Glaucoma Society of India

GSI Newsletter

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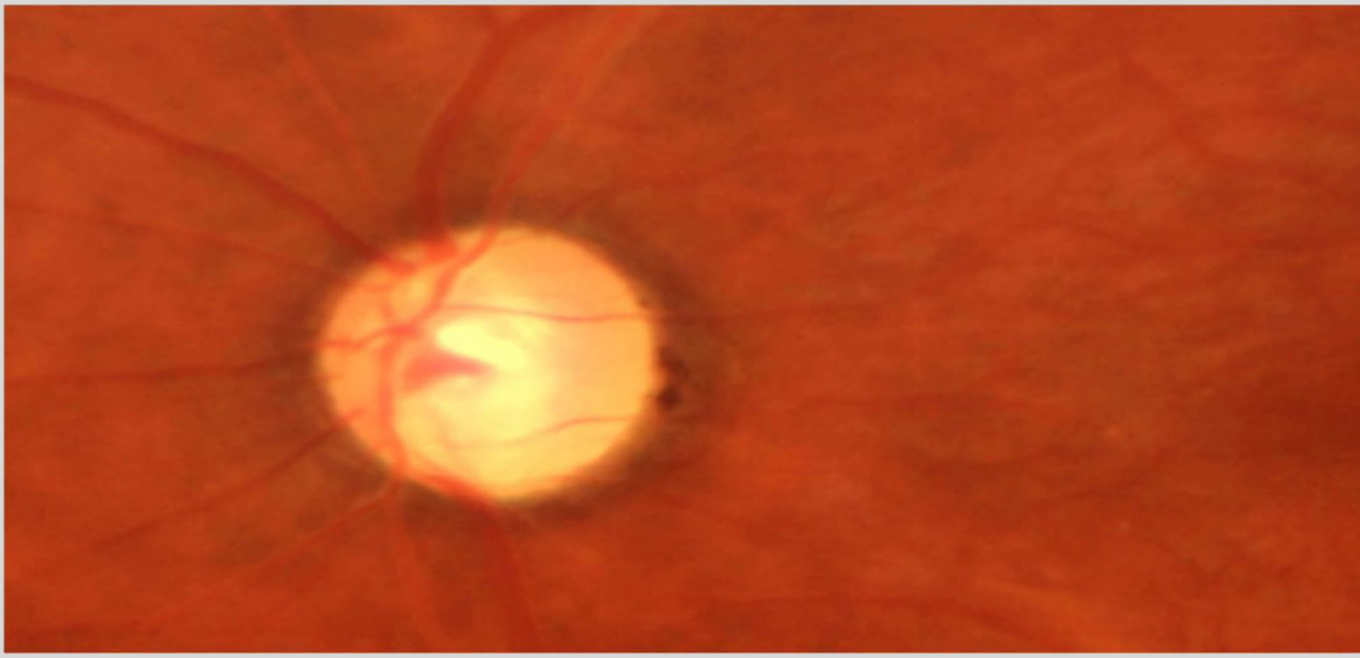

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Disclaimer

The aim of GSI newsletter is to provide a platform for ophthalmologists to interact and learn glaucoma from experienced stalwarts, to promote exchange of ideas, news, views and updates. Its content does not represent the official opinion of GSI and all views expressed are those of individual authors.

Contents

Editorial

It gives me immense pleasure to present to you first official e-newsletter of the Glaucoma Society of India (GSI). The GSI now comprises of over a thousand members and there is a need to have an official platform to present wealth of scientific information, GSI news and views besides updating the busy general ophthalmologists on recent advances in glaucoma. The first issue features mainly the content presented and discussed at the annual GSI conference meeting Glaucoknow 2019, Lucknow.

Training opportunities (short term observer ship and fellowships) in glaucoma are available in many centers in our country and we have enlisted them.

The editorial team comprises of large team of talented young glaucoma specialists across India including our –managing editor Dr Parveen Rewri, besides senior GSI members and international advisors. They have all worked enthusiastically to compile this newsletter. I pray for your safety and health during this COVID-19 pandemic. We welcome your feedback and suggestion (gsinewseditor@gmail.com) on our first GSI newsletter, an initiative of GSI executive team led by President Dr Devindra Sood, Hon Secretary Dr BK Nayak and treasurer Dr Manav Deep Singh.

Dr Murali Ariga

Editor-in-chief

President's Message

Dear Colleague,

Change is inevitable and it can happen in many ways. It could be a sudden tidal wave, a tsunami or like a glacier, creeping along slowly. It might come in the form of a devastating tragedy, difficult choices, broken relationships or even new opportunities. Even if it is for the better, change can be difficult. Even to accomplish something requires a change, something that could push us out of our comfort zones.

Blindness in glaucoma is inevitable. The aim of treatment is to slow the rate of loss of retinal ganglion cells so that a significant critical mass is maintained throughout the patient's lifetime, maintaining their quality of life.

Glaucoma in India presents late and a part of us wants to focus on early detection. There is also evidence at hand to show that once appropriate treatment is started the rate of progression can be significantly slowed down.

While healthcare specialists apply themselves to the feasibility and methodology for early case detection, we need to change our thought process too. It's time to ask ourselves "what is it that I can do to prevent further damage from glaucoma, once the patient is under our care? The disease process contributes to blindness, but are we as doctors contributing too?

We can't change the pathogenesis of glaucoma yet, but we can change ourselves. We need to diagnose the glaucoma once it comes to us. We need to diagnose it as primary or secondary. We must treat and treat appropriately when required. We need to do a laser iridotomy for angle closure. We must not delay surgical treatment when required and we must not opt for surgery when it can be deferred.

The Glaucoma Society of India (GSI) continues to change. This time Drs. Murali Ariga, Parveen Rewri, Monica Gandhi and others have worked on their idea of a GSI Newsletter. This first issue is a culmination of their efforts. I hope you enjoy this and the many other issues that follow.

I would like to thank Dr Barun Nayak and Prof. Manav Deep Singh for their continued support.

It doesn't matter where we are because we are nowhere compared to where we can go.

Dr. DevindraSood
President
Glaucoma Society of India

From the desk of Secretary-GSI

Dear GSI Colleagues,

Greetings

As much as it is a little stressful for me to write to you today in view of the COVID-19 situation which surrounds us all, I am truly happy to connect with you all through this newsletter at this hour of anxiety and confusion which we are in.

As your office bearer I can assure you that the society will be always there to protect and guide you through crisis. However, on a personal level I am with you, by your side, walking with you on the path which we are on but the destination seems confusing and hazy, at the moment. Having said that I am sure that this too shall pass and we humankind will be back on our feet, in due course of time.

The situation though grave I am sure has made us think about our priorities and goals. I can only say that we need to work hard, think hard and help each other survive.

We at the GSI office were busy preparing for yet another Annual Conference which was scheduled for September in Guwahati. But now we find ourselves in a situation which doesn't seem will settle down soon. The final decision regarding further course of action based on the situation and direction of the Advisory Board will be communicated to you in due course.

In the meantime, I urge you all to keep the good work going, take care of yourself and your family. Take time to think about what and how you will be conducting your life in regard to your family and work, your relations and your colleagues, your personal life and career goals. Take advice from elders and take inspiration from the youth. Adapt to the new situation and new ways of life.

I shall be in touch with you all from time to time and update you on whatever decisions are reached by the office bearers regarding the society and its events, soon.

