3 eyes. The mean value of eyelid pressure was  $30.4 \pm 7.8$  mmHg (15.8 to 48.0) in the upper eyelid and  $34.1 \pm 8.5$  mmHg (22.0 to 50.3) in the lower eyelid. Overall success rate was 83.0%, 77.8%, 66.7% in Definitions 1, 2, 3, respectively. In the subjects with the upper eyelid pressure  $\geq 35.1$  mmHg ( $n = 6$ ), the success rates were 40.0%, 40.0%, 40.0%, while in the subjects with upper eyelid pressure  $< 35.1$  mmHg ( $n = 13$ ), the success rates were 100%, 92.3%, 76.9% in Definitions 1, 2, 3, respectively. There were significant differences in the success rates ( $P = 0.0026$ ,  $P = 0.0029$ ,  $P = 0.1835$ ) between the two groups. The success rates were 25.0%, 25.0%, 25.0% in the subjects with lower eyelid pressure  $\geq 42.7$  mmHg ( $n = 5$ ), while the success rates were 100%, 92.3%, 76.9% in the subjects with lower eyelid pressure  $< 42.7$  mmHg ( $n = 14$ ) in Definitions 1, 2, 3, respectively. There were significant differences in success rates ( $P < 0.001$ ,  $P = 0.0067$ ,  $P = 0.0547$ ) between the two groups.

#### Conclusions

The higher eyelid pressure may affect the outcome of filtration surgery.

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## P-FS-204

### IMPACT OF PHACOEMULSIFICATION ON FILTERING BLEB MORPHOLOGY IDENTIFIED VIA THREE-DIMENSIONAL ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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#### Purpose

To identify the cross-sectional morphological changes of successful filtering blebs within 1 year post-phacoemulsification using three-dimensional anterior segment optical coherence tomography (3D AS-OCT).

#### Methods

A retrospective cohort study. One hundred eighty-nine eyes of 175 patients underwent trabeculectomies at Okayama Saiseikai General Hospital between April 2013 and June 2016. Out of the 189 eyes, 30 phakic eyes of 29 patients with successful filtering blebs after primary trabeculectomy were included in this study. Surgical success was defined as an intraocular pressure (IOP)  $\leq 15$  mmHg and  $> 20\%$  reduction in IOP without glaucoma medication or an additional glaucoma surgery after trabeculectomy. Subjects were classified into two groups according to whether they had undergone phacoemulsification or not after trabeculectomy. Filtering blebs were examined using 3D AS-OCT and evaluated for quantitative parameters, including maximum bleb height, maximum bleb wall thickness, and ratio of the hypo-reflective space of the bleb wall.

#### Results

Sixteen eyes were assigned to the study group, and 14 eyes to the control group. In the study group, the mean IOP was  $8.5 \pm 3.3$  mmHg pre-phacoemulsification and significantly increased to  $10.8 \pm 3.8$  mmHg at 1 year post-phacoemulsification ( $P = 0.003$ ). Regarding the 3D AS-OCT parameters, the eyes in the study group showed a significant decrease in the maximum bleb height ( $P = 0.030$ ), maximum bleb wall thickness ( $P = 0.006$ ), and ratio of the hypo-reflective space of the bleb wall ( $P = 0.011$ ) between pre-phacoemulsification and 1 year post-phacoemulsification. In contrast, the eyes in the control group showed no significant differences in the IOP or all the 3D AS-OCT parameters in the observation period matching that of the study group.

#### Conclusions

Phacoemulsification could have a negative impact on filtering bleb morphology for the following year, which may lead to an IOP increase.

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## P-FS-205

### GLAUCOMA IN PATIENTS WITH ANIRIDIA AND BOSTON TYPE 1 KERATOPROSTHESIS

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#### Purpose

To compare outcomes related to glaucoma and glaucoma management in aniridic vs. non-aniridic eyes after Boston type 1 Keratoprosthesis (KPro) implantation.

#### Methods

A retrospective study was conducted on KPro eyes with aniridia and KPro eyes with other preoperative diagnoses (controls), excluding Stevens-Johnson, pemphigoid, and congenital ocular disorders, with > 2 years of follow-up. One eye per patient was chosen based on longer follow-up time.

#### Results

Aniridic (n = 22) and control (n = 61) eyes were matched for follow-up time (mean  $\pm$  standard deviation,  $64.9 \pm 26.7$  months,  $P = 0.2$ ). The aniridia group was younger than the controls ( $46.7 \pm 13.2$  vs.  $61.9 \pm 15.6$  years,  $P < 0.01$ ) at the time of KPro surgery. Preoperatively, the groups had similar demographics, visual acuity (VA,  $1.86 \pm 0.52$  LogMAR) and intraocular pressure (IOP,  $15.6 \pm 5.6$  mmHg,  $P \geq 0.33$  for all); aniridic eyes had higher rates of glaucoma (86.4%) and glaucoma surgery (59.1%) compared to controls (50.8%, 23%, respectively;  $P < 0.01$  for all). There was more co-implantation of Ahmed valves with KPro surgery in aniridic eyes than controls (50% vs. 19.7%,  $P < 0.01$ ). Post KPro surgery, the aniridia group had higher rates of de novo glaucoma diagnoses in eyes with no pre-existing glaucoma (100%) than controls (40%,  $P = 0.047$ ), but the groups had similar rates in progression (32.5% had an increase in cup to disc ratio  $\geq 0.2$ ), IOP at final visit ( $13.7 \pm 5.1$  mmHg), use of two or more glaucoma medications (47%), and need for new glaucoma procedures (27.7%,  $P \geq 0.41$  for all). In eyes with glaucoma drainage devices, the aniridia group had similar rates of surgeries due to tube management (50%) compared to controls (35.7%,  $P = 0.34$ ). Although the aniridia group experienced more hypotony-related complications (18.2%) and vitreous hemorrhage (13.6%) compared to controls (1.6% and 0%, respectively,  $P < 0.01$ ), both groups had similar percentages of eyes with at least one serious vision-threatening complication (45.5% vs. 26.2%,  $P = 0.1$ ), with VA improvement after KPro surgery (72.7% vs. 72.1%,  $P = 0.96$ ), and similar postoperative VA at the end of follow-up ( $1.28 \pm 0.79$  vs.  $1.28 \pm 0.97$  LogMAR,  $P = 0.76$ ).

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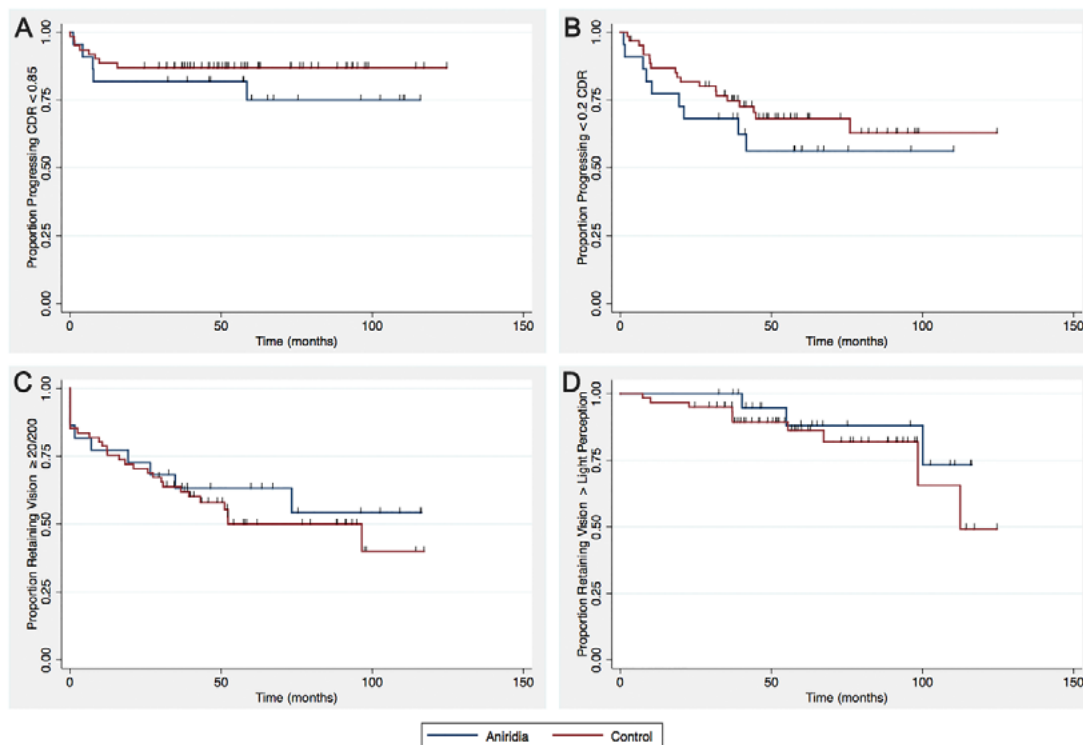
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**Figure:** Kaplan- Meier curves comparing the proportion of eyes in aniridia and control groups over time to retain a cup to disc ratio (CDR) of less than 0.85 (A), to have progressed by less than 0.2 on CDR (B), retain a visual acuity of 20/200 or better (C), and visual acuity better than light perception (D) after Boston type 1 Keratoprosthesis implantation. For the four analyses, there was no significantly difference in the survival probability between the two groups (  $P \geq 0.33$  by log-rank test).

## Conclusions

Despite a higher incidence of glaucoma, the aniridia group achieved similar VA and IOP outcomes as the control group at  $\geq 4$  years after KPro implantation. Boston KPro may offer satisfactory visual rehabilitation in aniridia patients when multi-disciplinary care is available.

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## P-FS-206

# SURGICAL OUTCOME OF TRABECULECTOMY WITH MANUAL SMALL INCISION SCLERAL FLAP

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### Purpose

To determine the efficacy of Trabeculectomy with manual small incision scleral flap in primary glaucoma.

### Methods

This is a retrospective analysis of 70 cases who underwent Trabeculectomy between July 2017 and June 2018 in NOOR Eye Hospital Kabul. Manual small incision scleral flap Trabeculectomy was performed in all cases. A 1/3 partial thickness 2.5 mm scleral incision 3mm behind and parallel to the limbus is made. Corneoscleral tunnel up to 1mm to clear cornea reconstructed by a crescent knife. The two edges of the flap cut with a corneal scissor, Trabeculectomy area marked and paracentesis was done. Trabeculectomy was done by punch. After peripheral iridectomy the scleral flap suture is made. Main outcome measures were success rate of Trabeculectomy, as determined by different IOP goals and incidence of postoperative complications.

### Results

The mean age was 57.5 (22 to 71 years). 49 eyes suffered from primary open angle glaucoma, 13 eyes from a pseudoexfoliation glaucoma and 8 eyes had a chronic angle closure glaucoma. Postoperatively intraocular pressure after one week was controlled (< 18 mmHg) without therapy in 64 (91%) eyes. Six (9%) eyes had to be treated with topical timolol twice a day after surgery. Mean intraocular pressure dropped from 21.2 +/- 6.0 mmHg preoperatively to 13.5 +/- 2.1 mmHg postoperatively. Post-operative complications included Bleb leak in 6 (8.5%) eyes, shallow AC in 5 (7%) and delayed hypotony (< 5 mmHg) with choroidal effusion in 2 (2.8%) eyes.

The minimum follow-up period was 12 months.

### Conclusions

The Manual small incision scleral flap Trabeculectomy offers excellent IOP control with minimal post-operative complications. It offers an effective and improved solution for primary glaucoma found in developing countries.

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## P-FS-207

### AHMED GLAUCOMA VALVE FP7 AND FP8 IN PEDIATRIC GLAUCOMA: A RANDOMIZED CLINICAL TRIAL

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#### Purpose

To compare intraocular pressure (IOP), corneal diameter, axial length and implant position in patients with pediatric glaucoma submitted to Ahmed glaucoma valve (AGV) implant FP7 (adult model) or FP8 (pediatric model).

#### Methods

*Design:* Prospective, randomized, masked to the evaluator, clinical trial.

*Participants:* Children between 0 and 16 years old with glaucoma and surgical indication for drainage implant. Surgical indication includes patients with the following conditions:

1. Primary congenital glaucoma with previous angle surgery and uncontrolled IOP;
2. Glaucoma secondary to aphakia;
3. Glaucoma secondary to other eye disorders unresponsive to medical therapy.

*Postoperative examination:* Follow up examination were performed at 0, 6 and 12 months of follow up. In all visits visual acuity, IOP, axial length, AGV plate-limbus distance and corneal diameter were measured. Postoperative exams were performed in an ambulatory basis whenever possible, or under anesthesia if the child was noncooperative.

*Statistical Analysis:* The statistical analysis was performed using Student t test. The significance level was set at 0.1.

#### Results

Thirty six eyes from 36 patients were included in this study. Eighteen patients (18 eyes) received FP7 implants and 18 patients (18 eyes) received FP8 implants. The mean age of the FP7 and FP8 groups was  $5.8 \pm 4.3$  years old and  $5.2 \pm 4.4$  years old, respectively.

Main glaucoma diagnosis was Primary Congenital Glaucoma (53%). The most frequent previous surgery was trabeculotomy. One patient had endophthalmitis one month after AGV implant. No statistically significant difference was seen between FP7 and FP8 at 6 and 12 month postoperative visit in intraocular pressure ( $17.2 \pm 5.8$  mmHg vs.  $15.6 \pm 4.6$  mmHg [ $P = 0.38$ ] and  $15.8 \pm 2.9$  mmHg vs.  $13.7 \pm 2.4$  mmHg [ $P = 0.03$ ]), axial length ( $26.8 \pm 3.3$  mm vs.  $28.0 \pm 2.0$  mm [ $P = 0.20$ ] and  $27.5 \pm 3.3$  mm vs.  $27.8 \pm 3.2$  mm [ $P = 0.76$ ]) nor AGV limbus-plate distance ( $9.7 \pm 0.8$  mm vs.  $9.3 \pm 1.0$  mm [ $P = 0.26$ ] and  $9.6 \pm 0.8$  vs.  $9.3 \pm 1.1$  mm [ $P = 0.38$ ]) between groups, respectively.

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### Conclusions

There is no statistically significant difference in the analyzed parameters after 6 or 12 months of anti-glaucomatous surgery using FP7 and FP8 AGV model in pediatric glaucoma.

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**P-FS-209**

**THE EVALUATION OF OPEN-ANGLE GLAUCOMA WITH iSTENT® TRABECULAR MICRO-BYPASS DEVICES IN A JAPANESE COHORT: EARLY EXPERIENCE**

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**Purpose**

The purpose of this study is to evaluate the safety and intraocular pressure (IOP) lowering effect of the iStent® trabecular micro-bypass stents (Glaukos Corporation, San Clemente, CA). The iStent® was implanted in combination with cataract surgery in patients with glaucoma and cataract. Although there is an abundance of literature on the iStent®, there is a need for the clinical evidence in Japanese patients where very little reports currently exists.

**Methods**

This is a single Japanese surgeon's retrospective consecutive case analysis of iStent® implanted in combination with cataract surgery. The study included patients with primary open-angle glaucoma (n = 26), pseudoexfoliative glaucoma (n = 13), and normal tension glaucoma (n = 19). Outcome measures were IOP, topical medications required, and complications/adverse events.

**Results**

Fifty-eight eyes were successfully implanted with the iStent® and have been followed to 6 months postop. The mean age of patients was  $73.7 \pm 8.8$  years with a mean visual field MD of  $-8.2 \pm 4.6$  dB. Preop IOP was  $16.4 \pm 3.3$  mmHg on  $2.0 \pm 1.0$  topical glaucoma medications. Postop IOP at 6 months was  $12.7 \pm 2.4$  mmHg on  $0.3 \pm 0.6$  medications. This represents a 23% reduction in IOP and 75% reduction in meds. At 6 months, 100% of eyes had IOP  $\leq 18$  mmHg. Medications was reduced in 70% of eyes. Prior to the surgery, all eyes were on 1-4 meds and there were no eyes on 0 meds; 83% of eyes were on 0 meds at postop. Complications that occurred during the early postop period included microhyphema (n = 4), transient IOP elevation (n = 7) and occlusion of the iStent® by the iris (n = 3), with no cases of severe complications.

**Conclusions**

The iStent® device combined with cataract surgery in Japanese effectively served to significantly reduce IOP and medications with a high safety profile.

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## P-FS-210

### THE ITALIAN XEN TREATMENT REGISTRY (XENGTR): BASELINE AND INTRA-OPERATIVE CHARACTERISTICS OF THE FIRST 100 PATIENTS

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#### Purpose

The Italian XEN Treatment Registry is a multicentre national initiative committed to collect observational prospective clinical and surgical data of glaucomatous patients treated with the XEN Gel Implant (Allergan Inc., CA, USA) in order to make available a comprehensive prospective dataset for descriptives and outcomes analyses ([www.XENGTR.net](http://www.XENGTR.net)).

#### Methods

Eligible patients were included in the registry and baseline demographic and ophthalmological characteristics were recorded including endothelial cell count (ECC) and NEI-VFQ-25 and GSS scores. Additionally, intra-operative variables were recorded including type of surgery, surgeon position, intra-operative complications, depth, location and subconjunctival course of the implant.

#### Results

Herein are reported the baseline and intra-operative characteristics of the first 100 patients enrolled. Mean age was  $76.4 \pm 7.2$  years, 57% were females, 51% had systemic hypertension, 18% diabetes and 10% autoimmune diseases. Anticoagulant drugs were used by 40% of the patients and were stopped before surgery in 35% of the cases. Sixty-two% were POAG, 31% PXFG and 7% PACG. Mean number of hypotensive medications was  $2.4 \pm 0.9$ , and the most common drug regimen were prostaglandin analogues plus beta-blockers (33%). Systemic carbonic anhydrase inhibitors were used by 41% of the patients. BCVA was  $0.46 \pm 0.29$  decimals, mean refractive error was  $-0.6 \pm 1.4D$ , IOP was  $23.2 \pm 5.2$  mmHg, central corneal thickness was  $522 \pm 41$  micron, visual field mean deviation was  $-10.5 \pm 7.2$  dB, and endothelial cell count was  $1913 \pm 521$  cells/mm<sup>2</sup>. Mean preoperative NEI-VFQ-25 composite score was  $69.5 \pm 16.2$ . The surgeon position during surgery was superior in 62% of the cases and temporal in the remaining cases. The subconjunctival course of the implant was defined linear in 90% of the eyes, curved in 3% and undeterminable in 6%. Intraoperative complications were 20 and were represented by traces/mild Hypoema in 55% of the cases.

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### Conclusions

This is the first national prospective registry of patients treated with the XEN Gel Implan designed to consistently collect data regarding the effectiveness, safety, patterns of care and cost/effectiveness of this procedure in the real world. The baseline characteristics from this cohort are presented and compared with those of previous published studies.

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## P-FS-211

### GLAUCOMA DRAINAGE DEVICE IMPLANT AS A SURGICAL OPTION FOR THE MANAGEMENT OF ADVANCED AND REFRACTORY GLAUCOMA IN NIGERIA: A RETROSPECTIVE STUDY

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#### Purpose

To assess the surgical outcomes in patients being managed for advanced glaucoma using both Baerveldt and Ahmed glaucoma drainage device (GDD) implants.

#### Methods

A retrospective, interventional, non-comparative study carried out between February, 2015 and June, 2018 at Eye Foundation Hospital, Lagos, Nigeria. Data was retrieved from case files of patients who underwent GDD implant surgery.

Patients with advanced and refractory glaucoma; previous trabeculectomy, with intraocular pressure (IOP)  $\geq 18$  mmHg on maximum medical therapy were included in the study. Exclusion criteria included eyes with no light perception, eyes that have undergone trans-scleral cycloablative photocoagulation laser as well as eyes undergoing active infective and/or inflammatory process.

All surgeries were carried out by a single glaucoma surgeon (OA) under general anaesthesia. Follow up period was between 6 weeks and 36 months.

Primary outcome measure was percentage reduction in IOP. IOP was measured using Goldmann applanation tonometry, model MOD A-900. Secondary outcome measure was number of topical anti-glaucoma medications used. Complete success was defined as IOP reduction by 25% from baseline or attainment of mean IOP of  $\leq 15$  mmHg without the use of topical antiglaucoma medications while qualified success was reduction of IOP by 25% from baseline or mean IOP  $\leq 15$  mmHg with the use of topical antiglaucoma medications. Failure was considered as IOP reduction of  $< 25\%$  or mean IOP  $> 15$  mmHg with the use of topical antiglaucoma medications. The type of postoperative complications was also noted.

#### Results

There were 64 eyes of 59 patients, 40 were male and 19 were female (M:F - 2.1:1). The mean age was 63.5 years (range: 28 - 82). Pre-operative mean IOP was 21.9 mmHg  $\pm$  8.7 and pre-intervention mean number of glaucoma medications was 3.2  $\pm$  0.8.

The mean post-operative IOP was 11.9 mmHg  $\pm$  3.4 (45.7% reduction) and the mean post-operative number of medications was 1.4  $\pm$  0.9 (56.3% reduction).

Qualified success was attained by 38 eyes (59.4%) and complete success was attained by 10 eyes (15.6%) based on percentage reduction of IOP  $\geq 25\%$ . Sixteen (25%) eyes had IOP reduction  $< 25\%$  with topical antiglaucoma medications.

There was no case of hypotony or endophthalmitis.

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### Conclusions

The study showed that 75% of the eyes achieved at least 25% reduction in IOP with or without topical antiglaucoma medications.

GDD's are a veritable alternative to conventional filtration surgery. Hence, it should be encouraged in sub-Saharan Africa.

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## P-FS-212

### OUTCOME OF MICROHOOK AB INTERNO TRABECULOTOMY

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#### Purpose

Trabeculotomy reduces the intraocular pressure by cutting the endothelial tissue of Schlemm's canal and ameliorating the drainage outflow obstruction. Trabeculotomy include an extra-ocular approach (*ab externo*) and an intraocular approach (*ab interno*). Because *ab interno* does not need to make a scleral flap, it has less influence on the ocular surface than *ab externo*, and surgical technique is also simple. Microhook *ab interno* trabeculotomy (Inami & Co., Ltd., Tokyo, Japan) reported by Tanito *et al* is smaller in tip than the conventional device and can be operated with smaller incision. To evaluate the surgical results of micro-hook *ab interno* trabeculotomy.

#### Methods

At the Ehime University Hospital from August 2017 to April 2018, we targeted glaucoma patients who underwent microhook surgery by the same surgeon and were able to observe after 6 months or more. Intraocular pressure, successful rate, eye drop scores, and postoperative complications were examined. Success rate was defined as Kaplan-Meier method, intraocular pressure of 22 mmHg or more, intraocular pressure decrease rate less than 20%, loss of light sensation, addition of glaucoma surgery as failure.

#### Results

The subjects were 35 eyes in 22 patients (25 men and 10 females), the mean age was  $64.9 \pm 15.2$  years, and the mean follow-up period was  $9.2 \pm 2.3$  months. The disease type was 11 primary open-angle glaucoma, 7 exfoliation glaucoma, 6 secondary glaucoma, 4 steroid glaucoma, 4 primary angle closure glaucoma 4 eyes, 3 developmental glaucoma. Intraocular pressure was  $22.6 \pm 10.3$  mmHg before operation,  $18.6 \pm 8.6$  mmHg for 1 month after operation,  $15.0 \pm 3.9$  mmHg for 2 months,  $14.1 \pm 3.0$  mmHg for 3 months,  $14.0 \pm 3.2$  mmHg for 4 months,  $14.4 \pm 3.8$  mmHg for 5 months,  $14.3 \pm 3.6$  mmHg for 6 months.

At any time point, the intraocular pressure reduced significantly before surgery ( $p = 0.0109$ ,  $p < 0.001$ ,  $p < 0.001$ ,  $p < 0.001$ ,  $p = 0.0046$ ,  $p < 0.001$ ). The success rate at 12 months was 75.9%. The instillation score was significantly reduced from  $3.6 \pm 1.3$  before surgery and  $1.5 \pm 1.5$  postoperatively ( $p < 0.001$ ). Postoperative complications were 5 eyes of anterior chamber bleeding accompanied by niveau (14.3%), 18 anterior chamber bleeding (51.4%), anterior chamber inflammation 1 eye (2.9%), transient intraocular pressure elevation 8 eyes (28.9%), additional glaucoma surgery 2 eyes (5.7%).

#### Conclusions

It was suggested that microhook *ab interno* trabeculotomy is a safe and useful technique.

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## P-FS-213

### NEW COST EFFECTIVE TECHNIQUE IN USING 23 GAUGE STRAIGHT CYSTOTOME TO PERFORM GONIOTOMY

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#### Purpose

We describe the use of a straight 23 gauge cystotome (Eagle Labs 120-23S) to perform a successful goniotomy on a patient who had been treated medically for ocular hypertension and underwent cataract surgery. The indication for goniotomy was to reduce intraocular pressure (IOP) and reduce the need for topical hypotensive medications.

#### Methods

The patient is an 80-year-old male with ocular hypertension status-post laser iridotomy for narrow angles, hypertension, and bilateral age related nuclear cataracts who presented with decreased vision in his left eye interfering with his activities of daily living. The patient underwent cataract extraction and goniotomy of the left eye. After cataract surgery by phacoemulsification, a direct gonioscopy was placed on the cornea and the anatomic landmarks were brought into focus. The 23 gauge cystotome was entered through the clear corneal incision and the tip of the cystotome was used to pierce the trabecular meshwork and the footplate of the cystotome was seated against the anterior wall of Schlemm's canal. The device was then advanced along the canal removing trabecular meshwork and exposing the collector channels. This was confirmed with blood reflux from the channels that subsequently resolved which is consistent with other instruments used to perform goniotomy.<sup>1</sup>

#### Results

We have demonstrated that a 23-gauge cystotome can be used with safety and efficacy to perform goniotomy in a patient with glaucoma. This device is much less expensive than other devices on the market for goniotomy such as Kahook dual blade and Trabectome. This cystotome can make micro-invasive glaucoma surgery<sup>2</sup> more accessible to developing countries with limited resources. The use of this new device could potentially increase access to minimally invasive glaucoma surgery due to its low cost (\$4 USD). Further research is required for longer-term success and efficacy.

#### Image



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### Conclusions

We have demonstrated that a 23-gauge cystotome can be used to perform goniotomy in a patient with glaucoma. This device is much less expensive than other devices on the market for goniotomy such as the Kahook dual blade and Trabectome. This cystotome can make microinvasive glaucoma surgery more accessible to developing countries with limited resources. Further research is required for longer-term success and efficacy.

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## P-FS-214

### POLYMETHYL METHACRYLATE GLAUCOMA IMPLANTS: A YEAR FOLLOW UP

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#### Purpose

To evaluate 1 year follow up of newly designed polymethyl methacrylate glaucoma implants.

#### Methods

The Refractory glaucoma patients underwent glaucoma implant procedure and observed thoroughly in a month, 3 months, 6 months and a year after the surgery. The study was done in Ciptomangunkusumo hospital/RSCM - Universitas Indonesia from August 2015 to July 2018. The refractory glaucoma was defined as intractable glaucoma despite full glaucoma medications with or without trabeculectomy. The intraocular pressure was measured, the clinical conditions, the glaucoma medications and the complications were noted.

#### Results

There was 75 patients had fulfilled a year follow up. The diagnosis mostly were Neovascular glaucoma mostly due to diabetic retinopathy (21%), failed bleb in primary open angle/juvenile glaucoma (16%) and glaucoma secondary to vitrectomy/silicon oil (13%). The IOP preoperatively was  $38.4 \pm 12.8$  mmHg, 1 month was  $21.2 \pm 13.2$  mmHg, 3 months was  $18.1 \pm 10.6$  mmHg, 6 months was  $15.4 \pm 9.7$  mmHg and a year was  $14.1 \pm 6.0$  mmHg. The medication used was dropped to  $1.1 \pm 0.8$ . There was none of endophthalmitis or extrusion of the implants noted.

#### Conclusions

The newly designed polymethylmethacrylate glaucoma implant was able to control the intraocular pressure of the refractory glaucoma patients. There was no endophthalmitis or extrusion of the implants.

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**P-FS-215**

**GLAUCOMA SURVEILLANCE IN PATIENTS RECEIVING INTRAVITREAL INJECTIONS IN A REGIONAL EYE CLINIC**

Eelin Ong\*

**Purpose**

To describe the awareness and methods used to monitor glaucoma development or progression in patients receiving IVI in a regional eye clinic in Australia. Background: Intravitreal injection (IVI) therapy has become the second most commonly performed ophthalmic day procedure after cataract surgery. Reports of associated sustained ocular hypertension, and the subsequent development of iatrogenic glaucomatous optic neuropathy after repeated IVIs have surfaced. There is currently no evidence on the recommended frequencies for IOP monitoring and glaucoma surveillance in patients who are receiving regular intravitreal injections.

**Methods**

A retrospective audit was conducted of patients receiving IVI over a 3 week period in a regional eye clinic in Queensland, Australia. Data collected include sex, diabetes status, previous PRP/YAG treatment, indication for IVI, eye injected, glaucoma diagnosis, ocular hypertension (OHT) and glaucoma investigations performed within past 12 months.

**Results**

Preliminary results of 79 patients show majority of patients (53%) received IVI therapy for neovascular AMD, 23% for retinal vein occlusions, and 18% for diabetic macula edema. Only 11% have formal diagnosis of glaucoma. Of these, less than half (44%) had intervention post-IVI to alleviate the effect of IOP rise. Whilst all glaucoma patients received OCT RNFL in the past 12 months, less than half (30%) of IVI patients without glaucoma had these scans.

**Conclusions**

Glaucoma surveillance was performed in less than half of the patients in this audit. This study highlights the need for increased awareness of glaucoma surveillance in this population of patients. Further research into the relationship between chronic IVI therapy and IOP changes with time will assist in identifying an optimal monitoring strategy for patients who are at higher risk of developing glaucoma.

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## P-FS-216

### LONG-TERM RESULTS OF 360-DEGREE SUTURE TRABECULOTOMY

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#### Purpose

To investigate the long-term efficacy and safety of circumferential 360-degree suture trabeculotomy (S-LOT) for adult glaucoma patients.

#### Methods

The eyes which underwent primary S-LOT *ab externo* and *ab interno* as a sole procedure were included in this retrospective study. We excluded the eyes with follow up period less than 2 months. Main Outcome Measures were Intraocular pressure (IOP), number of the antiglaucoma medications, complications and success rates in the survey periods. S-LOT was defined as failure when the IOP fulfilled criteria A (22mmHg or more and IOP decrease less than 20% from the preoperative IOP) or criteria B (18mmHg or more and IOP decrease less than 20% from the preoperative IOP) at any two consecutive follow-up visits after three months from surgery with or without antiglaucoma medication, or when the patient required a glaucoma reoperation, or loss of light perception vision was found during the observation period.

#### Results

A total of 312 eyes from 265 consecutive glaucoma patients which underwent S-LOT *ab externo* and *ab interno* were analyzed. The mean  $\pm$  standard deviation (SD) preoperative IOP value (the mean number  $\pm$  SD of antiglaucoma medications) was 29.0 $\pm$ 9.2mmHg (4.3 $\pm$ 1.5). The mean postoperative IOP value were 14.5 $\pm$ 4.3mmHg, 14.2 $\pm$ 4.7mmHg and 13.4 $\pm$ 3.6mmHg at 12, 36 and 60 months after S-LOT, respectively. The mean number of antiglaucoma medications were 1.4 $\pm$ 1.5, 1.5 $\pm$ 1.7 and 1.1 $\pm$ 1.6 at 12, 36 and 60 months after S-LOT, respectively. Complications included hyphema in 300 eyes (96.2%), a transient IOP elevation above 30mmHg in 90 eyes (28.8%) and Descemet's membrane detachment in 14 eyes (4.5%). But these complications did not alter the prognosis. The success rate of criteria A was 70.2%, 51.9% and 47.2% in 12, 36 and 60 months, respectively. The success rate of criteria B was 59.9%, 42.4 and 39.1% in 12, 36 and 60 months, respectively.

#### Conclusions

These results indicated that our procedure was safe and effective. S-LOT considerably reduced IOP with a favorable safety profile in Japanese glaucoma patients.

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**P-FS-217**

**ONE-YEAR RESULTS OF MODIFIED 360-DEGREE SUTURE TRABECULOTOMY AB EXTERNO FOR GLAUCOMA AFTER PENETRATING KERATOPLASTY**

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**Purpose**

To evaluate the one-year outcome of modified 360-degree suture trabeculotomy (S-LOT) ab externo for glaucoma after penetrating keratoplasty (PKP).

**Methods**

This retrospective study included 16 eyes of 15 patients with the history of PKP which underwent S-LOT to treat ocular hypertension. Best corrected visual acuity (BCVA), endothelial cell count (ECC), intraocular pressure (IOP), and number of medications were examined for a year postoperative follow-up. We also made Kaplan-Meier cumulative survival analysis. The two definitions of death we adopted were medicated IOP of 18 mmHg or higher (Criteria A), and that of 22 mmHg or higher (Criteria B) at two consecutive visits.

**Results**

Mean age was  $59.8 \pm 16.5$  years (11 males and 4 females). There were no severe complications. There was no significant difference between preoperative and postoperative BCVA ( $P = 0.390$ ). Although ECC decreased from  $1448.1 \pm 740.7$  cells/mm<sup>2</sup> to  $1140.7 \pm 762.9$  cells/mm<sup>2</sup>, the difference was not statistically significant ( $P = 0.340$ ). Mean IOP statistically significantly dropped from  $28.2 \pm 7.8$  mmHg to  $14.8 \pm 3.1$  mmHg ( $P < 0.01$ ), and number of medications reduced significantly from  $4.2 \pm 1.2$  to  $0.8 \pm 1.1$  as well ( $P < 0.01$ ). The one-year survival rates in each definition were 56% (Criteria A) and 75% (Criteria B) respectively.

**Conclusions**

Modified S-LOT to the glaucoma in the eyes with PKP history could control IOP effectively for postoperative one year without any severe complication.

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## P-FS-218

### PHACO TRABECULECTOMY IN ADVANCED GLAUCOMA WITH CATARACT

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#### Purpose

The objective of this study is to evaluate visual prognosis and post operative course in cases of advanced glaucoma with cataract who underwent phaco-trabeculectomy.

#### Methods

Records of 25 patients with advanced visual field defects with cataract undergoing phaco-trabeculectomy were retrospectively reviewed. Advanced visual field defects were defined as those:

Sensitivity of  $\leq 5\text{dB}$  in more than 85% of test points excluding central 4 points.

Sensitivity of  $\geq 75\%$  test points including central 3 points with automated threshold perimetry.

#### Main Outcome Measures

1. IOP
2. CORRECTED VISUAL ACUITY
3. MD of visual field tests

Mean pre op IOP, VA and MD values were compared with their respective post op values. The latest examination of each patient was used to determine post op outcome measures. In addition any complications were also noted.

#### Results

A total of 25 phaco-trabeculectomies were performed.

Mean age was 65.92yrs, mean follow up time was 12.96 months, Pre op mean IOP was 30.32mmHg, pre op mean Visual acuity in logmar was 0.78 pre -op mean value of Mean deviation was -26.27dB.

At latest follow up post op mean IOP was 15.84mmHg, post op mean Visual acuity in.

log-mar units was 0.51, post op mean Mean deviation was -27.97dB.

Transient hypotony occurred in 2 cases, 4 eyes had bleb fibrosis with high IOP which needed medical management.

No patient had blebitis /endophthalmitis, no patient experienced wipe out phenomenon.

#### Conclusions

In conclusion our study of advanced glaucoma with cataract undergoing phaco-trabeculectomy, vision either improved or got preserved with no cases of un-explained loss of central vision.

Hence safe to proceed with phaco-trabeculectomy even with the most advanced cases of glaucoma with cataract.

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## P-FS-219

### DELAYED POSTOPERATIVE APPLICATION OF MITOMYCIN C FOLLOWING TRABECULECTOMY MAY BE SUPERIOR TO THE STANDARD TECHNIQUE OF INTRAOPERATIVE APPLICATION

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#### Purpose

Antimitotic drugs like mitomycin C are routinely used to inhibit fibrosis and improve surgical outcome following trabeculectomy. Typically, MMC is applied subconjunctivally during the surgery *i.e.*, at time when wound healing cascade has barely started. Ideally its application should be timed to have maximum impact on fibroblast proliferation and not on early phases of wound healing. This can potentially avoid early complications like overfiltration, hypotony and wound leaks while producing good functional blebs. In this study we compared the surgical outcome of delayed (10-14days) application of MMC with the standard practice of intraoperative application.

#### Methods

The advanced primary glaucoma patients, requiring surgical intervention for IOP control were randomized into two groups.

*Group I-* Patients with intraoperative MMC (0.02%) soaked sponge application (0.02%) for 2 minutes followed by wash.

*Group II-* Patients in which MMC was given postoperatively between day 10-14 as a subconjunctival injection of 0.25 ml of 0.04% (0.01mg).

*Outcome Measures:* IOP and bleb morphology at various timepoints till 1.5 years. IOP  $\leq 6$  mmHg or  $\geq 16$  mmHg, use of antiglaucoma medication (agm), requirement of needling or surgical intervention was taken as failure.

#### Results

There were 17 patients including 9 in Group I (age:  $48.3 \pm 16.6$  yrs) and 8 in Group II (age:  $49.6 \pm 19.1$  yrs). The mean preoperative IOP in Group I and II were  $25.3 \pm 11.18$  mmHg and  $34.75 \pm 11.31$  mmHg ( $p = 0.09$ ) on systemic and topical agm ( $p = 1.00$ ). There was significant reduction in IOP and agm in both groups at all follow-up visits ( $P < 0.05$ ). The median postoperative IOP at 1.5year follow-up in Group I was 12 (after excluding hypotony cases, median: 17 mmHg) and in Group II was 15.5 mmHg ( $p = 0.41$ ) on  $0.5 \pm 0.76$  and  $1 \pm 1.1$  topical agm ( $p = 0.49$ ) respectively. The blebs in Group I were more avascular and developed more hypotony related complications- 2 had persistent hypotony while 1 had persistent choroidals requiring multiple interventions. The survival probability was 55.6% vs 62.5% in Group I and II at 1.5 years with Kaplan Meir plots using the failure criteria defined above.

#### Conclusions

Delayed postoperative MMC application had comparable outcome, in terms of IOP control, with less complications than intraoperative MMC group.

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## P-FS-220

# THE ISTENT TRABECULAR MICRO-BYPASS STENT REDUCES POST CATARACT SURGERY IOP SPIKES IN ADVANCED GLAUCOMA

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### Purpose

Cataract surgery in patients with advanced glaucoma is fraught with risk. The trabecular meshwork in such patients has a far less reserve and therefore this group of patients can suffer with higher post-operative IOP spikes leading to pain, corneal oedema, glaucomatous nerve damage or anterior ischemic optic neuropathy, further visual field loss and loss of fixation. We present data, which demonstrate that the iStent is useful in blunting the post-operative IOP spike following cataract surgery in moderate to advanced glaucoma.