Regards,

Dr BK Nayak

From the desk of the Treasurer -GSI

Dear GSI Members,

Greetings

I hope you are safe with your families in this difficult time of Covid19 pandemic. It gives me immense pleasure to share with you, the financial progress of the Society. The Annual Conference of GSI at Lucknow was a grand academic and financial success. The present executive team is determined to solve many issues related to finances. The compliance of GST was first of them and we are working with the aim of achieving zero penalty. The monthly GST is being paid regularly, income tax return has been filed in time and Annual GST will also be filed within stipulated time. The transition of authorized signatories during election years has been a big issue. It has been resolved with change of account from HDFC to IndusInd bank. The next issue is related to definition of corpus fund, which I am working on and will come back to you once a definite proposal is ready. All of you know that Public Awareness of Glaucoma is a major issue in preventing visual disability from this disease. Therefore, GSI united hands with Government of India, AIOS and DOS during the World Glaucoma Week and held major event in Delhi on 11.03.2020. The event attracted ample media coverage and the video of the same was circulated to you all. May I request the members working in state capitals to involve government machinery in such events as it helps in policy decisions of government. North-east is Nature's paradise. I hoped to meet all of you, with families, during the Guwahati conference in September, 2020. However, lot of un-certainty prevails at the moment.

I thank Dr. Devindra Sood and Dr. B. K. Nayak, who have been my guides and mentors during the last 19 months. Finally, I am thankful to all the members of this prestigious society for providing constant encouragement & support and also our CA Mr. Devender Thakur for his services during my tenure as treasurer. Wishing you all a safe passage from this Corona period to the normal family and professional life.

Yours Sincerely,

Dr. Manav Deep Singh

Treasurer–GSI

GSI:Award Winners 2019

Felicitation of Dr Arup Chakroborty for his contribution to the XXVIII Annual Meeting (2018) at Kovalam.

Dr Swati Upadhyaya recieving award for Best Free Paper from Dr. Devindra Sood, President GSI at Lucknow 2019

Dr Sushma Tejwani recieving award for Best Free Paper Runners up from Dr. Devindra Sood, President GSI at Lucknow 2019

Dr Sripriya Krishnamoorthy recieving award for Best Rapid Fire prsentation from Dr. Devindra Sood, President GSI at Lucknow 2019

Dr Mahesh Bharati recieving award for Best Video from Dr. Devindra Sood, President GSI at Lucknow 2019

Dr Julie Pegu recieving award for Best Video Runners up from Dr. Devindra Sood, President GSI at Lucknow 2019

How to read an optic disc
(Dr G Chandrasekar)

Stereoscopic clinical evaluation of the optic disc is an important skill that can be mastered with diligent practice. Evaluation of the disc size and correlating the cup to disc ratio with the disc size, is only a preliminary step. Concentrating on the neuroretinal rim and nerve fiber layer changes in each eye and comparing the findings of the superior to inferior areas of a given eye as well as the changes between the eyes is next step. Evaluation of the retinal nerve fiber layer, peripapillary atrophy and neuroretinal rim hemorrhages is the final step in disc evaluation. Ensuring that these changes are documented before the visual fields are evaluated is very crucial. Correlating the optic disc changes with the visual fields changes for the presence or absence of abnormality as well as the severity of damage is what would make one progressively better at clinical disc evaluation. Slit lamp biomicroscopic examination with a 78 or 90 D is ideal. Use meticulously drawn drawing or disc photo for serial follow up. Be careful in interpreting small, large or tilted discs. Always correlate clinical findings with visual fields and imaging.

Identifying structures on gonioscopy for meaningful decisions (Dr Ramanjeet Sihota)

Gonioscopy is the technique used to visualize the iridocorneal or anterior chamber angle. Gonioscopy not only provides information about the width of the angle– narrow or open angle, but also helps determine the cause of the raised IOP as in developmental abnormalities or acquired pathologies of the trabecular outflow pathways, recession, neovascularization etc.
It is ideal to start gonioscopy with a short, thin bright slit at low magnification placed away from the pupil, so that pupillary constriction is avoided, which may open up a narrow angle. The first step would be to identify a landmark - Schwalbe's line, the anterior edge of the angle. It is seen as a prominent white line and can be identified easily as a corneal wedge formed by the meeting of light reflected from the anterior and posterior surfaces of the cornea. Thereafter, moving towards the iris the trabecular meshwork with a grayish translucency can be divided into an anterior non-pigmented TM and the posterior pigmented TM. The scleral spur is seen as a white line immediately posterior to the TM. The grey ciliary body band is the anterior face of the ciliary body, from which the root of iris takes origin.

If in primary position only the Schwalbe's line or anterior trabecular meshwork is visible due to a convex iris, this signifies an occludable angle, and one needs to look over the hill, to see the extent of apposition, synechiae or pigment present to determine the stage of PACD and appropriate therapeutic measures. Manipulation of the gonio lens towards the angle being viewed or asking the patient to look towards that mirror may help see other structures. Alternately, indentation of the central cornea is possible with a gonioscope having a diameter less than the cornea, so that aqueous is displaced to the periphery, pushing the iris posteriorly, and opening the angle. For grading of angle Spaeth's grading system is recommended though modified Schaffer grading is commonly used.

How to read a Humphrey visual field printout?
(Dr L Vijaya)

Divide a single field print out to 8 zones for systematic evaluation (i) Patient Data (ii) Reliability Indices (iii) Greyscale (iv) Total

Deviation Plot (v) Pattern Deviation Plot (vi) Global Indices (vii) GHT (viii) Threshold Values. Anderson and Patella's criteria helps determine whether the field is abnormal.

1. Pattern deviation plot -A cluster of 3 or more non-edge points, in a location typical for glaucoma all of which are depressed at $p < 5\%$ level and one of which is at $p < 1\%$ level
2. CPSD/PSD that occurs in less than 5% of normal fields.
3. Glaucoma Hemi-field Test "Outside Normal Limits".

Severity of visual field defect grading is done using Hodapp Anderson Parish criteria. Always correlate optic disc findings with field changes. Never interpret the visual field chart in isolation

How to read an Octopus visual field printout? (Dr Murali Ariga)

The Octopus perimeter's seven in one printout is commonly used in clinical practice and is similar to interpret as the HFA except for a few different terminologies. Total deviation is termed Comparison and Pattern deviation is called Corrected comparison. HFA and Octopus machines differ in thresholding techniques and other parameters, therefore threshold values cannot be compared between them although a correction factor can be applied. There is a defect curve which ranks tested points from the least deviated to the most deviated points and gives an overall impression about the visual field. Fixation loss (FL) is not an issue with Octopus perimeters as stimulus is not presented when FL occurs. There are many models of Octopus perimeters such as 300, 600 and 900. Each of these models differ in their capabilities and the 900 can perform automated Kinetic perimetry. Cluster analysis and Polar analysis are unique features of Octopus perimetry reports.

Identifying structures on UBM
(Dr Sushmita Kaushik)

UBM offers an in vivo microscopic view of the angle structures. Uniform lighting in the room is desirable with fixation target at ceiling. Identify the scleral spur, which is the anterior limit of junction between sclera and ciliary body and is a landmark structure. AOD 250, AOD 500 and TCPD are minimal quantitative parameters of angle description. Clinical application includes confirmation of high iris insertion, plateau iris, hidden foreign body, pigment dispersion syndrome and evaluation of anterior segment structures in presence of opaque cornea.

Identifying structures on anterior OCT and their significance (Dr Mayuri Khamar)

Anterior segment OCT provides objective assessment of angles. Helpful in identifying mechanism of angle closure. Angles opening less than 5° indicate need for peripheral iridotomy. Lens rise or lens vault calculation is helpful in differentiating role of lens in angle closure. Bleb morphology assessment can be done in cases of trabeculectomy.

How to read an OCT printout?
(Dr Harsha Rao)

Ensure adequate scan quality (signal to noise ratio). Lower signal strengths affect the OCT measurements. Check for the accuracy of segmentation (of RNFL or inner macular thickness) on the B scans. Segmentation errors can cause inaccurate measurements. Look at the OCT thickness maps (as compared to deviation or color-

coded maps) for correct interpretation of the structural glaucomatous defects. Automated progression analysis software of OCT provide useful information about glaucoma progression which can complement the information provided by visual fields and clinical examination. OCT has limited utility in detecting progressive changes in moderate to advanced glaucoma as the structural measurements of OCT demonstrate a 'floor effect', where the measurements level off at a particular severity of disease (which is between -10 to -15 dB of mean deviation) beyond which further deterioration in glaucoma become undetectable on OCT.

Essential of interpreting OCT in glaucoma (Dr Meenakshi Dhar)

OCT is a diagnostic tool that helps in diagnosing early glaucoma and picks up the conversion of OHT to pre perimetric glaucoma. The problem with OCT is that it will still give values when a scan quality is questionable -look for signal quality; scan alignment and centration; watch out for opacities; and segmentation errors. Only if these not present consider the OCT to help in clinical decision making about the disease and its progression.

Single values should not be looked at in isolation, instead look at the whole printout. One needs to have a methodical approach to its interpretation quite like one interprets the HFA printout.

One should not be fooled by "Red Disease" but collate the data with clinical picture and then take a decision regarding management. In late disease Ganglion cell loss should be used to study progression while RNFL should be looked at in early disease. Progression is better on 'trend based analysis' and not on ''event based analysis'. Significant progression is said to occur if RNFL decline is > 8 microns

Essentials of interpreting IOP readings (Dr Manavdeep Singh)

The key point in the assessment of quality of any diagnostic equipment is its precision & accuracy. In reference to Intraocular pressure (IOP), accuracy means how close is tonometric value to true IOP or manometric value. Precision refers to the repeatability of measurement (inter/ intra observer variation). The precision is primarily affected by patient and observer factors, whereas the accuracy is primarily a function of the instrument itself. While interpreting the IOP values, both kinds of factors have to be taken into consideration. The five most important points in regard to this include:

The equipment used: Goldmann Applanation Tonometer (GAT) is, currently, the gold standard for measurement of IOP in common glaucoma patients, although it has its own limitations. Dynamic Contour Tonometer (DCT) is more accurate in patients with lower Central Corneal Thickness (CCT) and in post kerato-refractive surgery cases. Non-contact tonometer (NCT) is fairly accurate in normal range but gives higher readings where IOP is high and lower readings when intraocular pressure is low. In diseased corneas, tonopen is more accurate than GAT. However, in normal corneas, it is less accurate in measuring IOP beyond normal range. Schiotz tonometer is handy and economical but wide variations have been observed with varying scleral rigidity. Rebound tonometer does not require anesthesia and is especially useful for children and for IOP recording in sitting posture. Pneumotonometer provides information about 'Ocular Blood Flow'

(recorded as 'Ocular Pulse Amplitude) in addition to IOP. Corneal bio-mechanical properties are addressed by 'Ocular Response Analyzer' which does double applanation and measures Corneal 'Hysteresis' and 'Corneal Response Factor'.

Calibration: Inaccurate calibration of GAT can give inaccurate readings of IOP. Calibration should be performed once in 6 months for new instruments whereas a 3 monthly check is recommended for ageing instruments. At position 0 and 2, accuracy of up to 1 mm Hg is desirable whereas a variation of 2 mm during calibration check at position 6 is considered adequate. These are practical values. The recommendations of manufacturers are more stringent.

Central corneal thickness (CCT): All tonometers, currently available, are affected by thickness of cornea. High CCT gives falsely high IOP reading and low CCT gives falsely low readings. Although no nomogram is considered accurate, approximately 14 micrometer thickness increase gives one mm Hg higher GAT reading beyond 540 micrometers. Corneal modulus of elasticity has greater effect on IOP measured by GAT than CCT effect but Young's modulus is not easy to measures in clinical setting. The corneal modulus of elasticity increases with age, thus causing artefactual increase in Goldmann Tonometry. That may be one reason why IOP increases with age.

Astigmatism: If more than 4D, the applanated area will be elliptical and require more applanation. The resulting error can be avoided by applanation at 43° (red mark on prism) aligned to the minus axis of cylinder. Alternatively, reading may be taken at 90° and 180° and average calculated.

The Mires: Having taken care of above four per-recording considerations, the most important in actual measurement is the appearance of mires. The correct reading is obtained when the width of mires created from tear film is 1/10 of the size of each semi-circle, semi-circles one of equal size, inter locking internally and show cardiac pulsations. Large overlapping semi-circles or absence of cardiac pulsations suggest overapplanation. Small semi-circles away from each other suggest under-applanation i.e. actual IOP is higher than the current value on knob. If mires are thin, it indicates insufficient tear film and can under estimate IOP. One needs to put in a drop of tear substitute to have wider mires and thus accurate reading. Wide mires mean excess of tearing/ fluorescein and will result in over estimation of IOP. In such a scenario, one needs to wipe not only the eyes but also the bi-prism as it might have collected fluorescein. Readings should be repeated till all conditions, mentioned previously, are met.

Is my glaucoma patient progressing ?
(Drs Harsha Rao, Rangaraj, Shradha S & Parul I)

To determine whether a patient's glaucoma is stable or worsening is important because a failure to lower the intraocular pressure when the disease is worsening can result in avoidable consequences while incorrect determination that progression has occurred can lead to unnecessary addition of medications or surgery. Visual field progression is detected by the newer event or trend based software. A large proportion of ganglion cells usually must be lost before a visual field defect can be detected on standard automated perimetry (SAP). In early stage of glaucoma, spectral OCT may be sensitive and specific for the detection of progression. Conversely, later in the

disease process, losses in RNFL thickness become insensitive for progression detection as it reaches a numerical floor. Ganglion cell inner plexiform layer GPA may provide a new approach for evaluating glaucoma progression particularly in advanced stages of glaucoma as compared to RNFL GPA.

1. Baseline disease severity, disease subtype, clinical diagnosis and ethnicity should be considered when assessing glaucoma progression.

2. Several tests (VF or OCT) are needed to assess progression, rate of progression accurately and how fast is too fast for an individual patient.

There could be a role of a combined structure-function index and newer technology in the future

Managing glaucoma in patients with ocular surface disease

1. Recognition & treatment of OSD may improve patients' QOL and medication adherence.
2. For those on polypharmacy or with OSD, preservative-free preparations maybe considered.
3. Based on current evidence, there is no justification for routine use of preservative-free medications in those without significant OSD and especially those requiring only few medications.