### Methods

A non-comparative case series, data was collected prospectively on patients with moderate to advanced glaucomatous optic neuropathy. 66 consecutive cases were identified (26:40 male F:M, Mean age 76.0 years). Eighteen had advanced glaucoma. Following routine clear corneal temporal section phacoemulsification followed by implantation of 1-2 iStents depending on the target IOP in the nasal quadrant Schlemm canal. IOP readings were checked 2 hours post operatively and then 24 hours post operatively. All patients were prescribed a stat dose of Diamox 250mg immediately after surgery.

### Results

Sixty-six eyes from 59 patients (26:40-female:male, mean age 76.0 years, SD  $\pm$  9.9). Mean IOP; pre-operatively 23.0 mmHg (SD  $\pm$  7.1), immediately post-operatively 19.0 mmHg (SD  $\pm$  9.4), 1-day post-operatively 14.9 mmHg (SD  $\pm$  6.6) significant using Wilks' Lambda Multivariate Analysis of Variance was significant (MANOVA),  $p = 7 \times 10^{-8}$ ). Difference in mean IOP pre-operatively and immediately post-operatively was significant (paired *t*-test,  $p = 0.004$ ). No complications reported. Percentage of patients with 2-hour postop IOP < 15 mmHg, 42.4%. IOP < 21 mmHg, 66.7%. IOP < 25 mmHg, 72.7%. IOP < 30 mmHg, 86.4%. IOP < 35 mmHg 98.5%. One IOP spike reported at 55 mmHg. No statistical significance was found between immediately post-operative IOP between one iStent ( $n = 18$ , mean = 19.1, SD  $\pm$  8.2) and two iStents ( $n = 44$ , mean = 18.9, SD  $\pm$  10.2) (independent samples T-test  $p = 0.944$ ).

### Conclusions

The majority of patients did not suffer a significant IOP spike. This was despite borderline IOP in a number of patients with vulnerable optic discs. Two hours postoperative IOP was statistically significantly lower than preoperative. In the past, many of these patients would have required combined cataract and filtering surgery but now they can be managed successfully with iStent implantation at the time of cataract surgery, a procedure with an extremely favourable risk profile. The iStent may have great value in managing such complex cases.

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## P-FS-221

# LONG-TERM OUTCOMES OF PRIMARY TRABECULECTOMY IN UNCONTROLLED ADVANCED OPEN ANGLE GLAUCOMA

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### Purpose

of the study was success assessment after trabeculectomy in uncontrolled advanced open angle glaucoma patients (OAG)

### Methods

This was a retrospective cohort study that included patients with OAG (primary or secondary). Our indications for filtering surgery were: uncontrolled IOP despite maximal tolerated medication, progressive disease by optic disc assessment, general status/ life span of the patients, status of the other eye. Clinical variables of interest were: age (years), gender, visual acuity (VA), type of glaucoma, pre-operative IOP, number of glaucoma medications and duration of use, C/D ratio. Intra and postoperative complications, additional surgeries, major changes in visual acuity. Complete success, was declared for an IOP < 21 mmHg without any additional medication; qualified success was defined if IOP < 21 mmHg, with additional medications. Failure was recorded for IOP  $\geq$  21 mmHg with medication or IOP2 test) and Kaplan-Meier survival analysis.  $P \leq 0.05$  was considered statistically significant.

### Results

We studied 165 eyes from 165 patients with a mean age of  $64.72 \pm 14.6$  years, followed for  $24.34 \pm 13.67$  months; VA  $1.38 \pm 1.09$  (logMAR) and the mean baseline IOP reached  $34.54 \pm 12.31$  mmHg, under  $3.16 \pm 0.89$  topical medications. An important IOP drop was noted immediately after trabeculectomy, compared to baseline IOP (at release)  $= 12.33 \pm 8.81$  mmHg ( $P < 0.001$ ). The surgery effect was sustained: IOP measured at the last visit was  $15.52 \pm 8.45$  mmHg, with an overall reduction from baseline of 43.66%. The number of topical substances required for IOP control decreased significantly after trabeculectomy ( $0.5 \pm 1.01$ ,  $p = 0.000$ ).

Overall success of trabeculectomy was 84% at 12 months, 77% at 24 months and 51% after 36 months. In this study on advanced glaucoma eyes, success of trabeculectomy seemed to be influenced by sex, male patients having better chances to "survive" OR = 2.1, 95% confidence interval [CI]=1.13-3.10; the number of 5FU injections OR = 1.8, [CI]=0.88-2.7 and tenonectomy OR = 1.19, [CI]=0.2-2.06 were significantly related to the long term trabeculectomy success.

### Conclusions

Our study proved that trabeculectomy success was achieved in a high proportion of cases at 12 and 24 months, respectively; factors as male sex, tenonectomy or anti-fibrotic treatment (5FU injections) were related to the long term (>36months) surgical success for our patients.

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## P-FS-222

### TREATMENT OF OPEN-ANGLE GLAUCOMA USING TRABECULAR MICRO-BYPASS STENTS (ISTENT® AND ISTENT INJECT®): 1-YEAR OUTCOMES

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#### Purpose

The purpose of this study was to evaluate the safety and IOP lowering ability of MIGS with iStent® and iStent inject® (1<sup>st</sup> and 2<sup>nd</sup> generation trabecular micro-bypass stents (Glaukos Corporation, San Clemente, CA)). The stents were implanted in conjunction with cataract surgery in patients with OAG.

#### Methods

This analysis represents a retrospective consecutive interventional case series study of iStent and/or iStent inject implanted in combination with cataract surgery. Patients with OAG were treated with one iStent (n = 20 eyes), 2 iStent injects (n = 22), or combination one iStent and 2 iStent injects (n = 2). IOP, glaucoma medication usage, and complications/adverse events were assessed preoperatively and postoperatively.

#### Results

Forty-four eyes were implanted with the stents and have been followed for at least 1 year. Preoperative medicated mean IOP was  $16.0 \pm 3.5$  mmHg on an average of 1.1 medications. Postoperatively, mean IOP was  $12.6 \pm 2.5$  mmHg (21% IOP reduction). Medication burden was reduced in 49% of eyes when compared to medication usage pre-stenting. Notably 77% were medication-free compared to 30% preoperatively.

An overall favorable safety profile was observed with no documented intraocular complications. One eye underwent SLT post-implantation; unrelated to the stent.

#### Conclusions

In this cohort of patients with comorbid cataract and OAG, treatment with iStent and/or iStent inject safely reduced IOP and medication burden out to 1 year. These findings augment the existing clinical evidence for MIGS with iStent and iStent inject.

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**P-FS-223**

**EFFECTS OF AQUEOUS SUPPRESSANTS AND PROSTAGLANDIN ANALOGUES ON EARLY WOUND HEALING AFTER GLAUCOMA IMPLANT SURGERY**

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**Purpose**

To investigate whether the use of early topical anti-glaucoma medication affects wound healing following glaucoma tube surgery.

**Methods**

Eyes were randomly assigned to receive topical aqueous suppressant (timolol-dorzolamide fixed combination) or prostaglandin (PG) analogue (travoprost) or normal saline (control group). First, we observed the effects of topical eyedrops on Tenon's tissue in non-operated eyes in rabbits. Secondly, other rabbits had Ahmed glaucoma drainage device implantation.

**Results**

Interleukin-2 in the Tenon's tissue was elevated in the PG group than in the control or aqueous suppressant groups ( $P = 0.006$ ). In non-operated eyes, IOP was similar among the groups ( $P = 0.545$ ). After glaucoma implant surgery, average height of the inner collagenous layer and the average height of  $\alpha$ -SMA-positive blebs was the least in the aqueous suppressant group ( $P = 0.013$ ,  $P = 0.001$ , respectively) at 4 weeks postoperative. IOP was lesser in the aqueous suppressant group than in the control or the PG group ( $P = 0.001$ ) following tube surgery.

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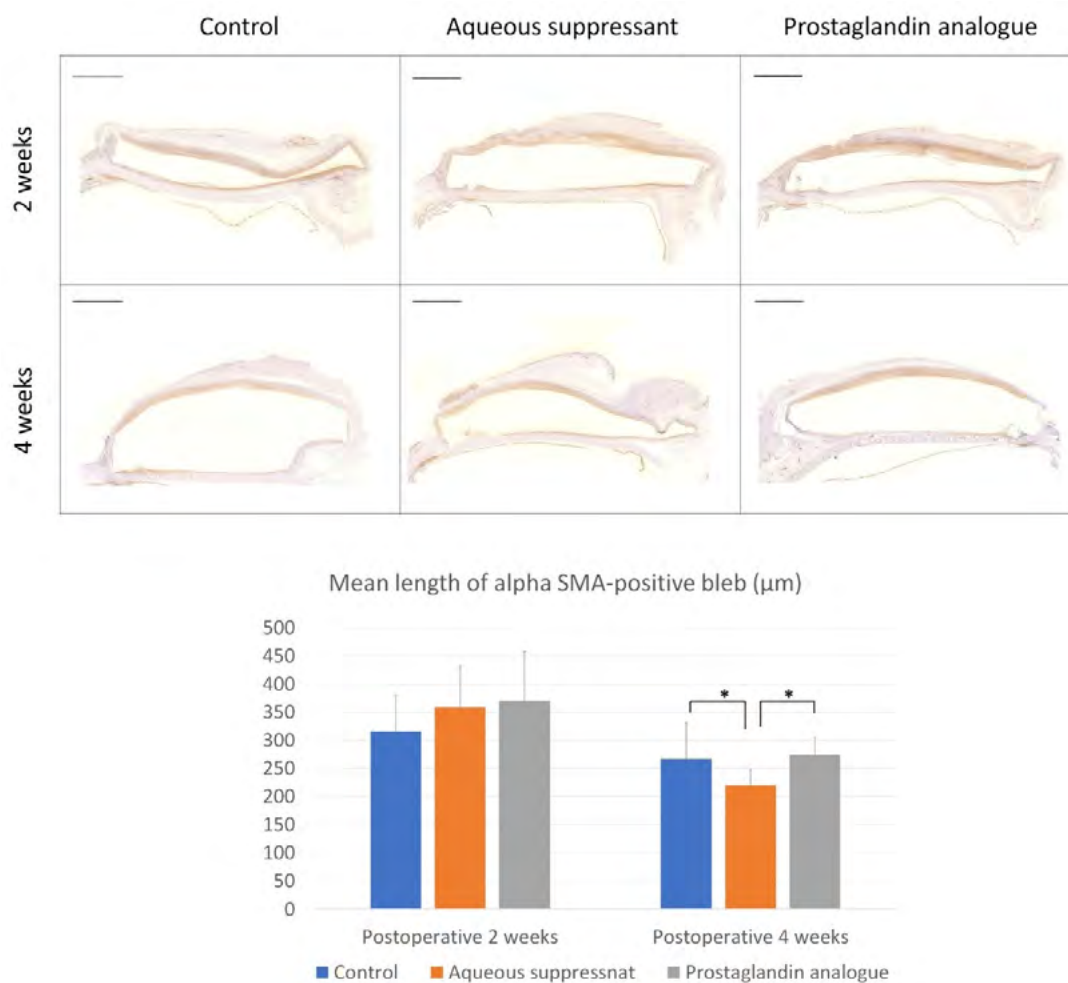
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## Conclusions

After tube surgery, early treatment of aqueous suppressant decreased fibrosis in the bleb whereas early treatment with the PG analogues did not.

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## P-FS-224

### COMBINED TREATMENT OF NEOVASCULAR POSTTROMBOTIC GLAUCOMA

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#### Purpose

To evaluate the efficacy of surgical treatment of neovascular glaucoma (NG) secondary to central retinal vein occlusion (CRVO)

#### Methods

Eight adult patients (8 eyes) with NG after CRVO had intraocular pressure (IOP) 36-48 mmHg and visual acute (VA) – counting fingers near face. They received one intravitreal (IVT) injection of Aflibercept after paracentesis of anterior chamber (AC). One week after injection Trabeculectomy with iridocycloretraction was performed. IOP decreased. After 1-1,5 month phacoemulsification with intraocular lens (IOL) implantation was performed. After 3-4 weeks panretinal laser coagulation (PLC) performed for all eyes. Visometry, tonometry, biomicroscopy, the central retinal thickness (CRT) measured by optical coherence tomography, fundus photographs, and fluorescein angiography were evaluated.

#### Results

One week after paracentesis of AC and IVT Aflibercept injection iris neovascularisation decreased and Trabeculectomy with iridocycloretraction was performed. Hyphema (1/3 – 3/4 of AC) occurred in all cases. IOP become 12-15 mmHg. After hyphema absorption Phacoemulsification with IOL implantation and PLC were performed. After 2 months of follow-up all patients gained VA up to 0,05-0,08; CRT showed a mean decrease of 55-65%. IOP had been normal. After 6 and 12 months of follow-up VA and IOP remained steady.

#### Conclusions

We used IVT Aflibercept injections to prepare patients with NG secondary to CRVO for surgical and laser treatment. Improvement of VA and IOP stabilization are very important for visually impaired patients of our group.

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## P-FS-225

### INTERMEDIATE RESULTS OF THE NEW AFFORDABLE NON-VALVED DEVICE AADI

Vanita Pathak Ray\*, Divya Rao<sup>1</sup>

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#### Purpose

To report the intermediate surgical outcomes in terms of efficacy and safety of the new, indigenously manufactured, affordable non-valved drainage device Aurolab Aqueous Drainage Implant (AADI) in the management of refractory glaucomas in the Indian population.

#### Methods

Retrospective review of consecutive patients > 12years, who underwent non-valved glaucoma drainage device surgery (GDD) via AADI, by a single fellowship-trained surgeon, between January 2014 and December 2017, who had at least 3 months of documented post-op follow-up.

#### Outcome measures

Primary - intra-ocular pressure (IOP)

Secondary - number of anti-glaucoma medication (AGM), LogMAR best corrected visual acuity (BCVA) and complications.

Complete success was defined as IOP  $\geq 5$  mmHg and  $\leq 21$  mmHg; qualified success with use of AGM. Failure was defined as inability to meet IOP criteria, loss of perception of light, explantation or any additional glaucoma surgery.

#### Results

A total of 61 eyes of 58 patients were included with a median follow up of 18 months (Q1 8, Q3 24, IQR 16). The IOP and number of AGM required was significantly lower at every time-point post-operatively ( $P < 0.001$ ). Median LogMAR BCVA remained unchanged ( $p = 0.121$ ). Complications occurred in 25 patients (40.9%); some eyes had more than one complication. Complete success was seen in 60.7%; overall success was 92%.

#### Conclusions

The new non-valved GDD, AADI, is effective in reducing IOP and need for AGM in the intermediate term, with a safety profile akin to published reports of prevailing GDDs. It certainly has the ability to breach the cost barrier in low-to-middle income countries; however, further follow-up is required to determine long-term sustainability.

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## **P-FS-226**

### **INTERMEDIATE RESULTS OF A NEW TWIN SITE PHACO-TRABECULECTOMY**

Vanita Pathak Ray\*, Divya Rao<sup>1</sup>

<sup>1</sup>LVPEI, Hyderabad, India

#### **Purpose**

To report the efficacy and safety of a new modified fornix-based separate-site phaco-trabeculectomy in the intermediate term.

#### **Methods**

This was a retrospective analysis of consecutive patients who underwent phacotrabeculectomy by one fellowship-trained glaucoma surgeon between May 2010 and December 2017. In this new separate-site technique, both phaco and trabeculectomy are accommodated superiorly ('twinned'), without change of position of surgeon during surgery. All secondary glaucomas other than pseudoexfoliation and angle-recession were excluded, including history of previous intra-ocular surgery.

Primary outcome measure: IOP [complete success - IOP > 5 and ≤18 mmHg without anti-glaucoma medications (AGM); qualified success - with AGM]. Failure to meet above and/or requirement for reoperation (trabeculectomy, GDD or trans-scleral diode laser) was defined as failure.

Secondary outcome measure was number of AGM, best corrected visual acuity (BCVA), complications.

#### **Results**

Analysis of 130 eyes of 117 patients was done. Data is presented as mean (SD). The preoperative intraocular pressure (IOP) was 24.1 mmHg (11.9) using 2.9 (1.1) anti-glaucoma medications (AGM). After 22.2 (18.1) months follow up, IOP was 13.4 mmHg (3.5) using 0.3 (0.8) anti-glaucoma medications. The probability of complete success (95% confidence interval) was 0.79 (0.67, 0.92) at 22 months. Serious surgical complications included aqueous misdirection (2.3%) and choroidal exudation (2.3%); late complications included hypotony maculopathy (0.8%) and failure (6.9%). None of the eyes lost vision.

#### **Conclusions**

New, modified twin-site fornix-based phacotrabeculectomy showed high probability of complete success in the intermediate term.

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**P-FS-227**

**OUTCOMES OF TWO SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IN OPEN-ANGLE GLAUCOMA PATIENTS ON ONE PREOPERATIVE OCULAR HYPOTENSIVE MEDICATION**

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**Purpose**

The purpose of this study was to prospectively evaluate the medium to long-term safety and intraocular pressure (IOP) lowering ability of two second-generation trabecular micro-bypass stents (iStent inject®, Glaukos Corporation, Laguna Hills, CA) implanted as a standalone procedure in patients with OAG who were not controlled on one ocular hypotensive medication.

**Methods**

A prospective, uncontrolled, nonrandomized, interventional case series study enrolled 57 subjects with both mild or moderate OAG who were not controlled by a single ocular hypotensive medication. Preoperative IOP was 18-30 mmHg (medicated) and 22-28 mmHg (post-washout). Outcome measures were IOP, ocular hypotensive usage, and adverse events.

All subjects underwent uncomplicated implantation of 2 iStent inject trabecular stents as a standalone procedure. Post operatively, ocular hypotensive medications were added in a cumulative manner if the IOP was uncontrolled.

**Results**

All 57 subjects completed 42 months of follow-up. Preoperative medicated mean IOP was  $19.5 \pm 1.5$  mmHg and post-washout IOP was  $24.4 \pm 1.3$  mmHg. Postoperative mean IOP was  $\leq 14.6$  mmHg at all study visits through 42 months. At 36 months postoperative, 95% of subjects achieved both mean IOP  $\leq 18$  mmHg and IOP reduction of  $\geq 20\%$  on no medication compared to pre-op unmedicated IOP.

Only two adverse events noted. One subject underwent trabeculectomy for uncontrolled IOP and the other experienced progression of pre-existing cataract.

**Conclusions**

Medium to long-term outcomes from this study demonstrate safe and sustained reduction of IOP to  $\leq 15$  mmHg with almost total elimination of medication in eyes with OAG following implantation of two iStent inject stents.

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## P-FS-228

### ANALYSIS OF ONE-YEAR SURGICAL OUTCOMES OF MINIMALLY INVASIVE GLAUCOMA SURGERIES (MIGS) IN MEDICALLY UNCONTROLLED UVEITIC GLAUCOMA PATIENTS

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<sup>1</sup>*Glaucoma, Hospital Clinico San Carlos, Madrid, Spain,* <sup>2</sup>*Glaucoma, Moorfields Eye Hospital, London, United Kingdom*

#### Purpose

To compare the IOP and glaucoma drops reduction of three “Minimally invasive Glaucoma Surgeries (MIGS)” (InnFocus, XEN and Cypass) with the gold standard surgery (trabeculectomy) in eyes with medically uncontrolled uveitic glaucoma.

#### Methods

This is a cross-sectional study. Eighty-four consecutive patients with medically uncontrolled uveitic glaucoma treated with a surgical glaucoma procedure along one-year (from March of 2017 and March of 2018) were included. Thirty patients underwent a XEN surgery; in 24 an InnFocus Microshunt was implanted; in 10 patients the Cypass implant was the elected surgery; and in 20 patients an augmented trabeculectomy was performed. The primary outcomes measures were intraocular pressure (IOP) reduction and hypotensive medication use at 12 months as compared to baseline. The second outcome was to compare (in terms of the IOP control and the reduction in drops) between trabeculectomy and the three MIGS devices included (XEN, Innfocus and Cypass).

#### Results

The baseline and 12 months postoperative mean  $\pm$  SD IOP and the p value as determined with a paired *t*-test were:  $27.47 \pm 2.16$  vs  $14.37 \pm 0.78$  mmHg for XEN ( $P < 0.001$ );  $28.40 \pm 3.80$  vs  $11.30 \pm 1.69$  mmHg for Innfocus ( $P = 0.01$ );  $19.88 \pm 3.41$  vs  $12.50 \pm 1.90$  mmHg for Cypass ( $P = 0.1$ ); and  $22.67 \pm 2.46$  vs  $12.20 \pm 1.49$  mmHg for trabeculectomy ( $P = 0.004$ ). The mean  $\pm$  SD number of glaucoma medications used before and after surgery and the p as determined using a Wilcoxon signed-rank test were:  $3.28 \pm 1.14$  vs  $0.37 \pm 0.76$  for XEN ( $<0.001$ );  $3.28 \pm 1.14$  vs  $1 \pm 1.05$  for Innfocus ( $0.004$ );  $3.55 \pm 0.93$  vs  $1.63 \pm 1.5$  for Cypass ( $0.002$ ); and  $3.25 \pm 1.29$  vs  $0.29 \pm 0.61$  for trabeculectomy ( $0.001$ ).

There were no statistically significant differences in IOP reduction with neither of the three MIGS devices: XEN ( $P = 0.6$ ); Innfocus ( $p = 0.33$ ); and Cypass ( $P = 0.61$ ), when compared with trabeculectomy (Mann-Whitney test).

Similarly, there were no differences in the reduction of medical therapy achieved with any of the devices [Innfocus ( $P = 0.78$ ), Xen ( $P = 0.46$ ) and Cypass ( $P = 0.11$ )] compared to the reduction achieved by the trabeculectomy (Mann-Whitney test).

#### Conclusions

MIGS procedures appear to be as effective as the gold standard glaucoma surgery (trabeculectomy) for the treatment of patients with medically uncontrolled uveitic glaucoma at least for the first year. Further follow up and prospective studies should be performed in order to confirm the results obtained in the preliminar presented study.

**VISIT ONLINE**

**P-FS-229**

**COMPARISON OF SURGICAL OUTCOME OF TRABECULECTOMY AND PHACOTRABECULECTOMY IN PRIMARY ANGLE CLOSURE GLAUCOMA (PACG) PATIENTS**

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**Purpose**

To compare the efficacy and safety of surgical outcome between trabeculectomy- phacoemulsification and trabeculectomy in primary angle-closure glaucoma (PACG) eyes.

**Methods**

A comparative retrospective case series study was conducted in Cipto Mangunkusumo Hospital Jakarta, Indonesia. Primary angle closure glaucoma (62) patients (72 eyes) underwent either trabeculectomy alone (42 eyes) or trabeculectomy-phacoemulsification (30 eyes) were included in this study. The main outcome was the final IOP. The complete success rate was defined as intraocular pressure (IOP) that remained below 21 mmHg, with no medications required. LogMAR visual acuity, number of glaucoma medications, and postoperative complications were also reviewed.

**Results**

Preoperative IOP was  $40,14 \pm 13,83$  mmHg in the trabeculectomy group and  $33,11 \pm 13,09$  mmHg in Phaco-trab group. A mean follow-up period was 24.5 (range 12 to 49 mo). Complete success was achieved in 59.5% of trabeculectomy, and 63.3% of phaco-trab group; while failure occurred in 14.3% of trabeculectomy, and 10% of phaco-trab at last follow up. There was reduction of number glaucoma medication in both groups. There was more hypotony after trabeculectomy (14.3% vs (3.3%) respectively. However, there was additional IOP-lowering surgical procedures were required in 25 eyes (59.5%) in the trabeculectomy only.

**Conclusions**

Trabeculectomy only and Phacotrabeculectomy demonstrated comparable success rate in reduction IOP and the number of glaucoma medication needed post-operatively in PACG eyes. The phacotrabeculectomy group required fewer subsequent surgical interventions.

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## P-FS-230

### XEN -45 IMPLANT AS TREATMENT FOR UVEITIC HYPERTENSIVE CRISES

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#### Purpose

Report the efficacy and safety of XEN-45 implant in eyes with uveitic glaucoma, including use as an emergency procedure.

#### Methods

Retrospective observational case series managing 38 eyes with medically uncontrolled uveitic glaucoma using XEN-45 implant. Primary outcome measures included visual acuity, intraocular pressure (IOP), degree of inflammation and ocular hypotensive medications. In addition, the time taken from decision to Xen to actual surgery was recorded. Data was collected preoperatively, 1 day, 1 week, 1, 3, 6 and 12 months postoperatively. Postoperative complications included hypotony and decompressive retinopathy. Requirement for further glaucoma surgery, including bleb needling, and failure were documented.

#### Results

Preoperatively all patients were on 3 or more ocular hypotensive medications, 76% of whom were on oral acetazolamide. 63% were on systemic immunosuppression and all on topical steroids. Mean preoperative IOP was 35mmHg (+/-SD 9.9) on average 3.7 (+/-SD 0.54) drops. The median time from decision to Xen to actual surgery was 5.5 days (range 1 – 120). Mean postoperative IOP was 14.1 mmHg (+/- SD 4.8) with an average 0.47 (+/- SD 1.1) drops at last follow up representing a 55% drop in IOP and 87% reduction in IOP lowering medication. Bleb needling with 5FU was performed on 6 eyes (15%). Symptomatic hypotony occurred in 7 eyes requiring further interventions. No decompressive retinopathy found. 6 eyes (18%) failed needing BVT or trabeculectomy.

#### Conclusions

The XEN-45 implant is an effective treatment for hypertensive crises in uveitic patients offering dramatic IOP lowering without significant uveitic flare up. In this group, needling rates are lower than in POAG however complications such as hypotony can still occur.

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**P-FS-231**

**EVALUATION OF NORMAL-TENSION GLAUCOMA IMPLANTED WITH ISTENT INJECT® IN COMBINATION WITH CATARACT SURGERY**

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**Purpose**

While micro-invasive glaucoma surgery (MIGS) has been traditionally used to manage primary open-angle glaucoma, this study evaluates the safety and performance of two second-generation trabecular micro-bypass stents (iStent *inject*®, Glaukos Corporation, San Clemente, CA) implanted in conjunction with cataract surgery in eyes with normal-tension glaucoma (NTG). There is a lack of evidence for the management of NTG with MIGS.

**Methods**

This is a retrospective analysis of NTG cases implanted with 2 iStent *inject* devices in combination with cataract surgery across several practices in Australia. Outcomes include IOP and glaucoma medication reduction and safety observations. Reported are cases that have been followed out to 1 year postoperative. Ongoing follow-up of additional cases is planned with the intention of sharing an updated analysis at the time of the conference.

**Results**

Ten eyes from 7 patients were included; all were Caucasian with a mean age of 70 years. Baseline mean C/D ratio was 0.9, VF MD was -9.1 dB, and 20% of eyes had prior glaucoma surgical interventions. Mean preoperative IOP was  $13.7 \pm 2.1$  mmHg on an average of 2.6 medications. Postoperative IOP at 1 year was  $9.9 \pm 2.2$  mmHg on 1.7 medications. This represents a 28% reduction in IOP and 35% reduction in the number of medications used. All eyes resulted in a  $\geq 20\%$  reduction in IOP by year 1 as compared to pre-stenting.

All eyes were successfully implanted with the iStent *inject* devices. No significant intraoperative or postoperative complications were noted. The safety profile was similar to that of cataract surgery alone.

**Conclusions**

In this cohort of eyes with NTG, iStent *inject* implanted in conjunction with cataract surgery was safe and resulted in clinically meaningful IOP and medication reduction out to 1 year. Although the sample size is small, this work provides an initial assessment of the iStent *inject* in a glaucoma subtype where the clinical evidence is currently sparse.

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## P-FS-232

### SYSTEMATIC REVIEW OF METHODS OF CONJUNCTIVAL WOUND CLOSURE IN MITOMYCIN C AUGMENTED TRABECULECTOMY

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#### Purpose

A systematic review comparing methods, efficacy and safety of conjunctival wound closure in mitomycin C augmented trabeculectomy surgery was conducted.

#### Methods

CENTRAL, Ovid MEDLINE, EMBASE, CINAHL, Web of Science and BIOSIS databases were searched to identify studies concerning wound closure techniques and suture materials used during mitomycin C augmented trabeculectomy surgery. Adult primary open angle glaucoma patients without prior glaucoma surgery were included. Both fornix-based and limbus-based conjunctival flap closures were included and compared.

#### Results

Two hundred forty-seven papers were identified and fifty-eight papers met the inclusion criteria. The Wise technique, the modified Wise technique, the Moorfields safer surgery system corneal groove sutures, corneal anchoring sutures and other methods of conjunctival closure were analysed and compared. Different gauges of nylon, vicryl and silk sutures and different needle types used in the above methods were compared. Conjunctiva closure using glue was also analysed.

#### Conclusions

There is wide variability in conjunctival closure techniques for trabeculectomy without a consensus on the best method of closure. A round bodied non-cutting needle was found to be superior to other needle types. In typical apprenticeship models of surgical training and in the absence of consensus, learned techniques are likely dependent upon local mentors. With different ways to achieve effective and safe wound closure, trainees and surgeons may seek to alter their strategy if they are having complications.

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## P-FS-233 TRABECULECTOMY WITH TRANSCONJUNCTIVAL RELEASABLE SUTURES

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### Purpose

A major advancement with current trabeculectomy surgery has been the introduction of releasable sutures. There are various releasable suture techniques that commonly used in surgical practice. This study is to report the outcome of trabeculectomy with transconjunctival releasable sutures as one of a choice in releasable sutures technique.

### Methods

In this non-comparative case series we present seven glaucoma cases underwent trabeculectomy or phaco-trabeculectomy with transconjunctival releasable sutures. Six of them were diagnosed as primary open angle glaucoma and one case with secondary glaucoma. One glaucoma specialist (AG) performed all procedures. Outcome measures included intraocular pressure (IOP), complications and additional medications. We used fornix-based conjunctival flap and trapezium-shaped scleral flap approximately 5x4x3mm. One permanent suture with 10.0 nylon is placed in the middle of posterior side of flap. The releasable sutures were placed in right and left side of flap, with the steps as follows: the needle first passed through conjunctiva at the same side to intact sclera and continue to the scleral flap. Next, a triple or quadruple throw is performed between the needle side of the suture and the loop between intact sclera and conjunctiva.

### Results

The mean IOP before procedures was 36.28 mmHg. In the first day postoperative and two weeks after the mean IOP was 11.57 mmHg and 10.29 mmHg respectively. During the postoperative period no additional hypotensive medications was used. Two patients were underwent the removal of releasable sutures in the first week, and the others within the second week after the operation. No complications such as hypotony and shallow or flat anterior chamber were recorded in all patients.

### Conclusions

Transconjunctival releasable sutures is one of releasable sutures technique in trabeculectomy that can be a choice in securing scleral flaps to reduce the incidence of hypotony and shallow or flat anterior chamber postoperative. With this technique, the sutures were easier to remove, even more than 14 days after the procedures.

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## P-FS-234

### OUTCOMES AND COMPLICATIONS OF AHMED GLAUCOMA VALVE IMPLANTATION AT DR YAP EYE HOSPITAL YOGYAKARTA

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#### Purpose

To evaluate the outcomes and complications of Ahmed Glaucoma valve implantation in patients with refractory glaucoma at Dr Yap Eye Hospital Yogyakarta.

#### Methods

Medical records of 30 patients who had Ahmed Glaucoma Valve implant surgery at Dr. Yap Eye Hospital from January 2014 to October 2016. Pre-operative data include age, gender, eye laterality, type of glaucoma, visual acuity, and intraocular pressure. The IOP and visual acuity was measured at 2 days, 1 month, 1 week, 1 month, 3 months, and 6 months. The post operative complications were documented.

#### Results

There were 30 eyes from 30 patients. The mean IOP at baseline  $45.78 \pm 13.04$  and reduced after the operation become  $14.41 \pm 9.86$  at the second postoperative day and  $17.6 \pm 14.6$  at 6 months follow up. The mean visual acuity was at baseline  $2.47 \pm 0.56$  and was unchanged  $2.4 \pm 0.74$  at last follow up. Early postoperative complication (0-3mos) was flat anterior chamber (3 eyes, 10%), hyphema (3 eyes, 10%), and tube obstruction (2 eyes, 15%). The late postoperative complication (after 3 mos) was tube exposure (4 eyes, 13.3%), bullous keratopathy (1 eye, 3.3%), and dislocation of implant (1 eye, 3.3%). Tube exposure onset ranging from 49-235 days (mean  $99.5 \pm 90.54$  days) after implantation. Flat anterior chamber and hyphema could be successfully managed conservatively while tube exposure needed surgical repair. Three cases of tube exposure required explantation. Endophthalmitis was found in one case of tube exposure.

#### Conclusions

Ahmad glaucoma implant placement appears to be a safe and effective surgical option in patients with refractory glaucoma.

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**P-FS-235**

**OUTCOMES OF SINGLE SITE, TWIN-STITCH PHACOTRABECULECTOMY IN ADVANCED PRIMARY ANGLE CLOSURE GLAUCOMA CASES**

Parveen Rewri\*

**Purpose**

To evaluate the outcomes of single site, twin suture phacotrabeculectomy in advance cases of primary angle closure glaucoma (PACG) as primary treatment.

**Methods**

This retrospective study include 143 eyes of 116 patients who underwent phacotrabeculectomy between 2013 and 2018, by single surgeon. Diagnosis of primary angle closure glaucoma was based on indentation 4-mirror gonioscopy. The visual field was done pre-operatively in patients with best corrected visual acuity of  $> 20/200$ , and in those with visual acuity  $< 20/200$ , first visual field was done 12 weeks post-operatively. This was used for classifying severity of glaucoma. A modified phacotrabeculectomy technique was used that included single site scleral incision approach. The scleral incision was closed by using two stitches, one releasable nylon 10-0 and second 8-0 polyglactin suture. The fornix based conjunctival flap was closed by single 8-0 polyglactin suture. The outcome measures included intra-ocular pressure (IOP), visual acuity, number of glaucoma medications, postoperative complications and interventions.

**Results**

Over a mean 21-month (range: 6-60 months) follow up, 117 (81%) eyes achieved IOP 18 mmHg without any anti-glaucoma medication, of these 93 (65%) eyes achieved IOP  $\leq 15$  mmHg. The IOP decreased from preoperative mean of 23.6 mmHg to a mean of 13.7 mmHg ( $p < 0.01$ ) at last available ( $> 6$  month) follow up. The visual acuity of better than 20/60 was achieved in 96 (67%) eyes. No eye lost vision post-operatively. The commonest post-operative complication was shallow anterior chamber with hypotony (IOP  $< 6$  mmHg), seen in 18 (13%) eyes. It was due to over-filtration in 14 (10%) eyes and bleb leakage in three eyes. Choroidal effusion developed in three (2%) eyes. Eight eyes required re-intervention in the form of re-suturing (3 eyes), compression suture (one eye) and injection of 5 Fluorouracil (FU) for reviving failing bleb (4 eyes).

**Conclusions**

Single site, twin suture phacotrabeculectomy technique achieved good IOP reduction in advanced cases of PACG as primary treatment, though incidence of hypotony was little higher.

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**P-FS-236**

**LONG-TERM OUTCOMES OF GLAUCOMA DRAINAGE DEVICE SURGERY IN  
INDONESIAN PATIENTS WITH REFRACTORY GLAUCOMA**

Elok Rochmawati\*

**Purpose**

This study aimed to assess the outcomes and incidence of postoperative complications of glaucoma drainage device implantations in treating refractory glaucoma in Indonesia.

**Methods**

This is a retrospective study done at Cipto Mangunkusumo Hospital in Indonesia. Charts of all patients who underwent glaucoma drainage device implantation at Cipto Mangunkusumo Hospital in Indonesia between July 2013 and August 2015 were reviewed. The study population include 23 patients (23 eyes).

**Results**

Mean IOP decreased from  $33.1 \pm 10.4$  mmHg pre-operatively to  $7.3 \pm 3.1$  mmHg at last follow-up ( $P < 0.001$ ) and number of medications reduced from  $3.4 \pm 0.7$  to  $2.0 \pm 0.9$ . The cumulative probability of success was 85% at 1 year, and 69% at 3 years. The highest incidence of post-operative complication was hyphema (21.7 %), hypotony (8.7%), and shallow anterior chamber (8.7%). The incidence of hypertension phase (HP) in our study was 8 patients (34.8%). Among them, 3 patients (37.5%) experienced the HP at 1 week, 3 patients (37.5%) at 1 month, and 2 patients (25%) at 3 months after the operation.

**Conclusions**

Glaucoma drainage device implantation appears to be safe and effective in controlling IOP in refractory glaucoma in Indonesia.

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**P-FS-237**

**FACTORS INFLUENCING THE SUCCESS AND FAILURE OF TRABECULAR MICRO-BYPASS STENTS, ISTENT AND ISTENT INJECT, WHEN COMBINED WITH CATARACT SURGERY**

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**Purpose**

To identify the pre-operative variables that may predict the success of trabecular micro-bypass stents combined with cataract surgery.

**Methods**

A prospective, interventional case series of 245 eyes undergoing trabecular micro-bypass stent insertion combined with cataract surgery. Baseline demographic information, pre-operative, intra-operative and post-operative outcomes including intraocular pressure (IOP), number of topical hypotensive agents, vertical cup-disc ratio, pattern standard deviation on Humphrey visual field analyser, central corneal thickness, and visual acuity were collected and analyzed. Primary success was defined as an IOP of  $\leq 18$  with zero medications at 12 months.

**Results**

245 eyes from 148 patients, aged 53-89 years (Mean 71, SD 7.1) were assessed. There were 145 eyes in the iStent and 100 eyes in iStent *inject* groups. All patients had a confirmed diagnosis of POAG. The mean pre-operative IOP was 18.9 (SD 5.2). 87 eyes (35.5%) failed to achieve an IOP of  $\leq 18$  with zero medications at 12 months. The failure of iStent/iStent *inject* was not associated with underlying glaucoma severity when VCDR, PSD, and central corneal thickness were used as surrogates. Pre-operative IOP and number of agents were independently associated with failure at 12 months. A pre-operative IOP of 16-20 mmHg had a relative risk of failure of 1.70 (95% CI 0.94, 3.05), and an IOP  $> 20$  mmHg had a relative risk of failure of 2.73 (95% CI 1.56, 4.79), compared to a pre-operative IOP of  $\leq 15$  mmHg. The adjusted relative risk for  $\geq 2$  pre-operative hypotensive agents was 1.65 (95% CI 1.17, 2.31), compared to those eyes with zero or one pre-operative agent.

**Conclusions**

Both trabecular micro-bypass stents in this study were most effective in achieving a post operative IOP of  $\leq 18$  mmHg with zero topical hypotensive agents at 12 months in patients with a pre-operative IOP of  $\leq 15$  mmHg who were treated with less than 2 topical hypotensive agents.

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**P-FS-239**

**COMBINED ISTENT® INJECT TRABECULAR MICRO-BYPASS AND PHACOEMULSIFICATION IN AUSTRALIAN PATIENTS WITH OPEN-ANGLE GLAUCOMA**

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**Purpose**

The primary purpose of this retrospective audit was to evaluate the impact of combined iStent® Inject and phacoemulsification on medication number in Australian patients with open-angle glaucoma (OAG). Secondary outcomes included IOP, best-corrected visual acuity (BCVA), refraction and visual fields.

**Methods**

Patients (n = 65) with open-angle glaucoma that had combined iStent® Inject and phacoemulsification between 1 February 2016 and 1 February 2018 performed by the same surgeon were audited for postoperative medication number, IOP after 1 day, 1 week, 4 weeks and 6, 12, 18 and 24 months, BCVA, refraction and visual fields. These parameters were compared to baseline levels and with those from patients (n = 61) without glaucoma that received standalone phacoemulsification.

**Results**

In patients having combined iStent® Inject and phacoemulsification the mean medication number was significantly reduced by 1.3 ( $p < 0.001$ ) for those on medication at baseline and by 0.5 ( $p = 0.002$ ) for the cohort overall. Mean IOP was significantly reduced from baseline (11.4 mmHg, -28%;  $p = 0.002$ ) in the combined iStent® Inject and phacoemulsification group and less so (11.4 mmHg, -17%;  $p < 0.001$ ) in the phacoemulsification-only group. No consistent differences in final BCVA, refraction or visual field outcomes were found between groups.

**Conclusions**

The results of this audit suggest that iStent® Inject, when combined with phacoemulsification, is at least as effective in controlling IOP as medical therapy and may have an important role in reducing medication number in Australians with coexistent cataract and OAG. This study is one of the first to confirm refractive stability in concomitant iStent® Inject and phacoemulsification.

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## P-FS-240

# REAL-WORD OUTCOMES OF SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IN PATIENTS WITH MILD TO SEVERE GLAUCOMA: ONE YEAR RESULTS OF A CANADIAN STUDY

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## Purpose

The first generation of trabecular micro-bypass stents have been effective in reducing the intraocular pressure (IOP) and medication burden in patients with open angle glaucoma and cataract. The recent emergence of second generation of trabecular micro-bypass stents has allowed improved multidirectional flow with good efficacy and safety profile. In this study, we aimed to assess outcomes following implantation of two second-generation trabecular micro-bypass stents (iStent inject®) with concomitant cataract surgery in glaucoma patients with varying glaucoma severity from mild to severe.

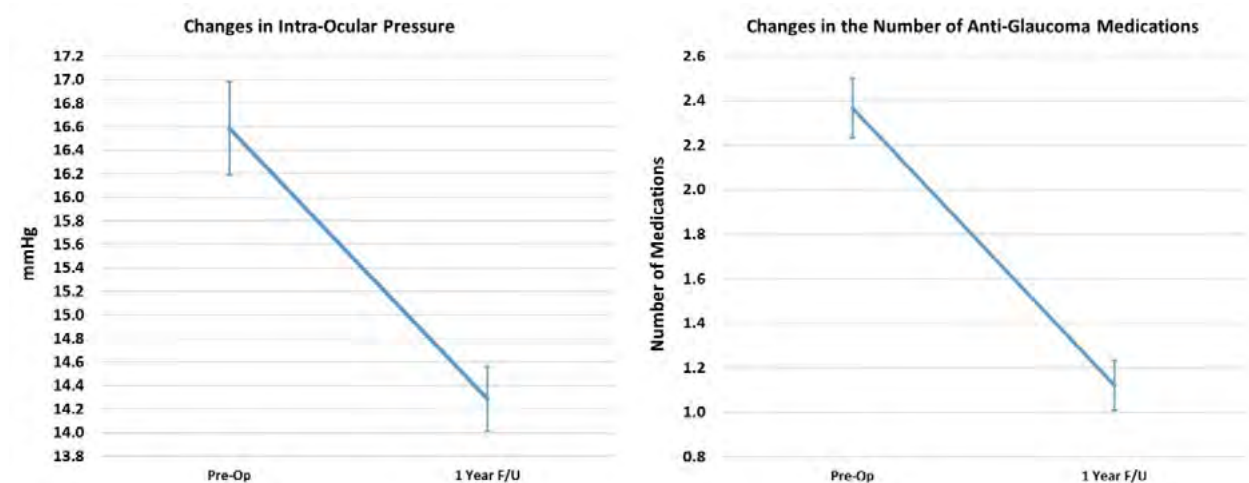
## Methods

In this retrospective chart review study, we evaluated clinical characteristics and 12-months outcomes of glaucoma patients who underwent implantation of two iStent inject devices with concomitant cataract surgery. The primary outcomes included the IOP and anti-glaucoma medication usage and the secondary outcomes were complete success (IOP  $\leq 18$  mmHg without medications) and qualified success (IOP  $\leq 18$  mmHg with or without medications). Changes in IOP and medications were evaluated using repeated measure ANOVA with  $P < 0.05$ .

## Results

A total of 101 eyes (48 male, 53 female) of 61 patients were included with an average age of  $68.5 \pm 8.8$  years. All eyes had moderate to severe glaucoma with the following subtypes: 56% primary open-angle, 18% primary closed-angle, 13% normal tension, 7% pseudoexfoliation, 5% pigmentary, and 1% congenital glaucoma. The preoperative IOP decreased significantly from  $16.6 \pm 4.0$  mmHg to  $14.3 \pm 2.8$  ( $p = 0.000$ ), and the average anti-glaucoma medication use dropped by 53% preoperatively to one-year follow-up ( $p = 0.000$ ). Qualified and complete success rates were 90.1% and 38.6%, respectively. There were no intraoperative complications but six eyes underwent secondary surgery for management of elevated IOP.

## Image



### Conclusions

This retrospective case series from a single ophthalmology clinic in Canada demonstrates that combined cataract surgery and implantation of second-generation trabecular micro-bypass stents (iStent inject®) is an effective treatment modality which significantly reduces IOP and the medication burden with a high success rate in mild to severe glaucoma patients.

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## P-FS-241

### OLOGEN® IMPLANT IN COMBINED PHACOEMULSIFICATION AND VISCOCANALOSTOMY, A PILOT STUDY

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#### Purpose

To study the efficacy of the biodegradable collagen implant (Ologen®) as an adjuvant in phacoviscocanalostomy in patients with coexisting cataract and primary open angle glaucoma.

#### Methods

This prospective, interventional, randomized clinical study was done at Alpha vision center, Zagazig, Egypt. Patients with coexisting cataract and glaucoma were randomized to receive either phacoviscocanalostomy (Phacovisco group (1)) (39 eyes), or phacoviscocanalostomy with Ologen® implant (OloPhacovisco group (2)) (40 eyes). Follow-up period was 2 years. Nd:YAG laser goniopuncture was done in any case if the intraocular pressure (IOP) was elevated above 21 mmHg after discontinuation of corticosteroid eye drops at any time follow-up visit.

#### Results

No significant operative or postoperative complications (other than failure) in both groups were encountered. At two years follow-up, the mean IOP level was statistically significantly decreases in OloPhacovisco group (2) ( $p = 0.02$ ), and complete success occurred in 23 (59.0%) eyes in Phacovisco group (1) and in 32 (80.0%) eyes in OloPhacovisco group, there was statistically significant higher success rates regarding complete success in patients received Ologen® implant ( $p = 0.04$ ).

#### Conclusions

Ologen® implant improved the success rate of phacoviscocanalostomy. Larger studies with longer follow-up periods may be required to confirm these findings.

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## P-FS-242

### THE USE OF AUTOLOGOUS BLOOD IN THE MANAGEMENT OF POST TRABECULECTOMY HYPOTONIA: ABOUT TWO CASES

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#### Purpose

Hypotonia remains one of the most serious complications of the trabeculectomy.

It can be defined by an IOP that's low enough to cause clinically significant complications such as macular edema, chorioretinal folds, optic nerve edema and vascular tortuosity.

there are several techniques to treat it, among them the injection of autologous conjunctival blood around the filtration bubble.

We report the case of two patients presenting a major early post operative hypotony, handled by injection of autologous blood with a successful result.

#### Methods

Case n1: 6-year-old child victim of a blunt ocular trauma of the right eye causing a recession of the angle with an intra ocular hypertension not controlled by medical treatment.

Case n2: 37-year-old patient without significant pathological history who presented an herpetic kerato-uveitis with an intra ocular hypertension at 30mmhg without improvement despite of a quadri therapy.

Both of these patients benefited from a trabeculectomy with using of MMC.

#### Results

The evolution was marked by an early hypotony ( 4mmhg for the child and 6mmhg for the adult, VA = account fingers)

The examination in the slit lamp had found a good bubble of filtration with a negative seidel, the cornea was clear, the anterior chamber was deep, the lens and the vitreous were clear, with macular and papillary edema confirmed at the OCT in patient n: 1 ,and choroïdal folds in patient n :2.

The management consisted first of all, in stopping the anti-inflammatory medications like steroids ,then we used the autologous blood injection in the operation room to maintain good asepsis . As no anticoagulant is used, the procedure was done quickly. After cleaning the antecubital region, the assistant withdrew blood into a 1-ml syringe and we changed the needle to 30-gauge and introduced it at least 5 mm away from the bleb , 0.1-0.3 ml of blood was injected.

At D3, IOP increased to 9mmhg, with a recovery of good visual acuity at 6 weeks for the child and 10 weeks for the adult.

#### Conclusions

Trabeculectomy remains a mainstay in the management of glaucoma, despite problems frequently associated with it, such as hypotony.

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Leaving postoperative hypotony untreated can result in permanent visual damage.

The autologous blood injection is one of the techniques used, it is relatively non-invasive and can give satisfactory results.

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## P-FS-243

# POSTURE-INDUCED INTRAOCULAR ALTERATIONS AFTER CATARACT SURGERY IN EYES WITH PRIMARY ANGLE CLOSURE

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### Purpose

To determine whether phacoemulsification and aspiration (PEA) affects the posture-induced changes in the intraocular pressure (IOP) in eyes with primary angle closure (PAC), primary angle closure suspect (PACS) and primary angle closure glaucoma (PACG).

### Methods

Thirty eyes of 30 patients with PAC/PACS and PACG who were scheduled for PEA were subjected. The IOP was measured in the sitting and the lateral decubitus position with an Icare rebound tonometer before, and 1, 3 months after the cataract surgery.

### Results

The mean age was  $70.0 \pm 5.5$  years with a range of 57 to 78 years. There were 28 women and 2 men. Sixteen eyes had PAC, 9 eyes had PACS, and 5 eyes had PACG. The mean extent of the peripheral anterior synechiae was  $34.6 \pm 43.0$  degrees with a range of 0 to 150 degrees. The mean baseline IOP measured with the Icare was  $15.5 \pm 3.6$  mmHg in the sitting position and  $19.4 \pm 3.8$  mmHg in the lateral decubitus position ( $P < 0.001$ ; paired *t*-test). At one month, the mean IOP was  $13.5 \pm 3.3$  mmHg in the sitting position and  $17.0 \pm 3.6$  mmHg in the lateral decubitus position ( $P < 0.001$ ; paired *t*-test). At three months, the mean IOP was  $12.7 \pm 3.2$  mmHg in the sitting position and  $15.8 \pm 3.3$  mmHg in the lateral decubitus position ( $P < 0.001$ ; paired *t*-test). This postural IOP difference was  $+3.9 \pm 2.5$  mmHg at baseline,  $+3.4 \pm 1.8$  mmHg at one month, and  $+3.1 \pm 2.0$  mmHg at 3 months after the cataract surgery ( $P = 0.283$  repeated-ANOVA).

### Conclusions

Our results indicate that PEA has no effect on posture-induced IOP changes from the sitting to the lateral decubitus position in eyes with primary angle closure.

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## P-FS-244

### INTERMEDIATE TERM OUTCOMES OF STAND-ALONE SIBS MICROSHUNT OR IN COMBINATION WITH PHACOEMULSIFICATION

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#### Purpose

To compare 1-year outcomes of stand-alone Poly(styrene-block-isobutylene-block-styrene) (SIBS) microshunt with mitomycin C (SMS) or in combination with phacoemulsification (SMSP) in consecutive glaucomatous eyes from July 2015 to July 2018 in Mississauga, Canada.

#### Methods

We reviewed consecutive patients receiving SIBS microshunt with MMC from July 2015 until July 2018 at Credit Valley Hospital in Ontario, Canada. Exclusion criteria included atypical forms of glaucoma, previous ophthalmic surgery, or < 1 month of follow-up. The primary outcome was hazard ratio of failure between SMS and SMSP, with failure defined as an IOP < 6 with > 2 lines of vision loss from baseline, or > 17 on no medications on 2 consecutive visits despite in-clinic maneuvers (including needling). Secondary outcomes included change in IOP, medications over follow-up, and number of interventions, complications, and reoperations. A Cox proportional hazards model was used to determine hazard ratios between the two cohorts, and explore other risk factors for failure, including stand-alone vs. combination surgery, ethnicity, disease severity, age less than 75, and others.

#### Results

195 eyes received SMS and 62 eyes received SMSP in a total of 228 patients. Median age of patients was 58.0 (50.0-68.0) for SMS and 68.0 (64.0-73.0) for SMSP, with 18 (9.2%) and 13 (21.0%) patients greater than 75 years of age, respectively. Median pre-operative mean deviation was -11.1 (-20.3 - -3.9) and -9.4 (-19.6 - -3.5). The hazard ratio of failure was 1.55 (0.97-2.48) for SMSP relative to SMS. No risk factors for failure were statistically significant. Complete success rates at 1 year were 0.67 (SE 0.04) for SMS and 0.45 (SE 0.08), and qualified success rates were 0.92 (SE 0.02) and 0.89 (SE 0.05). Median IOP (mmHg) decreased from 20 (17-27) and 22 (20-27) at baseline to 12 (10-15) and 15 (12-19) at 1 year; medications decreased from 4 (3-4) and 4 (3-4) at baseline to 0 (0-0) and 0 (0-0) at 1 year. Needling was performed in 18 (9.2%) and 16 (26.0%) eyes. There were 50 (25.6%) and 23 (37.1%) patients that experienced complications, including shallow anterior chamber in 13 (6.8%) and 6 (9.7%) eyes. Reoperation was required in 13 (6.7%) and 5 (8.1%) eyes.

#### Conclusions

SIBS microshunt lowers IOP and medication use in patients with glaucoma. We did not detect a statistically significant difference in the risk of failure for stand-alone versus combination SIBS microshunt placement, or identify other risk factors for failure to date.

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## P-FS-245

### FIRST PERSPECTIVES AND OUTCOMES OF AN AB-INTERNO GELATIN STENT: A NATION-WIDE, MULTICENTRE STUDY

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#### Purpose

To compare the efficacy, safety, and risk factors for failure in patients receiving an *ab interno* gelatin microstent with mitomycin C, with particular attention to any potential learning curve.

#### Methods

Canadian multicentre retrospective study of 466 consecutive eyes in 394 patients. Patients age 40 and older with primary or pigmentary/pseudoexfoliative open angle, primary closed angle, or combined mechanism glaucoma on maximum tolerated medical therapy who received a gelatin stent with MMC and had at least 1 month of follow-up were included. The primary outcome was hazard ratio of failure between early surgical cases (1-20) and later cases (21+), with failure defined as an IOP < 6 with > 2 lines of vision loss from baseline, or > 17 on no medications on 2 consecutive visits despite in-clinic maneuvers (including needling). Secondary outcomes were an IOP of 6-14 and 6-21 mmHg  $\pm$  medications, interventions, complications, reoperations.

#### Results

Baseline characteristics in patients receiving an *ab interno* gelatin microstent as their first glaucoma surgery included a median age of 68.5 years (IQR = 60.9-76.4), median pre-operative visual acuity of 0.2 logMar (IQR = 0.1-0.4), median decision IOP of 20.0 mmHg (IQR = 16.0-24.5), and median pre-operative mean deviation of -10.5 dB (IQR = -17.9 to -5.4). From 2-year survival analysis estimates, 32.7% of eyes had IOP 6-17, 30.0% had 6-14, and 34.2% had 6-21; 65.2%, 54.0%, and 75.9% allowing for medications. Risk factors for failure were previous glaucoma surgery (HR = 2.0 (1.4-3.0)), diabetes (HR = 1.5 (1.1-2.0)), combined surgery (HR = 1.6 (1.2-2.0)), prior LPI (HR = 1.9 (1.3-2.7)) and first 20 cases (HR = 1.6 (1.1-2.2)). There were 230 needlings in 154 eyes (33%), 223 number of distinct complications, 91 which occurred after the first month. The most frequently occurring complications were bleb leak (8 eyes, 1.7%), hyphema (5 eyes, 1.1%), and dellen (5 eyes, 1.1%). There were 123 (26%) reoperations, including 23 tube shunt procedures (4.9%), 18 trabeculectomies (3.9%), and 8 CPC lasers (1.7%).

#### Conclusions

In a large Canadian multicentre retrospective study of consecutive cases, the *ab-interno* microstent most effectively lowered IOP as a primary, solo procedure in open angle non-diabetic patients after the surgeon had performed more than 20 previous cases.

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## P-FS-246

### INTRAOCULAR PRESSURE REDUCTION IN SPECTRUM OF ANGLE CLOSURE DISEASE FOLLOWING CATARACT EXTRACTION

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#### Purpose

The beneficial role of cataract surgery on intraocular pressure in primary angle closure (PAC) and early cases/ medically controlled primary angle closure glaucoma (PACG) is known.<sup>1</sup> In PACG eyes with advanced glaucomatous neuropathy/ medically uncontrolled glaucoma, it is still a matter of debate that phacoemulsification alone or combined phacotrabeculectomy should be performed. The purpose of the study was to observe the effect of cataract extraction on Intraocular pressure (IOP) in patients with Angle closure disease (ACD) including advanced and medically uncontrolled glaucoma.

#### Methods

Retrospective analysis of patients with ACD including medically uncontrolled and advanced PACG who had significant cataract were included. These patients had undergone cataract extraction alone irrespective of their ISGEO classification or amount of glaucoma damage. The IOP trend was analysed at postoperative day 1, day 7, 1 month, 3 months, 6 months, 1 year and final follow up along with requirement of antiglaucoma medication (agm)/surgery.

#### Results

One hundred ten eyes of 79 patients (PACS: 21, PAC: 34, PACG: 55 eyes) were analysed. Thirty-one eyes had advanced PACG and 20 eyes had medically uncontrolled glaucoma. BCVA > 6/12 was seen in 51 eyes at baseline and 87 eyes at final follow up. After cataract surgery alone, there was significant reduction in IOP {9.1% in PACS ( $p < 0.01$ ), 8.55% in PAC ( $p = 0.04$ ), 22.82% in PACG ( $p < 0.01$ ), 18.27% in advanced PACG ( $p = 0.01$ ), 19.87% in medically uncontrolled glaucoma ( $p < 0.01$ )} and significant reduction in topical agm (51.85% in PAC, 32.35% in PACG, 18.61% in advanced PACG and 37.66% in medically uncontrolled PACG at median follow up of 1,2.5,1,1.3 and 1 year. Eleven PACG patients, who were on systemic medication preoperatively, were off systemic therapy at final follow up while 6 other PACG eyes (10.9%) required glaucoma surgery.

#### Conclusions

Cataract surgery leads to significant drop in IOP across the spectrum of Angle closure disease with visually significant cataract. Cataract surgery may be considered initially for IOP control even in advanced or medically uncontrolled PACG followed by glaucoma surgery later if required.

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**P-FS-247**

**EFFICACY OF GONIOTOMY IN ADULT GLAUCOMAS UNDERGOING PHACOEMULSIFICATION**

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**Purpose**

To evaluate the intraocular pressure (IOP)–lowering efficacy and safety of Goniotomy with Phacoemulsification in mild to advanced glaucoma.

**Methods**

Twenty-three eyes of 21 consecutive consenting patients, with glaucoma, who had phacoemulsification with goniotomy were prospectively enrolled in this study. Clinical data were collected, including preoperative and postoperative IOP, medication use, post-operative complications and requirement of additional glaucoma surgery during a 3-month follow-up.

**Results**

The mean age of patients was  $51.94 \pm 15.5$  years. Of the 23 eyes included in this study, 65% had primary angle closure glaucoma. Other diagnoses included open angle, combined mechanism, and post-trabeculectomy refractory glaucoma. Forty-three percent of eyes were classified as having severe glaucoma and 56%, mild to moderate glaucoma. The mean baseline IOP decreased from  $25.33 \pm 8.6$  mmHg to  $12.56 \pm 4.4$  mmHg at 3 months postoperatively ( $p = 0.0005$ ) and the hypotensive medication use decreased from a median of 3 (0 to 5) to 1 (0 to 3) ( $p = 0.0033$ ), respectively. The most common intra-operative complication was bleeding, seen in 38% of the patients that resolved in all the eyes by the third post operative day. None of the eyes required additional glaucoma surgery.

**Conclusions**

Performing a goniotomy with phacoemulsification was effective in reducing IOP as well as the number of ocular hypotensive medications in patients with mild to advanced glaucoma and could be used as an alternative surgical procedure.

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**P-FS-249**

**JUVENILE OPEN ANGLE GLAUCOMA: OUR SURGICAL EXPERIENCE AND ITS SOCIAL IMPACT**

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**Purpose**

Juvenile open angle glaucoma (JOAG) is a severe disease with major social and psychological impact on patient and family, and it usually affects the productive age group. Unlike adult onset primary open-angle glaucoma, it presents with high intraocular pressure and diffuse visual field loss, which if left untreated leads to severe visual disability.<sup>1</sup> Surgery remains the mainstay for such patients.

**Methods**

We studied our juvenile open angle glaucoma patients who had undergone trabeculectomy for the social impact related to the disease and the surgery. All the juvenile open angle glaucoma patients were enrolled in the study. Best corrected visual acuity, intraocular pressure (IOP), gonioscopy, fundus photography, optical coherence tomography, and visual fields were done in all patients. They underwent trabeculectomy with Bevacizumab soaked collagen matrix implant as adjuvant along with mitomycin-C. This improves success in such cases with maintained vision and IOP adding to productive life years and improving the quality of life.

**Results**

20 eyes of 15 patients of JOAG cases were studied. Age range was 8 yrs to 48 yrs, collagen matrix implant was used in all cases, and in 8 cases antivgef was used. All cases had cupping of 0.9 or more, 7 had almost total cupping with GOA and 6 cases were of failed trabeculectomy cases. AC reformation was needed in 3 cases, three cases developed cataract. 2 cases needed needling. In 3 cases surgery failed, of which two were lost to follow up and one case is awaiting re surgery.

**Conclusions**

Anti-VEGF and collagen matrix implant are useful adjuvant in trabeculectomy in JOAG cases. Further studies are needed with depot role of implant soaked in Bevacuzimab, which can help in local regulation of fibrosis, collagen and angiogenic modulation. The disease is a social responsibility on the part of doctor. It needs proper counselling and a good relationship between patient, his family and the doctor. This is specially important when we deal with women considering marriage and child birth.

**References**

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## P-FS-250

### POST-OPERATIVE COMPLICATIONS OF TRABECULECTOMY: OUR EXPERIENCE

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#### Purpose

To study the post-operative complications of trabeculectomy, and their effect on long term outcome.

#### Methods

All the patients who had undergone trabeculectomy with or without augmentation were studied to report the early as well as late complications after the surgery.

#### Results

171 eyes which underwent trabeculectomy [with mitomycin C (MMC) -45 eyes, MMC+ OLOGEN – 64 eyes, MMC + OLOGEN + Antivegf- 62 eyes) were studied. Of these, 80 underwent combined phaco-trabeculectomy, and 26 were cases of Retrabeculectomy. Fifteen cases needed AC reformation, 17 needed needling with 5FU in a follow up ranging from 6 months to 58 months. Two cases needed conjunctival autograft with amniotic membrane graft, for infection and OLO implant exposure, one underwent PPV for malignant Glaucoma, SF6 for persistent CD was put intracamerally in two cases. One case of Blebitis was seen, which was managed medically and part of implant was trimmed, which was exposed. One cornea went into decompensation following combined surgery. Four cases failed, of which 2 lost to follow up. Almost all cases were on topical antiglaucoma post surgery, as all cases were advanced glaucoma, 36 cases had almost total cupping, glaucomatous atrophy stage and almost all cases were 0.9 or more in cupping. Preoperative vision though was recovered in almost all cases, took upto 4 to 6 weeks in some, and was maintained or improved in almost all cases.

#### Conclusions:

Re-intervention post trabeculectomy is needed in few cases, and one should not shy from same. Vision recovery post trabeculectomy takes time and Strict IOP control, post-surgery addition of topical antiglaucoma is needed in advanced cases to maintain vision.

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**P-FS-251**

**ASSOCIATION BETWEEN EXTENT OF TRABECULOTOMY AND SUCCESSFUL INTRAOCULAR PRESSURE CONTROL IN 360-DEGREE SUTURE TRABECULOTOMY**

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**Purpose**

360-degree suture trabeculotomy (S-LOT) is one of the emerging glaucoma surgery and has been reported to have a stronger intraocular pressure (IOP) reduction than conventional trabeculotomy with metal probes. Two surgical approaches of S-LOT have been reported: *ab externo* technique with a scleral flap and gonioscopy assisted *ab interno* technique. The aim of this study is to investigate pre-operative and perioperative factors related to successful IOP control with S-LOT as a sole procedure.

**Methods**

A hundred glaucomatous eyes which underwent S-LOT with *ab externo* technique (50 eyes) and gonioscopy assisted *ab interno* technique (50 eyes) were included in this prospective non-randomized cohort study. We defined the criteria of IOP control failure that IOP with medications was 18mmHg or higher at two consecutive visits for postoperative 1 year. We adopted Cox proportional hazard model to determine which preoperative and perioperative factors associated with successful IOP control. Factors used for the analysis included age, sex, laterality, type of glaucoma, preoperative lens status, surgical approach whether *ab externo* or *ab interno*, preoperative IOP and angle extent of trabeculotomy in degree.

**Results**

The p values with cox regression were age: 0.657, sex: 0.478, laterality: 0.800, type: 0.980, lens: 0.367, preIOP: 0.412, approach: 0.955 and extent: 0.003. Hazard ratio of extent of S-LOT in degree for failure was 0.992 (95%CI: 0.986-0.97).

**Conclusions**

Wider extent of trabeculotomy had an advantage in controlling IOP less than 18mmHg.

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## P-FS-252

### LONG-TERM SURGICAL OUTCOMES OF AHMED GLAUCOMA VALVE IMPLANTATION – THE ASIAN EXPERIENCE

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#### Purpose

The Ahmed Glaucoma Valve (AGV) is a glaucoma drainage device which is a choice implant in refractory glaucoma. There is currently little literature examining the long-term outcomes and efficacy of the AGV in Asian eyes with glaucoma. This study aims to evaluate long-term outcomes and risk factors for surgical failure of AGV implantation in Asian eyes.

#### Methods

This was a retrospective, single-institution study of 150 eyes from 150 subjects which underwent AGV implantation from January 2001 to October 2017. Outcomes evaluated were: intraocular pressure (IOP), number of IOP-lowering medications and failure defined as IOP > 18mmHg or < 5mmHg on two consecutive visits after post-operative Month 3, reoperation for glaucoma, removal of implant or loss of light perception. Cox proportional hazard regressions were used to evaluate the risk factors. Kaplan-Meier analysis was used to examine the cumulative proportion of success. All statistical analyses were performed using IBM SPSS Statistics (version 19, IBM Corp, New York, USA). P-values less than 0.05 were considered statistically significant.

#### Results

The mean age was  $59.7 \pm 15.1$  years. 97 (64.7%) eyes belonged to male subjects and 116 (77.3%) belonged to Chinese subjects. The mean follow-up period was  $67.5 \pm 47.6$  months. Cumulative probability of success was 46.5% at Year 5 and 38.1% at Year 10. At Year 10, mean IOP was reduced from  $30.7 \pm 9.7$  to  $15.2 \pm 6.3$  mmHg ( $P < 0.001$ ) and number of medications decreased from  $3.8 \pm 1.1$  to  $0.7 \pm 1.1$  ( $P < 0.001$ ).

Increased age was associated with less failure at Year 2 (HR 0.98,  $p = 0.046$ ) and Year 5 (HR 0.98,  $p = 0.032$ ).

Higher pre-operative medicated IOP associated with less failure at Year 5 (HR 0.97,  $p = 0.022$ ) and Year 10 (HR 0.97,  $p = 0.023$ ). Upon removing % IOP decrease from success criteria, the association between pre-operative IOP and failure was no longer significant. However, now previous trabeculectomy was associated with less failure at all timepoints (Year 2: HR 0.42,  $p = 0.046$ ; Year 5: HR 0.39,  $p = 0.023$ ; Year 10: HR 0.35,  $p = 0.009$ ).

#### Conclusions

AGV implantation is effective for long-term IOP control in Asian eyes. Depending on the success criteria used, previous trabeculectomy, older age and higher pre-operative medicated IOP may be associated with a lower risk of failure up to 10 years after surgery.

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## P-FS-253

### ASYMPTOMATIC CHRONIC HYPOTONY DUE TO SUBCLINICAL CHOROIDAL EFFUSION AFTER BLUNT TRAUMA

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#### Purpose

To present a case report of asymptomatic post-traumatic chronic hypotony in which the cause that was undetected until phacoemulsification.

#### Methods

Case Report.

#### Results

A 55 y/o female's left eye suffered blunt trauma causing hyphema and iritis, which were successfully managed; however ever since the trauma up to a year after, the intraocular pressure (IOP) of this eye was persistently hypotonic with IOP's ranging from 3 to 5 mmHg and the anterior chamber remained to be very shallow (Van Herrick Grade 4) with the lens-iris diaphragm pushed anteriorly with no evidence of angle recession with a slit lamp 4-mirror gonioscopy. Visual acuity was initially 20/20 upon resolution of the hyphema but worsened to 20/40 a year after, presumably due to a developing posterior subcapsular cataract. Periodic dilated fundus examinations ever since the trauma revealed normal findings - no hypotony maculopathy and no observable choroidal effusions. Prior to phacoemulsification, ultrasound biomicroscopy (UBM) revealed 360 degrees of mild peripheral choroidal effusions. During phacoemulsification, after intraocular lens insertion, direct intraoperative gonioscopy revealed a supero-nasal cyclodialysis cleft (2 clock hours) and this was repaired intraoperatively with direct cyclohexy through a partial thickness scleral flap. Post-operatively, the vision improved to 20/20 without correction and the IOP normalized to 16-18 mmHg.

#### Conclusions

Chronic hypotony post-trauma may be asymptomatic and not cause vision loss or macular findings. The cause may not be detected clinically but UBM may detect subclinical choroidal effusion and addressing the cause in this case (performing cyclohexy on the cyclodialysis cleft, only observed intraoperatively during phacoemulsification) increased the IOP to physiologic levels.

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**P-FS-254**

**THE OUTCOME OF TRABECULECTOMY IN PATIENTS WITH END STAGE PRIMARY OPEN ANGLE GLAUCOMA**

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**Purpose**

To evaluate the outcome of trabeculectomy in patients with end stage primary open angle glaucoma.

**Methods**

Twenty-seven eyes of 26 patients with end stage primary open angle glaucoma who underwent trabeculectomy between 2000 and 2018 were retrospectively analysed. Patients with visual acuity under 20/200 and with less than 10° diameter of visual field were defined as end-stage glaucoma. Pre-operative and post-operative records of the patients including visual acuity, intraocular pressure (IOP), biomicroscopy, visual field examination and fundus examination were evaluated. Intra-operative and post-operative complications were noted. Postoperative results were compared with preoperative data.

**Results**

Seventeen patients (65.4%) were male and 9 patients (34.6%) were female. The mean age of the patients was  $63 \pm 9.49$  years. The mean follow-up period was  $26.59 \pm 38.21$  months. The mean IOP in the preoperative period was  $26.59 \pm 10.2$  mmHg and it decreased to  $11.59 \pm 4.12$  mmHg at the last visit postoperatively. The mean number of antiglaucoma medications used in the preoperative period was  $3.0 \pm 0.1$ . The mean number of antiglaucoma medication was decreased to 0.7 (range 0-3) at the last follow-up visit. Visual acuity was increased in 9 eyes and no change was observed in 18 eyes during the follow-up. There was no visual loss in any eye. Three of the 27 eyes (11.1%) had hypotonia in the early post-operative period. Hypotonia was resolved without any intervention.

**Conclusions**

Trabeculectomy surgery can effectively reduce intraocular pressure without serious complications and wipe out phenomenon in advanced glaucoma patients in which targeted IOP cannot be achieved with medical treatment.

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**P-FS-255**

**A PROSPECTIVE, RANDOMIZED PIVOTAL STUDY OF SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IMPLANTED IN CONJUNCTION WITH CATARACT SURGERY**

Inder Singh\*

**Purpose**

The US IDE pivotal trial aims to evaluate the effectiveness and safety of the second-generation trabecular micro-bypass stents (iStent *inject*®) implanted in conjunction with cataract surgery compared to cataract surgery alone in subjects with mild to moderate open-angle glaucoma (OAG).

**Methods**

This is a two-year prospective, randomized, concurrently controlled, parallel groups, multi-center trial that enrolled subjects  $\geq 45$  years diagnosed with mild to moderate OAG on 1-3 medications with a cataract eligible for surgery. Baseline post-washout mean diurnal IOP of 21-36 mmHg was required in the study eye. Qualified subjects were randomized to implantation with 2 iStent *inject* devices in conjunction with cataract surgery (treatment group) or cataract surgery alone (control group). Annual medication washouts were performed. Key study assessments included: IOP, BCVA, pachymetry, VF, specular microscopy, biomicroscopy, gonioscopy, funduscopy, and adverse events.

**Results**

505 subjects were randomized. Subject accountability at Month 24 was 96%. At M24, 75.8% of treatment eyes vs 61.9% of control eyes achieved  $\geq 20\%$  reduction from baseline in unmedicated IOP (difference = 13.9%;  $p = 0.003$ ). Mean reduction in unmedicated IOP from baseline was greater in treatment eyes ( $7.0 \pm 4.0$  mmHg) than control eyes ( $5.4 \pm 3.7$  mmHg;  $p < 0.001$ ). Overall the safety profile of the treatment group was favorable and similar to that of the control group throughout the 2-year follow-up.

**Conclusions**

Clinically and statistically greater reductions in IOP without medication were achieved after iStent *inject* implantation in combination with cataract surgery vs. cataract surgery alone. A favorable safety profile was observed in the iStent *inject* group through 2 years and was similar to cataract surgery alone.

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## P-FS-256

### LONG TERM OUTCOME OF AHMED GLAUCOMA VALVE IMPLANTATION IN PAEDIATRIC GLAUCOMA

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#### Purpose

The study was designed to evaluate the long term success and complications of Ahmed Glaucoma valve implantation in paediatric eyes.

#### Methods

42 paediatric glaucoma patients who had undergone Ahmed Glaucoma valve implantation and had minimum follow up of 3 years were retrospectively evaluated for surgical success and complications. Success was defined as IOP between 5 to 21 mmHg with (Qualified) or without (Complete) medication. Any data regarding age, specific glaucoma diagnosis, surgical complication, IOP and best corrected vision before and after surgery was analysed.

#### Results

Aphakic/ pseudophakic glaucoma(16/42cases) was the most common type of glaucoma followed by A-R Anomaly (10/42 cases). At 3 years complete surgical success was achieved in 12/42 (28.5%) patients while 20 patients required additional medical therapy to control IOP(Qualified Success = 76%). 2 patient required repeat valve implantation while 8 patients required Diode CPC for better IOP control.

A total of 17 patients had some complication but none of which affected the vision of the patients. The most common complication encountered was tenon cyst (6/42) one of which required bleb needling. Plate erosion and tube extrusion was seen in 2 cases each requiring resurgery. Hypotony with choroidal detachment was seen in 2 case and was managed conservatively. Tube corneal touch was seen in 2 case and was managed surgically while late localised corneal decompensation was noted in 3 cases, none of which affected the best corrected vision and were managed conservatively.

#### Conclusions

Ahmed Glaucoma valve implantation is a safe surgery for paediatric glaucoma with long term surgical success of 76% by 3 years, However a majority (>50%) of patients do require glaucoma medication by 3 yrs.

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## P-FS-257

### BEST EQUATION OF SCLERAL FLAP SIZE AND SCLEROSTOMY OPENING FOR TRABECULECTOMY

Srikant Singh\*

#### Purpose

This prospective interventional study was conducted to find out the best equation of scleral flap size and sclerostomy opening to achieve the most favourable outcome of trabeculectomy.

#### Methods

Trabeculectomy was performed on thirty eyes of thirty patients of primary open angle glaucoma without MMC. Small (2x1.5mm, 3mm<sup>2</sup> n = 10), medium (2x2mm, 4mm<sup>2</sup> n = 10), and large (2x2.5mm, 5mm<sup>2</sup> n = 10) sclerostomy made under a triangular scleral flap (4x4mm, 8mm<sup>2</sup>). All the patients were followed for at least 6 months. The outcome variables were IOP reduction and complications.

#### Results

The mean IOP reduction was found to be 75.54%, 70.27% and 64.21% in large, medium and small sclerostomy groups, respectively, at the end of six months. However, the incidence of post op complications was highest in the larger sclerostomy group followed by medium and small sclerostomy groups. The incidence of shallow anterior chamber was found to be 40%, 20% and 10% in large, medium and small sclerostomy groups, respectively. The incidence of Blebitis was 10%, 10% and 0% in large, medium and small sclerostomy group respectively. The Incidence of cataract progression was 60%, 30% and 10% in larger, medium and small sclerostomy respectively. Incidence of failure was found in 20% cases of small sclerostomy group.

#### Conclusions

Large sclerostomy appears to provide better IOP control but carries a higher risk of post-operative complications. Conversely, a small sclerostomy may have minimal complication but carries a higher risk of failure. A medium sized sclerostomy of 2x2 mm size has the advantage of better IOP control with lesser post-operative complications. Concluded that a triangular scleral flap of 4 mm sides and sclerostomy of 2x2 mm is the best equation to achieve the most favourable outcome of trabeculectomy.

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**P-FS-258**

**YAG-LASER ACTIVATION OF TRABECULA AND CATARACT SURGERY: A COMBINED TECHNIQUE FOR THE MANAGEMENT OF PRIMARY OPEN-ANGLE GLAUCOMA AND COEXISTING CATARACT**

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**Purpose**

Laser treatment of glaucoma has a minimal damaging effect on the trabecular meshwork and has a pathogenetic orientation. Thus, it is a great interest for studying of modern microinvasive laser interventions in the combined treatment of patients with POAG and cataract. The aim of this study was to investigate the therapeutic success of YAG-laser activation of trabecula (YAG-LAT) with cataract surgery.