Glaucoma and refractive surgeries

1.Preoperative work up to rule out glaucoma especially myopes for ablative procedures and the risk factors for angle closure for phakic Iols is important. Baseline good quality disc photos along with IOP on applanation with CCT should be mandatory part of work up.

2.The altered corneal biomechanics and change in Central corneal thickness (CCT) can affect the IOP measurements and glaucoma management in these patients postoperatively
3.The phakic IOLs involve a change in the physiology of anterior chamber and can cause glaucoma, due to high vault, iris tuck, oversized lens despite a patent iridotomy/ iridectomy
4.After ablative refractive surgeries, the interphase haze, can mask the IOP effects and can cause significant damage in a short time if appropriate evaluation of IOP and nerve is not done from glaucoma point of view. ASOCT can be useful in diagnosis.
5.As far as possible, refractive surgery is to be avoided in established glaucoma patients. Myopic shift from baseline in early post refractive surgery period can be an early clue to raised IOP.

Pearls of cataract surgery in glaucomatous eyes

Cataract surgery in an eye with glaucoma poses unique problems and requires careful pre-operative planning, methodical intra-operative execution and vigilant post-operative monitoring.
1.In glaucoma patients with a significant cataract, a combined cataract surgery and trabeculectomy may be considered in the following situations:
a.Very advanced glaucoma
b.Intraocular pressure (IOP) over target on maximally tolerated medical therapy
c.Patients with allergy to eye drops
d.Patients who require 3-4 medications for IOP control to reduce their dependence on drops.
In eyes with secondary glaucoma where trabeculectomy is known to have a poor success rate (neovascular glaucoma, uveitic glaucoma, etc), cataract surgery may be combined with a glaucoma drainage device.

2.In hard cataracts with a small pupil and uncontrolled glaucoma, a manual small incision cataract surgery with trabeculectomy is a safe and good option. If phacoemulsification is planned in these cases, a direct chop technique is preferred.

3.Irrespective of the technique used, certain principles must be followed during cataract surgery
a.Generous use of viscoelastics to protect the endothelium
b.A meticulous cortical clean-up and thorough aspiration of viscoelastics to prevent excessive post-operative uveitis / IOP spikes.
c.Ensure the entire intraocular lens is in the bag to prevent UGH syndrome

4.If cataract surgery is being performed in a small eye with an extremely shallow anterior chamber (AC), a 25-gauge trocar-cannula through the pars plana taps the vitreous and helps to deepen the AC to allow for safe cataract surgery.

5.If cataract surgery is being performed post-trabeculectomy:
a.Use a clear corneal incision, and avoid the area of a bleb.
b.Avoid intra-operative iris manipulation as it has been associated with bleb failure
c.Monitor the IOP and bleb carefully post-op and modulate if required.

Managing glaucoma in pregnancy

Factors influencing IOP during pregnancy

1.Glaucoma and pregnancy are not commonly seen together. Of late, a greater number of women tend to delay pregnancy and we are more likely to see an increased number of pregnant women with glaucoma.
2. IOP decreases during pregnancy and is more significant in the third trimester.
3. Pregnant women with pre-existing glaucoma may be observed and if feasible anti glaucoma medications maybe be withheld.

Essentials of Medical management of glaucoma in pregnancy

1.The highest risk of damage to foetus is during the first trimester. Treatment withdrawal and alternative strategies such as laser trabeculoplasty could be an option during this phase.
2.Encourage patients in the child-bearing age group to discuss pregnancy plans as this will allow planning of measures to allow them to be drug free during pregnancy and breast feeding.
3.Initiation of medical therapy should involve counselling the patient about the benefits, risks, and potential side effects of therapy. Teach naso-lacrimal duct occlusion.
4.Brimonidine is classified as category B (Presumed safety based on animal studies). All the rest are Category C (Uncertain safety). Use category C medicationswhen benefits outweigh risks. Beta-blockers are the most preferred amongst Category C medications and prostaglandins are the least preferred.
5.Remember to withdraw high risk therapy during the last month of pregnancy as the drugs have the potential to cross placenta and enter foetal circulation.
6.Topical carbonic anhydrase inhibitors (CAI)is preferred during the third trimester and both CAI's and β-blockers can be used with NLD occlusion during nursing.

Pearls of surgical management during pregnancy

1.Weigh benefits to mother and risks to foetus during the decision-making process.
2.Extensive counselling and involvement the obstetrician and anaesthetist are of paramount importance.
3.Consider the potential benefits of Argon/ Selective laser trabeculoplasty prior to considering surgical intervention.
4.Ideal time for surgical intervention is the second or third trimester.Surgery under

topical, or augmented with sub conjunctival or sub-tenonsXylocaine block is preferred.
5.Ensure torso of patient is slightly rotated to one side to avoid hypoxia to the foetus.

Genetic testing: Role in predicting likelihood of glaucoma in the antenatal period

1.Antenatal testing for common genes causing congenital glaucoma or anterior segment dysgenesis is possible.
2.It is important to assess genetic disease risk in the parents or siblings prior to planning the pregnancy.
3.Routine diagnostic panels may miss deletions causing disease.
4.Planning the amniocentesis early is important.

Glaucoma surgery in advanced patient of PACG post PI (Dr Harsh Kumar)

In our country its quite common to see patients who have had advanced primary angle closure glaucoma who have a split fixation and who have undergone an iridotomy along with full anti glaucoma medications which can be tolerated. Yet the pressure may be uncontrolled or borderline controlled with fields which are becoming worse over the time. What could be even more challenging is that a number of these patients are those who have already lost one eye.

The first challenge is for the doctor to accept the fact that very few choices are left except convincing the patient to undergo a surgery. However the patient has to be told that there is a small theoretical chance that the vision may be lost during and after the surgery though most patients would benefit by it with stabilisation of fields and vision. The next question ,the surgeon has to ask is to himself if he is up to the challenge of operating the case or he should refer it to a higher centre.

If the patient completely refuses to get operated, two options are there. First you can do additional gonioplasty 360 degrees and there a number of patients who do respond and additional control can be maintained for a further couple of years. If this does not succeed then one can give low dose acetzolamide (half tablet bd or tid) for long time provided the gastric tolerance is there and the liver and kidney functions especially the electrolytes stay in control.

If one is forced to operate , one should have a written consent in the language of the patient , preferably in the writing of the patient or a close relative explaining the possibility of the vision loss during surgery.

One should always give preoperative adequate pressure lowering agents to operate on a soft eye. The eye should at no point of time have a sudden lowering of IOP and this can be done by continuous ac irrigation or by using a side port and injecting air or viscoelastic. The replaced sutures are a must so that immediate closure of the chamber is possible. One would like the post-operative pressure to be average and not too low to avoid hypotony and maculopathy.

Glaucoma surgery in patients with advanced open angle glaucoma with split fixation
(Dr JC Das)

1.Eyes are said to have split macular fixation when two contiguous scotoma of <5dB in the central four test locations with increased risk of wipe out phenomenon.
2.These are the eyes with high risk of disease progression.

3.The main goal of treatment is aggressive IOP control to achieve single digit IOP to preserve central vision.
4.Watch out for wipe out phenomenon, hypotensive maculopathy and IOP spike. They may require more frequent steroid drops.
5.Despite the risk of compromise that surgical procedure pose, surgery should be strongly considered.