**Methods**

Thirty four open-angle glaucoma eyes (34 patients, mean age, 62.7 years) underwent YAG-laser activation of trabecula with phacoemulsification. YAG-LAT were realized by Tango Laser unit (LasereX company, Australia): Nd-YAG laser, 1064nm, 0.9-1.5MJ energy, 30NS pulse duration, a spot diameter of 10-15µm, in the quantity of 55-70 pulses in the lower semicircle. Cataract phacoemulsification with IOL implantation was carried out according to a standard technique 30-60 minutes later. Primary end-points included the mean IOP and mean number of glaucoma medications at each follow-up visit. Secondary end-points were intraoperative and postoperative complications.

**Results**

The mean IOP was  $24.1 \pm 2.3$  mmHg at baseline and  $16.4 \pm 2.1$  mmHg at 18 months after combined treatment. The number of medications decreased from  $1.8 \pm 0.4$  at baseline to  $1.2 \pm 0.2$  at 18 months postoperatively. So YAG-LAT with phacoemulsification achieved an IOP reduction of 31.9% after 1.5 years. Eighteen months after surgery 20.6% patients were free of IOP-lowering medication. No complications were noted.

**Conclusions**

Combined phacoemulsification and YAG-LAT was effective in reducing IOP and/or medication burden in POAG patients.

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**P-FS-259**

**LONG AND SHORT TERM COMPLICATIONS AND THEIR CORRELATIONS OF AHMED GLAUCOMA VALVE SETON IMPLANT SURGERY**

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**Purpose**

To investigate the vision threatening and minor complications followed by Ahmed Glaucoma Valve (AGV) implant surgery and their correlations with demographic properties of patients.

**Methods**

Between dates July 2009- July 2018, 315 eyes of 294 patients underwent AGV implant surgery in Glaucoma Unit of the Eye Hospital as tertiary referral center. Preoperative and postoperative visual acuity, Intra ocular pressure (IOP), number of medication, corneal edema, shallow anterior chamber, cataract, coroidal detachment, vitreous hemorrhage, retinal detachment, conjunctival erosions and tube exposures noted. Complications seen postoperative 3 months accepted as early after than as late complications. Demographic properties as age, gender, type of glaucoma, lens status, refractive error, previous surgeries analysed for correlations between complications.

**Results**

Most common early complication was hypotony as 11,2 %(35 eyes). Encapsulated cyst was most common late complication (16,1%, 51 eyes). The rate of conjunctival erosion and tube exposure was 2,2%. Encapsulated cysts and number of medication are significantly correlated with previous surgeries and age of the patient. AGV implant extracted in 4 (1,2%) patients secondary to recurrent tube exposures.

**Conclusions**

AGV implant surgery is effective and safe surgery for intractable glaucoma patients. Hypotony is the most common early but recovering complications. Previous surgeries are correlated with encapsulated cysts and high IOP and number of medications.

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## P-FS-260

### MODERN TRABECULECTOMY OUTCOMES: SEVEN YEAR STUDY IN A LARGE TERTIARY REFERRAL EYE HOSPITAL

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#### Purpose

The aim of the study was to evaluate the long-term outcomes of a large series of 'modern' trabeculectomies augmented with Mitomycin C (MMC) in a large tertiary referral eye unit.

#### Methods

An audit of 325 cases of trabeculectomy surgery augmented with MMC was performed in 2009 to demonstrate outcomes of surgical intraocular pressure (IOP) reduction in an advanced cases of primary open angle glaucoma (POAG) population. Audit outcomes were compared to the large national database published 8 years previously<sup>1</sup>. The results of our audit were superior and so formed a new audit standard to which future audits would be compared.

Six years of further audit were performed comparing outcomes of 100 randomised cases in each year totaling 600 POAG trabeculectomy surgeries augmented with MMC. Data including pre-operative IOP, post-operative IOP at visit closest to 1 year from surgery and post-operative complications are presented in this study.

#### Results

Our initial study compared the outcomes of 325 POAG cases undergoing trabeculectomy augmented with MMC. The pre-operative listing IOP was found to be 22.2 (SD 7.9) mmHg which was lower than the audit standard of 25.8. The IOP closest to 1 year follow up after surgery was 12.2 (SD 4.8) mmHg, which again was lower than the standard of 14.4. Complications following trabeculectomy were separated into early and late and were more acceptable than those found in the national set standards.

The following six years of audit, report consistently low IOP listing pressures with corresponding lower 1 year follow up IOP and reduced complication rates.

#### Conclusions

Modern trabeculectomy with MMC augmentation is a highly successful and safe surgery used to reduce IOP in our multi-cultured population of advanced POAG from a large tertiary referral eye unit. Listing for surgery at earlier IOP's suggest progression of POAG occurs in "sub-optimal" IOP rather than only "high" IOP cases and should be evaluated along side other factors such as age, optic nerve cupping and field loss. The "Moorfields Safer Surgery" techniques which was adhered to for the surgeries in this study suggests greater efficacy in IOP reduction and a reduction in post-operative complication<sup>2</sup>.

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## P-FS-261

### AHMED GLAUCOMA VALVE (AGV) TUBE INSERTION TECHNIQUE (GRAFT SPARING) AND MANAGEMENT OF RARE SITUATIONS DURING AGV SURGERIES

Irshad Ahamed Subhan\*

#### Purpose

The purpose of this 5 surgical videos presentation is to demonstrate a NEW technique of Tube insertion in AGV implantations, and also provide audience with rare situations of AGV surgeries and managing complications.

The presentation package has 2 videos showing AGV insertion techniques involving only needles. It gives an easy route for the tube as the scleral tunnel is designed using only needles. Hence the difficulty in pushing the tube from the large tunnel created by crescent blade (Gdih technique) into the 23G tunnel is totally avoided. There is no need to have a crescent blade and graft to cover the tube.

The presentation has videos of the following surgeries.

#### Methods

Tube insertion technique: Subhan's Scleral tunnel technique. Anterior cut tube insertion technique: A modification of Subhan's Scleral tunnel technique for long tunnels.

Plate Migration- Management: Shows pictures and video of surgical management of AGV plate migration in a case having high myopia and prominent globes in a 15 year old child. The cause of plate migration was constant rubbing of the lid by the patient as the lids showed swelling because of the large bleb around the plate, which was more prominent because of the large globes. The video shows rare images of the encapsulation around the plate when surgically exposed during exchange of the AGV plate.

Tube exposure repair technique: This video demonstrates a rare situation where the patient had undergone penetrating kerato plasty, with phaco IOL previously and AGV implant. The patient already had one episode of tube exposure repair, which re-exposed again. This case was managed with a pedicle kind of conjunctival graft.

Tube inadvertently entering the Vitreous cavity: This video shows surgical management of tube inadvertently entering the vitreous cavity during insertion. It has two videos of accurately placing the tube in the sulcus, with an approach from the opposite limbus, and needle tracking the tube.

#### Results

The tube insertion techniques provide a safe, simple and secure method, saving the need for crescent blade and graft.

The other three videos provide clear and safe skills to come over tough situations in surgical management of AGV implants and its complications.

#### Conclusions

The surgical video packages help the viewing surgeon to adopt new techniques and improve surgical skills, in order to give quality surgical care in difficult situations with confidence.

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**P-FS-262**

**AHMED GLAUCOMA VALVE (AGV) TUBE INSERTION TECHNIQUE (GRAFT SPARING). SUBHAN'S SCLERAL TUNNEL TECHNIQUE**

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Irshad Ahamed Subhan\*

**Purpose**

The purpose of this presentation is to demonstrate a NEW technique of Tube insertion in AGV implantations. We know that GDDs require patch graft to cover the tube. The grafts are expensive and are not available everywhere. Hence this novel technique will allow the surgeon to complete the surgery safely with a well covered tube.

**Methods**

The presentation has 2 videos showing AGV insertion techniques involving only injection needles. It gives an easy route for the tube as the scleral tunnel is designed using only needles. Hence the difficulty in pushing the tube from the large tunnel created by crescent blade (Gdih technique) into the 23G tunnel is totally avoided. There is no need to have a crescent blade and graft to cover the tube.

21G needle is used to design a 4mm partial thickness scleral tunnel, 6 mm from the limbus. Then 23 G needle is used to continue the tunnel into the anterior chamber through the angle.

The AGV tube is pushed through this tunnel. The tube is well covered with the scleral wall and does not require to be covered by pericardial patch graft.

**Results**

AGV implant without Graft.

**Conclusions**

The tube insertion techniques provide a safe, simple and secure method, saving the need for crescent blade and graft.

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## P-FS-263

### EVALUATION OF BLOOD-FILLING PATTERNS IN SCHLEMM'S CANAL FOR TRABECTOME SURGERY

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#### Purpose

To assess the relationship between blood-filling patterns in Schlemm's canal and surgical results at 1 year after Trabectome surgery combined with phacoemulsification.

#### Methods

A retrospective cohort study. One hundred fourteen eyes of 97 Japanese patients who had undergone Trabectome surgery combined with phacoemulsification at Okayama Saiseikai General Hospital between January 2016 and July 2017 were included in this study. Provocative gonioscopy was performed at the beginning of the surgery to classify the blood-filling patterns in Schlemm's canal into three grades: no filling (grade 1), incomplete filling (grade 2), and complete filling (grade 3). Surgical success was defined as an IOP  $\leq 15$  mmHg and  $\geq 20\%$  reduction in IOP. Subjects were classified into 3 groups according to the grade of the blood-filling patterns in Schlemm's canal in order to compare the clinical data, including age, glaucoma type, visual field mean deviation (MD), IOP, number of glaucoma medications, percentage IOP reduction, and surgical success rate at 1 year post-surgery.

#### Results

Mean preoperative IOP of  $17.1 \pm 3.5$  mmHg significantly decreased by  $21.5 \pm 16.1\%$  to a mean post-operative IOP of  $13.2 \pm 2.8$  mmHg at 1 year after Trabectome surgery combined with phacoemulsification. A Kaplan-Meier survival analysis showed the success rate was  $53.5 \pm 4.7\%$  at 1 year. Regarding the subgroup analysis based on the grade of the blood-filling patterns in Schlemm's canal, there were no significant differences between the three groups in age ( $P = 0.078$ ), pre-operative MD ( $P = 0.677$ ), pre- and post-operative IOP ( $P = 0.803$  and  $0.206$ , respectively), pre- and post-operative number of glaucoma medications ( $P = 0.654$  and  $0.113$ , respectively), percentage IOP reduction ( $P = 0.428$ ), or surgical success rate ( $P = 0.150$ ), except in glaucoma type ( $P = 0.043$ ).

#### Conclusions

Trabectome surgery is an effective procedure for mild to moderate open-angle glaucoma cases with the expectation of mid-teen IOP in the Japanese population. However, the grade of the blood-filling patterns in Schlemm's canal is unlikely to be associated with the outcome of Trabectome surgery.

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## P-FS-264

### RECTIFYING A MISJUDGEMENT IN PERFORMING TRABECULECTOMY

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#### Purpose

To describe a case of patient with advanced primary angle closure glaucoma (PACG) following unnecessary trabeculectomy.

#### Methods

A 54-years-old male patient presented with a closed angle with presentation of tunnel vision in Humphrey visual field of right eye (RE). Visual acuity RE was 1.0 with no cataract. Patient had a peripheral iridectomy from previous hospital. Intraocular pressure (IOP) was 22 mmHg maintained with Prostaglandin analogue and Timolol eyedrop. Due to adverse effect and bad compliance in medication, trabeculectomy was performed.

#### Results

Series of early trabeculectomy complications occurred, which are hypotonia, shallow anterior chamber (AC), corneal edema and Descemet's tear. Several surgical attempts to reform AC were unsuccessful before finally decided to close the trabeculectomy and did phacoemulsification. During the surgery, we found the patient had a lens moving forward due to undetected zonulysis. Visual acuity was dropped to hand movement because of Descemet's tear and corneal edema. It finally resolved to 1.0 after 9 months with anti-inflammation and hyperosmotic agents eyedrop continuously. IOP was controlled without post-operative medication.

#### Conclusions

Zonulysis may undetected when a prolonged iridolenticular contact cause the lens to adhere to posterior of the iris. Despite the advanced of glaucoma condition, early lens removal can be beneficial to lower the IOP and open the angle at the same time before proceeding to trabeculectomy.

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## P-FS-265

### NEW WAY OF TRABECULECTOMY IN SURGICAL TREATMENT OF GLAUCOMA

Olga Kiseleva<sup>1</sup>, Alexander Bessmertny<sup>1</sup>, Anastasia Zhuravleva<sup>1</sup>, Elena Suleiman\*, Ksenia Lugovkina<sup>1</sup>

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#### Purpose

To demonstrate the efficacy and safety of a new modification of trabeculectomy in primary open-angle glaucoma (POAG) treatment.

#### Methods

27 patients (27 eyes) with advanced uncontrolled POAG were operated. All patients had the maximum hypotensive therapy. The following technique of the operation was used. After limbus-based conjunctival dissection in superior part of a limbus prepared scleral 2/3 thickness flap (4.0x7.0 mm). Performed of trabeculectomy (3.0x1.0 mm) and iridectomy. Further the edges scleral flap twisting in the middle by 180° so that the inner surface of its lower part was facing outwards. Edges were fixed it by seams to the sclera. Reposition of conjunctival flap was performed.

#### Results

Patients average follow-up of 11.7 months (range, 8-15 months). The mean IOP reduction stabilized on  $13.9 \pm 5.9$  mmHg at 6 months follow-up. At the last visit complete success rate defined IOP  $\leq 21$  mmHg without medications was 92.6% (25 eyes). Only 2 eyes returned to hypotensive medication. All patients had unchanged visual acuity and visual field after the surgery. Hyphemas (3 eyes – 11.1%) were the only major complication, and there resolved spontaneously. The parameters of a new fistula in postoperative period was assessed by method of ultrasound biomicroscopy in 3, 6, 9 and 12 months after surgery. In most cases the functionally active cavity without elements of scarring was determined in the surgery area.

#### Conclusions

The described technique seems simple, safe, effective and allows preserve a sustained hypotensive effect in long-term period after surgery with less intra- and postoperation complications.

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## P-FS-266

### REDUCTION OF INTRAOCULAR PRESSURE AND TONOGRAPHIC OUTFLOW FACILITY AFTER A MODIFIED 360-DEGREE SUTURE TRABECULOTOMY

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#### Purpose

A modified 360-degree suture trabeculotomy (S-LOT) involves making an incision along the entire circumference of the trabecular meshwork (TM) and inner wall of Schlemm canal (IWSC) using a suture<sup>1</sup>, and it was previously reported S-LOT was effectively reduced IOP for the patients with glaucoma<sup>2,3</sup>. In this study, we investigated the relationship between reduction of the intraocular pressure (IOP) and outflow resistance by measuring tonographic outflow facility (TOF).

#### Methods

20 eyes of 16 patients with glaucoma who underwent S-LOT at Hokkaido University Hospital between April 2017 and February 2018 were enrolled. The glaucoma in this study was diagnosed as: primary open angle glaucoma (14 eyes), uveitic glaucoma (4 eyes), exfoliation glaucoma (1 eye), and steroid induced glaucoma (1 eye). The mean age was  $56.0 \pm 9.1$  years and mean following-up period was  $12.9 \pm 1.9$  months. IOP and TOF were evaluated preoperatively, and postoperatively at 3 months after surgeries.

#### Results

The postoperative IOP ( $16.7 \pm 3.5$  mmHg) was significantly lower than preoperative IOP ( $22.3 \pm 8.7$  mmHg) (Wilcoxon signed-rank test;  $P < 0.01$ ), and postoperative TOF ( $0.28 \pm 0.11$   $\mu\text{l}/\text{min}/\text{mmHg}$ ) was significantly higher than preoperative TOF ( $0.21 \pm 0.10$   $\mu\text{l}/\text{min}/\text{mmHg}$ ) ( $P < 0.05$ ). There was a statistically significant correlation between preoperative TOF and preoperative IOP (Pearson correlation test;  $r = 0.61$ ,  $P < 0.05$ ), and between preoperative TOF and IOP reduction at 3 months after the surgeries ( $r = 0.57$ ,  $P < 0.05$ ). In addition, the changing rates of IOP and TOF showed a linear correlation ( $r = 0.44$ ,  $P < 0.05$ ).

#### Conclusions

S-LOT completely removed the outflow resistance between TM and IWSC by incising those circumferentially, consequently TOF increased and IOP decreased. The patients with glaucoma who have lower TOF may be suitable for S-LOT. Preoperative TOF could be a feasible predictor of surgical outcomes after S-LOT.

#### References

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2. Chin S, Nitta T, et al. Reduction of intraocular pressure using a modified 360-degree suture trabeculotomy technique in primary and secondary open-angle glaucoma: A pilot study. J Glaucoma. 2012; 21: 401-407
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**P-FS-267**

**A MULTI-CENTRE RETROSPECTIVE OBSERVATIONAL STUDY COMPARING BAERVELDT 350-101 AGAINST BAERVELDT 350-101 WITH INTRAOPERATIVE USE OF MITOMYCIN C**

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**Purpose**

To compare the clinical outcomes of Baerveldt tube implantation with and without the use of intra-operative Mitomycin-C (MMC).

**Methods**

A retrospective comparative consecutive case series of 107 eyes in 102 patients at the Sydney Eye Hospital and Royal Victorian Eye and Ear Hospital, Melbourne. 44 eyes of 44 patients underwent Baerveldt tube insertion with intraoperative MMC use (0.02-0.04%), compared with 59 eyes of 53 patients with no MMC use. Cases were only included from surgeons who routinely either always use, or never use MMC, to avoid case selection bias. A minimum of one year follow up was required. Primary outcome measures were change in intraocular pressure (IOP), number of glaucoma medications, visual acuity, and success and failure reported per the World Glaucoma Association guidelines.

**Results**

Mean age was 61 years and 67 patients (63%) were male. Mean follow up was 17.7 months. Baseline IOP in the MMC group was 26.6 +/- 11.8 mmHg while in the no-MMC was 22.0 +/- 8.5 mmHg ( $p = 0.02$ ). Final IOP in the MMC group was 11.6 +/- 4.6 mmHg (range 2-22) while in the no MMC group it was 12.5 +/- 4.7 mmHg (range 5-27) ( $p = 0.16$ ). The decrease in IOP between baseline and final follow up was 15.0 +/- 13.2 mmHg in the MMC group, and 9.5 +/- 8.6 mmHg in the no-MMC group ( $p = 0.02$ ). There was no significant difference in the mean decrease in number of glaucoma medications in each group (MMC, 1.8; no-MMC, 2.2). Rates of unqualified and qualified success (IOP < 18 and 30% reduction from baseline without meds and with meds respectively) were not significantly different between groups: for MMC vs no-MMC unqualified success was 28% vs 31% and qualified success was 42% vs 41% respectively. Mean visual acuity at baseline and final follow up were not significantly different between groups. Incidence of post-operative complications, and rate of return to surgery for complications was not statistically significantly different between the groups.

**Conclusions**

The MMC group was associated with a greater IOP lowering effect, however both procedures were associated with similar qualified and unqualified success rates at mean 18-month follow up. Post-operative complications in each group were similar.

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**P-FS-268**

**COMPARISON OF ANTERIOR CHAMBER FLARE AFTER TRABECULECTOMY, EX-PRESS SHUNT, OR MICRO-HOOK *ab interno* TRABECULOTOMY**

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**Purpose**

To compare anterior chamber flare (ACF) value among eyes treated with trabeculectomy (LEC), the EX-PRESS shunt (EXP), or microhook *ab interno* trabeculotomy ( $\mu$ LOT).

**Methods**

One hundred twenty-five eyes with primary open angle glaucoma that underwent LEC (n = 12), EXP (n = 75), or  $\mu$ LOT (n = 38) were included. The ACF measured by FM-600 flare meter (Kowaa Company Ltd., Nagoya, Japan) at preoperatively and 2 weeks, 1, 3, and 6 months postoperatively were collected by chart review. The ACF and the postoperative changes in ACF (postoperative minus preoperative values;  $\Delta$ ACF) were compared among 3 surgical groups by mixed effect regression models followed by post hoc tests.

**Results**

The interaction between postsurgical period and surgical procedure significantly associated with the ACF (p = 0.0004) and  $\Delta$ ACF (p = 0.0017) values. The mean  $\Delta$ ACF at postoperative 2 weeks was  $7.1 \pm 19.4$ ,  $15.4 \pm 27.3$ , and  $25.4 \pm 52.3$  pc/msec in EXP, LEC, and  $\mu$ LOT, respectively; difference was significant between EXP and  $\mu$ LOT (p = 0.0069). At postoperative 1 month and later,  $\Delta$ ACF was not significantly different among surgical groups. The mean  $\Delta$ ACF at postoperative 6 months was  $0.1 \pm 5.2$ ,  $0.9 \pm 6.9$ , and  $-0.2 \pm 1.9$  pc/msec in EXP, LEC, and  $\mu$ LOT, respectively.

**Conclusions**

EXP associated with less anterior chamber inflammation than  $\mu$ LOT in the early postoperative period.

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## P-FS-270

### END STAGE/ ADVANCED GLAUCOMA WITH FAILED SURGERY: A SHORT CASE SERIES OF OUR APPROACH

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#### Purpose

End stage glaucoma/ advanced glaucoma is not uncommon scenario in a tertiary speciality ophthalmology set up, with such cases being already having operated trabeculectomy. We present our approach to such cases.

#### Methods

Twenty one eyes, all of which were failed trabeculectomy and were on topical antiglaucoma medications, along with most on systemic medications when on presentation to us, were treated with retractorabeculectomy with mitomycin C (MMC) with collagen implant, with higher contact time for MMC (0.04% for 4 mins).

#### Results

Twenty one eyes of 21 patients, age range 8 yrs to 78 yrs were included in the study. MMC and ologen matrix implant was used in all cases, bevacuzimab was used to soak implant in 11 eyes. In seven eyes, phacotrabeulectomy was done. Follow up was from 10 months to 52 months. Two cases failed – both JOAG, one had been operated thrice, age 8 yrs, with IOP on presentation was over 40 on topical and systemic medications, other being 40 yrs, JOAG case operate twice, with IOP high on systemic and topical. In 19 eyes, we were able to maintain vision, and keep IOP under 12 mmHg, till the last follow up.

#### Conclusions

Using collagen matrix implant with high contact time of MMC along with anti-VEGF to soak matrix, for local regulation of fibrosis, collagen modulation and angiogenic modulation can play an important role in advanced glaucoma cases, specially with failed surgery.

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## P-FS-271

### AUGMENTED TRABECULECTOMY: OUR TECHNIQUE AND EXPERIENCE

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#### Purpose

Failure of trabeculectomy due to excessive scarring at conjunctival and *ab interno* site is a common problem. Use of collagen matrix implant (olo) along with antimetabolites ( MMC) in filtration surgery is an evolving practice. We studied the effect of anti-VEGF agent Bevacuzimab combined with implant and MMC in filtration surgery.

#### Methods

Fornix based standard trabeculectomy was done in 62 eyes of advanced glaucoma cases. MMC was used in concentration of 0.04% for 3 minutes and OLO implant was placed in sub-scleral and sub-conjunctival area. In addition, we used Bevacuzimab 0.1 ml to soak the implant at both locations, which acted as a depot.

#### Results

Sixty two eyes were studied, of age range 12 yrs to 76 yrs. Most cases had follow up of over 12 months. AC reformation was needed in seven cases, two needed conjunctival resuturing and use of intra-cameral gas(SF6) was needed in two cases for persistent choroidals. Vision was restored in all cases post surgery, by 6 to 8 weeks and target IOP range was achieved in all with medications. Two cases had scleral melting with exposure, where in autoconj-grafting was done, and three cases needed needling at later period.

#### Conclusions

Anti-VEGF can be an useful adjuvant with implant and MMC for advanced glaucoma cases, and its presumed action on fibrosis, wound modulation by affecting angiogenesis and its synergistic action with OLO implant (collagen modulation), can help fight the twin dangers of fibrosis and excessive vascularization.

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## P-FS-272

# OUTCOME OF PHACOTRABECULECTOMY WITH DOUBLE PLACEMENT OF COLLAGEN MATRIX IMPLANT AND MMC- 0.04% WITH/ WITHOUT ANTIVEGF AS WOUND MODULATION

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### Purpose

The purpose of this article is to analyze the results achieved in lowering intraocular pressure (IOP) after combined surgery (phacotrabeculectomy) with normal-dose mitomycin C (MMC- 0.04%, contact time 4 mins) using the Ologen Collagen Matrix (Ologen CM) implant, placed subsclerally and sub-conjunctivally, with in some cases, implant soaked in antivegf bevacuzimab.

### Methods

This retrospective study included 61 eyes who underwent filtering surgery combined with cataract surgery. Bevacuzimab as wound modulator was used in 35 eyes. Follow up was from 6 months to 50 months.

### Results

All cases underwent reduction in IOP, age group being 40- 78 yrs. Twenty four patients were using systemic medications before surgery. Twenty seven cases were CPACG, 28 CPOAG, three JOAG and three secondary glaucoma. Eleven cases needed AC reformation, six needed needling and one needed conjunctival resuturing. One case developed malignant glaucoma and needed PPV, this cases failed. Another case which failed was of JOAG, operated twice before and failed twice, with high IOP at presentation. One cases needed intra-cameral gas injection for CD. One case went into corneal decompensation. All cases were advanced, and we added topical medications in all cases gradually at 6 weeks after surgery to come closer to target IOP.

### Conclusions

Double modulation can be a promising future in advanced high risk cases of glaucoma, and addition of anti-VEGF can further help in such cases (Triple wound modulation). Normal dose MMC with contact time of 4 min maybe bit aggressive in such cases, however detailed proper randomized studies are needed for same. Strict IOP control was achieved in most cases, with addition of topical medication, and vision was maintained till follow up.

### References

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**P-FS-273**

**AQUEOUS VENTING FOR NEW NON-VALVED GLAUCOMA DRAINAGE DEVICE: IS IT EFFECTIVE? AN IN VITRO EXPERIMENTAL STUDY**

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**Purpose**

To study the aqueous venting efficacy of a new indigenously manufactured non-valved glaucoma drainage device, Aurolab Aqueous Drainage Implant (AADI) tube puncture or slit.

**Methods**

Multiple AADI tubes were collected (extra length cut off after the implantation), same was punctured of sizes like 0.38 mm (5-0 needle), double puncture (20G MVR blade) and slits of size (mm) 1, 2, 3 and 4. One end of the tube was ligated water tight and other end was connected to a pressure gated syringe pump to the measure Opening Pressure (OP) through the puncture or slit. OP was measured *in vitro* with or without breaking the fluid column.

**Results**

Mean initial Opening pressure (mmHg) was 87.16, 45.5, 54.16, 26.33 and 17 for slit sizes of 1mm, double puncture (MVR blade), 2, 3 and 4mm respectively. On subsequent flow the mean Opening pressure (mmHg) for same slit sizes was 78.16, 34.00, 25.66, 13.33 and 7.66 respectively and difference was significant ( $P < .05$ ). There was no flow through single or multiple 5-0 needle puncture even at 90 mmHg pressure.

**Conclusions**

Needle puncture, double slit with MVR or single 1-2mm not likely effective for venting of aqueous to manage initial high intraocular pressure (IOP) following a non-valved glaucoma drainage device implantation. A slit size between 2-3 mm is required for venting of aqueous, which may be effective *in vivo* also.

**References**

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## P-FS-274

# PILOT SERIES OF SOUTH EAST ASIAN EYES WHICH UNDERWENT COMBINED ISTENT TRABECULAR MICRO-BYPASS STENT IMPLANTATION AND CATARACT SURGERY

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### Purpose

To evaluate the safety and efficacy of combined iStent® trabecular micro-bypass device (Glaukos, Laguna Hills, CA) in eyes with primary angle closure disease.

### Methods

A multi-center prospective interventional case series of consecutive patients with primary angle closure (PAC) or primary angle closure glaucoma (PACG) who underwent iStent implantation with cataract surgery and required at least one glaucoma medication before the surgery. Post-operatively, patients were assessed on days 1 and 7, and months 1, 3, 6 and 12. The intraocular pressure (IOP), glaucoma medication use, visual acuity, iStent patency and the presence of complications were assessed at each visit. Complete success was defined as intraocular pressure (IOP) reduction  $\geq 20\%$  without the use of glaucoma medications.

### Results

37 eyes of 31 patients were included in this study, with two iStents implanted in 16 eyes and one iStent implanted in 21 eyes. At one year, post-operative IOP ( $14.8 \pm 3.94$  mmHg) is significantly decreased compared with pre-operative medicated ( $17.5 \pm 3.82$  mmHg,  $p = 0.01$ ) and unmedicated ( $24.6 \pm 3.41$  mmHg,  $P < 0.01$ ) IOP. 89.2% of the eyes achieved complete success. Pre-operative medicated IOP was a risk factor for failure (Hazard Ratio 3.45, 95% confidence interval 1.52-7.85,  $P < 0.01$ ), after adjustment for age, gender and race. iStent occlusion occurred in 10 eyes (27.0%). The most common post-operative complication was hyphema, which occurred in 7 eyes (18.9%), and there were no sight-threatening complications.

### Conclusions

Combined iStent implantation with cataract surgery was effective in lowering the IOP and the number of glaucoma medications for at least 12 months, with a favourable safety profile.

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## P-FS-276

### EARLY RESULTS OF MIGS WITH TRABECULAR MICRO-BYPASS STENT COMPARED TO AB INTERNO TRABECULOTOMY PERFORMED IN CONJUNCTION WITH CATARACT SURGERY

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#### Purpose

To compare the safety and effectiveness of trabecular micro bypass stent (iStent®) to that of *ab interno* trabeculotomy (*ab interno* LOT) performed with concomitant cataract surgery in eyes with open-angle glaucoma. Patients underwent both procedures, one in each eye.

#### Methods

Prospective, comparative, uncontrolled, interventional case series study enrolling subjects with open-angle glaucoma with concurrent cataract. *Ab interno* LOT was performed in eyes with progressive glaucomatous optic neuropathy in one eye, and iStent was implanted in the contralateral eye of the same subject. Intraocular pressure (IOP) before and after surgery, changes in anterior chamber flare and corneal endothelial cell count (ECC) were evaluated.

#### Results

Ten subjects were enrolled (mean age:  $74.5 \pm 8.2$  years). Mean medicated baseline IOP was 18.6 mmHg (iStent) and 18.7 mmHg (*ab interno* LOT). Mean final IOP at 6 months was 13.3 mmHg in the iStent eyes and 15.1 mmHg in the *ab interno* LOT eyes, representing 27% and 18%, respectively. The preoperative anterior chamber flare value in the *ab interno* LOT eyes was 9.6 pc/ms and returned to normal by 30 days postop with a value of 10.2 pc/ms. In the iStent eyes it was 9.9 pc/ms preop and by 7 days postop returned to normal (12.2 pc/ms at day 7 and by day 30 was  $8.5 \pm 4.2$  pc/ms) demonstrating less postop inflammation in the iStent eyes. ECC with *ab interno* LOT was significantly decreased from 2762/mm<sup>2</sup> to 2593/mm<sup>2</sup>; in contrast, ECC in iStent eyes remained essentially the same (from 2610/mm<sup>2</sup> to 2622/mm<sup>2</sup>).

#### Conclusions

In this cohort of Japanese patients, iStent and *ab interno* LOT are effective early postoperatively. Safety was observed to be more favorable in the iStent eyes based on early anterior chamber inflammation and ECC assessments. There are limited reports of the iStent procedure in Japanese patients with OAG. To our knowledge, this is one of the first reports.

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## P-FS-278

### EVALUATION OF SCHLEMM'S CANAL AND CILIARY BODY USING ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY AFTER AB INTERNO TRABECULAR SURGERIES

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#### Purpose

To examine Schlemm's canal (SC) and ciliary body by anterior segment optical coherence tomography (AS-OCT) <sup>1-3</sup> after *ab interno* trabecular surgeries.

#### Methods

In this retrospective observational case series 50 patients with glaucoma who underwent *ab interno* trabeculotomy using goniosynechiaelysis needle (nLOT) or 5-0 nylon (sLOT) were included. Sixty-three eyes of fifty consecutive patients (34 eyes with nLOT and 29 eyes with sLOT) were enrolled. Mean (SD) age was 69.2 (12.9) years, and 27 (54%) were male. Opening of SC, enlargement of SC, angle bleeding, chiliochoroidal effusion and cyclodialysis were diagnosed using AS-OCT in four quadrants 1 week after operations.

#### Results

SC opening was detected in nLOT and sLOT equally (66.7% and 83.3%, respectively  $p = 0.18$ ). Enlargement of SC in operated nasal quadrants were more frequently observed in nLOT (92.9%) than sLOT (45.5%) ( $p = 0.00021$ ). Angle bleeding and chiliochoroidal effusion was observed more in sLOT (51.7% and 55.2%, respectively) than nLOT (22.6% and 16.1%, respectively), (both  $P < 0.002$ ). Cyclodialysis was only detected in sLOT group (24.1%) ( $p = 0.0036$ ).

#### Conclusions

Using AS-OCT, enlargement of SC was seen more in nLOT. Postoperative complications of angle bleeding, chiliochoroidal effusion and cyclodialysis were seen more in sLOT.

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## P-FS-279

### SURGICAL OUTCOME OF GLAUCOMA FILTERING SURGERY IN VITRECTOMIZED EYES: EX-PRESS SHUNT VERSUS AHMED GLAUCOMA VALVE

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#### Purpose

Trabeculectomy is the most common procedure performed to reduce intraocular pressure (IOP) in patients with glaucoma that cannot be controlled with medical or laser treatment. However, various intra- and post-operative complications may occur. The EX-PRESS glaucoma filtration device (EX-PRESS) is a miniature stainless steel shunt that offers a simple and safe alternative to the classic trabeculectomy. The Ahmed glaucoma valve (AGV) consists of a silicone tube attached to a valve system designed to forestall early hypotony. Implantation of EX-PRESS or AGV maintains stable IOP during surgery, which potentially reduces serious complications commonly seen in trabeculectomy for previously vitrectomized eyes. However, the efficacy and safety of the 2 devices in vitrectomized patients remain unclear.

The purpose of this study was to compare the surgical outcome between EX-PRESS and AGV implantation in patients who had undergone prior vitrectomy.

#### Methods

We retrospectively analyzed 28 cases with medically uncontrolled glaucoma after vitrectomy; 14 eyes were treated with EX-PRESS (EX-PRESS group) and 14 eyes with AGV (AGV group). All subjects were followed for at least 12 months after surgery. Preoperative IOP was 24.7 mmHg versus 26.8 mmHg, and follow-up period was 54.4 months versus 21.6 months in EX-PRESS group versus AGV group, respectively. EX-PRESS model P-50 (Alcon Japan Laboratories, Fort Worth, TX, USA) was placed under a partial-thickness scleral flap. Mitomycin C was applied intraoperatively in all cases. AGV model FP7 (New World Medical Inc., Rancho Cucamonga, CA, USA) was positioned in the superior or inferior temporal quadrant, then the tube was inserted into the anterior chamber. Success rate and incidence of complications were compared between two groups. Surgical success was defined as an IOP between 4 and 18 mmHg.

#### Results

At 12 months after surgery, the success rate was 64% in EX-PRESS group versus 29% in AGV group (Kaplan-Meier survival curve analysis, log-rank test,  $p = 0.08$ ). There were no significant differences between two groups with respect to excess filtration, hyphema, vitreous hemorrhage, reoperation of glaucoma. One eye in AGV group whereas no eyes in Ex-PRESS group lost light perception. Expulsive hemorrhage did not occur in both groups.

#### Conclusions

Implantation of EX-PRESS may be a safer and more effective procedure than that of AGV for glaucoma patients with vitrectomized eyes.

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## P-FS-281

### EFFECTS OF SUTURE TRABECULOTOMY *AB INTERNO* ON POSTURE-INDUCED INTRAOCULAR PRESSURE CHANGES IN EYES WITH OPEN ANGLE GLAUCOMA

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#### Purpose

To determine whether suture trabeculotomy *ab interno* affects postural-induced changes in intraocular pressure (IOP), and whether it is maintained.

#### Methods

Twenty-three eyes of 23 patients with open-angle glaucoma (primary open angle glaucoma in 17 eyes and exfoliation glaucoma in 6 eyes) who were scheduled for their initial suture trabeculotomy *ab interno* were prospectively examined. The entire circumference of Schlemm's canal was incised in all cases. The IOP was measured in the sitting and the lateral decubitus position with an ICare rebound tonometer before, 1, 2 and 3 months after suture trabeculotomy *ab interno* procedure.

#### Results

The mean baseline IOP measured with the ICare tonometer was  $15.4 \pm 3.0$  mmHg in the sitting position and  $17.7 \pm 3.4$  mmHg in the lateral decubitus position ( $P < 0.01$ ). This postural IOP difference,  $+2.3 \pm 0.3$  mmHg, was not significantly reduced to  $+2.1 \pm 0.3$  mmHg at 1 month,  $+2.1 \pm 0.3$  mmHg at 2 months, and  $+2.2 \pm 0.4$  mmHg at 3 months after surgery ( $p = 0.93$ ,  $p = 0.89$ ,  $p = 0.92$ , respectively). The mean IOP in the sitting position decreased significantly to 12.0 mmHg at 1 month, 12.2 mmHg at 2 months, and 12.2 mmHg at 3 months after surgery ( $p < 0.01$  at each time point).

#### Conclusions

Our results indicate that suture trabeculotomy *ab interno* for open angle glaucoma does not affect the posture-induced changes in the IOP.

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## P-FS-282

### ASSESSMENT OF GLAUCOMA PROGRESSION AFTER XEN GEL STENT IMPLANTATION - PRELIMINARY RESULTS

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#### Purpose

To evaluate glaucoma progression after XEN Gel Stent implantation by the means of visual field (VF) testing and retinal nerve fiber layer (RNFL) thickness measurements in comparison to the pre-surgical glaucoma stage (classified by Hodapp).

#### Methods

39 open-angle glaucoma patients planned for XEN implantation were included in this prospective study. They were divided in 3 groups based on the Hodapp classification of pre-operative VF (groups were marked: H1, H2, H3 respectively for early, moderate and advanced glaucomatous loss). The control group consisted of the other eye of each patient except for one case of bilateral implantation. They were marked analogically to the XEN group (C1, C2, C3). All patients underwent a complete ophthalmological examination including slit-lamp biomicroscopy, fundoscopy and gonioscopy as well as VF testing using standard white on white VF and RNFL thickness using Spectralis OCT. In the follow-up period, additionally to the standard ophthalmological examination, VF and RNFL thickness examinations were performed in the 3rd and 6th month to assess glaucoma progression.

#### Results

Therapeutical failure was observed in 3 patients who required further glaucoma surgery and they were excluded from the study. Numbers of subjects in each group were as follows: 10, 15 and 11 for H1, H2 and H3 in the study subgroups, and 10, 15 and 9 for C1, C2 and C3 in the control subgroups respectively. There were no differences observed in the sex and age distribution across the matched groups. No progression or statistical differences were detected in the VF measures (Mean Deviation, Pattern Standard Deviation), and both global and local RNFL thickness during the 6-month follow-up period in both XEN and control group ( $p > 0.05$  for both groups). Additionally, no difference in ganglion cell complex (GCC) thickness was recorded in the surgical subgroups while tendency towards deterioration was observed in the control ones ( $P < 0.05$ ). Interestingly, from the 3rd month after XEN implantation there is a tendency of RNFL thickness to increase ( $p = 0.05$ ), however this effect was not observed in the control group ( $p > 0.05$ ).