Management of failing filtering bleb (Dr Sirisha Senthil)

Tabeculectomy with or without antimetabolite usage is the surgical procedure of choice for the reduction of intraocular pressure in patients with medically uncontrolled glaucoma.
The success rate of trabeculectomy decreases with time due to scarring and fibrosis of sub-conjunctival tissue in the post-operative period. One should recognize eyes at high risk for failure of trabeculectomy and use adjunctive anti-metabolites to decrease scarring and increase the success rate.
Use topical steroids preoperatively for inflamed eyes and stop systemic anticoagulants to minimize bleeding intra operatively.
Intra-operatively, care should be taken to minimize the trauma to the tissue while dissecting / cauterizing. One should prevent excessive bleeding and achieve good homeostasis during the procedure.
Post operatively, early identification and appropriate interventions can salvage most of the blebs and increase the survival and success rates of trabeculectomy. The important step in deciding if the bleb has failed or not is to confirm the patency of the sclerostomy.
The Signs of Bleb Failure are: Local conjunctival hyperemia, excessive vascularization, elevated IOP, flat bleb or highly elevated cystic bleb or small avascular cystic blebs
Digital ocular pressure will push aqueous through the sclerostomy into the subconjunctival space, thus lowering the intraocular pressure. If bleb forms reluctantly with massage can consider laser suturolysis or release of releasable sutures.
Early inflammation and hyperemia should be treated with aggressive hourly topical steroids with or without administration of sub tenons 5 fluorouracil.
Despite all these if the intraocular pressure is high, bleb needling can be performed. Needling is an intraocular procedure and should be performed under sterile settings in OPD or OT. 0.1 ml of 0.04 mg/ ml MMC in a tuberculin syringe (this concentration is 10 times lower than that used during trabeculectomy) is taken.
If all these fails, then bleb revision or repeat trabeculectomy or a tube shunt procedure will be required.

MMC application -best method and its implications (Dr Aditya Neong)

One of the main reasons for failure of trabeculectomy is scarring and obstruction to aqueous drainage. This scarring is mostly due to the wound healing process in response to the surgical trauma. Various techniques have been tried to regulate wound healing and increase the success oftrabeculectomy.
Antimetabolites are drugs used to prevent bleb failure due to scarring. The drugs used are 5-fluorouracil (5-FU) or Mitomycin C (MMC). Both these drugs are used intra-operatively, while 5-FU is also used in the post-operative period. The choice of drug is decided based on the clinical condition of the patient.
Mitomycin C (MMC) is derived from Stretomyces caespitosus. It is an alkylating agent which prevents DNA synthesis. Studies on human Tenon's capsule tissue

have shown inhibition of fibroblast proliferation with the use of MMC. But, the efficacy of MMC depends on the dose delivered to the tissues. This depends on various factors like the concentration of MMC, volume, duration of exposure, administration and tissue related factors. MMC is available as powder which is reconstituted with balanced salt solution to make a solution.

The usual concentration in which MMC is used is 0.2mg/ml or 0.4mg/ml. In vitro studies of Tenons' capsule suggest that the main factor for efficacy is the drug concentration. Clinical studies have shown that the tissue gets saturated with MMC after exposure for 1 minute.

The efficacy of MMC also depends on the area of tissue that comes in contact with the drug. Application of MMC over a larger surface area of MMC application achieves better IOP reduction and a significantly lower incidence of bleb scarring compared to eyes that receive MMC application over a smaller area. The method of MMC application may have a role and studies have compared different microsurgical sponges used during surgery for MMC application. MMC application may lower IOP by decreasing aqueous production as a result of toxicity to the ciliary body. Histopathological studies have demonstrated the toxic effects of MMC on the ciliary body and its epithelium.

MMC administration during surgery may result in development of avascular thin-walled, cystic blebs. These blebs may leak and predispose the eyes to infection. These blebs can also cause bleb dysthesia. Cystic blebs are more common with limbus based conjunctival flaps. Fornix based conjunctival flaps with posterior application of MMC creates more diffuse blebs which are safer.

The traditional approach to MMC application has been in the Sub-Tenon's space intraoperatively. But, there are surgeons who place it beneath the scleral flap. MMC is also being used by surgeons as a preoperative subconjunctival injection prior to trabeculectomy, but there are no peer reviewed publications to suggest that this method is superior to other techniques. The decision on the usage of MMC during trabeculectomy depends on the clinical scenario and the surgeon's management plan.

The concentration of MMC and time of exposure are decided depending on the clinical condition of the patient. Accordingly, the appropriate dilution of the drug should be made. Sponges of adequate size (approx 4X4mm) are made and soaked in the solution. The MMC is preferably applied after the conjunctival peritomy and making the sclera flap, before intraocular entry.

The area of MMC application should be as large as possible and directed posteriorly and also under the sclera flap. A large posterior area of MMC application creates more diffuse posterior bleb. While applying MMC, care should be taken to avoid contact of the drug with the cut conjunctival peritomy edge, as it may retard healing and cause wound leaks.

After the drug application is over, the area is irrigated well with balance salt solution. Care should also to be taken to ensure that no sponge pieces are left behind in the subconjunctival space.

MMC is an important tool in the armamentarium of the surgeon to ensure success of glaucoma surgery. Using it in the proper way is essential to get the best result and minimize the complications.

Bleb revision for hypotony
(Dr R Krishandas)

Clinical hypotony represents a condition where the intraocular pressure is low enough to result in visual loss. The

incidence of hypotony following glaucoma filtering surgery increases with the use of adjunctive antimetabolite therapy for preventing fibrosis and bleb failure. Young males, myopes and higher concentration and more prolonged use of antimetabolites, history of uveitis are significant risk factors for ocular hypotony following filtering surgery. Corneal folds, accelerated cataract progression, choroidal folds and effusions, hypotony maculopathy with RPE alterations, optic disc edema and cystoid macular edema are the ocular manifestations of hypotony and can result in significant visual loss. For chronic hypotony following filtering surgery with thin cystic blebs that cause persistent bleb leaks that often predispose to recurrent blebitis or bleb related ocular infections, surgical wound revision with re-suturing of the scleral flap, clear corneal or scleral patch graft or autograft with conjunctival advancement is the procedure of choice

Managing MMC disasters
(Dr B Shantha)

The use of Mitomycin as an adjunct to glaucoma filtration surgery has enhanced success rates in terms of intraocular pressure control especially in the management of refractory glaucoma. However, there is a price to pay in the form of hypotony related complications, both in the early post-operative period as well in long term follow-up. Most of these complications can be managed using conservative measures. However, surgical procedures are often required for prolonged and persistent hypotony. Bleb infection and endophthalmitis is the worst form of MMC related disasters and need prompt treatment

Glaucoma implants
(Dr George Puthuran)

Supero-temporal quadrant is the most preferred location for placement of Aurolab Aqueous Drainage Implant (AADI). Inferonasal quadrant is the second preferred location - due to the absence of oblique muscle complexes in these two quadrants

1.Anterior edge of the episcleral plate of AADI should be positioned 9-10 mm posterior to limbus with the lateral wings placed underneath adjacent recti muscles

2.Complete temporary tube occlusion , critical in non valved implants is achieved by ligating the tube with two 6-0 vicryl sutures

3.A 23 gauge needle generated 4 mm long scleral track without fashioning a scleral flap to insert the tube into anterior chamber is preferred to avoid the risk of tube exposure and extrusions

4.Tube is positioned as far away from endothelium and as close to iris as possible to minimise tube related corneal complications

Cyclodestruction-Safe surgery or last resort
(Dr Gowrimurthy)

Cyclodestruction, or destruction of the ciliary body, is a surgical method used to reduce intraocular pressure in the management of Glaucoma.

1.The dose response curve or the amount of IOP reduction per degree / extent of cyclodestruction is unpredictable.

2.Hypotony, and phthisis bulbi, therefore are possibilities.

3.Micropulse Diode laser CPC is a recent development and has shown promise as a safer alternative

Does evidence justify selective laser trabeculoplasty in Indian eyes (Dr Ramakrishnan

Laser Trabeculoplasty is the most common laser procedure performed to control intraocular pressure (IOP) in patients with POAG and ocular hypertension (OHT). Though procedure has been described as early as 1970's , its role in the treatment of POAG as primary therapy or after medical treatment is found to be still inadequate. Selective Laser Trabeculoplasty (SLT) has been in vogue from 2001. However it has not gained popularity due to the laser being expensive in the developing countries, unpredictable result, need for repeat procedure and also due to negative social marketing and lack of data available in our population. There are many advantages of this procedure as patient compliance is not required and complications are few. Retrospective study done among south Indian patients showed that SLT is as effective as topical antiglaucoma medication in POAG and OHT patients as primary treatment modality. Therefore SLT may be a cost effective option in selected cases of POAG and OHT offering a better quality of life in current Indian scenario.

AN OVERVIEW OF GLAUCOMA TYPES

Non-steroidal drug induced glaucoma
(Dr Shraddha Satav)

All thoughts turn to steroids when we need to recall a drug that causes Glaucoma. But there is a plethora of other medications; both common and unusual that may contribute in a myriad of ways. Topical medications are often the culprit. The mechanism of action is usually by precipitating angle closure in an already predisposed patient like in the case of mydriatics or use of impure pilocarpine. Other mechanisms like inflammation via use of postoperative ointments or even use of Latanoprost causing cilio-choroidal effusion may contribute to rise in intraocular pressure (IOP). Sulfa drugs, cycloplegics, Botulinum toxin have all been associated with drug induced glaucoma. Mechanical obstruction by Silicone oil, viscoelastic agents also worsens outflow problems. Often patients suffer from more serious issues which would lead to their eyes not being considered till vision loss was complained of. Anti-depressants, anti-psychotics, anti-Parkinsonism drugs are often causes of a high IOP. A bilateral glaucoma should point towards a systemic causative agent. Ipratropium bromide, an anticholineric agent used to relive broncho constriction causes mydriasis and might precipitate an angle closure attack in susceptible individuals. Anti allergic agents, anaesthetic agents - the list of drugs inadvertently leading to glaucoma is a large one. The take home message is physicians need to be careful with use of certain medications and need to look beyond the eye (and steroids) when we can't explain the high pressure we have measured

Glaucoma associated with uveitis
(Dr Manju Pillai)

Uveitis is the third leading cause of preventable blindness and over 2 million people are affected worldwide. Glaucoma in uveitis is one of the most serious complications of intraocular inflammation, it was first reported by Joseph Beer in 1813 and in 1891 Priesley Smith proposed the first modern classification of uveitic glaucoma. When raised IOP is temporary

and does not damage the optic nerve, the term uveitis-related ocular hypertension is used. Uveitic glaucoma is reserved for cases in which elevated IOP is associated with optic nerve damage and/or presence of visual field defects. Anterior uveitis, older age at presentation and chronic inflammation are all related to prevalence of uveitic glaucoma and is around 5% - 16% in both adults and children. Specific Uveitic disorders associated with glaucoma are- Fuchs heterochromic uveitis, Posner-Schlossman syndrome, Juvenile idiopathic arthritis and Herpetic uveitis.

Clinically, uveitic ocular hypertension or glaucoma can be classified based on status of anterior chamber angle and timing of onset of inflammation.

1.Inflammatory Ocular Hypertension Syndromes (IOHS) Herpes, Toxo, Sarcoidosis, Posner-schlossman syndrome.

2.Acute Uveitic Angle Closure (Seclusio-pupillae, Uveal effusion).

3.Corticosteroid-Induced Ocular Hypertension/Glaucoma.

4.Chronic, Mixed-Mechanism Ocular Hypertension/Glaucoma.

Treatment of glaucoma in uveitis depends on the underlying disease. The choice of IOP lowering agent depends on the state of inflammation and the extent of optic nerve damage.

Clinical pearls :

• Adequate control of inflammation is the primary goal of treatment.

• With increasing use of intravitreal steroids, more patients likely to develop steroid induced glaucoma.

• Aqueous suppressants are the first line of therapy.

• Laser trabeculoplasty is contraindicated.

• Trabeculectomy without antimetabolites has a high chance of failure.

• Cyclodestructive procedures must be avoided due to risk of hypotony/ phthisis.

Recent advances in the treatment of congenital glaucoma (Dr AK Mandal)

Congenital glaucoma poses diagnostic and therapeutic challenge to the clinician. Medical therapy has limited role, surgery is still being primary option.

1.Goniotomy is reserved in early cases with clear cornea. Trabeculotomy ab externo and combined trabeculectomy-trabeculectomy is reserved for advanced cases.

2. Newer surgical techniques like 360° trabeculotomy, endoscopic goniotomy and fiber-optic microcather trabeculectomy is helpful in challenging cases where visualization is difficult.

3.Glaucoma drainage devices is reserved for cases with refractory advanced glaucoma. Non-penetrating surgery has limited role in congenital glaucoma.

4.Cyclodestructive procedures should be reserved in patients where the above procedures have been failed. Management of residual vision and low visual rehabilitation should be part of management of congenital glaucoma.

5. Lifelong follow-up is must for these patients

Glaucoma following surgery for congenital /developmental cataract

Prevalence of glaucoma in eyes which have undergone pediatric cataract surgery to vary between 0-100%, vary based on definitions, surgical techniques, age at diagnosis, type of surgery and duration of follow up

Multifactorial causes

Angle closure (develops early)

•Pupillary block

•Retained lens material

•Uveitis (inflammatory membranes, PAS)

•Vitreous in anterior chamber

•Irido-pseudophakic synechiae

•Chronic angle-closure glaucoma
Open angle: (develops late)
•Mechanical theory: Release of traction on TM—collapse of the trabecular spaces
•Mechanical theory: Lens particles or protein, inflammatory cells, vitreous, steroids—clogging of TM
•Chemical theory: Exposed LE cells release chemical mediators that alter the TM structure and function

Who is at risk?

•Younger age: Glaucoma developed in 37% of eyes after cataract surgery at < 9 old and 6% after 9 mo old. Rabia et al, AJO, 2004.
•Second surgery
•Retained lens matter
•Microcornea (<10 mm)

How do you diagnose?

Challenge: Minimal corneal changes, high IOP, increase in myopic shift(> that is age related), increase or asymmetry in cupping

How do you treat?

Medically with antiglaucoma medication, Surgery by MMC Trab or drainage implants

Follow up?