#### Conclusions

There is no VF deterioration effect after XEN Gel Stent implantation even in the patients with severely damaged glaucomatous visual fields. The tendency of RNFL thickness to increase may be the effect of intraocular pressure decrease resulting in filling in the vessels, anterior shift of lamina cribrosa and tissue remodelling in the area of the optic nerve head.

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## **P-FS-283** **15-YEAR TRABECULECTOMY RESULTS IN A SINGLE CENTRE**

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Jasper Wong\*

### **Purpose**

To evaluate the long-term outcomes of trabeculectomy in a single tertiary center, particularly in Chinese populations.

### **Methods**

It is a retrospective study. Medical records of patients with trabeculectomy done in the past 15 years are reviewed. Outcome measurements included post-operative intraocular pressure (IOP), IOP reduction, number of medications used and medication reduction. Complications were also evaluated, such as hypotony, choroidal effusion, bleb leak, bleb failure, blebitis, endophthalmitis etc. The long term survival rate was also evaluated.

### **Results**

Under formal statistical analysis in an attempt to include more data for detailed analysis, including differences in surgical methods (e.g. anti-metabolite use). The temporary impression suggested that the data was in line with most published data.

### **Conclusions**

Still under formal statistical analysis. Temporary impression suggested that our results are comparable with the published data. Further conclusions on differences in outcomes between variations in surgical methods would depend on results of subgroup analysis.

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**P-FS-284**

**CO<sub>2</sub> LASER-ASSISTED SCLERECTOMY SURGERY (CLASS) IN EXFOLIATIVE GLAUCOMA. 2-YEAR FOLLOW-UP**

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**Purpose**

To report on the efficacy and safety of CO<sub>2</sub> laser-assisted sclerectomy surgery (CLASS) in exfoliative glaucoma.

**Methods**

32 pseudophakic patients underwent CLASS for exfoliative glaucoma and were followed up for 24 months. 'Complete success' was defined as intraocular pressure (IOP) between 10 and 18 mmHg and reduced by at least 30% from the baseline without medications, while 'qualified success' was compliant with the above criteria, with or without the medications.

**Results**

Baseline IOP was  $22.5 \pm 2$  mmHg with average use of  $3 \pm 1$  glaucoma medications. At the end of the follow-up period the mean IOP reduction rate was  $26.2 \pm 12.8\%$  ( $P < 0.001$ ) and average use of the medications was  $1.3 \pm 1.3$  (range 0-3). The complete success rate was 34% (11 patients), while the qualified success rate was 72% (23 patients). 6 patients (19%) developed early complications, including hyphema (1 patient; 3%), bleb leakage with choroidal detachment (1 patient; 3%), anterior uveitis (1 patient 3%) and iris incarceration (3 patients; 9%). 9 patients (28%) failed to achieve the target IOP despite adjuvant medications and they required further surgical intervention between 6 and 18 months after the CLASS. Mean endothelial cell density (ECD) loss was  $1.4 \pm 1.4\%$  ( $P < 0.001$ ). Neither the change in mean total corneal refractive power astigmatism in a 3-mm zone ( $0.0 \pm 0.1$  D;  $p = 0.075$ ), nor the change in the best corrected visual acuity ( $0.2 \pm 0.2$  lines; range 0– 2 lines;  $p = 0.126$ ) were statistically significant.

**Conclusions**

CLASS in exfoliative glaucoma shows sub-maximal hypotensive effect and offers the reduction in number of medications up to 24 months. The technique produces a small number of complications and a low ECD loss. It doesn't induce significant postsurgical astigmatism or visual acuity deterioration. Therefore, CLASS may be considered in patients with early to moderate glaucoma neuropathy and, especially, with a compromised corneal endothelium.

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## P-FS-285

### SUCCESS OF MODIFIED TRABECULOTOMY IN THE MANAGEMENT OF PRIMARY CONGENITAL GLAUCOMA

Ilgaz Yalvac\*

#### Purpose

To determine the efficacy and safety of modified trabeculotomy in congenital glaucoma patients operated on within first year of life.

#### Methods

A total of 20 eyes of 10 patients were included. Preoperative and postoperative intraocular pressures (IOP), corneal clarity, diameter, axial length, success rates, and complications were evaluated in this study.

#### Results

Results The mean follow-up was  $38.4 \pm 1.8$  months (range 12–48 months). Mean IOP was  $33.2 \pm 0.28$  mmHg (range 23–50 mmHg) preoperatively. At the final follow-up visit, the mean IOP was  $21.4 \pm 7.34$  mmHg (range 8–38 mmHg). Pre- and postoperative IOP differences were statistically significant at all examination periods ( $P < 0.001$ ). A 12-, 24-, and 36-month success rates were 85%, 82%, and 74%, respectively. Survival analysis regarding to gender, preoperative corneal diameter and consanguinity were not statistically significant.

Only preoperative axial length was a statistically significant parameter ( $P < 0.02$ )

#### Conclusions

Modified trabeculotomy is a safe and effective procedure for congenital glaucoma patients when operated within 1 year of birth. It has a favourable IOP control and a low rate of complications.

#### References

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## P-FS-286

### SHORT TERM OUTCOME OF MICROHOOK IN PEDIATRIC GLAUCOMA

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#### Purpose

Trabeculotomy has been commonly performed for childhood glaucoma to reduce the intraocular pressure (IOP). Trabeculotomy has an advantage that it can be performed even if it is difficult to see through the cornea, but it is necessary to prepare conjunctival valves and scleral valves at the time of the operation. Microhook *ab interno* trabeculotomy ( $\mu$ LOT) has been reported as a novel minimal invasive glaucoma surgery. In this study, we report short term outcome of  $\mu$ LOT in childhood glaucoma patients.

#### Methods

This retrospective observational case series study included 7 eyes of 6 childhood glaucoma patients, the mean age was  $6.7 \pm 5.1$  years (0 to 13 years). The all patients underwent  $\mu$ LOT at the Ehime University Hospital from August 2017 to April 2018, and were able to observe for more than 2 months. The intraocular pressure before and after surgery, eye drop scores, and postoperative complications were examined.

#### Results

At the surgery, the trabecular meshwork was sufficiently visible under the gonioscopy lens. The average follow-up period was  $5.5 \pm 3.4$  months. The clinical entities were primary congenital glaucoma in 1 eye, glaucoma associated with non-acquired ocular anomalies in 1 eye, glaucoma associated with non-acquired systemic disease or syndrome in 2 eyes, and juvenile open angle glaucoma in 3 eyes. The intraocular pressure was  $34.4 \pm 11.0$  mmHg before surgery, and  $22.1 \pm 7.7$  mmHg for 1 week,  $20.5 \pm 9.8$  mmHg for 1 month,  $17.6 \pm 5.1$  mmHg for 2 months after surgery. The intraocular pressure at 2 months after surgery significantly decreased than before surgery ( $p = 0.0204$ ). The instillation score was  $1.3 \pm 1.3$  after surgery and  $2.4 \pm 1.4$  before surgery ( $p = 0.103$ ). Postoperative complications were seen in the anterior chamber bleeding in 4 eyes (57.1%) temporarily. Additional glaucoma surgeries were required in 2 eyes (28.5%)

#### Conclusions

The results suggested that microhook *ab interno* trabeculotomy for childhood glaucoma may be a safe and useful technique.

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**P-FS-287**

**THE EFFICACY AND SAFETY OF MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION (MP-CPC) IN JAPANESE REFRACTORY GLAUCOMA**

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**Purpose**

The traditional transscleral cyclophotocoagulation is an established method of treatment for refractory glaucoma, but may induce significant complications such as severe inflammation, intraocular bleeding, or phthisis bulbi. Micropulse transscleral cyclophotocoagulation (MP-CPC; MicroPulse®) is a new glaucoma laser treatment to lower intraocular pressure (IOP). The purpose of this study is to evaluate the efficacy and safety of MP-CPC.

**Methods**

We retrospectively investigated patients who underwent MP-CPC approved by the institutional review boards of the University of Tokyo from July 2017 to May 2018. MP-CPC procedure was delivered with 2000 mW applied for 80 seconds. The duty cycle was 31.3 %, which translated to 0.5 ms of “on time” and 1.1 ms of “off time. IOP, and medication score were measured at baseline and at 1 day, 2 week, 1, 3, and 6 months after the treatment. We also evaluated complications after MP-CPC.

**Results**

Twenty-nine eyes of 28 patients ( $66.7 \pm 19.3$  years old) were enrolled in the current study. The mean IOP was  $35.4 \pm 9.2$  mmHg at baseline. After the treatment the mean IOP was  $28.5 \pm 9.1$  mmHg at 1 day and  $23.1 \pm 9.6$  mmHg at 3 months ( $P < 0.05$ , paired *t*-test with Bonferroni correction). The medication score before the treatment was  $4.2 \pm 1.0$  and decreased to  $2.9 \pm 2.0$  at 3 months ( $P < 0.05$ , paired *t*-test with Bonferroni correction). About visual acuity, there was no significant difference between before and after MP-CPC. One patient occurred vitreous hemorrhage after MP-CPC, but other complications such as phthisis bulbi, deposition of fibrin, bleeding, or obvious cystic choroidal detachment in the posterior was not happened.

**Conclusions**

In refractory glaucoma, MP-CPC was effective and safe to lower the IOP and medication score. No severe complications were occurred. This treatment was relatively easy and can be repeated several times if necessary.

**References**

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## P-FS-288

# INTRAOCULAR PRESSURE CHANGES DURING ZIEMER LDV Z8 FEMTOSECOND LASER PRETREATMENT BETWEEN EYES WITH PRIMARY ANGLE CLOSURE DISEASE AND NORMAL EYES

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### Purpose

Hypothesis: Intraocular pressure (IOP) in primary angle closure/glaucoma patients increases more than those without glaucoma during femtosecond laser pre-treatment of cataract but that there will be no long term sequelae (i.e. optic nerve head damage).

Specific objectives: Quantify and compare changes in IOP during Ziemer LDV Z8 FLACS pre-treatment of cataract between primary angle closure disease (PACD) and normal eyes.

### Methods

Patients with clinically stable PACD who had undergone laser peripheral iridotomies and normal patients underwent FLACS.

Pre-treatment was performed using a fluid-filled optical docking system (Ziemer ZDVZ8). With the patient supine, the IOP was measured at 3 time points using an applanation tonometer (Tonopen, Reichert-Jung, Depew, NY, USA) – prior to administration of suction, with the suction from the platform on and 1 minute after laser pre-treatment.

Optical coherence tomography and Humphrey visual fields were also performed pre and post operatively at specified time points.

### Results

There were 41 eyes of which 53.7% had PACD. The mean age of the patients was 71.1 years  $\pm$  6.4 (SD) (range 59 to 86 years). The mean baseline IOP was 18.0 mmHg  $\pm$  2.2 (SD) in PACD eyes and 16.0  $\pm$  5.2 mmHg in normal eyes ( $P = .08$ ).

In PACD eyes, the mean IOP before, during and after suction was 21.1  $\pm$  5.3 mmHg (range 12 to 37 mmHg), 79.1  $\pm$  14.9 mmHg (range 42 to 89 mmHg) and 18.5  $\pm$  5.9 (range 8 to 33 mmHg) respectively.

In normal eyes, the mean IOP before, during and after suction was 18.9  $\pm$  1.4 mmHg (range 17 to 21 mmHg), 71.9  $\pm$  13.0 mmHg (range 45 to 86 mmHg) and 15.9  $\pm$  4.0 (range 10 to 21 mmHg) respectively.

Between the 2 groups, the mean difference in IOP before and during suction was 5.0  $\pm$  3.9 mmHg ( $P < .01$ , Wilcoxon signed-rank test). The mean difference between IOP during and after suction was -3.7  $\pm$  1.9 mmHg ( $P < .01$ , Wilcoxon signed-rank test). The mean suction duration was 203  $\pm$  16 seconds (range 175 to 235 seconds).

The HVF for PACD patients preoperatively had a mean MD of -5.6  $\pm$  4.5 and mean PSD of 2.5  $\pm$  1.2. 6 months post operatively, the mean MD was -2.5  $\pm$  2.5 and mean PSD of 3.0  $\pm$  3.2 ( $P = 0.4$ )

### Conclusions

Femtosecond pre-treatment caused a slightly greater transient rise in IOP in PACD eyes compared to normal eyes during and after vacuum application. This was well tolerated short term with functional

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tests showing no significant damage however, long-term implications for angle closure eyes are still unknown.

### References

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**P-FS-289**

**TWO-YEAR OUTCOMES OF PENETRATING CANALOPLASTY FOR THE TREATMENT OF PRIMARY OPEN ANGLE GLAUCOMA**

Cong Ye<sup>1</sup>, Huanhuan Cheng<sup>1</sup>, Yanqian Xie<sup>1</sup>, Rongrong Le<sup>1</sup>, Shaodan Zhang<sup>1</sup>, Yuanbo Liang<sup>1</sup>

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**Purpose**

Penetrating canaloplasty is a new surgical procedure which combines canaloplasty and trabeculectomy with the scleral flap tightly sutured to avoid bleb formation.<sup>1</sup> This study is to compare the 2-year surgical outcomes between penetrating canaloplasty and canaloplasty for the treatment of primary open angle glaucoma (POAG).

**Methods**

Totally 37 eyes with POAG were recruited. 20 of them received penetrating canaloplasty and the rest received canaloplasty, based on the subject's preference. Pre-operative intraocular pressure (IOP) and IOP at day 1, week 1, month 1, month 3, month 6, year 1, and year 2 post-operatively were compared. Complete and qualified success were defined as post-operative IOP  $\leq 21$  mmHg and IOP reduction  $\geq 20\%$  without and with topical IOP lowering eye drops, respectively. Surgical complications were also compared between the two groups.

**Results**

Both surgical procedures could reduce the IOP significantly ( $P < 0.05$ ). The differences of IOP values were compared at different time points (Table 1). Eyes received penetrating canaloplasty had a lower IOP than those received canaloplasty ( $16.4 \pm 2.3$  vs  $20.2 \pm 2.3$ ,  $p = 0.04$ ) at 2 years post-operatively, while the numbers of topical IOP lowering eye drops used at 2 year after surgeries were 0 vs  $0.4 \pm 0.5$  respective for the two group. The complete and qualified success rates were also higher in the penetrating canaloplasty group (94.6% vs 76.5% and 94.6% vs 82.4%), based on the latest IOP measurements for all 37 eyes. Hyphema (30% vs 11.8%) and hypotony (5% vs 0%) were more commonly seen in the eyes received penetrating canaloplasty.

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## Image

Table 1

		Penetrating canaloplasty n=20	Canaloplasty n=17	P-value
Pre-operative IOP (mmHg) n=37		33.8±11.7 on 2.8±0.9 drugs	28.5±11.7 on 2.8±1.0 drugs	0.128
Post-operative IOP (mmHg)	Day 1 n=37	9.8±2.6	16.0±6.8	0.001
	Week 1 n=37	15.4±6.8	21.8±10.3	0.029
	Month 1 n=30	19.3±6.4	17.9±5.0	0.500
	Month 3 n=24	15.2±4.0 on 0.3±1.1 drugs	17.7±4.9 on 0.3±0.9 drugs	0.188
	Month 6 n=19	14.9±2.6 on 0 drug	16.5±3.2 on 0.9±1.5 drugs	0.235
	Year 1 n=15	12.7±2.8 on 0 drug	14.4±2.8 on 0.3±0.5 drugs	0.268
	Year 2 n=9	16.4±2.3 on 0 drug	20.2±2.3 on 0.4±0.5 drugs	0.040

## Conclusions

Penetrating canaloplasty may be considered as an effective and safe surgical procedure for the treatment of POAG, although further randomized controlled trials are indicated.

## References

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**P-FS-290**

**EVALUATION OF THE SCHLEMM'S CANAL AND CILIARY BODY USING AS-OCT AFTER ISTENT TRABECULAR MICRO-BYPASS STENT FOR OPEN ANGLE GLAUCOMA**

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**Purpose**

To examine the Schlemm's canal (SC) and ciliary body by anterior segment optical coherence tomography (AS-OCT) after iStent trabecular micro-bypass stent for open angle glaucoma.

**Methods**

In this retrospective observational case series 12 eyes of 10 patients who underwent iStent trabecular micro-bypass stent for open-angle glaucoma were included. Single iStent was inserted to SC during small-incision cataract surgery at the nasal quadrant in all cases. Enlargement of SC, chiliochoroidal effusion and cyclodialysis were diagnosed using AS-OCT (CASIA SS-1000, Tomey, Japan) in four quadrants 1 week after operation. Preoperative intraocular pressure (IOP), postoperative IOP and numbers of antiglaucoma medications at 1 week, 1, 3, 6, 12 months were recorded.

**Results**

Preoperative IOP ( $19.4 \pm 2.6$  mmHg) decreased significantly to  $14.2 \pm 2.2$ ,  $13.9 \pm 3.4$ ,  $14.5 \pm 3.2$ ,  $14.1 \pm 2.9$  mmHg at the 1, 3, 6 months and 1 year after surgeries (all  $P < 0.01$ ), respectively. The preoperative number of glaucoma medications of  $2.8 \pm 1.2$  decreased significantly to  $1.6 \pm 1.2$ ,  $1.4 \pm 1.4$  and  $1.3 \pm 1.5$  at the 3, 6 month and 1 year (all  $P < 0.05$ ), except the 1 month ( $2.8 \pm 1.7$ ). None of enlargement of SC, chiliochoroidal effusion nor cyclodialysis were observed using AS-OCT.

**Conclusions**

Although IOP was successfully reduced after iStent trabecular micro-bypass stent surgery for open-angle glaucoma, no obvious change of SC or ciliary body was observed using AS-OCT.

**References**

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**P-FS-291**

**TWO YEARS FOLLOW-UP OF EXPRESS® IMPLANTATION SURGERY FOR GLAUCOMA IN HIGH MYOPIC EYES**

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**Purpose**

We prospectively evaluated the 2-year outcome of Ex-PRESS® glaucoma filtration surgery for the treatment of open-angle glaucoma in eyes with pathological myopia.

**Methods**

This study included 28 pathological myopic eyes (axial length  $\geq 26.5$  mm) of 21 patients with open-angle glaucoma. Each eye received EX-PRESS® filtration surgery. A follow-up examination was performed at 3, 6, 12, 18 and 24 months after surgery. The main outcome measures were change of intraocular pressure (IOP), reduced medication score, postoperative visual acuity, and postoperative complication rate.

**Results**

The IOP was significantly reduced at all postoperative follow-up examination ( $P < 0.001$ ). Visual acuity was maintained and the number of IOP-lowering medications was significantly reduced at the all point of follow-up examination compared to the baseline. 6 eyes were needed more than 2 IOP lowering medications after surgery. 3 eyes were required additional IOP lowering surgery during follow-up period. Serious postoperative complications were not observed.

**Conclusions**

Analysis of the 2-year efficacy and safety of EX-PRESS® filtration surgery showed favorable results in eyes with pathological myopia, which is in line with previous studies with non-high myopic eyes.

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## P-FS-292

### LONG TERM OUTCOMES OF AHMED VALVE IMPLANTATION FOR GLAUCOMA AFTER VITREORETINAL SURGERY

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#### Purpose

To investigate long-term success of Ahmed glaucoma valve (AGV) implantation for the management of refractory glaucoma after vitreoretinal surgery.

#### Methods

Twenty medically uncontrolled glaucoma patients before 23 G vitrectomy for various reasons underwent primary superior AGV implantation.

The control of intraocular pressure (IOP), preoperative and postoperative best-corrected visual acuity, optic nerve examinations were evaluated preoperatively and at multiple follow-up visits postoperatively. Preoperative and postoperative use of anti-glaucomatous medications, the development of intraoperative and postoperative complications were evaluated during the follow-up. Success of the treatment was defined as patients achieving intraocular pressure (IOP) levels between 6 and 21 mmHg with or without additional anti glaucomatous medications.

#### Results

The average follow-up after AGV implantation was 22.2 months (range: 12-48 months). Mean preoperative IOP was  $29.2 \pm 6.6$  mmHg, mean first day of postoperative IOP was  $13.3 \pm 5.2$  and mean of last visit of postoperative IOP was  $17.1 \pm 6.8$  mmHg. ( $P < 0.001$ ). During the follow-up period, visual acuity increased in 9 patients, decreased in 5 patients, and there was no change in 7 patients. There was a statistically significant difference between preoperative ( $3.48 \pm 1.5$ ) and postoperative ( $0.48 \pm 0.81$ ) anti-glaucomatous medication use ( $P < 0.001$ ). In all patients, there was a decrease in the number of medications after the AGV implantation. The complications that occurred were hypotonia in three eyes, one of them needed to be removal of AGV implantation and two of them needed to be revised.

#### Conclusions

Long term success of AGV implantation is safe and effective in reducing IOP, decreasing the number of glaucoma medications with glaucoma after vitreoretinal surgery in long term.

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**P-FS-293**

**MALIGNANT GLAUCOMA FOLLOWING TRABECULECTOMY IN PROPTOTIC EYE – A CASE REPORT**

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**Purpose**

Malignant glaucoma is one of the most feared complication related to its visual threat. It is still one of the most challenging problem faced by ophthalmologist. We present a case of a patient with malignant glaucoma following trabeculectomy co-existed with proptotic eye.

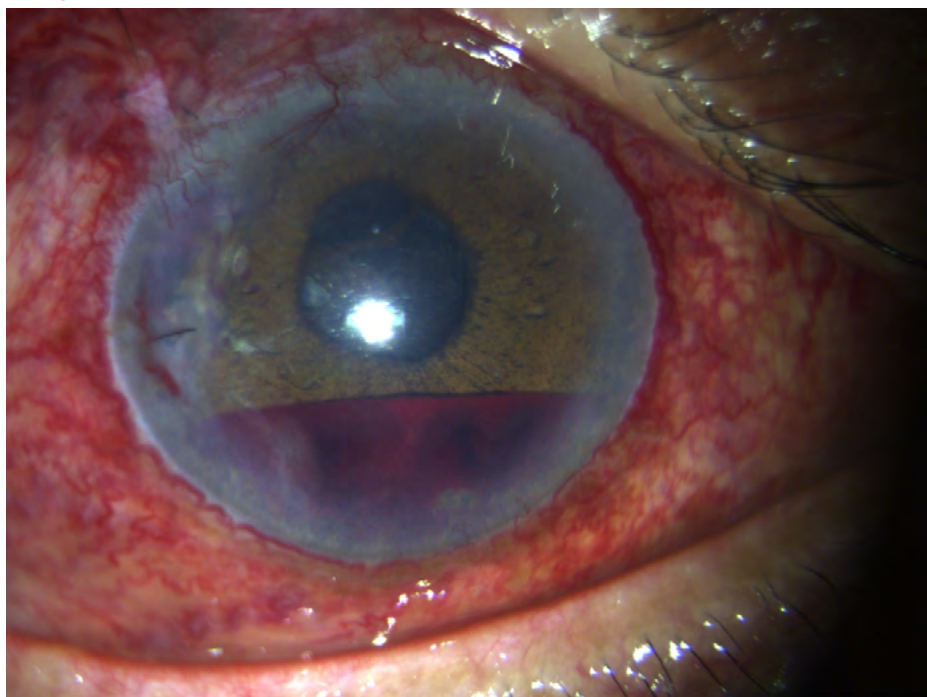
**Methods**

This is a case report of a 55 year-old male referred from other hospital due to flat anterior chamber following trabeculectomy. The right eye was proptotic and ocular motility was restricted. It also showed numerous tortuous and engorged episcleral vessels. The visual acuity was half meter finger counting. The initial intraocular pressure (IOP) was 14 with maximum oral and topical antiglaucoma medications. The ultrasound was within normal limit. Anterior chamber reformation was performed two times since the anterior chamber became flat recurrently. During the last surgery, the eye became firm and patient was in pain. The iris was accidentally touched, thus there was hyphema and the anterior chamber remained shallow after the last surgery and we suspected malignant glaucoma.

**Results**

The ultrasound biomicroscopy (UBM) examination was performed and showed anterior rotation of iris-lens diaphragm which confirmed malignant glaucoma. Orbital CT-scan revealed proptotic right eye with enlargement of rectus muscles suspected thyroid eye disease (TED). Cerebral angiography was negative for arteriovenous fistula. The last IOP was 13 with topical medication, and he was planned to undergo Nd-YAG laser hyaloidotomy.

**Image**



HAAG-STREIT  
DIAGNOSTICS

### Conclusions

Appropriate diagnostic tests should be ordered to diagnose which would help determine appropriate treatment since malignant glaucoma and raised episcleral venous pressure due to TED would cause elevated IOP by different mechanism.

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## P-FS-295 NANOPHTHALMOS - A SURVIVAL GUIDE

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### Purpose

Nanophthalmos can be defined as an axial length of two standard deviations below average or as an extremely short eye with a shallow anterior chamber. There are an array of challenges associated with the pre-operative assessment, intra-operative surgical technique and post operative care of Cataract surgery in Nanophthalmos patients.

### Methods

Eight consecutive nanophthalmic eyes undergoing cataract surgery were analysed. The pre-operative assessment including; UBM, Pentacam, Anterior segment OCT and IOL Master were utilised to address the uncertainty that occurs with IOL power calculation in short eyes. A shallow anterior chamber, small corneal diameter, positive posterior pressure and high dioptric IOL requirements, can all be hazardous to the endothelium, iris, anterior and posterior capsule. Surgical techniques including scleral incisions, anterior chamber maintainer, increased bottle height and anterior surgical incision placement were used in all cases to minimize the risk of these and choroidal or uveal effusion.

### Results

Eight eyes of four patients (range 47-80 years) were included. The mean axial length was 20.15mm (range 19.75-20.43mm). All 8 eyes underwent posterior lens insertion. Cataract surgery resulted in improvement of  $\geq 2$  Snellen lines in 5 eyes (62.5%). One eye achieved the predicted refractive outcome, the other 7 eyes were slightly more myopic than predicted (greatest difference being -1.3 more myopic than predicted). During the entire follow-up period, no complications of uveal effusion, aqueous misdirection or CME occurred. Two eyes were found to have had angle closure prior to surgery and one eye had an angle cyst. (Intraoperative Technique for Nanophthalmos - Please see pictures of OCTs, UBMs and intraoperative videos)

### Conclusions

In nanophthalmos eyes it is important to use -Multiformula IOL calculations including Barrett and Hoffer Q and Combine as much information as possible in the pre-operative assessment including Pentacam, refraction, Anterior segment OCT and UBM to achieve the best visual outcome for patients.

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## P-FS-296

### MANCHESTER ISTENT STUDY: 7-YEAR RESULTS AND COST ANALYSIS

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#### Purpose

We report the first published 7 year outcomes of combined phacoemulsification and iStent implantation in patients with open angle glaucoma. The IOP lowering efficacy, safety profile and visual outcomes are analysed and presented alongside a model of cost-effectiveness within the UK health system.

#### Methods

This study was a prospective, uncontrolled, interventional case series. Forty-one patients underwent ab-interno single iStent implantation alongside phacoemulsification surgery. The principal outcome measures were IOP reduction and number of glaucoma drops. The original Manchester iStent Study<sup>1</sup> outlined 3 year outcomes for this cohort. Our 7 year results provides data for the longest follow up period after iStent implantation published to date.<sup>2</sup> Inclusion criteria were mild to moderate open angle glaucoma and the current use of at least one glaucoma medication. Patients with previous glaucoma surgery were excluded.

#### Results

The mean preoperative IOP was 21.24 mmHg (4.92 SD) with an average of 2.17 (0.95 SD) drops per patient and 6 patients on oral acetazolamide. The lowest recorded IOP occurred at 24 months with a 5.12 mmHg absolute reduction yielding a mean IOP of 16.12mmHg (2.96 SD) on 1.02 (1.15 SD) drops. This 5.12 mmHg IOP reduction was maintained at 7 years, with mean IOP of 16.13 mmHg (3.29 SD) on 1.67 (1.18 SD) drops.

The mean preoperative vs final follow up clinical parameters were as follows: logMAR visual acuity 0.52 vs 0.33, cup to disc ratio 0.67 vs 0.70, visual field index 79% vs 77%, mean deviation -9.41 vs -8.13, and pattern standard deviation 5.65 vs 6.06. The mean number of clinic visits per year was 1.5 at year 7.

Ten patients passed away during the course of the study and five required further glaucoma surgery. One patient had hyphaema and there were no long term complications.

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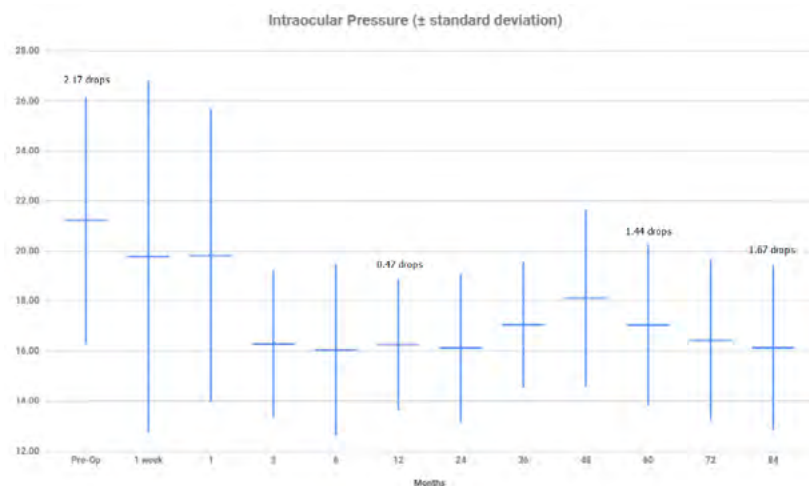
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## Image



## Conclusions

We demonstrate the 7 year safety and efficacy of iStent implantation at the time of cataract surgery for mild to moderate glaucoma. A 5.12 mmHg drop in IOP is maintained over 7 years with an average reduction of 0.9 drops per patient over the course of the study. Progression of disc cupping and VF loss is entirely halted except for 12% of patients that required further glaucoma surgery.

A cost-effectiveness analysis taking into account the additional expense of iStent implantation and increased number of follow ups in year one versus the reduction of hypotensive drops and number of clinic visits from year 2 onwards is being undertaken and will be presented.

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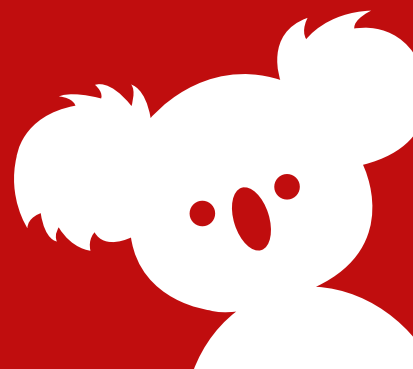
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I

# INDEX



<b>PL-S-1</b>	BILATERAL CYSTOID MACULAR EDEMA FOLLOWING SLT BOTH EYES	2	
<b>PL-S-2</b>	'A STICKY SITUATION' - VITREOUS OCCLUSION OF TUBE OF A GLAUCOMA DRAINAGE IMPLANT	5	
<b>PL-S-3</b>	UNUSUAL CASE OF PUPILLARY BLOCK SIXTEEN YEARS AFTER PHACOEMULSIFICATION: A DIAGNOSTIC CHALLENGE!	7	
<b>PL-S-4</b>	A CASE REPORT OF SECONDARY ANGLE CLOSURE GLAUCOMA WITH MICROSPHEROPHAKIA IN A YOUNG FEMALE	10	
<b>PL-S-5</b>	CASE OF ACQUIRED ANIRIDIA WITH RAISED INTRA-OCULAR PRESSURE AND ABSENT RETINAL CIRCULATION	12	
<b>PL-S-6</b>	UNILATERAL OPEN ANGLE GLAUCOMA IN AN ADULT WITH LARGE CORNEAS	15	
<b>FF-01</b>	A DEVICE GLAUCOCLAW MEANT TO TREAT CHRONIC ANGLE CLOSURE GLAUCOMA	19	
<b>FF-02</b>	A NOVEL SURGICAL TECHNIQUE FOR AN EASY AND PRECISE INSERTION OF THE DRAINAGE DEVICE TUBE	20	
<b>FF-03</b>	A NOVEL TECHNIQUE FOR MANAGEMENT OF TUBE MIGRATION AFTER GLAUCOMA DRAINAGE DEVICE IMPLANT	21	
<b>FF-04</b>	A NOVEL TECHNIQUE FOR MANAGING PERSISTENT HYPOTONY FOLLOWING AUROLAB AQUEOUS DRAINAGE IMPLANT.	22	
<b>FF-05</b>	AADI: NEW GDD ON THE BLOCK – LOW IN COST BUT IS IT HIGH IN PERFORMANCE?	23	
<b>FF-06</b>	AHMED VALVE IMPLANT FOR BEGINNERS	24	
<b>FF-07</b>	BLEB LEAK	25	
<b>FF-08</b>	BLEB RESCUE OPERATIONS	26	
<b>FF-10</b>	DEALING WITH COMPLEX NEOVASCULAR GLAUCOMA PRESENTATIONS	27	
<b>FF-11</b>	FAMILY SCREENING- AN EFFECTIVE APPROACH TO COMBAT GLAUCOMA BLINDNESS.	28	GR
<b>FF-12</b>	HOW TO FIX AND PREVENT A SHORT TUBE	29	FF
<b>FF-13</b>	HOW TO INSERT THE ISTENT INJECT ( G2 )	30	
<b>FF-14</b>	INNOVATIONS IN TRABECULECTOMY	31	RF
<b>FF-15</b>	I-OCT GUIDED BLEB SPARING EPITHELIAL EXCHANGE	32	
<b>FF-16</b>	ISTENT INJECT - HOW TO DEAL WITH OVER-IMPLANTATION	33	P
<b>FF-17</b>	MANAGEMENT OF CYCLODIALYSIS: COMING A FULL CIRCLE	34	I
<b>FF-18</b>	NIGHTMARES IN GLAUCOMA SURGERY	35	
<b>FF-19</b>	OPTIC RECONSTRUCTIVE SURGERY IN TREATMENT OF ACUTE ANGLE CLOSURE	36	
<b>FF-20</b>	OVERCOMING BLINDNESS	37	

<b>FF-21</b>	RECURRENT AQUEOUS MISDIRECTION – CAN IZHV PASS WHERE PPV FAILED?	38	<b>O-TH-06 / P-FS-070</b>	COMBINED OPTICAL COHERENCE TOMOGRAPHY AND VISUAL FIELD ENDPOINTS TO IMPROVE FUTURE GLAUCOMA CLINICAL TRIALS	52
<b>FF-22</b>	REMODELLING OF AN AVASCULAR BLEB	39	<b>O-TH-05 / P-FS-294</b>	IN VITRO AND <i>IN VIVO</i> DELIVERY OF A SUSTAINED RELEASE NANOCARRIER-BASED FORMULATION OF AN MRTF/SRF INHIBITOR IN CONJUNCTIVAL FIBROSIS	53
<b>FF-23</b>	SAVING THE ENDOTHELIUM- REPOSITIONING THE SHUNT TUBE	40	<b>O-FR-10 / P-FS-143</b>	RISK FACTORS FOR CORNEAL ENDOTHELIAL CELL LOSS AFTER TRABECULECTOMY WITH MITOMYCIN C	55
<b>FF-24</b>	SURGICAL MANAGEMENT OF POST-TRAUMATIC CYCLODIALYSIS CLEFT AND HYPOTONOUS MACULOPATHY	41	<b>O-FR-05 / P-FS-196</b>	MULTICENTER, RANDOMIZED STUDY OF A SCHLEMM'S CANAL MICROSTENT FOR REDUCTION OF IOP IN PRIMARY OPEN ANGLE GLAUCOMA (THE HORIZON TRIAL)	56
<b>FF-25</b>	TRABECULECTOMY WITH OLOGEN IMPLANT WITH RELEASABLE SUTURE & ITS RELEASE DURING POST OP PERIOD	42	<b>O-FR-09 / P-FS-248</b>	LENS EXTRACTION WITH OR WITHOUT GONIO-SYNECHIALYSIS IN PRIMARY ANGLE CLOSURE DISEASE FOR ANGLE PARAMETERS ASSESSMENT	57
<b>FF-26</b>	TUBE EXPOSURE REPAIR SUBMISSION	43	<b>O-FR-07 / P-FS-187</b>	POST-OPERATIVE OUTCOMES OF REVISION SURGERY FOR FAILED XEN IMPLANTS AT A UK TERTIARY EYE CENTRE	60
<b>FF-27</b>	TUBE IN TUBE: A SOLUTION FOR RETRACTED AHMED GLAUCOMA VALVE TUBE	44	<b>O-TH-08 / P-FS-094</b>	INTERIM RESULTS OF A PROSPECTIVE, RANDOMIZED PHASE 2 STUDY EVALUATING THE SAFETY AND EFFICACY OF TRAVOPROST INTRA-OCULAR IMPLANTS	61
<b>FF-28</b>	UNUSUAL PRESENTATIONS IN SECONDARY GLAUCOMA	45	<b>O-FR-01 / P-FS-123</b>	XEN GEL STENT SURGERY IN PATIENTS WITH OPEN ANGLE GLAUCOMA: TWO-YEAR RESULTS	62
<b>FF-29</b>	WALK WITH ME - COUNSELING IN GLAUCOMA	46	<b>O-FR-02 / P-FS-277</b>	OUTCOMES OF COMBINED TRABECULOTOMY WITH TRABECULECTOMY IN CHILDREN WITH ANIRIDIA AND SECONDARY GLAUCOMA	63
<b>FF-30</b>	WHAT HAPPENS TO THIS SURGERY?	47			
<b>FF-31</b>	WORM IN THE EYE? LOOK CLOSER!	48			
<b>O-FR-04 / P-FS-164</b>	COMPARISON OF BLEB MORPHOLOGY BY CONJUNCTIVAL INCISION AFTER TRABECULECTOMY	50			
<b>O-TH-01 / P-WT-107</b>	SPONTANEOUS NORMAL TENSION GLAUCOMA IN AGED MARMOSETS	51			

**O-FR-11 / P-FS-275**

GONIOWASH: A NEW SURGICAL APPROACH COMBINED WITH CATARACT SURGERY TO LOWER INTRAOCULAR PRESSURE IN PSEUDO-EXFOLIATION SYNDROME

64

**O-TH-07 / P-WT-282**

PROGRESSION IN PERIMETRICALLY NORMAL EYES OF OPEN-ANGLE GLAUCOMA PATIENTS WITH UNILATERAL VISUAL FIELD LOSS: AN EIGHT-YEAR-FOLLOW-UP STUDY

66

**O-FR-08 / P-FS-167**

AB INTERNO GEL IMPLANT FOR THE TREATMENT OF REFRACTORY GLAUCOMA: RESULTS FROM THE INTERNATIONAL GLAUCOMA SURGERY REGISTRY (IGSR)

68

**O-FR-03 / P-FS-166**

TRABECULAR MICRO-BYPASS WITH CATARACT SURGERY FOR PATIENTS WITH GLAUCOMA: A SYSTEMATIC REVIEW AND META-ANALYSIS

69

**O-FR-06 / P-FS-082**

REAL WORLD MIGS: AUSTRALIAN & NEW ZEALAND EXPERIENCE OF > 1000 HYDRUS MICRO-STENT IMPLANTS WITH 1 TO 3 YEAR FOLLOW UP.

70

**O-TH-10 / P-FS-280**

WOUND HEALING AND ITS POTENTIAL BIOMARKERS IN HUMAN TEAR AFTER TRABECULECTOMY

72

**O-TH-02 / P-WT-138**

BIMATOPROST SUSTAINED-RELEASE IMPLANT FOR LOWERING INTRAOCULAR PRESSURE: LONG-TERM EFFICACY AND PATIENT-REPORTED OUTCOMES

74

**O-TH-04 / P-WT-212**

EFFICACY OF A DEEP LEARNING SYSTEM FOR DETECTING GLAUCOMATOUS OPTIC NEUROPATHY BASED ON COLOR FUNDUS PHOTOGRAPHS

76

**O-TH-09 / P-WT-257**

DEVELOPMENT AND VALIDATION OF A DEEP LEARNING CLASSIFIER TO DETECT GONIOSCOPIC ANGLE CLOSURE BASED ON ANTERIOR SEGMENT OCT IMAGES

77

**P-WT-001**

MEDICATION ADHERENCE BY GLAUCOMA PATIENTS ATTENDING A NIGERIAN HOSPITAL

80

**P-WT-002**

FUNCTIONAL VISUAL ABILITY AND QUALITY OF LIFE IN CHILDREN WITH GLAUCOMA

81

**P-WT-003**

INFLUENCE OF PSYCHIATRIC SYMPTOMS ON UTILITY BASED QUALITY OF LIFE AMONG GLAUCOMA PATIENTS IN A WEST AFRICA TERTIARY HOSPITAL

83

**P-WT-004**

LIVING WITH GLAUCOMA - HOW DIFFICULT IT IS IN A SOUTH ASIAN SET UP? A QUALITATIVE STUDY OF FUNCTIONAL IMPLICATIONS IN ADVANCED GLAUCOMA

84

**P-WT-005**

CORRELATION OF CENTRAL CORNEAL THICKNESS(CCT) WITH RETINAL VEIN OCCLUSION (RVO) & PRIMARY GLAUCOMA AT TERTIARY HOSPITAL

85

**P-WT-006**

DEMOGRAPHY & REFERRAL PATTERN OF GLAUCOMA CLINIC PATIENTS IN A TERTIARY HOSPITAL IN INDIA

87

**P-WT-007**

INCIDENCE AND MANAGEMENT OF SECONDARY GLAUCOMA FROM RETINAL DETACHMENT SURGERY IN A TERTIARY HOSPITAL IN THE PHILIPPINES

88

**P-WT-008**

TO STUDY THE ASSOCIATION OF GLAUCOMA AND HELICOBACTER PYLORI IN SOUTH INDIAN POPULATION

90

GR

FF

RF

P

I

<b>P-WT-009</b>	NORMAL TENSION GLAUCOMA IN PATIENTS WITH MODERATE TO SEVERE OBSTRUCTIVE SLEEP APNEA	91	
<b>P-WT-010</b>	VISUAL ABILITY AND QUALITY OF LIFE IN CHILDREN WITH CHILDHOOD GLAUCOMA: MOVING BEYOND CLINICAL ENCOUNTER	92	
<b>P-WT-011</b>	STEROID INDUCED GLAUCOMA AFTER KIDNEY TRANSPLANT	94	
<b>P-WT-012</b>	POPULATION BASED CROSS SECTIONAL STUDY ON PREVALENCE OF PRIMARY GLAUCOMA IN THE RURAL AND URBAN POPULATION: KARAMSAD GLAUCOMA STUDY	95	
<b>P-WT-013</b>	CHANGES IN INTRAOCULAR PRESSURE DURING PREGNANCY	97	
<b>P-WT-014</b>	PRIMARY OPEN-ANGLE GLAUCOMA AND INCREASED RISK OF CHRONIC KIDNEY DISEASE	98	
<b>P-WT-015</b>	ASSOCIATION BETWEEN ESODEVIATION AND PRIMARY OPEN-ANGLE GLAUCOMA IN KOREAN ADULTS: THE KOREA NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY	99	
<b>P-WT-016</b>	THE RELATIONSHIP BETWEEN EYE DISEASES AND HEARING	103	
<b>P-WT-017</b>	BAK-FREE PROSTAGLANDINS: EFFECT ON QUALITY OF LIFE IN PRIMARY OPEN ANGLE GLAUCOMA PATIENTS	104	
<b>P-WT-018</b>	MANAGEMENT OF GLAUCOMA PROGRESSION	105	
<b>P-WT-019</b>	PRIMARY ANGLE CLOSURE DISEASE IN THE YOUNG	107	
<b>P-WT-020</b>	DRIVING LIMITATION IN GLAUCOMA	108	
<b>P-WT-021</b>	THE DEFINITION OF HIGH INTRAOCULAR PRESSURE ASSOCIATED WITH OPEN ANGLE GLAUCOMA IN THE KOREAN POPULATION	109	
<b>P-WT-022</b>	RESULTS OF THREE QUANTITATIVE VISUAL TESTS WITH PRIMARY OPEN ANGLE GLAUCOMA PATIENTS ACCORDING TO DIFFERENT LIGHTS	110	GR
<b>P-WT-023</b>	OBSTRUCTIVE SLEEP APNOEA AND OPTIC DISC PARAMETERS IN YOUNG ADULTS	111	FF
<b>P-WT-024</b>	COMPARISON OF THE CLINICAL PROFILE OF GLAUCOMA PATIENTS BETWEEN PRIVATE AND GOVERNMENT CLINICS IN THE PHILIPPINES	113	RF
<b>P-WT-025</b>	ASSOCIATION OF METFORMIN USE AMONG DIABETICS AND THE INCIDENCE OF POAG – RESULTS FROM THE CHENNAI EYE DISEASE INCIDENCE STUDY	115	P
<b>P-WT-026</b>	CHILDHOOD GLAUCOMA PROFILE USING CHILDHOOD GLAUCOMA RESEARCH NETWORK CLASSIFICATION	116	I
<b>P-WT-027</b>	THE PREVALENCE OF GLAUCOMA AND OCULAR HYPERTENSION AMONG ADULTS IN THE CENTRAL REGION OF POLAND	118	
<b>P-WT-028</b>	PRESCRIBING PATTERN OF TOPICAL B-BLOCKERS IN POAG PATIENTS WITH COMORBIDITIES THAT ARE CONTRAINDICATIONS FOR ITS USE-A RETROSPECTIVE STUDY FROM THE UK	119	

- P-WT-029**  
UTILITY INDEX OF GLAUCOMA PATIENTS IN THAILAND 120
- P-WT-030**  
POSNER-SCHLOSSMAN SYNDROME (GLAUCOMATOCYCLITIC CRISIS): A 5-YEAR REVIEW 122
- P-WT-031**  
TO STUDY CLINICAL AND GENETIC PROFILE OF PATIENTS WITH JUVENILE ONSET NORMAL TENSION OPEN ANGLE GLAUCOMA (JNTG) 124
- P-WT-032**  
THE GLAUCOMA AUSTRALIA EDUCATIONAL IMPACT STUDY: AN RCT EVALUATING GLAUCOMA EDUCATION AND PATIENT KNOWLEDGE, ANXIETY AND TREATMENT SATISFACTION 125
- P-WT-033**  
SHARED MEDICAL APPOINTMENTS IN GLAUCOMA CARE PROVISION AT A TERTIARY CARE EYE HOSPITAL - A RANDOMIZED TRIAL 128
- P-WT-034**  
FACTORS ASSOCIATED WITH GLAUCOMATOUS BLINDNESS 129
- P-WT-035**  
REVISITING BIOMETRIC RISK FACTORS FOR PHACOMORPHIC GLAUCOMA 131
- P-WT-036**  
CLINICAL PROFILE AND TREATMENT OUTCOMES OF PATIENTS WITH NEOVASCULAR GLAUCOMA IN A TERTIARY HOSPITAL 132
- P-WT-037**  
IS MYOPIA AS A RISK FACTOR FOR PRIMARY OPEN-ANGLE GLAUCOMA? 134
- P-WT-038**  
FACTORS ASSOCIATED WITH DRIVING SELF-REGULATION AT NIGHT IN SUBJECTS WITH PRIMARY OPEN-ANGLE GLAUCOMA 138
- P-WT-039**  
ASSOCIATION OF ALCOHOL CONSUMPTION AND IOP IN MEN AND WOMEN: THE 5TH KOREA NATIONAL HEALTH AND NUTRITIONAL EXAMINATION SURVEY 2010-2012 139
- P-WT-040**  
FACTORS ASSOCIATED WITH DRIVING SELF-REGULATION IN RAIN IN SUBJECTS WITH PRIMARY OPEN-ANGLE GLAUCOMA 140
- P-WT-041**  
THE CORRELATION BETWEEN GLAUCOMA POLYGENIC RISK SCORE AND IOP MEASURED BY ICARE® HOME TONOMETRY WITHIN AND OUTSIDE OF OFFICE HOURS 142
- P-WT-042**  
AQUEOUS HUMOR METABOLOMICS IS ABLE TO DISCRIMINATE GLAUCOMA PATIENTS 143
- P-WT-043**  
GLAUCOMA SCREENING IN FAMILY MEMBERS OF GLAUCOMA PATIENTS IN EASTERN REGION OF NEPAL 145
- P-WT-044**  
IS WEAK CORNEAL BIOMECHANICS A BIO-MARKER FOR GLAUCOMA IN EYES WITH PSEUDOEXFOLIATION 147
- P-WT-045**  
DE NOVO MYRF MUTATIONS AS CANDIDATES FOR NANOPHTHALMOS THROUGH ANALYSES OF TRIO-BASED WHOLE GENOME SEQUENCING 148
- P-WT-046**  
CLINICAL AND MOLECULAR CHARACTERIZATION OF JUVENILE NORMAL TENSION GLAUCOMA 149
- P-WT-047**  
OCULAR BIOMETRY AND GENOMIC ASSOCIATION IN PRIMARY ANGLE CLOSURE DISEASE- A DESCRIPTIVE STUDY 150

GR

FF

RF

P

I

- P-WT-048**  
EFFECTIVENESS OF TREATMENT FOR GLAUCOMA IN STURGE-WEBER SYNDROME: EXPERIENCE FROM A TERTIARY REFERRAL PAEDIATRIC HOSPITAL 151
- P-WT-049**  
ENDOTHELIN-1 AND ENDOTHELIN RECEPTOR-A IN BULGARIAN POPULATION WITH PRIMARY OPEN-ANGLE GLAUCOMA - PROGNOSTIC IMPORTANCE 152
- P-WT-050**  
ANALYSIS OF C-REACTIVE PROTEIN SINGLE NUCLEOTIDE POLYMORPHISMS IN KOREAN PATIENTS WITH EXFOLIATION SYNDROME 153
- P-WT-051**  
ANALYSIS OF SYSTEMIC RENIN AND ANGIOTENSIN II LEVELS IN NORMAL-TENSION GLAUCOMA 154
- P-WT-052**  
GENETIC VARIANTS ASSOCIATED WITH PROGRESSION OF VISUAL FIELD DEFECT IN PRIMARY OPEN-ANGLE GLAUCOMA 155
- P-WT-053**  
PROFILING METALLOPROTEINASE RELATED GENES USING MICE HYPERTENSION/ISCHEMIA MODEL REVEALS THE CANDIDATES IN EARLY STAGE RETINAL DENATURATION 157
- P-WT-054**  
INTERLEUKIN-8 PROFILE IN AQUEOUS HUMOUR OF PATIENTS ACROSS PRIMARY ANGLE CLOSURE DISEASE SPECTRUM 158
- P-WT-056**  
THE HERITABILITY OF ANTERIOR CHAMBER DEPTH IN HANDAN EYE STUDY 159
- P-WT-057**  
ANGIOPOIETIN RECEPTOR TEK-ASSOCIATED PRIMARY CONGENITAL GLAUCOMA: FIVE NOVEL GENE VARIANTS WITH PHENOTYPE EXPANSION 162
- P-WT-058**  
SHORT-TERM INTRAOCULAR PRESSURE ELEVATION AFTER PHACOEMULSIFICATION SURGERY 165
- P-WT-059**  
RECURRENT OPTIC DISC HEMORRHAGE AND ITS EFFECT ON VISUAL FIELD PROGRESSION IN GLAUCOMA 166
- P-WT-060**  
POPULATION VARIABILITY OF BIOMECHANICAL PROPERTIES OF THE CORNEA AND THE SCLERA IN HEALTHY SUBJECTS 167
- P-WT-061**  
EXCIMER LASER TRABECULOSTOMY (ELT) A LASER BASED MIGS PROCEDURE ENABLES SAFE & CONSISTENT 12 YEAR INTRAOCULAR PRESSURE-LOWERING EFFICACY 169
- P-WT-062**  
DYNAMIC CHANGES IN IRIS PARAMETERS UNDER PHYSIOLOGICAL CONDITIONS AMONG PATIENTS AT RISK OF ANGLE CLOSURE 171
- P-WT-063**  
PREFERRED SLEEPING POSITION AND ASYMMETRIC GLAUCOMA: IS THERE A RELATIONSHIP? 172
- P-WT-064**  
INFLUENCE OF DIFFERENT PHYSIOLOGICAL PARAMETERS ON INTRAOCULAR PRESSURE DURING PHYSICAL ACTIVITY – EARLY RESULTS FROM A PILOT STUDY WITH THE EYEMATE™ 174
- P-WT-065**  
MACHINE LEARNING TO DETECT INTRAOCULAR PRESSURE PEAK AT 6AM FROM A MORNING MINICURVE IN SUSPECTED AND GLAUCOMA PATIENTS 175
- P-WT-066**  
EVALUATION OF CORNEAL HYSTERESIS IN EARLY GLAUCOMA PATIENTS - A NEW TOOL FOR DETECTION OF THE DISEASE 177

GR

FF

RF

P

I

- P-WT-067**  
PROLONGED UNSUPERVISED USE OF STEROID EYE DROPS LEADING TO BILATERAL GLAUCOMA AND CATARACT: A CASE REPORT 178
- P-WT-068**  
INTRAOCULAR PRESSURE PROFILE AND VISUAL ACUITY IN FELLOW EYE AFTER OPEN GLOBE INJURY 180
- P-WT-069**  
CASE REPORT OF A RARE ACUTE ANGLE CLOSURE ATTACK SECONDARY TO SILICONE OIL PUPILLARY BLOCK IN A VITRECTOMIZED APHAKIC EYE 181
- P-WT-070**  
ASSOCIATION OF BLEB MORPHOLOGY PARAMETER USING BLEB GRADING SOFTWARE AND INTRA OCULAR PRESSURE 182
- P-WT-071**  
PERIPAPILLARY AND MACULAR CHOROIDAL AREA IN PATIENTS WITH NORMAL-TENSION GLAUCOMA 183
- P-WT-072**  
RELATIONSHIP BETWEEN A SENSING CONTACT LENS OUTPUT AND VF GLAUCOMA PROGRESSION IN OAG: A PRACTICAL TOOL TO ILLUSTRATE THE LIKELIHOOD OF PROGRESSION 184
- P-WT-073**  
TWENTY-FOUR-HOUR INTRAOCULAR PRESSURE LOWERING EFFECTS OF LATANOPROST EXAMINED BY ICARE HOME SELF-TONOMETER 185
- P-WT-074**  
COMPARISON OF INTRAOCULAR PRESSURE MEASUREMENTS WITH THE GOLDMAN APPLANATION TONOMETRE AND PERKINS TONOMETRE 186
- P-WT-075**  
CHANGE IN INTRAOCULAR PRESSURE AFTER GLENN OR FONTAN PROCEDURE IN PATIENTS WITH SINGLE VENTRICLE 188
- P-WT-076**  
MEAN AMPLITUDE OF INTRAOCULAR PRESSURE EXCURSIONS, A NEW ASSESSMENT PARAMETERS FOR 24-HOUR IOP FLUCTUATIONS IN UNTREATED POAG PATIENTS 189
- P-WT-077**  
THE RISK OF OCULAR HYPERTENSION IN CHILDREN TREATED WITH SYSTEMIC STEROID 190
- P-WT-078**  
SHORT-TERM EFFECTS AND SAFETY OF AN ACUTE INCREASE OF INTRAOCULAR PRESSURE AFTER INTRAVITREAL BEVACIZUMAB INJECTION ON CORNEAL ENDOTHELIAL CELLS 191
- P-WT-079**  
POSITION OF CENTRAL RETINAL VASCULAR TRUNK IN UNILATERAL NORMAL-TENSION GLAUCOMA: A COMPARISON OF THE LAMINA CRIBROSA SHIFT 192
- P-WT-080**  
THE EFFECT OF AGEING ON THE RECOVERY OF RETINAL GANGLION CELL FUNCTION FOLLOWING INTRAOCULAR PRESSURE ELEVATION IN MICE 195
- P-WT-081**  
THE EFFECT OF ULTRASOUND CYCLOPLASTY (UCP) USING HIGH INTENSITY FOCUSED ULTRASOUND (HIFU) ON AQUEOUS HUMOUR DYNAMICS: A 1 YEAR FOLLOW UP 196
- P-WT-082**  
EFFECT OF INTRAOCULAR PRESSURE ELEVATION ON THE TRILAMINAR RETINAL VESSEL NETWORK IN MOUSE EYES 197
- P-WT-083**  
MEASURING 24H INTRAOCULAR PRESSURE FLUCTUATIONS WITH A NEW SENSING CONTACT LENS DEVICE 198
- P-WT-084**  
EFFECT OF TOPICAL ANESTHESIA ON MEASUREMENTS OBTAINED WITH OCULAR RESPONSE ANALYZER: A RANDOMIZED CONTROLLED TRIAL 200

GR

FF

RF

P

I

- P-WT-085**  
EFFECT OF UPPER EYELID ELEVATION ON INTRAOCULAR PRESSURE MEASUREMENT OBTAINED USING REBOUND TONOMETERS AND THE GOLDMANN APPLANATION TONOMETER 201
- P-WT-086**  
INFLUENCE OF BLOOD PRESSURE AND OTHER FACTORS ON 24-HOUR CONTACT LENS SENSOR MEASUREMENTS IN PATIENTS WITH UNTREATED GLAUCOMA 202
- P-WT-087**  
CORRELATION BETWEEN BLOOD PRESSURE (BP), INTRAOCULAR PRESSURE (IOP) AND INTRACRANIAL PRESSURE (ICP) – A PILOT STUDY 203
- P-WT-088**  
CENTRAL RETINAL VENOUS PRESSURE IN ASYMMETRIC PRIMARY OPEN ANGLE GLAUCOMA (POAG) 204
- P-WT-089**  
LONG-TERM INTRAOCULAR PRESSURE FLUCTUATION AS A RISK FACTOR FOR VISUAL FIELD PROGRESSION – RESULTS FROM THE SINGAPORE 5-FLUOROURACIL STUDY 205
- P-WT-090**  
EFFECT OF GENERAL ANESTHESIA ON INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING OPHTHALMIC SURGERY 206
- P-WT-091**  
INTRAOCULAR PRESSURE ELEVATION AFTER PHACOEMULSIFICATION AND ITS PREVENTION IN EYES WITH GLAUCOMA OR EXFOLIATION SYNDROME 207
- P-WT-092**  
THE VARIABILITY OF INTRAOCULAR PRESSURE BETWEEN BOTH EYES ACCORDING TO THE TYPE OF TONOMETER IN PATIENTS WITH UNILATERAL TEARING 208
- P-WT-093**  
POSTURAL CHANGE IN INTRAOCULAR PRESSURE IS MORE STRONGLY ASSOCIATED WITH WAIST HIP RATIO THAN BODY MASS INDEX 210
- P-WT-094**  
THE EFFECTS OF EYE MOVEMENTS ON INTRAOCULAR PRESSURE IN GLAUCOMA PATIENTS WITH A NOVEL INTRAOCULAR PRESSURE SENSOR 213
- P-WT-096**  
A STUDY ON THE ASSOCIATION BETWEEN SINGLE CRANIAL NERVE PALSIES AND THE INTRAOCULAR PRESSURE OF THE AFFECTED AND UNAFFECTED EYES 214
- P-WT-097**  
INFLUENCE OF CARDIOVASCULAR SYSTEM ON 24 HOUR OCULAR VOLUME CHANGES, MEASURED WITH CONTACT LENS SENSOR IN HEALTHY AND POAG SUBJECTS 215
- P-WT-098**  
ANGLE RECESSON GLAUCOMA – LOOKING FOR THE POINT OF NO RETURN 217
- P-WT-099**  
CLINICAL CHARACTERIZATION OF REFRACTORY VIRUS-RELATED INFLAMMATION INSIDE AQUEOUS OUTFLOW PATHWAYS IN IMMUNOCOMPETENT CHINESE PATIENTS 219
- P-WT-100**  
ASSESSMENT OF ANXIETY AND DEPRESSION IN YOUNG CHINESE PATIENTS WITH EARLY-STAGE PRIMARY OPEN ANGLE GLAUCOMA 220
- P-WT-101**  
EXPLORING THE ROLE OF ENDOCANABINOIDS IN PRIMARY ADULT GLAUCOMA 222
- P-WT-102**  
THE INHIBITORY EFFECTS OF AG-100 ON TGF-BETA STIMULATED HUMAN TENON FIBROBLASTS 224
- P-WT-103**  
IOP CHANGE AFTER TRIAMCINOLONE ACETONIDE (TA) SUBCONJUNCTIVAL INJECTION IN C57BL/6J MOUSE EYES 225

GR

FF

RF

P

I

- P-WT-104**  
METABOLOMICS OF THE AQUEOUS HUMOR IN PATIENTS WITH PRIMARY CONGENITAL GLAUCOMA 227
- P-WT-105**  
THE DESCMET'S MEMBRANE IN PRIMARY CONGENITAL GLAUCOMA 228
- P-WT-106**  
EFFECTS OF RANIBIZUMAB ON PTEN, AKT1 AND THBS1 PROTEINS ON HUMAN TENON'S FIBROBLASTS *IN VITRO* 230
- P-WT-108**  
SPATIOTEMPORAL CHANGES AND PROTECTIVE EFFECTS OF PACAP IN RETINAL GANGLION CELLS AFTER OPTIC NERVE CRUSH 231
- P-WT-109**  
MESENCHYMAL STEM CELLS ARE DIFFERENTIATING TO RETINAL GANGLION-LIKE CELLS IN RAT POLYSTYRENE MICROSPHERES INDUCED GLAUCOMA MODEL 232
- P-WT-110**  
PROTECTIVE EFFECTS OF TAMOXIFEN AGAINST PRESSURE-INDUCED INJURY IN A RAT *EX VIVO* GLAUCOMA MODEL 234
- P-WT-111**  
CYTOPROTECTIVE EFFECT OF PLANT-DERIVED ANGIOGENIN FUSION PROTEIN ON TRABECULAR MESHWORK DAMAGE INDUCED BY BENZALKONIUM CHLORIDE 235
- P-WT-112**  
IMPACT OF INTRAOCULAR PRESSURE REDUCTION ON NEURODEGENERATION IN DIABETIC RAT RETINA 237
- P-WT-113**  
OPTIC NERVE REGENERATION FOLLOWING GLAUCOMATOUS INJURY IN AGED MICE 239
- P-WT-115**  
LOCAL DELIVERY AND SUSTAINED-RELEASE OF NITRIC OXIDE DONOR LOADED IN MESOPOROUS SILICA PARTICLES FOR EFFICIENT TREATMENT OF OCULAR HYPERTENSION 241
- P-WT-116**  
BIO-MODULATION OF PRIMARY HUMAN TENON'S CAPSULE FIBROBLASTS USING A NOVEL APPLICATION OF COATED MAGNESIUM 242
- P-WT-117**  
MICRORNA PROFILING IN GLAUCOMA EYES WITH VARYING DEGREES OF OPTIC NEUROPATHY 246
- P-WT-118**  
CONJUNCTIVAL HISTOPATHOLOGY OF EYES ON LONG TERM ANTIGLAUCOMA MEDICATIONS 247
- P-WT-119**  
NEUROPROTECTIVE EFFECT OF BRAZILIAN GREEN PROPOLIS ON RETINAL GANGLION CELLS IN ISCHEMIC MOUSE RETINA 248
- P-WT-120**  
EFFICACY AND TOLERABILITY OF A NEW THERMOSTABLE FORMULATION OF LATANOPROST IN NANOPARTICLES 249
- P-WT-121**  
OUTCOMES OF IN-VITRO CONVERSION OF FLOW RESTRICTIVE GLAUCOMA DRAINAGE DEVICE TO NON-RESTRICTIVE DRAINAGE IMPLANT 251
- P-WT-122**  
INHIBITION OF TGF-BETA PATHWAY REVERSES EPITHELIAL-TO-MESENCHYMAL TRANSITION IN TRABECULAR MESHWORK CELLS 252
- P-WT-123**  
DISTRIBUTION OF INTER-ENDOTHELIAL JUNCTION AND VASCULAR MURAL CELLS MAY ACCOUNT FOR HIGHER VASCULAR PERMEABILITY IN PORCINE IRIS PUPILLARY REGION 253
- P-WT-124**  
CRITICAL DURATION FOR REVERSIBILITY OF RETINAL GANGLION CELL INJURY IN A MOUSE CIRCUMLIMBAL SUTURE MODEL 255
- P-WT-125**  
ULTRASOUND CYCLOPLASTY IN SURGICAL NAÏVE OPEN-ANGLE GLAUCOMA PATIENTS. INTERIM 18 MONTH RESULTS OF A PROSPECTIVE MULTI-CENTER CLINICAL TRIAL 257

GR

FF

RF

P

I

- P-WT-126**  
INITIAL OUTCOMES OF MYCROPULSE TRANSSCLERAL CYCLOPHOTOAGULATION IN PATIENTS WITH GLAUCOMA AND PENETRATING KERATOPLASTY OR BOSTON KERATOPROSTHESIS 258
- P-WT-127**  
IOP-LOWERING EFFICACY AND LONG-TERM SAFETY PROFILE OF OMIDENEPAG ISOPROPYL 0.002%, A SELECTIVE EP2 AGONIST, IN OAG AND OHT 259
- P-WT-128**  
DEVELOPMENT OF NANOEMULSIONS TO IMPROVE THE OCULAR BIOAVAILABILITY AND PATIENT COMPLIANCE IN GLAUCOMA TREATMENT USING TIMOLOL MALEATE 260
- P-WT-129**  
EFFECTS OF INTRAVITREAL DEXAMETHASONE ON INTRAOCULAR PRESSURE IN TREATMENT OF MACULAR EDEMA SECONDARY TO NON-INFECTIOUS UVEITIS 262
- P-WT-130**  
CARDIOVASCULAR EFFECTS AND SAFETY OF MANNITOL IN TREATING RAISED INTRAOCULAR PRESSURE 263
- P-WT-131**  
ULTRASOUND CILIARY PLASTY IN GLAUCOMA TREATMENT – MEDIUM-TERM FOLLOW-UP 264
- P-WT-132**  
ASSESSMENT OF ANTERIOR SEGMENT OF THE EYE AFTER ULTRASOUND CILIARY PLASTY IN GLAUCOMA TREATMENT 265
- P-WT-133**  
REAL-WORLD EFFICACY OF SELECTIVE LASER TRABECULOPLASTY IN THE UK AND FACTORS PREDICTING SUCCESS 266
- P-WT-134**  
NOVEL MICROPULSE TRANSSCLERAL CYCLOPHOTOAGULATION: INITIAL RESULTS IN GLAUCOMA 267
- P-WT-135**  
SAFETY AND EFFICACY OF ULTRASOUND CYCLOPLASTY IN INDIAN EYES WITH REFRACTORY GLAUCOMA 268
- P-WT-136**  
LONG TERM EFFECT OF PROSTAGLANDIN ANALOGUES ON CENTRAL CORNEAL THICKNESS 269
- P-WT-137**  
USE OF MAXIMUM MEDICAL THERAPY IN PRIMARY OPEN ANGLE GLAUCOMA: A RETROSPECTIVE, ELECTRONIC MEDICAL RECORDS-BASED STUDY FROM THE UK 271
- P-WT-139**  
THE USE OF PATTERN SCANNING LASER TRABECULOPLASTY TO DECREASE INTRAOCULAR PRESSURE IN FILIPINO PATIENTS: L SHORT TERM RESULTS 272
- P-WT-140**  
SAFETY AND EFFECTIVENESS OF SELECTIVE LASER TRABECULOPLASTY WITH A PULSE ENERGY OF 0.8–1.2 MJ VERSUS 0.8–1.4 MJ: A PROSPECTIVE OBSERVATIONAL STUDY 274
- P-WT-141**  
PREDICTORS OF SUCCESS IN SELECTIVE LASER TRABECULOPLASTY: THE LAUSANNE SLT REGISTRY (LASER) 275
- P-WT-142**  
RHO-KINASE INHIBITORS, WHAT DO OPHTHALMOLOGISTS THINK? 276
- P-WT-143**  
CLINICAL OUTCOME OF MICROPULSE TRANSSCLERAL CYCLOPHOTOAGULATION IN INDIAN GLAUCOMA PATIENTS: PILOT STUDY 278
- P-WT-144**  
THE STUDY OF NEURONAL MARKERS IN RETINOPROTECTION OF PRIMARY OPEN-ANGLE GLAUCOMA 280
- P-WT-145**  
A PROSPECTIVE ANALYSIS OF PENTACAM PARAMETERS PRE AND POST YAG PI IN PACS EYES 281

GR

FF

RF

P

I

- P-WT-146**  
BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED-DOSE COMBINATION AS AN ADJUNCTIVE THERAPY TO A PGA IN PATIENTS WITH OAG OR OHT: SUBGROUP ANALYSIS 282
- P-WT-147**  
TREATMENT OUTCOMES OF MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION IN REFRACTORY GLAUCOMA PATIENTS IN A TERTIARY GOVERNMENT HOSPITAL 284
- P-WT-148**  
CLINICAL OUTCOMES OF TRANSSCLERAL DIODE LASER CYCLOPHOTOCOAGULATION IN PEDIATRIC GLAUCOMA PATIENTS 286
- P-WT-149**  
LONG-TERM RESULT OF INTRAOCULAR PRESSURE REDUCTION EFFICACY OF PATTERN LASER TRABECULOPLASTY IN REFRACTORY GLAUCOMA PATIENTS 287
- P-WT-150**  
COMPARISON OF MEIBOMIAN GLAND DYSFUNCTION IN PATIENTS USING PRESERVATIVE-CONTAINING OR PRESERVATIVE-FREE FORMULATION OF PROSTAGLANDIN ANALOGUES 288
- P-WT-151**  
COMPARISON OF OUTCOME PREDICTORS FOR MICROPULSE LASER TRABECULOPLASTY AND SELECTIVE LASER TRABECULOPLASTY 289
- P-WT-152**  
A REVIEW OF THE CURRENT STATUS OF SIMULTANEOUS TOPICAL AND SYSTEMIC BETA BLOCKER PRESCRIPTION 290
- P-WT-153**  
EFFICACY AND SAFETY OF MICROPULSE LASER TRABECULOPLASTY FOR PRIMARY OPEN ANGLE GLAUCOMA 292
- P-WT-154**  
COMBINED SUBCONJUNCTIVAL INJECTION OF DEXAMETHASONE FOR THE MANAGEMENT OF ACUTE PRIMARY ANGLE CLOSURE 293
- P-WT-155**  
BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED COMBINATION ADJUNCTIVE TO TRAVOPROST 0.004%/TIMOLOL 0.5% FIXED COMBINATION: EFFECT OF MMT ON IOP LOWERING AND OPP 294
- P-WT-156**  
COMPARATIVE RESULTS OF AB INTERNO CANALOPLASTY VS TRABECULECTOMY IN OPEN ANGLE GLAUCOMA 295
- P-WT-157**  
COMPARISON OF DIFFERENT COMBINATIONS OF MAXIMUM MEDICAL THERAPY FOR LOWERING INTRAOCULAR PRESSURE IN PRIMARY OPEN ANGLE GLAUCOMA 296
- P-WT-158**  
FACTORS AFFECTING INTRAOCULAR PRESSURE CHANGE AFTER LASER IRIDOTOMY IN FELLOW EYE WITH ACUTE ANGLE CLOSURE GLAUCOMA 297
- P-WT-159**  
EFFECT OF BRINZOLAMIDE 1%/BRIMONIDINE 0.2% BID FIXED-DOSE COMBINATION AS AN ADJUNCTIVE THERAPY TO A PGA ON OPP IN PATIENTS WITH OAG OR OHT 299
- P-WT-160**  
OUTCOMES OF SELECTIVE LASER TRABECULOPLASTY FOR POST VITREORETINAL SURGERY SECONDARY GLAUCOMA 301
- P-WT-161**  
INHIBITORS OF RENIN-ANGIOTENSIN SYSTEM AS POTENTIAL TREATMENT OF STEROID INDUCED TRABECULAR MESHWORK REMODELING: *IN VITRO* STUDY 303
- P-WT-162**  
LONG-TERM EFFECTS OF TOPICAL BRIMONIDINE TARTRATE 0.2% ON OCULAR SURFACE PARAMETERS IN A TERTIARY EYE CARE HOSPITAL IN BANGLADESH 304

GR

FF

RF

P

I

- P-WT-163**  
THE EFFECTIVENESS OF INTRAOCULAR PRES-  
SURE REDUCTION AND SUPPRESSION OF  
VISUAL FIELD LOSS PROGRESSION ON EARLY  
GLAUCOMA 305
- P-WT-164**  
A RANDOMIZED CONTROLLED TRIAL COMPAR-  
ING THE EFFICACY AND SAFETY BETWEEN PAT-  
TERN LASER TRABECULOPLASTY AND SELEC-  
TIVE LASER TRABECULOPLASTY 307
- P-WT-165**  
A COMPARISON OF EFFICACY AND SAFETY  
BETWEEN PATTERN SCANNING LASER TRABEC-  
ULOPLASTY AND SELECTIVE LASER TRABECU-  
LOPLASTY IN OPEN ANGLE GLAUCOMA 309
- P-WT-166**  
BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED-  
DOSE COMBINATION AS AN ADJUNCT TO  
TRAVOPROST 0.004%/TIMOLOL 0.5% FIXED-  
DOSE COMBINATION THERAPY IN OAG OR OHT  
310
- P-WT-167**  
MICROPULSE TRANSSCLERAL CYCLOPHOTO-  
COAGULATION IN CONTROLLED PRIMARY OPEN  
ANGLE GLAUCOMA BY MEDICATION 311
- P-WT-169**  
BRINZOLAMIDE 1%/BRIMONIDINE 0.2% FIXED  
COMBINATION ADJUNCTIVE TO TRAVOPROST  
0.004%/TIMOLOL 0.5% FIXED COMBINATION IN  
OAG OR OHT: A SUBGROUP ANALYSIS 312
- P-WT-170**  
MICROPULSE TRANSSCLERAL CYCLOPHOTO-  
COAGULATION- EVALUATING THE LASER OUT-  
PUT OF THE MICROPULSE P3 LASER DELIVERY  
DEVICE FOLLOWING REPEATED USE 313
- P-WT-171**  
SUBCAPSULAR CATARACT FORMATION AFTER  
LASER IRIDOTOMY PERFORMED AS A PREPA-  
RATION FOR PHAKIC IOL(INTRAOCULAR LENS)  
IMPLANTATION 314
- P-WT-172**  
MP3 PLUS: A MODIFIED MICROPULSE TRANS-  
SCLERAL CYCLOPHOTOCOAGULATION TECH-  
NIQUE FOR THE TREATMENT OF REFRACTORY  
GLAUCOMA 315
- P-WT-173**  
FIXED COMBINATION OF BRIMONIDINE TAR-  
TRATE AND BRINZOLAMIDE IN THE TREATMENT  
OF THE EARLY STAGE OF PRIMARY OPEN-ANGLE  
GLAUCOMA 316
- P-WT-174**  
DIODE LASER CYCLOPHOTOCOAGULATION IN  
THE MANAGEMENT OF ANTERIOR STAPHYLOMA  
IN CHILDREN 317
- P-WT-175**  
SD-ANGLE OCT WITH PILOCARPINE DROP HELP  
CHOOSING CANDIDATES FOR YAG PERIPHERAL  
IRIDECTOMY WITH GREATER RELIABILITY WITH  
LESS PERSONAL BIAS 319
- P-WT-176**  
UVEAL & OCULAR ADNEXAL LYMPHOMA MAS-  
QUERADING AS UVEITIS WITH SECONDARY  
GLAUCOMA - A CASE REPORT 320
- P-WT-177**  
TRANSSCLERAL CYCLOPHOTOCOAGULATION IN  
REFRACTORY GLAUCOMA IN EYES WITH GOOD  
VISION 321
- P-WT-178**  
PHACOEMULSIFICATION+ENDOCYCLOPHO-  
TOCOAGULATION AND AB INTERNO TRABEC-  
ULOTOMY VS PHACOEMULSIFICATION+ENDO-  
CYCLOPHOTOCOAGULATION IN OPEN ANGLE  
GLAUCOMA 323
- P-WT-179**  
MICROPULSE CYCLOPHOTOCOAGULATION OUT-  
COMES IN FILIPINO PATIENTS WITH REFRAC-  
TORY GLAUCOMA 324
- P-WT-180**  
OMIDENEPAG ISOPROPYL 0.002%: A NOVEL  
OCULAR HYPOTENSIVE AGENT WITH A NEW  
MECHANISM OF ACTION 325