•Life long, starting every 3 months during the 1st postoperative year
•Twice yearly until the 10th year and annually thereafter

GLAUCOMA MEDICATION & LASERS

Generics: Friend or foe
(Dr SS Pandav)

Glaucoma medications are lifelong treatment. Branded drugs have an edge in terms of quality control. But being expensive can cause significant financial burden to the patient. Authorized generic is an off-patented drug that is re-released into the market with a different brand name. A good generic drug has to meet bioequivalence and therapeutic equivalence of that of branded drug. It is okay to use generics when there is short term therapy, stable easy to formulate molecules like timolol maleate. The drugs with complex unstable molecules need careful monitoring. So, while prescribing generics it is essential to monitor for therapeutic effects and side effects.

Preservative-free glaucoma medication- The science behind the noise (Dr Prafulla Sharma)

Ocular surface disease (OSD) is a significant problem in patients with glaucoma and affect adherence to treatment and compromise quality of life. OSD is a risk factor for failure of glaucoma filtration surgery. BAK is the main culprit causing OSD by causing goblet cell toxicity and impaired mucin production. Alternative preservatives like polyquad, purite etc are less toxic on the ocular surface. PF Multi dose bottles use COMOD system and Novelia system. These are innovative multi-dose container with multiple non-return valve containing drugs without need of any preservative.

New medication for IOP lowering: What's in pipeline? (Dr Sathi Devi)

Medical therapy continues to be the first line of management in glaucoma. Often, most patients require multiplemedications for adequate intraocular pressure (IOP) control. Increase in the number of medications adversely affects adherence. What we need are drugs that are long lasting, effective and safe. Newer drugs with unique mechanisms of action and novel drug delivery mechanisms are currently in development.

Topical Medications :

• Ripasudil (Glanatec), a Rho kinase inhibitor (Kowa Company, Ltd., Nagoya, Aichi, Japan) is the first Rho kinase inhibitor approved for the treatment of glaucoma.

• Netarsudil (AR-13324), a Rho kinase inhibitor (Aerie Pharmaceuticals, Durham, North Carolina, USA) is both a novel Rho kinase inhibitor and norepinephrine transporter inhibitor.

• Latanoprostene bunod (BauschþLomb, Bridgewater, New Jersey, USA) is a prostaglandin F2-alpha analog. It acts on both aqueous outflow pathways.

• Trabodenoson (INO-8875) acts as an agonist for the adenosine A1 receptor subtype.

• DE-117 and ONO-9054 act on prostanoid receptors, such as Ep2 and Ep3. DE-117 (Santen Pharmaceutical, Ofuka-cho, saka, Japan) is an Ep2 agonist.

• Bamosiran (SYL040012) (Sylentis S.A., Tres Cantos,Madrid, Spain) is a naked small interfering RNA (siRNA) which specifically blocks the b2-adrenergic receptor (ADRB2) and thus the ciliary body's production of aqueous humor.

Preservative-free drug formulations of glaucoma medications and fixed combination drugs would potentially reduce ocular surface symptoms but are costlier options.

Drug Delivery Systems : Several injectable products and implants are currently under investigation as alternatives to topical IOP-lowering therapies. These drugs are longer lasting and not dependent on patient's adherence to therapy. Also, as IOP-lowering is sustained, the rate of glaucomatous progression may be reduced.

• Allergan (Irvine, CA, USA) has developed a sustained-release bimatoprost implant.

• ENV515 (Envisia Therapeutics, Morrisville, North Carolina USA) is a biodegradable formulation of travoprost for intracameral injection.

• The Travoprost punctal plug (Ocular Therapeutix, Inc., Bedford, Massachusetts, USA) is inserted through the punctum and stays within the canaliculus.

• The bimatoprost corneal ring (ForSight VISION5, Menlo Park, California, USA) rests on the surface of the eye in the conjunctival fornices. Both products have shown tdecrease IOP and had a tolerable safety profile.

Silicone hydrogel soft contact lenses, loaded with nanoparticles containing timolol, have been found to elute the drug for more than a month in animal models.

Writing a proper glaucoma prescription
(Dr Roopali Narlikar)

The prescription should have the full name, age, date, and preferably the diagnosis. The medication being prescribed should be printed or written in capital letters, mentioning the molecular name and strength (where applicable). The preferred brands, if any, can be mentioned in brackets. The number of drops to be instilled and frequency should be clearly stated, with timings where possible to ensure correct instillation. Where oral medication is prescribed the instructions about before or after meals must be mentioned. The duration for which each component is to be used should be clearly mentioned. Any special instructions like

punctal occlusion, gentle closure of eye for 2-3 minutes after instillation etc. should be mentioned at the end. The name of the prescriber should be legibly written beneath the signature.

Common mistakes include wrong strength (pilocarpine 4%), wrong combination (timolol with betaxolol), wrong frequency (Prostaglandin analogue twice daily) or improper drug for the particular age group or diagnosis (alpha-agonists in paediatric age group/PG analogues in uveitis). Omissions of co prescription of drugs like potassium supplement with oral acetazolamide, H2 blockers with Oral steroids etc. Possible consequences of medication errors include induced myopia and accommodative spasm due to 4% pilocarpine, lower efficacy of BD dosing of PG analogue or flare up of uveitis due to use of pilocarpine or PG analogue, apnoea or bradycardia in young children and aggravation of asthma due to use of timolol in asthmatics.

In conclusion, the search for newer glaucoma medications and novel methods of drug administration continues and they may offer better options for management of glaucoma in the future.

Lasers in glaucoma (Drs Amit Porwal, Deven Tuli, Suresh Kumar, Gursatinder Singh)

Lasers are a part of armamentarium for glaucoma treatment since ages. Over the years, many laser techniques have been developed to be used in various forms and stages of glaucoma.

Laser iridotomy is the most commonly used laser in angle closure disease to relieve pupillary block. In cases of angle closure with non-pupillary blocks like plateau iris syndrome, laser iridoplasty is the treatment of choice. However, the indication of iridotomy is a debatable topic especially in angle closure suspects. In cases of open angle glaucoma, argon and selective laser trabeculoplasty has emerged as an important adjunct to medical and surgical treatment. Lasers have also emerged as a treatment choice in postsurgical leaking, overhanging blebs and also in lysis of flap sutures to treat under-filtration. This has made post-op trabeculectomy management easier for clinicians.

Diode laser cyclophotocoagulation is a cyclodestructive procedure used in end stage disease to help improve the quality of life of patient. However, with the advent of endocyclophotocoagulation and micro pulse laser technology, cyclophotocoagulation can now be used in earlier stages as well.

NEW THOOUGHTS IN GLAUCOMA

Validation of a head mounted virtual reality visual field screening device

This is a supra threshold device and therefore not suitable for accurate diagnosis and management. The author demonstrated accuracy in glaucoma screening, with good sensitivity. It is very useful in neurological field defects where the pattern is more important than the actual thresholds. Virtual Reality based perimeters (C3 Field Analyze) hold promise of being developed further for a role in screening for glaucoma in the community. At present it is unlikely to replace conventional automated perimetry.

Smartphone aided quantification of iridocorneal angle

Smartphone photography for the angle image is a cheaper alternative developing countries for research, telemedicine and

select clinical setting for developing countries like India. It can be a good ancillary tool but cannot replace gonioscopy in glaucoma management.