GR

FF

RF

P

I

- P-WT-181**  
INVESTIGATION OF PHYSICAL AND VISUAL  
FUNCTION FACTORS AFFECTING SUCCESSFUL  
EYEDROP INSTILLATION 326
- P-WT-182**  
QUANTITATIVE COMPARISON OF TEAR LIPID  
LAYER IN UNILATERAL GLAUCOMA EYE AND  
NORMAL EYE 327
- P-WT-184**  
A COMBINED METHOD FOR LASER TREATMENT  
OF PRIMARY NARROW-ANGLE (MIXED) GLAU-  
COMA 329
- P-WT-185**  
EFFECT OF LASER PERIPHERAL IRIDOTOMY ON  
CONTRAST SENSITIVITY USING SPAETH RICH-  
MAN CONTRAST SENSITIVITY TEST 330
- P-WT-186**  
EFFICACY OF MICROPULSE TRANSCLERAL  
CYCLOPHOTOCOAGULATION IN UNCON-  
TROLLED GLAUCOMA AT SRINAGARIND HOSPI-  
TAL, THAILAND: 1-YEAR RESULT 331
- P-WT-187**  
EFFICACY AND SIDE EFFECTS OF RIPASUDIL  
HYDROCHLORIDE HYDRATE (RIPASUDIL) 333
- P-WT-188**  
ADDITIVE IOP LOWERING OF BRINZOLAMIDE  
1%/BRIMONIDINE 0.2% BID FIXED-DOSE COM-  
BINATION IN OAG OR OHT PATIENTS RECEIVING  
PGA: A PHASE IV STUDY RESULTS 334
- P-WT-189**  
EFFECTS OF CARTEOLOL HYDROCHLORIDE /  
LATANOPROST COMBINATION OPHTHALMIC  
SOLUTION ON OCULAR SURFACE 336
- P-WT-190**  
ONE-YEAR EFFICACY OF ADJUNCTIVE USE OF  
RIPASUDIL, A RHO-KINASE INHIBITOR, AND FAC-  
TORS RELATED TO THE EFFICACY 337
- P-WT-191**  
HIGH-INTENSITY FOCUSED ULTRASOUND NEW  
NON-INVASIVE ALTERNATIVE FOR GLAUCOMA  
TREATMENT. REPORT OF THE FIRST CASES IN  
LATIN AMERICA 338
- P-WT-192**  
A RETROSPECTIVE REVIEW COMPARING THE  
SAFETY AND EFFICACY OF 120 VERSUS 160  
APPLICATIONS OF SELECTIVE LASER TRABECU-  
LOPLASTY 339
- P-WT-193**  
EFFICACY OF TRANSCLERAL DIODE LASER  
CYCLOPHOTOCOAGULATION IN THE MANAGE-  
MENT OF END-STAGE GLAUCOMA 340
- P-WT-194**  
ASSOCIATION BETWEEN FUCHS ENDOTHELIAL  
DYSTROPHY AND ACUTE ANGLE CLOSURE AND  
APPROACH TO MANAGEMENT 342
- P-WT-195**  
DEEP LEARNING SYSTEM EVALUATION FOR THE  
DETECTION OF GLAUCOMA FROM COLOUR FUN-  
DUS PHOTOGRAPHS 343
- P-WT-196**  
SELECTIVE LASER TRABECULOPLASTY IN  
PATIENTS WITH ANGLE RECESSON GLAUCOMA:  
A CASE SERIES 345
- P-WT-197**  
TREATMENT OF PAPILOMACULAR RETINOSCHI-  
SIS IN GLAUCOMA PATIENTS WITH AN ACQUIRED  
OPTIC DISC PIT 346
- P-WT-198**  
PRIMARY CONGENITAL GLAUCOMA IN DEN-  
MARK, 1977-2016: EPIDEMIOLOGY, SURGICAL  
PROCEDURES AND VISUAL OUTCOME 347
- P-WT-199**  
WHAT TYPE OF DISC HEMORRHAGE IS A RISK  
FACTOR FOR GLAUCOMA PROGRESSION?  
DEVELOPMENT OF THE NOMOGRAM USING  
FUNDUS PHOTOGRAPH 348

GR

FF

RF

P

I

<b>P-WT-200</b>	NEW INNOVATION GLAUCOMA MANAGEMENT: NIO GLAUCOMA MOBILE APP	349	
<b>P-WT-201</b>	ADHERENCE OF GLAUCOMA SURGICAL TRI- ALS TO THE WORLD GLAUCOMA ASSOCIATION GUIDELINES IN THE ERA OF MIGS	351	
<b>P-WT-203</b>	PROGRESSION TO BLINDNESS IN 20 YEARS AMONG PATIENTS WITH GLAUCOMATOUS VISUAL FIELDS IN A TERTIARY HOSPITAL IN THE PHILIPPINES	352	
<b>P-WT-204</b>	GLAUCOMA LOGISTICS – PREVENTING BLIND- NESS – A NEW SWEDISH STRATEGY FROM THE COUNTY OF ÖSTERGÖTLAND	353	
<b>P-WT-205</b>	RISK STRATIFICATION OF GLAUCOMA PATIENTS SUITABLE FOR VIRTUAL CLINICS IN UK - INNO- VATIVE AND REPLICABLE RESTRUCTURING OF LOCAL SERVICES	355	
<b>P-WT-206</b>	DIURNAL IOP FLUCTUATION IN PATIENTS WITH GLAUCOMA AFTER GELATIN STENT PLACEMENT	357	
<b>P-WT-207</b>	IATROGENIC GLAUCOMAS	358	
<b>P-WT-209</b>	OPTICAL COHERENCE TOMOGRAPHY ANGIOG- RAPHY OF OPTIC DISC PERFUSION IN PRIMARY OPEN ANGLE GLAUCOMA	360	
<b>P-WT-210</b>	REAL WORLD TREATMENT AND OUTCOMES FOLLOWING TRABECULECTOMY IN US CLINICAL PRACTICE: AN ANALYSIS OF THE AAO IRIS REGIS- TRY	361	
<b>P-WT-211</b>	RELATIONSHIP BETWEEN INTRAOCULAR PRES- SURE, BLOOD PRESSURE AND CEREBROSPINAL FLUID PRESSURE AND IMPACT ON OCULAR BIOMECHANICS AND PERFUSION	362	
<b>P-WT-213</b>	THE LONG-TERM EFFECT OF CONTINUOUS POSITIVE AIR PRESSURE ON THE INTRAOCULAR PRESSURE IN PRIMARY OPEN-ANGLE GLAU- COMA WITH OBSTRUCTIVE SLEEP APNEA	363	
<b>P-WT-214</b>	GLAUCOMA FILTRATION SURGERY BY OPHTHAL- MOLOGY TRAINEES IN AUSTRALIA – A SURGICAL AUDIT	364	
<b>P-WT-215</b>	SELF-CHECKING SHEET (CLOCK CHART® DRIV- ING EDITION) FOR BINOCULAR VISUAL FIELD DEFECTS	365	GR
<b>P-WT-216</b>	EVALUATING THE EFFECTIVENESS OF EDU- CATION IN IMPROVING THE KNOWLEDGE OF INDIVIDUALS ABOUT GLAUCOMA	366	FF
<b>P-WT-217</b>	MIDTERM OUTCOME OF MITOMYCIN C AUG- MENTED TRABECULECTOMY IN OPEN ANGLE GLAUCOMA VERSUS ANGLE CLOSURE GLAU- COMA	367	RF
<b>P-WT-218</b>	TO IDENTIFY MORPHOLOGICAL RISK FACTORS FOR DEVELOPMENT OF GLAUCOMA IN MICRO- PHthalmic EYES UNDERGOING CONGENITAL CATARACT	368	P
<b>P-WT-219</b>	OCULAR PERFUSION PRESSURE AND THE RISK OF OPEN-ANGLE GLAUCOMA: SYSTEMATIC REVIEW AND META-ANALYSIS	370	I
<b>P-WT-220</b>	THE EFFECT OF COMMON BEVERAGE ON THE DEVELOPMENT OF GLAUCOMA	371	
<b>P-WT-221</b>	PRACTICE OF TARGET INTRAOCULAR PRESSURE SETTING IN GLAUCOMA MANAGEMENT - AN AFRICAN SETTING	372	

<b>P-WT-222</b> EFFECT OF 2% GANCICLOVIR EYE DROPS ON CYTOMEGALOVIRUS POSITIVE POS- NER-SCHLOSSMAN SYNDROME 373	<b>P-WT-232</b> PRIMARY CONGENITAL GLAUCOMA: BASELINE FEATURES AND SHORT TERM SURGICAL OUT- COME 385
<b>P-WT-223</b> INFORMATION MANAGEMENT IN GLAUCOMA SUSPECTS 374	<b>P-WT-233</b> THE EFFECT OF ND:YAG LASER POSTERIOR CAP- SULOTOMY ON INTRAOCULAR PRESSURE 386
<b>P-WT-224</b> COMPARISON OF SURGICAL OUTCOMES BETWEEN AB-INTERNO TRABECULECTOMY USING A KAHOOK DUAL BLADE AND ISTENT TRABECULAR MICRO-BYPASS STENT 375	<b>P-WT-234</b> COMPARISON OF CENTRAL CORNEAL THICK- NESS MEASUREMENTS USING OPTICAL AND ULTRASOUND PACHYMETRY IN GLAUCOMA PATIENTS AND ELDERLY AND YOUNG CONTROLS 387
<b>P-WT-225</b> CLINICAL CHARACTERISTICS OF GLAUCOMA PATIENTS FOLLOWING REFRACTIVE SURGERY FOR MYOPIA CORRECTION 376	<b>P-WT-235</b> COMPARISON OF THE EFFECT OF 1% CYCLO- PENTOLATE AND 1% TROPICAMIDE ON THE INTRAOCULAR PRESSURE IN TYPE II DIABETIC PATIENTS 388
<b>P-WT-226</b> EFFECT OF MACULAR SURGERY WITH INTERNAL LIMITING MEMBRANE PEELING ON PROGRES- SION OF VISUAL FIELD DEFECT: A PRELIMINARY STUDY 377	<b>P-WT-236</b> ACUTE ANGLE CLOSURE AFTER PTERYGIUM EXCISION 391
<b>P-WT-227</b> INCIDENCE OF SURGICAL GLAUCOMA SECOND- ARY TO ANTI-VEGF INTRAVITREAL INJECTIONS IN A 2 YEARS STUDY 378	<b>P-WT-237</b> MANAGEMENT OF PATIENTS OF IRIDOCORNEAL ENDOTHELIAL SYNDEROME (ICE SYNDEROME ) WITH SECONDARY GLAUCOMA 392
<b>P-WT-228</b> QUALITY OF LIFE AND CONTRAST SENSITIVITY BASED STUDY IN PATIENTS WITH GLAUCOMA 380	<b>P-WT-238</b> HISTOPATHOLOGY USING LIGHT MICROS- COPY- A COST EFFECTIVE METHOD TO IDENTIFY NANOPHTHALMOS 393
<b>P-WT-229</b> BAYES LINEAR REGRESSION WITH VARIATIONAL AUTOENCODER 382	<b>P-WT-239</b> CLINICAL PROFILE AND TREATMENT OUTCOMES IN PATIENTS WITH NANOPHTHALMOS 394
<b>P-WT-230</b> CHARACTERISTIC OF FACIAL FEATURES AMONG MALAY PRIMARY ANGLE CLOSURE GLAUCOMA PATIENTS: AN OBSERVATIONAL CASE SERIES 383	<b>P-WT-240</b> INTRA-OPERATIVE ASOCT: EFFECT OF PHACOEMULSIFICATION ALONE VS PHACO-EN- DOCYCLOPLASTY ON ANGLE RECESS IN PLA- TEAU IRIS SYNDROME - A PRELIMINARY REPORT 395
<b>P-WT-231</b> TREATMENT OUTCOMES OF SECONDARY GLAU- COMA WITH CYTOMEGALOVIRUS IRITIS 384	<b>P-WT-241</b> BLOOD PRESSURE VARIABILITY IN OPEN-ANGLE GLAUCOMA PATIENTS 397

GR

FF

RF

P

I

- P-WT-242**  
COMPUTER ASSISTED GLAUCOMA DETECTION  
USING FUNDUS IMAGES 398
- P-WT-243**  
ACUTE BILATERAL ANGLE CLOSURE INDUCED  
BY THE INFUSION OF MONOCLONAL ANTIBODY  
(DARATUMUMAB) IN TREATING A PATIENT WITH  
RELAPSING MULTIPLE MYELOMA 401
- P-WT-244**  
GLAUCOMA IN THE JAPANESE HALLER-  
MANN-STREIFF SYNDROME: CASE REPORT 402
- P-WT-245**  
JAPANESE LOWER NORMAL PRESSURE GLAU-  
COMA STUDY: RISK FACTORS FOR GLAUCOMA  
PROGRESSION 403
- P-WT-246**  
THE EFFECT OF STEEP TRENDLENBURG POSI-  
TIONING DURING ROBOT-ASSISTED LAPARO-  
SCOPIC RADICAL PROSTATECTOMY ON INTRA-  
OCULAR PRESSURE AND VISUAL FUNCTION 404
- P-WT-247**  
LIFE-THREATENING SUPRASellar ANEURYSM  
PRESENTING WITH OPTIC DISC EXCAVATION  
MIMICKING GLAUCOMA 405
- P-WT-248**  
REPEATABILITY OF SCLERAL SPUR TRACKING  
FOR ANGLE ANALYSIS AND REGISTRATION  
(STAR) FOR ANTERIOR CHAMBER ANGLE MEA-  
SUREMENTS WITH SS-ASOCT 407
- P-WT-249**  
EYE MODELS FOR SURGICAL SIMULATION OF  
MINIMALLY INVASIVE GLAUCOMA SURGERY 408
- P-WT-250**  
USEFULNESS OF FLAMMER SYNDROME QUES-  
TIONNAIRE FOR GLAUCOMA PATIENTS 409
- P-WT-251**  
DIAGNOSTIC DILEMMA OF A CASE OF UNILAT-  
ERAL OPEN ANGLE GLAUCOMA 410
- P-WT-252**  
ASSOCIATION BETWEEN CENTRAL CORNEAL  
THICKNESS AND OCULAR DOMINANCE IN  
SOUTH INDIAN POPULATION 411
- P-WT-253**  
ACHIEVING AN IOP OF LESS THAN 12 MM HG IN  
SEVERE GLAUCOMA 412
- P-WT-254**  
RESIDENT COMPETENCY ASSESSMENT TOOLS  
FOR ND:YAG LASER PERIPHERAL IRIDOTOMY  
AND SELECTIVE LASER TRABECULOPLASTY 414
- P-WT-255**  
PRIMARY EXTRADURAL ORBITAL MENINGIOMA  
AND SECONDARY GLAUCOMA - A CASE REPORT 415
- P-WT-256**  
APPOSITIONAL ANGLE CLOSURE AND CONVERT-  
ING OF PRIMARY ANGLE CLOSURE INTO GLAU-  
COMA AFTER LASER PERIPHERAL IRIDOTOMY 416
- P-WT-258**  
MACULAR MORPHOLOGY IN JUNIOR HIGH  
SCHOOL STUDENTS USING OCT VERTICAL  
IMAGE 418
- P-WT-259**  
INTRAOCULAR PRESSURE CHANGES FOLLOW-  
ING DROPPED NUCLEUS: OUR EXPERIENCE AT  
HOSPITAL SELAYANG 419
- P-WT-260**  
COMPARISON OF SURGICAL OUTCOMES OF  
TRABECULECTOMY AND TRABECULOTOMY COM-  
BINED WITH CATARACT SURGERY IN EXFOLIA-  
TION GLAUCOMA 420
- P-WT-261**  
JUVENILE UVEITIC GLAUCOMA - NEW TREAT-  
MENT PARADIGMS 421
- P-WT-262**  
SUPRACHOROID STRUCTURE AND ITS ROLE IN  
UVEOSCLERAL OUTFLOW 422

GR

FF

RF

P

I

- P-WT-263**  
VESSEL DENSITY CHANGES IN THE PERIPAPILLARY AND MACULAR AREA IN PSEUDOEXFOLIATION GLAUCOMA 425
- P-WT-264**  
COMPARISON OF THREE METHODS OF TONOMETRY PRIOR AND FOLLOWING MYORING IMPLANTATION IN PATIENTS WITH KERATOCONUS 426
- P-WT-265**  
RATES OF FAST & CATASTROPHIC VISUAL FIELD LOSS IN THREE GLAUCOMA SUBTYPES 427
- P-WT-266**  
MACULAR VESSEL DENSITY IN EYES WITH UNTREATED PRIMARY OPEN ANGLE GLAUCOMA AND A HEMIFIELD DEFECT 428
- P-WT-267**  
PROGRESSION PATTERN OF INITIAL SINGLE HEMIFIELD DEFECT IN GLAUCOMA PATIENTS 429
- P-WT-268**  
A DEEP LEARNING ALGORITHM TO AUTOMATICALLY SEGMENT THE TRABECULAR MESHWORK FROM ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IMAGES 431
- P-WT-269**  
RETINAL NERVE FIBER LAYER THICKNESS AND VISUAL FIELD CHANGES IN OBSTRUCTIVE SLEEP APNEA: A META - ANALYSIS 432
- P-WT-270**  
INVESTIGATING THE PERFORMANCE OF CHANGE ANALYSIS PRINTOUT FOR DETECTING DISEASE SEVERITY AND PROGRESSION OF GLAUCOMA 434
- P-WT-271**  
THE ASSOCIATION OF IRIS COLOR AND DYNAMIC IRIS CHANGE ASSESSED BY THREE-DIMENSIONAL SWEPT-SOURCE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY 436
- P-WT-272**  
SEQUENTIAL CHANGES IN RETINAL VESSEL DENSITY AND GANGLION CELL COMPLEX THICKNESS AFTER ACUTE PRIMARY ANGLE CLOSURE ATTACK 437
- P-WT-273**  
APPLICATION OF ISNT AND IST RULES ON RETINAL NERVE FIBER LAYER THICKNESS IN GLAUCOMA 438
- P-WT-274**  
CORNEAL AND ANGLE PARAMETERS AFTER LASER IRIDOTOMY COMBINED WITH IRIDOPLASTY ASSESSED BY DUAL SCHEIMPFLUG ANALYZER 439
- P-WT-275**  
OCT- ANGIO AND OPTIC DISC DRUSEN 442
- P-WT-276**  
CLINICAL FEATURES OF MICROVASCULATURE IN SUBZONES OF PARAPAPILLARY ATROPHY IN MYOPIC EYES 443
- P-WT-277**  
TO STUDY THE MACULAR THICKNESS IN PATIENTS WITH DIABETES & SEE IF IT CAN AFFECT THE SAME IN PATIENTS WITH GLAUCOMA & DIABETES 444
- P-WT-278**  
RELATIONSHIP BETWEEN NOCTURNAL PEAK IOP RECORDED BY CONTACT LENS SENSOR AND DISEASE PROGRESSION IN TREATED GLAUCOMATOUS EYES 446
- P-WT-279**  
CORRELATION OF MGCC THICKNESS AND CENTRAL 10-2 VISUAL FIELD CHANGES OF ADULT PATIENTS WITH PRIMARY OPEN ANGLE GLAUCOMA: A MULTICENTER STUDY IN NIGERIA 447
- P-WT-280**  
RETINAL NERVE FIBER LAYER ANALYSIS IN PARKINSONIAN SYNDROMES USING SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY 450

GR

FF

RF

P

I

- P-WT-281**  
FACTORS RELATED TO SUPERIOR AND INFERIOR  
HEMI-FIELD DEFECTS IN PRIMARY OPEN ANGLE  
GLAUCOMA 452
- P-WT-283**  
SELF-DIRECTED HOME MONITORING OF VISUAL  
FIELD WITH IPAD TABLET PERIMETER: SHORT-  
TERM COMPLIANCE AND RELIABILITY 453
- P-WT-284**  
THE EFFECT OF FEMTOSECOND LASER CATA-  
RACT SURGERY ON THE INTRAOCULAR PRES-  
SURE AND PERIPAPILLARY RETINAL NERVE  
FIBER LAYER THICKNESS 454
- P-WT-285**  
DECREASED SURFACE AREA IN OCCIPITAL  
CORTEX IS ASSOCIATED WITH PUPIL REFLEX IN  
GLAUCOMA PATIENTS 455
- P-WT-286**  
PERIPAPILLARY CAPILLARY PLEXUS DENSITY  
AND MACULAR VESSEL DENSITY IN EYES WITH  
PSEUDOEXFOLIATION SYNDROME 456
- P-WT-287**  
ASSESSMENT OF INTRAOCULAR PRESSURE AND  
ANGLE CHANGES POST-PERIPHERAL IRIDOTOMY  
IN SPECTRUM OF PRIMARY ANGLE CLOSURE  
DISEASE BY SS-OCT 457
- P-WT-288**  
EFFECT OF TROPICAMIDE ON LASER FLARE  
METER MEASUREMENTS IN PATIENTS WITH  
PSEUDOEXFOLIATION 458
- P-WT-289**  
EVALUATION OF PHOTOPIC NEGATIVE RESPON-  
SE(PHNR) USING RETEVAL™ IN GLAUCOMA EYES 459
- P-WT-290**  
IS(N'T) IT POSSIBLE (NOT) TO PERCEIVE SCOTO-  
MAS? 460
- P-WT-291**  
CLINICAL CHARACTERISTICS OF GLAUCOMA  
PATIENTS WITH DISC HEMORRHAGE IN DIFFER-  
ENT LOCATIONS 461
- P-WT-292**  
BINOCULAR VISUAL FIELD IN VARIOUS STAGES  
OF PRIMARY GLAUCOMA AND ITS IMPACT ON  
LIFE PERCEPTION IN DIFFERENT ENVIRON-  
MENTS 462
- P-WT-293**  
CLUSTER ANALYSIS OF LONGITUDINAL VISUAL  
FIELDS IDENTIFIES PATTERNS OF PROGRES-  
SION IN GLAUCOMA PATIENTS 463
- P-WT-295**  
ASSESSING CHANGE IN CONTRAST SENSITIV-  
ITY IN PATIENTS WITH SEVERE PRIMARY OPEN  
ANGLE GLAUCOMA USING SPAETH RICHMAN  
CONTRAST SENSITIVITY TEST 465
- P-WT-296**  
MEASUREMENT OF EYE MOVEMENT DURING  
STIMULATING TO PHYSIOLOGIC SCOTOMA BY  
HEIJL-KRAKAU METHOD WITH HEAD-MOUNTED  
PERIMETER IMO® 466
- P-FS-001**  
LONGITUDINAL ANALYSES OF PHYSIOLOGICAL  
AGING EFFECT ON THICKNESS OF RETINAL GAN-  
GLION CELL-RELATED LAYERS AND SAP SENSI-  
TIVITY IN NORMAL JAPANESE EYES 467
- P-FS-002**  
INTER-EYE CORRELATIONS IN RETINAL NERVE  
FIBER LAYER THICKNESS RATES OF CHANGE 469
- P-FS-003**  
RELATIONSHIP BETWEEN PATTERN ELECTRO-  
RETINOGRAM AND OPTIC DISC MORPHOLOGY IN  
GLAUCOMA 470
- P-FS-004**  
PROGRESSIVE OPTIC DISC TILT IN YOUNG MYO-  
PIC GLAUCOMATOUS EYES 471
- P-FS-005**  
THE RELATIONSHIP BETWEEN PERIPAPILLARY  
VESSEL DENSITY AND VISUAL FIELD MEAN SEN-  
SITIVITY IN PSEUDOEXFOLIATION GLAUCOMA  
AND PRIMARY OPEN ANGLE GLAUCOMA 472

GR

FF

RF

P

I

- P-FS-006**  
SCREENING FOR GLAUCOMATOUS VISUAL FIELD DEFECTS: EYE MOVEMENT PERIMETRY VS FREQUENCY DOUBLING PERIMETRY 474
- P-FS-007**  
DEVELOPING A METHOD TO PREDICT MEAN DEVIATION OF 10-2 TEST FROM 24-2 TEST IN THE STANDARD AUTOMATED PERIMETRY 476
- P-FS-008**  
ELEVATED INTRAOCULAR PRESSURE AND HIGH PACHYMETRY, WHAT THE OPHTHALMOLOGIST DO IN BARCELONA, SPAIN 477
- P-FS-009**  
SWEPT SOURCE OPTICAL COHERENCE TOMOGRAPHY'S GLAUCOMA, HOOD REPORT AND CHOROIDAL THICKNESS PARAMETERS IN ADULTS WITH BETA THALASSEMIA MAJOR 479
- P-FS-010**  
STRUCTURE-FUNCTION RELATIONSHIP WITH 2 DIFFERENT SPECTRAL DOMAIN OCT PLATFORMS 480
- P-FS-011**  
THE USE OF TRYPAN BLUE AS AN AQUEOUS TRACER DYE TO ASSESS TRABECULECTOMY FUNCTION AND INVESTIGATE POST-TRABECULECTOMY HYPOTONY 482
- P-FS-013**  
EFFECT OF COLD PROVOCATION ON VESSEL DENSITY IN EYES WITH PRIMARY OPEN ANGLE GLAUCOMA: AN OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY STUDY 484
- P-FS-014**  
CORRELATION OF OPTIC COHERENCE TOMOGRAPHY FINDINGS AND OPHTHALMIC ARTERY RESISTIVITY INDEX: COMBINED RESULTS OF RANDOMIZED CONTROLLED CLINICAL TRIALS 485
- P-FS-015**  
CHANGES OF THE BRUCH'S MEMBRANE AND OF THE RETINAL NERVE FIBER LAYER ASSESSED BY OPTICAL COHERENCE TOMOGRAPHY AFTER FILTRATION SURGERY 486
- P-FS-016**  
PERIPAPILLARY AND MACULAR NERVE FIBER LAYER EVALUATION IN PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS - DIAGNOSTIC ABILITIES 487
- P-FS-017**  
POST-DILATATION ANGLE CONFIGURATION USING THE SWEPT SOURCE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IN UNTREATED PRIMARY ANGLE CLOSURE SUSPECTS 488
- P-FS-018**  
ASSOCIATION BETWEEN RIGHT-LEFT DIFFERENCE IN VISUAL FIELD DEFECT AND IN VESSEL DENSITY IN EYES WITH PRIMARY OPEN ANGLE GLAUCOMA 490
- P-FS-019**  
SERIAL COMBINED WIDE-FIELD OCT MAPS (PANOMAPS) FOR DETECTION OF EARLY-GLAUCOMATOUS STRUCTURAL PROGRESSION 491
- P-FS-020**  
ORIENTATION OF THE TEMPORAL NERVE FIBER RAPHE MEASURED WITH WIDE FIELD SWEPT SOURCE OPTICAL COHERENCE TOMOGRAPHY 494
- P-FS-021**  
AUTOMATIC DIFFERENTIATION OF GLAUCOMA VISUAL FIELD FROM NON-GLAUCOMA VISUAL FIELD USING DEEP CONVOLUTIONAL NEURAL NETWORK 495
- P-FS-022**  
UNDERSTANDING CORNEAL BIOMECHANICAL PARAMETERS IN NORMAL TENSION GLAUCOMA AFTER WATER DRINKING TEST 498
- P-FS-023**  
CORRELATION BETWEEN OPTIC DISC SIZE ASSESSMENT USING VEIN-TO-DISC DIAMETER RATIO AND DISC SIZE ASSESSMENT BY DISC AREA IN OPTICAL COHERENCE TOMOGRAPHY 499

GR

FF

RF

P

I

- P-FS-024**  
SENSITIVITIES OF CORTICALLY MEDIATED  
OBJECTIVE PERIMETRY CORRESPOND LINEARLY  
WITH RNFL LOSS 500
- P-FS-025**  
DUAL SCHEIMPFLUG IMAGING AS A SCREENING  
METHOD FOR OCCLUDABLE ANGLES - A COM-  
PARISON WITH GONIOSCOPY 502
- P-FS-026**  
PROGRESSION OF VISUAL FIELD DEFECTS IN  
EYES WITH PRIMARY OPEN-ANGLE GLAUCOMA  
SHOWING FLOOR OF MACULA GANGLION CELL  
COMPLEX THINNING 504
- P-FS-027**  
EFFECTS OF HEAD TILT ON VISUAL FIELD TEST-  
ING WITH A HEAD-MOUNTED PERIMETER IMO 505
- P-FS-028**  
AUTOMATIC ANTERIOR CHAMBER ANGLE PIG-  
MENTATION ANALYSES USING A 360-DEGREE  
GONIOSCOPE 506
- P-FS-029**  
RATE OF ANTERIOR CHAMBER DEPTH REDUC-  
TION FOR EYES WITH ANGLE CLOSURE IN LATE  
MIDDLE AGE 507
- P-FS-030**  
GLAUCOMA HEMI-FIELD TEST IN EYE MOVE-  
MENT PERIMETRY: COMPARISON OF SACCADIC  
REACTION TIME IN SUPERIOR AND INFERIOR  
HEMI-FIELD SECTORS 508
- P-FS-031**  
EFFECT OF PERIPAPILLARY RETINOSCHISIS ON  
RETINAL LAYER THICKNESS MEASUREMENT IN  
GLAUCOMA AND GLAUCOMA SUSPECT 510
- P-FS-032**  
DETECTION RATE OF DISC HAEMORRHAGES IN  
NORMAL CLINICAL PRACTICE. COMPARISON  
BETWEEN CLINICAL EXAMINATION AND HEIDEL-  
BERG RETINA TOMOGRAPH IMAGES 511
- P-FS-033**  
EFFECTS OF FUNDUS TRACKING ON STRUC-  
TURE-FUNCTION RELATIONSHIP IN GLAUCOMA 513
- P-FS-034**  
SWEPT-SOURCE OCT ANGIOGRAPHY OF THE  
MACULAR CAPILLARY NETWORK IN VARIOUS  
TYPES OF GLAUCOMA 515
- P-FS-035**  
SPATIAL BIAS IN DETERMINING VISUAL FIELD  
SENSITIVITIES 516
- P-FS-036**  
COMPARISON OF MACULA GANGLION CELL  
COMPLEX THICKNESS SLOPE BETWEEN PREPE-  
RIMETRIC GLAUCOMA AND EARLY NORMAL  
TENSION GLAUCOMA EYES 517
- P-FS-037**  
SCREENING OF PROGRESSION IN PRIMARY  
OPEN ANGLE GLAUCOMA PATIENTS 518
- P-FS-038**  
A NOVEL VISUAL FIELD PREDICTION USING  
RECURRENT NEURAL NETWORK ARCHITECTURE 520
- P-FS-039**  
TOPOGRAPHIC RELATIONSHIP BETWEEN ANTE-  
RIOR SCLERA AND OPTIC NERVE HEAD DEFOR-  
MATION IN MYOPIC EYES 523
- P-FS-040**  
CHOROIDAL MICROVASCULAR DROPOUT IN  
PSEUDOEXFOLIATION GLAUCOMA 524
- P-FS-041**  
DECREASED VISUAL FIELD RESPONSIVENESS  
IN AREAS WITH NORMAL SENSITIVITY THRESH-  
OLDS IN MODERATE AND SEVERE GLAUCOMA 525
- P-FS-042**  
PERIPAPILLARY PERFUSED CAPILLARY DENSITY  
IN ACUTE PRIMARY ANGLE CLOSURE VER-  
SUS PRIMARY OPEN-ANGLE GLAUCOMA AND  
HEALTHY CONTROLS 527

GR

FF

RF

P

I

- P-FS-043**  
COMPARISON OF SITA-FASTER AND SITA-STANDARD IN A CLINICAL COHORT OF NORMAL SUBJECTS, GLAUCOMA SUSPECTS AND PATIENTS WITH GLAUCOMA 529
- P-FS-044**  
DETERMINANTS OF MISCLASSIFICATION ERRORS BY SWEPT-SOURCE OPTICAL COHERENCE TOMOGRAPHY IN ANGLE CLOSURE ASSESSMENT 531
- P-FS-045**  
COMPARISON OF SPECTRAL DOMAIN AND SWEPT SOURCE OPTICAL COHERENCE TOMOGRAPHY FOR ANGLE ASSESSMENT OF CHINESE ELDERLY SUBJECTS 532
- P-FS-046**  
DETERMINANTS OF THE RETINAL NERVE FIBER LAYER PROFILE IN MYOPIC EYES: A SEPARATE ANALYSIS OF THE SUPERIOR AND INFERIOR HEMIRETINA 534
- P-FS-047**  
RELATIONSHIP BETWEEN SWEPT-SOURCE OCT EN-FACE IMAGE AND THE FOVEAL THRESHOLD IN GLAUCOMA PATIENTS 535
- P-FS-048**  
CHOROIDAL MICROVASCULAR DROPOUT IN PRIMARY OPEN-ANGLE GLAUCOMA EYES WITH DISC HEMORRHAGE 536
- P-FS-049**  
OBJECTIVE TESTING OF BOTH VISUAL FIELDS IN 80 SECONDS 537
- P-FS-050**  
ALTERED BRAIN ACTIVITY OF RESTING BRAIN MICROSTATES IN EARLY GLAUCOMA: AN EVIDENCE FROM HIGH DENSITY EEG STUDY 539
- P-FS-051**  
ASSESSMENT OF SPONTANEOUS RETINAL VENOUS PULSATIONS IN GLAUCOMA PATIENTS ON MEDICAL TREATMENT OVER TWO-YEARS 540
- P-FS-052**  
COMPARISON OF CENTRAL VISUAL SENSITIVITY UNDER MONOCULAR AND BINOCULAR CONDITIONS IN GLAUCOMA PATIENTS USING NEW STATISTICAL PERIMETRY 541
- P-FS-053**  
DIAGNOSTIC PERFORMANCE OF OPTIC NERVE HEAD HEMOGLOBIN LEVELS MEASUREMENT IN EYES WITH EARLY PRIMARY OPEN ANGLE GLAUCOMA 542
- P-FS-054**  
COMPARISONS BETWEEN RETINAL VESSEL DIAMETERS AND VARIOUS OPTIC NERVE HEAD MORPHOLOGY PARAMETERS IN GLAUCOMA; THE GLACUOMA STEREO ANALYSIS STUDY (GSAS) 543
- P-FS-055**  
INFLUENCING FACTORS OF THE PERIPAPILLARY CHOROIDAL VASCULARITY INDEX IN GLAUCOMA 544
- P-FS-056**  
THE CORRELATION BETWEEN THE PAPILLOMACULAR BUNDLE AND VISUAL ACUITY 545
- P-FS-057**  
ASSOCIATION BETWEEN THE CHANGES OF STRUCTURE AND BLOOD FLOW WAVEFORM BEFORE AND AFTER TRABECULECTOMY 546
- P-FS-058**  
THE SHORT-TERM EFFECT OF INTRAOCULAR PRESSURE REDUCTION ON THE PHOTOPIC NEGATIVE RESPONSE IN GLAUCOMA 547
- P-FS-059**  
PERIPAPILLARY PERFUSED CAPILLARY DENSITY IN TRUE EXFOLIATION SYNDROME VERSUS PSEUDOEXFOLIATION SYNDROME: AN OCTA STUDY 548
- P-FS-060**  
CORRELATION BETWEEN MELBOURNE RAPID FIELD (MRF) USING A PORTABLE DEVICE AND HUMPHREY VISUAL FIELD IN CHILEAN GLAUCOMA PATIENTS 550

- P-FS-061**  
NON-PROGRESSIVE FIELD DEFECT IN  
UNTREATED POAG PATIENT- A CASE REPORT 551
- P-FS-062**  
COMPARISON OF MICROPERIMETRY, OPTICAL  
COHERENCE TOMOGRAPHY AND HUMPHREY  
VISUAL FIELD ANALYZER IN OCULAR HYPERTEN-  
SION AND GLAUCOMA PATIENTS 552
- P-FS-063**  
COMPARISON BETWEEN LONG-TERM AND  
SHORT-TERM VARIABILITY ON STANDARD AUTO-  
MATED PERIMETRY (SAP) 553
- P-FS-064**  
CORRELATIONS BETWEEN MACULA VESSEL  
DENSITY AND MACULA THICKNESS IN EARLY  
STAGE OF PRIMARY OPEN-ANGLE GLAUCOMA 554
- P-FS-065**  
IMPROVING OBJECTIVE PERIMETRY 555
- P-FS-066**  
INCREASING SPOT SIZE WITH ECCENTRICITY  
IMPROVES PERIMETRY OUTCOMES 557
- P-FS-067**  
GLAUCOMA PROGRESSION DETECTION IN  
ADVANCED DISEASE 558
- P-FS-068**  
COMPARISON OF DIFFERENCE IN PROGRES-  
SION RATE OF NORMAL-TENSION GLAUCOMA  
GROUPS CLASSIFIED BY HIERARCHICAL CLUS-  
TER ANALYSIS 559
- P-FS-069**  
COMPARISON OF VISUAL FIELD PROGRESSION  
AFTER TRABECULECTOMY WITH PHACOEMULSI-  
FICATION OR AGV WITH PHACOEMULSIFICATION  
IN ASIAN EYES WITH GLAUCOMA 560
- P-FS-071**  
INTER-EYE ASYMMETRY OF OPTICAL COHER-  
ENCE TOMOGRAPHY ANGIOGRAPHY VESSEL  
DENSITY AND THICKNESS PARAMETERS IN  
UNILATERAL EXFOLIATION SYNDROME 561
- P-FS-072**  
THERMAL AND MECHANICAL STRESS ENHANCE  
STEROID-INDUCED AUTOTAXIN EXPRESSION  
AND FIBROTIC RESPONSE IN THE HUMAN TRA-  
BECULAR MESHWORK CELLS 562
- P-FS-073**  
RELIABILITY OF LOW FREQUENCY CONTACT B  
SCAN IN ASSESSMENT OF OPTIC NERVE HEAD  
CUPPING 564
- P-FS-074**  
PREDICTION PRECISION OF VISUAL FIELD BY  
RETINAL FIBER LAYER THICKNESS IN PANEL  
DATA 565
- P-FS-075**  
DETECTING VISUAL FIELD PROGRESSION BY  
CLUSTER-BASED VS GLOBAL-BASED TREND  
ANALYSIS AMONG GLAUCOMA PATIENTS 568
- P-FS-076**  
RETINAL VASCULAR TOPOGRAPHY INFLUENCES  
THE SPECTRAL DOMAIN OCT DIAGNOSTIC  
GLAUCOMA CLASSIFICATION IN MYOPIC EYES 570
- P-FS-077**  
INFLUENCE OF MUSIC ON INTRAOCULAR  
PRESSURE AND MORPHOLOGY OF SCHLEMM'S  
CANAL: AN SS-OCT STUDY 572
- P-FS-078**  
ZINN-HALLER ARTERIAL CIRCLE BY OCT-ANGI-  
OGRAPHY IN DIAGNOSIS OF GLAUCOMA ASSOCI-  
ATED WITH MYOPIA 573
- P-FS-079**  
INCISIONLESS, MINIMALLY INVASIVE SUB-TEN-  
ON'S ANAESTHESIA IN GLAUCOMA SURGERY:  
REAL WORLD OUTCOMES 576
- P-FS-080**  
OUTCOMES OF SURGICAL TREATMENT OF  
GLAUCOMA IN ANIRIDIA 578
- P-FS-081**  
MIGS IN THE AUSTRALIAN OUTBACK: THE CHAL-  
LENGE OF GLAUCOMA SURGERY IN ISOLATED  
AND REMOTE SETTINGS 579

GR

FF

RF

P

I

- P-FS-083**  
A FIRST-IN-HUMAN STUDY OF THE EFFICACY AND SAFETY OF MINIJECT IN PATIENTS WITH MEDICALLY-UNCONTROLLED OPEN ANGLE GLAUCOMA 580
- P-FS-084**  
TOPICAL ANAESTHESIA VERSUS PERIBULBAR ANAESTHESIA IN PENETRATING TRABECULECTOMY 581
- P-FS-085**  
UNDERSTANDING THE IMPACT OF AQUEOUS FLOW ON WOUND HEALING PROCESS FOLLOWING GLAUCOMA FILTERING SURGERY (GFS) 583
- P-FS-086**  
AQUEOUS OUTFLOW RESISTANCE AND ITS RELEVANCE TO MICRO-INVASIVE GLAUCOMA SURGERY 585
- P-FS-087**  
RISK FACTORS FOR GLAUCOMA DRAINAGE DEVICE EXPOSURE IN A MIDDLE-EASTERN POPULATION 586
- P-FS-088**  
SPONTANEOUS GLAUCOMA DRAINAGE DEVICE EXTRUSION AFTER EARLY POSTOPERATIVE ORBITAL CELLULITIS – CASE REPORT AND LITERATURE REVIEW 588
- P-FS-089**  
OUTCOMES OF CANALOPLASTY VERSUS NON-PENETRATING DEEP SCLERECTOMY IN UNCONTROLLED OPEN ANGLE GLAUCOMA 589
- P-FS-090**  
COMPARISON OF SURGICAL OUTCOMES BETWEEN SULCUS AND ANTERIOR CHAMBER IMPLANTED GLAUCOMA DRAINAGE DEVICES 592
- P-FS-091**  
COMPLICATIONS OF AHMED GLAUCOMA VALVE IMPLANT IN JORDANIAN PATIENTS 593
- P-FS-092**  
COMPARISON OF LONG-TERM OUTCOMES OF TRABECULECTOMY WITH POLYVINYLPYRROLIDONE COLLAGEN VERSUS TRABECULECTOMY WITH MITOMYCIN C. 36-MONTH FOLLOW-UP 594
- P-FS-093**  
PROSPECTIVE EVALUATION OF A SCHLEMM'S CANAL MICROSTENT FOR TREATMENT OF PRIMARY ANGLE CLOSURE GLAUCOMA IN COMBINATION WITH PHACOEMULSIFICATION 595
- P-FS-095**  
CHANGES IN INTRAOCULAR PRESSURE AND ANGLE STATUS POST PHACO IN PRIMARY ANGLE CLOSURE HYPERTENSION 596
- P-FS-096**  
IMPACT OF PREOPERATIVE TOPICAL STEROIDS ON TRABECULECTOMY OUTCOMES: A RANDOMIZED CONTROLLED TRIAL 598
- P-FS-097**  
A NOVEL GLAUCOMA SURGICAL TECHNIQUE: INTRASCLERAL CILIARY SULCUS-SUPRACHOROIDAL MICROTUBE 599
- P-FS-098**  
A NEW METHOD OF AB INTERNO TRABECULOTOMY WITH GONIOSYNECHIALYSIS NEEDLE: A SHORT-TERM, PRELIMINARY STUDY 601
- P-FS-099**  
LONG-TERM EFFECTS OF TOPICAL BEVACIZUMAB ON SUTURELESS SCLERAL TUNNEL TRABECULECTOMY 602
- P-FS-100**  
OMNI-AN INITIAL EXPERIENCE WITH A NEW SURGICAL GLAUCOMA TREATMENT DEVICE 604
- P-FS-101**  
COMPARING PHACO AND PHACOTRAB IN THE MANAGEMENT OF PRIMARY ANGLE CLOSURE GLAUCOMA 605
- P-FS-102**  
OUTCOMES OF SUTURELESS PCIOI IN PATIENTS WITH SURGICALLY CONTROLLED GLAUCOMA 606

GR

FF

RF

P

I

- P-FS-103**  
XEN IMPLANTATION IN REFRACTORY GLAUCOMA 607
- P-FS-104**  
OUTCOME OF AHMED GLAUCOMA VALVE SURGERY AS PRIMARY TREATMENT 608
- P-FS-105**  
PRE-TRABECULECTOMY INTRACAMERAL BEVACIZUMAB FOR RUBEOTIC GLAUCOMA 609
- P-FS-106**  
BLEB MORPHOLOGY RESULTING FROM NOVEL CONJUNCTIVAL FRILL INCISION (SMILE) TRABECULECTOMY 610
- P-FS-107**  
TRABECULECTOMY MODIFIED WITH COLLAGEN MATRIX IMPLANT IN CONGENITAL / JUVENILE GLAUCOMA - A PRELIMINARY STUDY 611
- P-FS-108**  
COMPARISON OF OLOGEN® AND INTRAOPERATIVE MITOMYCIN C IN PHACOTRABECULECTOMY OVER 5 YEARS: A RANDOMISED STUDY 612
- P-FS-109**  
XEN-AUGMENTED BAERVELDT IN REFRACTORY GLAUCOMA: ONE YEAR OUTCOMES 613
- P-FS-110**  
NOVEL MIGS PROCEDURE COMBINING KAHOOK DUAL BLADE GONIOTOMY AND DIRECT VISCODILATION OF THE COLLECTOR CHANNELS WITH CATARACT SURGERY: ONE YEAR RESULTS 614
- P-FS-111**  
LONG-TERM OUTCOMES OF MITOMYCIN-C TRABECULECTOMY OF PHAKIC EYES VERSUS PSEUDOPHAKIC EYES IN EXFOLIATIVE GLAUCOMA 615
- P-FS-112**  
OUTCOMES OF COMBINED GONIOSCOPY-ASSISTED TRANSLUMINAL TRABECULOTOMY AND GONIOSYNECHIALYSIS IN PRIMARY ANGLE CLOSURE: A RETROSPECTIVE CASE SERIES 616
- P-FS-113**  
TOO BIG OR TOO SMALL, DOES IT MATTER? DETERMINING ANTERIOR SEGMENT DIMENSION CHANGE BY THE LASER IRIDOTOMY SIZE IN ANGLE CLOSURE EYES 617
- P-FS-114**  
RETROSPECTIVE STUDY EVALUATING SAFETY AND EFFICACY OF AN ABINTERNO CILIARY SULCUS IMPLANTATION OF BAERVELDT TUBES IN PATIENTS WITH GLAUCOMA 618
- P-FS-115**  
OUTCOMES WITH SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IN PATIENTS WITH GLAUCOMA 619
- P-FS-116**  
HIGH INTENSITY FOCUSED ULTRASOUND FOR GLAUCOMA: 1-YEAR RESULTS FROM A PROSPECTIVE PRAGMATIC STUDY 620
- P-FS-117**  
FP8 AHMED VALVES IN PATIENTS OLDER THAN 85 621
- P-FS-118**  
A COMPARISON OF SURGICAL OUTCOMES OF TUBE SHUNT SURGERY, BLEB NEEDLE REVISION AND REVISION TRABECULECTOMY FOLLOWING FAILED TRABECULECTOMY 622
- P-FS-119**  
EFFICACY AND SECURITY OF TRABECULECTOMY WITH SUBCONJUNTIVAL BIODEGRADABLE COLLAGEN MATRIX IMPLANT: LONG-TERM FOLLOW-UP 623
- P-FS-120**  
KDB-ASSISTED GONIOTOMY COMBINED WITH CATARACT SURGERY: A PROSPECTIVE ANALYSIS OF SURGICAL OUTCOMES AND SUCCESS PREDICTORS 624
- P-FS-121**  
EXPRESS SHUNT RESULTS 626

GR

FF

RF

P

I

- P-FS-122**  
OUTCOME OF SURGICAL BLEB REVISION USING  
SCLERAL PATCH GRAFT FOR BLEB RELATED  
COMPLICATIONS FOLLOWING TRABECULECTOMY 627
- P-FS-124**  
FIXING TECHNIQUE OF THE TENON IMPROVES  
BLEB CHARACTERISTICS AND PROGNOSIS OF  
THE SURGERY 629
- P-FS-125**  
TRANSSCLERAL CYCLOPHOTOCOAGULATION  
VERSUS TRABECULECTOMY – SAFETY IN  
POST-KERATOPLASTY PATIENTS 630
- P-FS-126**  
TRANSLERAL MICROPULSE DIODE LASER  
SCHLEMMS-TRABECULOPLASTY FOR PRIMARY  
OPEN ANGLE GLAUCOMA: A PILOT STUDY 631
- P-FS-127**  
GONIOTOMY WITH TM EXCISION VS TRABECULAR  
BYPASS DEVICE IMPLANTATION IN GLAUCOMA  
PATIENTS UNDERGOING CATARACT  
EXTRACTION: 12 MO SUBGROUP ANALYSIS 632
- P-FS-128**  
AHMED GLAUCOMA VALVE EXPLANTATION 634
- P-FS-129**  
PHACOTRABECULECTOMY WITH RELEASABLE  
SUTURES IN PRIMARY ANGLE CLOSURE GLAUCOMA:  
A RANDOMIZED CONTROLLED STUDY 636
- P-FS-130**  
EFFICACY AND SAFETY OF THE CYPASS  
SUPRACHOROIDAL SHUNT – A CASE SERIES 637
- P-FS-131**  
CO<sub>2</sub> LASER-ASSISTED SCLERECTOMY VERSUS  
TRABECULECTOMY 638
- P-FS-132**  
2-YEAR RESULTS OF A PROSPECTIVE, MULTICENTER,  
RANDOMIZED COMPARISON OF HYDRUS VERSUS TWO  
ISTENTS IN STANDALONE SURGERY FOR OPEN ANGLE  
GLAUCOMA 640
- P-FS-133**  
A 2-YEAR POOLED ANALYSIS OF THE MICRO-SHUNT  
IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA  
(POAG): 0.2 VERSUS 0.4 MG/ML MITOMYCIN C (MMC)  
OUTCOMES 641
- P-FS-134**  
COMPARATIVE ANALYSIS OF ENRICHMENT OF TWO  
BIODEGRADABLE GLAUCOMA DRAINAGE MODELS WITH  
CYCLOSPORINE A FOR WOUND HEALING MODULATION 642
- P-FS-135**  
PROSPECTIVE STUDY OF ISTENT INJECT® MICROSTENT  
IMPLANTATION COMBINED WITH CATARACT SURGERY IN  
OPEN-ANGLE GLAUCOMA PATIENTS: 6-MONTH RESULTS 644
- P-FS-136**  
RETROSPECTIVE SURGICAL OUTCOME ANALYSIS OF  
TRABECULAR MICRO-BYPASS STENT, 180-DEGREE AND  
360-DEGREE GONIOSCOPY ASSISTED TRANSLUMINAL  
TRABECULOTOMY 645
- P-FS-137**  
OMNI TM IN OPEN-ANGLE GLAUCOMA TREATMENT:  
A 1-YEAR FOLLOW-UP 646
- P-FS-138**  
UBM IMAGING PATTERNS IN SUCCESSFUL TRABECULECTOMY  
WITH SUPRACHOROIDAL DERIVATION. A LONG TERM  
ANALYSIS 647
- P-FS-139**  
SUCCESS RATE AND SAFETY OF MICROPULSE  
TRANSSCLERAL CYCLOPHOTOCOAGULATION WITH  
VARIABLE TREATMENT DURATIONS IN GLAUCOMA 649
- P-FS-140**  
TRABECULECTOMY WITH SUPRACHOROIDAL DERIVATION:  
2 YEARS FOLLOW-UP 651
- P-FS-141**  
TWO YEARS RESULT OF AHMED GLAUCOMA VALVE  
IMPLANTATION IN THE TREATMENT OF REFRACTORY  
GLAUCOMA IN A TERTIARY EYE CARE CENTER IN  
BANGLADESH 652

GR

FF

RF

P

I

- P-FS-142**  
TRABECULAR MICRO-BYPASS AS A STAND-ALONE PROCEDURE FOR PATIENTS WITH GLAUCOMA: A SYSTEMATIC REVIEW AND META-ANALYSIS 653
- P-FS-144**  
COMPARISON OF AB-INTERNO 360-DEGREE TRABECULOTOMY AND AB-INTERNO TRABECULECTOMY USING DUAL BLADE OUTCOMES 654
- P-FS-145**  
OUTCOME OF PHACOEMULSIFICATION WITH KAHOOK DUAL BLADE GONIOTOMY IN SEVERE GLAUCOMA AT 6 MONTHS 655
- P-FS-146**  
2-YEAR EXPERIENCE WITH THE XEN45 GEL STENT IN PSEUDOEXFOLIATION AND PRIMARY OPEN ANGLE GLAUCOMA 657
- P-FS-147**  
MANAGEMENT OF PSEUDOEXFOLIATIVE GLAUCOMA WITH 2ND GENERATION TRABECULAR MICRO-BYPASS STENTS (ISTENT INJECT®) 658
- P-FS-148**  
EARLY EXPERIENCE WITH COMBINED PHACOEMULSIFICATION AND ISTENT INJECT IMPLANTATION IN ASIAN EYES WITH GLAUCOMA 659
- P-FS-149**  
REPAIR OF EXPOSED AHMED GLAUCOMA VALVE TUBE WITH SCLERAL PATCH GRAFTING AND CONJUNCTIVAL GRAFTING 660
- P-FS-150**  
EFFECT OF MITOMYCIN C APPLICATION VIA SPONGE VERSUS INJECTION WITH DEEP SCLERECTOMY IN OPEN-ANGLE GLAUCOMA 661
- P-FS-151**  
SHORT TERM OUTCOMES IN ASIAN EYES OF TWO SECOND GENERATION TRABECULAR BYPASS MICROSTENT INSERTIONS IN SUBJECTS WITH OPEN ANGLE GLAUCOMA 662
- P-FS-152**  
REFRACTIVE OUTCOMES AFTER COMBINED CATARACT AND ISTENT INJECT SURGERY 663
- P-FS-153**  
SURGICAL REPAIR OF SEVERE TRAUMATIC CYCLODIALYSIS BY A CIRCUMFERENTIALLY INSERTED 5-0 PROLINE THREAD ALONG THE CILIARY SULCUS 664
- P-FS-154**  
EFFECT OF AHMED GLAUCOMA VALVE IMPLANTATION ON UNCONTROLLED INTRAOCULAR PRESSURE IN POST- VITRECTOMY PATIENTS- A RETROSPECTIVE ANALYSIS 665
- P-FS-155**  
SUCCESS RATE OF SECOND FILTERING SURGERY 666
- P-FS-156**  
EXPERIENCES OF HIGH-STAKES 'ONLY-EYE' SURGERY: PATIENT AND SURGEON PERSPECTIVES 667
- P-FS-157**  
SHORT TERM SURGICAL OUTCOME OF COMBINED PROCEDURE IN PATIENTS WITH SECONDARY GLAUCOMA AND CATARACT IN PEDIATRIC AGE GROUP IN BANGLADESH 668
- P-FS-158**  
COMPARATIVE STUDY OF INJECTION MITOMYCIN-C VERSUS SPONGES IN PHACOTRABECULECTOMY 669
- P-FS-159**  
POST KERATOPLASTY GLAUCOMA IN PERFORATED FUNGAL KERATITIS 670
- P-FS-160**  
CLINICAL RESULTS OF TRABECULAR MICRO-BYPASS STENT IMPLANTATION COMBINED WITH CATARACT SURGERY 671
- P-FS-161**  
EFFECTIVENESS OF THE TRABECTOMY AB INTERNO IN PATIENTS WITH VARIOUS STAGES OF OPEN-ANGLE GLAUCOMA 672

GR

FF

RF

P

I

- P-FS-162**  
MANAGEMENT OF APPOSITIONAL ANGLE-CLOSURE GLAUCOMA WITH SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS (ISTENT INJECT®) 673
- P-FS-163**  
MID-TERM OUTCOMES OF SUTURE TRABECULOTOMY AB INTERNO FOR AMYLOIDOTIC GLAUCOMA 674
- P-FS-165**  
COMPARISON OF THE EFFECT OF TRABECULECTOMY WITH MITOMYCIN C ON MACULAR THICKNESS IN PRIMARY OPEN-ANGLE GLAUCOMA AND PSEUDOEXFOLIATIVE GLAUCOMA 675
- P-FS-168**  
TWENTY-FOUR MONTH ABIC RESULTS IN PATIENTS WITH POAG 676
- P-FS-169**  
NATURAL HISTORY OF CONJUNCTIVAL BLEB FOLLOWING BIODEGRADABLE COLLAGEN IMPLANT – ANTERIOR SEGMENT OCT (AS-OCT) MORPHOLOGICAL STUD 677
- P-FS-170**  
PROSPECTIVE STUDY OF TWO TRABECULAR MICRO-BYPASS STENTS COMPARED TO PROSTAGLANDIN AS TREATMENT IN NEWLY DIAGNOSED OPEN-ANGLE GLAUCOMA: 5-YEAR OUTCOMES 678
- P-FS-171**  
CLINICAL OUTCOMES OF AHMED GLAUCOMA VALVE IMPLANTATION WITHOUT FIXATION OF PLATE: THE FREE PLATE TECHNIQUE 679
- P-FS-172**  
SURGICAL OUTCOMES OF AB-INTERNO SCHLEMM'S CANAL PROCEDURES IN OPEN-ANGLE GLAUCOMA PATIENTS WITH PREVIOUS SELECTIVE LASER TRABECULOPLASTY 680
- P-FS-173**  
LONG-TERM EVALUATION OF TRABECTOME SURGERY PERFORMED ON JAPANESE PATIENTS 681
- P-FS-174**  
EFFECT OF GLAUCOMA DRAINAGE IMPLANT SURGERY ON CORNEAL TOPOGRAPHY AND ENDOTHELIAL CELL DENSITY 682
- P-FS-175**  
OUTCOME OF GLAUCOMA SURGERY IN ONE-CHAMBER EYES 683
- P-FS-176**  
EARLY EFFICACY AND SAFETY OF CYPASS MICRO-STENT IMPLANTATION IN AN AUSTRALIAN TERTIARY HOSPITAL 684
- P-FS-177**  
KAHOOK DUAL BLADE:AB INTERNOTRABECULECTOMY - TECHNIQUE AND FIRST RESULTS 685
- P-FS-178**  
A SYSTEMATIC REVIEW AND META-ANALYSIS OF OUTCOME IN MINIMALLY-INVASIVE GLAUCOMA SURGERIES 686
- P-FS-179**  
EFFICACY AND SAFETY OF CROSSLINKING ON LEAKING CYSTIC BLEB: A PROSPECTIVE STUDY 688
- P-FS-180**  
A PROSPECTIVE, RANDOMIZED TRIAL COMPARING THE USE OF POST-OPERATIVE ADJUNCTIVE BEVACIZUMAB VS PLACEBO IN PRIMARY TRABECULECTOMY SURGERY FOR GLAUCOMA 690
- P-FS-181**  
SURGICAL OUTCOMES OF SILICONE OIL-INDUCED GLAUCOMA IN CIPTO MANGUNKUSUMO HOSPITAL: 4-YEAR DESCRIPTIVE STUDY 691
- P-FS-182**  
CYPASS PERFORMANCE IN POST KERATOPLASTY GLAUCOMA 692
- P-FS-183**  
COMBINED PHACOEMULSIFICATION AND MICROINVASIVE GLAUCOMA SURGERY (MIGS) IN COMPARISON TO PHACOEMULSIFICATION ALONE FOR OPEN ANGLE GLAUCOMA 693

- P-FS-184**  
A CASE OF UVEITIS-GLAUCOMA-HYPHEMA (UGH) SYNDROME TREATED BY SUTURELESS SCLERAL FIXATION POSTERIOR CHAMBER INTRAOCULAR LENS 694
- P-FS-185**  
RISK FACTORS FOR CONJUNCTIVAL TUBE EROSION IN EYES IMPLANTED WITH AHMED GLAUCOMA VALVE IN A PRIVATE EYE INSTITUTION IN THE PHILIPPINES 695
- P-FS-186**  
CLINICAL OUTCOMES OF TRABECULAR MICROBYPASS STENT (ISTENT®) IMPLANTATION IN MEDICALLY CONTROLLED OPEN-ANGLE GLAUCOMA: 6 MONTHS FOLLOW-UP 696
- P-FS-188**  
AB-INTERNO CANALOPLASTY TO REDUCE IOP, TOPICAL MEDICATIONS AND SYMPTOMATIC OCULAR SURFACE DISEASE IN PATIENTS WITH PREVIOUS MICRO STENT IMPLANTATION 697
- P-FS-189**  
MIGS WITH SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS AND TOPICAL PROSTAGLANDIN IN EYES WITH OAG ON TWO PREOP MEDICATIONS: 42-MONTH OUTCOMES 698
- P-FS-190**  
INTRAOPERATIVE INJECTION VS SPONGE-APPLIED MITOMYCIN C DURING TRABECULECTOMY: ONE-YEAR STUDY 699
- P-FS-191**  
THE TENON'S REPOSITIONING APPROACH OF TRABECULECTOMY – A LONGITUDINAL CASE SERIES 700
- P-FS-192**  
DYSAESTHETIC BLEB REVISION WITH FIBRIN GLUE 702
- P-FS-193**  
REAL-WORLD CLINICAL OUTCOMES OF SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS (ISTENT INJECT®) IN OPEN ANGLE GLAUCOMA: 2 YEAR OUTCOMES 703
- P-FS-194**  
TRABECULECTOMY INCREASES OPTIC NERVE HEAD NEURORETINAL RIM TISSUE 704
- P-FS-195**  
SURGICAL OUTCOMES OF BAERVELDT TUBE SHUNT SURGERY FOR EXFOLIATION GLAUCOMA 705
- P-FS-197**  
BIOMETRIC AND ANTERIOR SEGMENT PARAMETERS CHANGES AFTER UNEVENTFUL AHMED GLAUCOMA VALVE IMPLANTATION 706
- P-FS-198**  
LONG-TERM OUTCOMES OF VISUAL FUNCTION IN PATIENTS WITH OPEN-ANGLE GLAUCOMA FOLLOWING PRIMARY TRABECULOTOMY OR TRABECTOME 707
- P-FS-199**  
A COMPARISON OF ONE-YEAR SURGICAL OUTCOME BETWEEN TRABECULOTOMY AB EXTERNO AND MICROHOOK AB INTERNO TRABECULOTOMY USING THE PROPENSITY SCORE ANALYSIS 708
- P-FS-200**  
YAG GONIOPUNCTURE AUGMENTATION OF CATHETER-BASED SCHLEMM'S CANAL SURGERY 709
- P-FS-201**  
EFFICACY AND SAFETY OF THE AADI FILTERING DEVICE 710
- P-FS-203**  
EFFECTS OF EYELID PRESSURE ON THE OUTCOME OF FILTRATION SURGERY 711
- P-FS-204**  
IMPACT OF PHACOEMULSIFICATION ON FILTERING BLEB MORPHOLOGY IDENTIFIED VIA THREE-DIMENSIONAL ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY 712
- P-FS-205**  
GLAUCOMA IN PATIENTS WITH ANIRIDIA AND BOSTON TYPE 1 KERATOPROSTHESIS 713

- P-FS-206**  
SURGICAL OUTCOME OF TRABECULECTOMY  
WITH MANUAL SMALL INCISION SCLERAL FLAP 715
- P-FS-207**  
AHMED GLAUCOMA VALVE FP7 AND FP8 IN PEDI-  
ATRIC GLAUCOMA: A RANDOMIZED CLINICAL  
TRIAL 716
- P-FS-209**  
THE EVALUATION OF OPEN-ANGLE GLAUCOMA  
WITH ISTENT® TRABECULAR MICRO-BYPASS  
DEVICES IN A JAPANESE COHORT: EARLY EXPE-  
RIENCE 718
- P-FS-210**  
THE ITALIAN XEN TREATMENT REGISTRY  
(XENGTR): BASELINE AND INTRA-OPERATIVE  
CHARACTERISTICS OF THE FIRST 100 PATIENTS 719
- P-FS-211**  
GLAUCOMA DRAINAGE DEVICE IMPLANT AS A  
SURGICAL OPTION FOR THE MANAGEMENT OF  
ADVANCED AND REFRACTORY GLAUCOMA IN  
NIGERIA: A RETROSPECTIVE STUDY 721
- P-FS-212**  
OUTCOME OF MICROHOOK AB INTERNO TRA-  
BECULOTOMY 723
- P-FS-213**  
NEW COST EFFECTIVE TECHNIQUE IN USING 23  
GAUGE STRAIGHT CYSTOTOME TO PERFORM  
GONIOTOMY 724
- P-FS-214**  
POLYMETHYL METHACRYLATE GLAUCOMA  
IMPLANTS: A YEAR FOLLOW UP 726
- P-FS-215**  
GLAUCOMA SURVEILLANCE IN PATIENTS  
RECEIVING INTRAVITREAL INJECTIONS IN A  
REGIONAL EYE CLINIC 728
- P-FS-216**  
LONG-TERM RESULTS OF 360-DEGREE SUTURE  
TRABECULOTOMY 729
- P-FS-217**  
ONE-YEAR RESULTS OF MODIFIED 360-DEGREE  
SUTURE TRABECULOTOMY AB EXTERNO FOR  
GLAUCOMA AFTER PENETRATING KERATO-  
PLASTY 730
- P-FS-218**  
PHACO TRABECULECTOMY IN ADVANCED GLAU-  
COMA WITH CATARACT 731
- P-FS-219**  
DELAYED POSTOPERATIVE APPLICATION OF  
MITOMYCIN C FOLLOWING TRABECULECTOMY  
MAY BE SUPERIOR TO THE STANDARD TECH-  
NIQUE OF INTRAOPERATIVE APPLICATION 733
- P-FS-220**  
THE ISTENT TRABECULAR MICRO-BYPASS  
STENT REDUCES POST CATARACT SURGERY IOP  
SPIKES IN ADVANCED GLAUCOMA 735
- P-FS-221**  
LONG-TERM OUTCOMES OF PRIMARY TRABE-  
CULECTOMY IN UNCONTROLLED ADVANCED  
OPEN ANGLE GLAUCOMA 737
- P-FS-222**  
TREATMENT OF OPEN-ANGLE GLAUCOMA USING  
TRABECULAR MICRO-BYPASS STENTS (ISTENT®  
AND ISTENT INJECT®): 1-YEAR OUTCOMES 739
- P-FS-223**  
EFFECTS OF AQUEOUS SUPPRESSANTS AND  
PROSTAGLANDIN ANALOGUES ON EARLY  
WOUND HEALING AFTER GLAUCOMA IMPLANT  
SURGERY 740
- P-FS-224**  
COMBINED TREATMENT OF NEOVASCULAR  
POSTTROMBOTIC GLAUCOMA 743
- P-FS-225**  
INTERMEDIATE RESULTS OF THE NEW AFFORD-  
ABLE NON-VALVED DEVICE AADI 744
- P-FS-226**  
INTERMEDIATE RESULTS OF A NEW TWIN SITE  
PHACO-TRABECULECTOMY 746

GR

FF

RF

P

I

- P-FS-227**  
OUTCOMES OF TWO SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IN OPEN-ANGLE GLAUCOMA PATIENTS ON ONE PREOPERATIVE OCULAR HYPOTENSIVE MEDICATION 747
- P-FS-228**  
ANALYSIS OF ONE-YEAR SURGICAL OUTCOMES OF MINIMALLY INVASIVE GLAUCOMA SURGERIES (MIGS) IN MEDICALLY UNCONTROLLED UVEITIC GLAUCOMA PATIENTS 748
- P-FS-229**  
COMPARISON OF SURGICAL OUTCOME OF TRABECULECTOMY AND PHACOTRABECULECTOMY IN PRIMARY ANGLE CLOSURE GLAUCOMA (PACG) PATIENTS 749
- P-FS-230**  
XEN -45 IMPLANT AS TREATMENT FOR UVEITIC HYPERTENSIVE CRISES 750
- P-FS-231**  
EVALUATION OF NORMAL-TENSION GLAUCOMA IMPLANTED WITH ISTENT INJECT® IN COMBINATION WITH CATARACT SURGERY 751
- P-FS-232**  
SYSTEMATIC REVIEW OF METHODS OF CONJUNCTIVAL WOUND CLOSURE IN MITOMYCIN C AUGMENTED TRABECULECTOMY 752
- P-FS-233**  
TRABECULECTOMY WITH TRANSCONJUNCTIVAL RELEASABLE SUTURES 753
- P-FS-234**  
OUTCOMES AND COMPLICATIONS OF AHMED GLAUCOMA VALVE IMPLANTATION AT DR YAP EYE HOSPITAL YOGYAKARTA 754
- P-FS-235**  
OUTCOMES OF SINGLE SITE, TWIN-STITCH PHACOTRABECULECTOMY IN ADVANCED PRIMARY ANGLE CLOSURE GLAUCOMA CASES 755
- P-FS-236**  
LONG-TERM OUTCOMES OF GLAUCOMA DRAINAGE DEVICE SURGERY IN INDONESIAN PATIENTS WITH REFRACTORY GLAUCOMA 756
- P-FS-237**  
FACTORS INFLUENCING THE SUCCESS AND FAILURE OF TRABECULAR MICRO-BYPASS STENTS, ISTENT AND ISTENT INJECT, WHEN COMBINED WITH CATARACT SURGERY 757
- P-FS-239**  
COMBINED ISTENT® INJECT TRABECULAR MICRO-BYPASS AND PHACOEMULSIFICATION IN AUSTRALIAN PATIENTS WITH OPEN-ANGLE GLAUCOMA 758
- P-FS-240**  
REAL-WORD OUTCOMES OF SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IN PATIENTS WITH MILD TO SEVERE GLAUCOMA: ONE YEAR RESULTS OF A CANADIAN STUDY 759
- P-FS-241**  
OLOGEN® IMPLANT IN COMBINED PHACOEMULSIFICATION AND VISCOCANALOSTOMY, A PILOT STUDY 761
- P-FS-242**  
THE USE OF AUTOLOGOUS BLOOD IN THE MANAGEMENT OF POST TRABECULECTOMY HYPOTONIA: ABOUT TWO CASES 763
- P-FS-243**  
POSTURE-INDUCED INTRAOCULAR ALTERATIONS AFTER CATARACT SURGERY IN EYES WITH PRIMARY ANGLE CLOSURE 765
- P-FS-244**  
INTERMEDIATE TERM OUTCOMES OF STAND-ALONE SIBS MICROSHUNT OR IN COMBINATION WITH PHACOEMULSIFICATION 766
- P-FS-245**  
FIRST PERSPECTIVES AND OUTCOMES OF AN AB-INTERNO GELATIN STENT: A NATION-WIDE, MULTICENTRE STUDY 767
- P-FS-246**  
INTRAOCULAR PRESSURE REDUCTION IN SPECTRUM OF ANGLE CLOSURE DISEASE FOLLOWING CATARACT EXTRACTION 768

GR

FF

RF

P

I

- P-FS-247**  
EFFICACY OF GONIOTOMY IN ADULT GLAUCOMAS UNDERGOING PHACOEMULSIFICATION 769
- P-FS-249**  
JUVENILE OPEN ANGLE GLAUCOMA: OUR SURGICAL EXPERIENCE AND ITS SOCIAL IMPACT 770
- P-FS-250**  
POST-OPERATIVE COMPLICATIONS OF TRABECULECTOMY: OUR EXPERIENCE 771
- P-FS-251**  
ASSOCIATION BETWEEN EXTENT OF TRABECULOTOMY AND SUCCESSFUL INTRAOCULAR PRESSURE CONTROL IN 360-DEGREE SUTURE TRABECULOTOMY 772
- P-FS-252**  
LONG-TERM SURGICAL OUTCOMES OF AHMED GLAUCOMA VALVE IMPLANTATION – THE ASIAN EXPERIENCE 773
- P-FS-253**  
ASYMPTOMATIC CHRONIC HYPOTONY DUE TO SUBCLINICAL CHOROIDAL EFFUSION AFTER BLUNT TRAUMA 775
- P-FS-254**  
THE OUTCOME OF TRABECULECTOMY IN PATIENTS WITH END STAGE PRIMARY OPEN ANGLE GLAUCOMA 776
- P-FS-255**  
A PROSPECTIVE, RANDOMIZED PIVOTAL STUDY OF SECOND-GENERATION TRABECULAR MICRO-BYPASS STENTS IMPLANTED IN CONJUNCTION WITH CATARACT SURGERY 777
- P-FS-256**  
LONG TERM OUTCOME OF AHMED GLAUCOMA VALVE IMPLANTATION IN PAEDIATRIC GLAUCOMA 778
- P-FS-257**  
BEST EQUATION OF SCLERAL FLAP SIZE AND SCLEROSTOMY OPENING FOR TRABECULECTOMY 779
- P-FS-258**  
YAG-LASER ACTIVATION OF TRABECULA AND CATARACT SURGERY: A COMBINED TECHNIQUE FOR THE MANAGEMENT OF PRIMARY OPEN-ANGLE GLAUCOMA AND COEXISTING CATARACT 781
- P-FS-259**  
LONG AND SHORT TERM COMPLICATIONS AND THEIR CORRELATIONS OF AHMED GLAUCOMA VALVE SETON IMPLANT SURGERY 782
- P-FS-260**  
MODERN TRABECULECTOMY OUTCOMES: SEVEN YEAR STUDY IN A LARGE TERTIARY REFERRAL EYE HOSPITAL 783
- P-FS-261**  
AHMED GLAUCOMA VALVE (AGV) TUBE INSERTION TECHNIQUE (GRAFT SPARING) AND MANAGEMENT OF RARE SITUATIONS DURING AGV SURGERIES 784
- P-FS-262**  
AHMED GLAUCOMA VALVE (AGV) TUBE INSERTION TECHNIQUE (GRAFT SPARING). SUBHAN'S SCLERAL TUNNEL TECHNIQUE 785
- P-FS-263**  
EVALUATION OF BLOOD-FILLING PATTERNS IN SCHLEMM'S CANAL FOR TRABECTOME SURGERY 786
- P-FS-264**  
RECTIFYING A MISJUDGEMENT IN PERFORMING TRABECULECTOMY 787
- P-FS-265**  
NEW WAY OF TRABECULECTOMY IN SURGICAL TREATMENT OF GLAUCOMA 788
- P-FS-266**  
REDUCTION OF INTRAOCULAR PRESSURE AND TONOGRAPHIC OUTFLOW FACILITY AFTER A MODIFIED 360-DEGREE SUTURE TRABECULOTOMY 789

GR

FF

RF

P

I

- P-FS-267**  
A MULTI-CENTRE RETROSPECTIVE OBSERVATIONAL STUDY COMPARING BAERVELDT 350-101 AGAINST BAERVELDT 350-101 WITH INTRAOPERATIVE USE OF MITOMYCIN C 790
- P-FS-268**  
COMPARISON OF ANTERIOR CHAMBER FLARE AFTER TRABECULECTOMY, EX-PRESS SHUNT, OR MICRO-HOOK AB INTERNO TRABECULOTOMY 791
- P-FS-270**  
END STAGE/ ADVANCED GLAUCOMA WITH FAILED SURGERY: A SHORT CASE SERIES OF OUR APPROACH 792
- P-FS-271**  
AUGMENTED TRABECULECTOMY: OUR TECHNIQUE AND EXPERIENCE 793
- P-FS-272**  
OUTCOME OF PHACOTRABECULECTOMY WITH DOUBLE PLACEMENT OF COLLAGEN MATRIX IMPLANT AND MMC- 0.04% WITH/ WITHOUT ANTIVEGF AS WOUND MODULATION 794
- P-FS-273**  
AQUEOUS VENTING FOR NEW NON-VALVED GLAUCOMA DRAINAGE DEVICE: IS IT EFFECTIVE? AN *IN VITRO* EXPERIMENTAL STUDY 795
- P-FS-274**  
PILOT SERIES OF SOUTH EAST ASIAN EYES WHICH UNDERWENT COMBINED ISTENT TRABECULAR MICRO-BYPASS STENT IMPLANTATION AND CATARACT SURGERY 796
- P-FS-276**  
EARLY RESULTS OF MIGS WITH TRABECULAR MICRO-BYPASS STENT COMPARED TO AB INTERNO TRABECULOTOMY PERFORMED IN CONJUNCTION WITH CATARACT SURGERY 797
- P-FS-278**  
EVALUATION OF SCHLEMM'S CANAL AND CILIARY BODY USING ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY AFTER AB INTERNO TRABECULAR SURGERIES 798
- P-FS-279**  
SURGICAL OUTCOME OF GLAUCOMA FILTERING SURGERY IN VITRECTOMIZED EYES: EX-PRESS SHUNT VERSUS AHMED GLAUCOMA VALVE 799
- P-FS-281**  
EFFECTS OF SUTURE TRABECULOTOMY AB INTERNO ON POSTURE-INDUCED INTRAOCULAR PRESSURE CHANGES IN EYES WITH OPEN ANGLE GLAUCOMA 800
- P-FS-282**  
ASSESSMENT OF GLAUCOMA PROGRESSION AFTER XEN GEL STENT IMPLANTATION - PRELIMINARY RESULTS 801
- P-FS-283**  
15-YEAR TRABECULECTOMY RESULTS IN A SINGLE CENTRE 803
- P-FS-284**  
CO2 LASER-ASSISTED SCLERECTOMY SURGERY (CLASS) IN EXFOLIATIVE GLAUCOMA. 2-YEAR FOLLOW-UP 804
- P-FS-285**  
SUCCESS OF MODIFIED TRABECULOTOMY IN THE MANAGEMENT OF PRIMARY CONGENITAL GLAUCOMA 805
- P-FS-286**  
SHORT TERM OUTCOME OF MICROHOOK IN PEDIATRIC GLAUCOMA 806
- P-FS-287**  
THE EFFICACY AND SAFETY OF MICROPULSE TRANSSCLERAL CYCLOPHOTOCOAGULATION (MP-CPC) IN JAPANESE REFRACTORY GLAUCOMA 807
- P-FS-288**  
INTRAOCULAR PRESSURE CHANGES DURING ZIEMER LDV Z8 FEMTOSECOND LASER PRE-TREATMENT BETWEEN EYES WITH PRIMARY ANGLE CLOSURE DISEASE AND NORMAL EYES 808

GR

FF

RF

P

I

**P-FS-289**

TWO-YEAR OUTCOMES OF PENETRATING  
CANALOPLASTY FOR THE TREATMENT OF PRI-  
MARY OPEN ANGLE GLAUCOMA 810

**P-FS-290**

EVALUATION OF THE SCHLEMM'S CANAL AND  
CILIARY BODY USING AS-OCT AFTER ISTENT  
TRABECULAR MICRO-BYPASS STENT FOR OPEN  
ANGLE GLAUCOMA 812

**P-FS-291**

TWO YEARS FOLLOW-UP OF EXPRESS® IMPLAN-  
TATION SURGERY FOR GLAUCOMA IN HIGH  
MYOPIC EYES 813

**P-FS-292**

LONG TERM OUTCOMES OF AHMED VALVE  
IMPLANTATION FOR GLAUCOMA AFTER VITREO-  
RETINAL SURGERY 814

**P-FS-293**

MALIGNANT GLAUCOMA FOLLOWING TRA-  
BECULECTOMY IN PROPTOTIC EYE – A CASE  
REPORT 815

**P-FS-295**

NANOPHTHALMOS - A SURVIVAL GUIDE 817

**P-FS-296**

MANCHESTER ISTENT STUDY: 7-YEAR RESULTS  
AND COST ANALYSIS 818

GR

FF

RF

P

I



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