Does artificial intelligence have a role to play in glaucoma screening? (Dr R Venkatesh)

Artificial intelligence (AI) will be a reality and the platforms may deliver effective screening tests that are reproducible and have high specificity and sensitivity. But glaucoma by nature is a complex disease. Most platforms may define glaucoma based on the optic disc but may miss out individuals at risk such as those with narrow angles. We must be very conscious of the fact that our current healthcare infrastructure is grossly inadequate and will be unable to address the huge volumes of "positive" cases that may be generated by AI screening tools. The psychological impact of a positive diagnosis without an infrastructure to address it may be more detrimental. Adequate brain-storming, effective healthcare policies, strong data protection measures and judicious choice of target population are a must before any of these AI technologies are put in use for population based screening.

Which is the best way to determine if someone is genetically predisposed to glaucoma- Genomic Analysis or assessment of family history (Dr Ronnie George)

For most primary open glaucoma a positive family history can indicate a 7 to 9 fold increased risk of POAG in their lifetime.

1.Family history can be incomplete because most people in India have not had routine eye exams.

2.Examination of siblings or first degree relatives of those with primary glaucoma in India showed significant rates of disease.

3.In specific situations such as congenital glaucoma or severe forms of disease with a strong family history genetic testing has value in predicting risk.

Effect of YOGA-based ocular exercises in lowering IOP (Dr Tanuj Dada)

The ancient Indian science of YOGA was described by Maharishi Patanjali in the second century BC with the aim of achieving holistic health for the individual. It has three major components - postures/physical exercises, breathing control/breathing exercises and withdrawal of senses with meditation. Although certain forms of physical YOGA such as head down postures (Shirshasana) have been reported to increase IOP, the main benefits of YOGA related to IOP reduction come from slow and deep breathing techniques ("Pranayam") and meditation focused on the breath.

Meditation and slow-deep breathing lead to a "Relaxation Response" which counteracts the "stress response" and is associated with reduction in activity of the sympathetic nervous system. There is a reduction in blood pressure, heart rate and oxygen consumption as the relaxation response is mediated by an increase in Nitric Oxide levels. Nitric Oxide is a signaling molecule that causes vasodilation as well as smooth muscle relaxation. The stress response is associated with an increase in endogenous cortisol, which can lead to an increase in IOP especially since glaucoma patients are steroid responders. There is a reduction in serum cortisol levels post meditation and this can lead to reduction in IOP levels.

Meditation has also been associated with increased cortical thickness in areas of the brain which are associated with attention, emotion and sensory processing such as prefrontal cortex and insula, therefore, has been shown to reverse CNS neuro-degeneration with neurogenesis of both grey matter and white matter.

Glaucoma being an irreversible condition, can affect the patient's quality of life significantly. The diagnosis and the fact that the vision lost cannot be regained can put the patient under major psychological stress. This along with the socioeconomic burden due to increasing expenditure on medications as well as hospital visits can lower the morale of patients and the families. Studies have found that the prevalence of depression, anxiety, and psychological disorders is more common in glaucoma patients than controls. Meditation is known to reduce anxiety, depression and other psychological disorders and has been found to improve mild cognitive impairment by improving neural networks. Studies done at Dr. RP Centre, AIIMS found that glaucoma patients who underwent mindful meditation had a significant reduction in IOP and improved quality of life scores as compared to controls suggesting that mindful meditation could help improve quality of life in glaucoma patients and reduce the need for medication/surgery. In conclusion the practice of meditation focused on the breathing leads to stress reduction with reduction in IOP and improves quality of life of glaucoma patients. It can be recommended as an adjunctive therapy in glaucoma patients.

GENERAL TOPICS FOR GLAUCOMA PRACTICE

Don't believe everything you read : Evaluating published results

(Dr Syril Dorairaj)

Journal publications are crucial to the further development and advancement of medicine, offering insights from physicians around the world. The influx of publications along with the rise in physician workload makes it progressively more important to apply citation analysis in the investigation of articles prior to their implementation into the clinical setting. Adequacy of an article typically relies on it being 'cutting-edge,' introducing innovative ideas with suitable methods, a comprehensive discussion, and an applicable purpose in the clinical setting. As the number of seemingly 'adequate' publications in varying ophthalmology journals continues to climb, it is imperative that clinicians and researchers have a substantial comprehension of the measures typically used to determine the validity and applicability of an article. Thus, it is becoming increasingly more crucial for physicians to evaluate the validity of research publications prior to incorporating them into their practice. With the rise of the internet, access to such publications has drastically expanded, giving medical professionals the opportunity to learn of new innovations in medicine around the world. With there being over 100 ophthalmology journals, it is critical that physicians and researchers alike assess the impact and performance of publications. Citation analysis provides a method of evaluating publications and their efficacy in the clinical setting. This method counts the number of times an article, publication or author has been cited in other works. The aim of this strategy is to assess the importance of

research based in its previous uses amongst fellow researchers.

How I integrate data from clinical trials into my clinical practice (Dr Rajul Parikh)

Clinical trials are performed in a controlled environment. In clinical setting no control on variability in their age, disease characteristics, socio-economic status, follow up patterns etc. It is necessary to extrapolate the data obtained by calculating number needed to treat, absolute risk and absolute risk reduction and then to apply on our clinical scenarios. The best available evidence, modified by patient's circumstances and preferences is applied to improve the quality of clinical judgements.

Electronic medical records in glaucoma (Dr Ganesh Vankataraman)

Electronic medical records are now universally accepted methods of documenting patient condition for easy reference and data communication and auditing. The legibility and standardised manner of data capture has necessitated their implementation in the day to day practice. A minimum standard has to be followed for universal acceptance and glaucoma practitioners must ensure this with the vendors.

The EMR providers should have a plan for transition from paper notes, appropriate launch programme and robust data backup records system and be able to exchange the full set of ophthalmic clinical data with EMRs from other vendors and have comprehensive real time support and education to users.

EMR for glaucoma should be easy to learn and use (intuitive), with minimal inputs form the user, and permit the capture of all data in various forms and the terminologies used should be understood across different vendors. The EMR should have ophthalmic specific history, examination and investigations and surgical modules. Also the EMR should permit data capture and display from networked devices. It should have the summary of the patients history, diagnosis list and current management in a accessible view. Finally the EMR should facilitate clinical audit, reporting of performance, be useful for research purposes.

Is early surgery a risk to quality of life (Dr R Sharmila)

Our main concern in glaucoma management is to control the disease by controlling the intraocular pressure (IOP). However, the question we need to ask ourselves is "Are we improving the quality of life by controlling the IOP medically? We need to treat the patient, considering his age, socioeconomic status, severity of glaucoma and compliance to treatment. Although we may achieve the target IOP with the prescribed medications, we are exposing the individual to preservatives, side effects, high costs and burden to lifelong treatment. Considering these factors can we improve the quality of life by performing an early surgery. Evidence based reports suggest the success rate of individuals who underwent early surgery is better than those who are exposed to chronic medications.

Iatrogenic blindness in glaucoma

(Dr SS Pandav)

Some of the causes of may be unavoidable consequence of therapeutic intervention such as glaucoma associated with VR procedures, while in other cases it could also be result of lack of attention such as steroid induced glaucoma. Erroneous diagnosis may also contribute to iatrogenic blindness. Problem of under diagnosis in clinics also contribute. Surgical complications or lack of follow up after cataract surgery in angle closure eyes is also an important contributor.

Preventing Blindness from Glaucoma: What do we know and what we can do?
(Dr L Vijya)

POAG and PACG end in blindness if not treated effectively. PACG blindness rates are more than for POAG. Lowering IOP helps in reducing blindness due to glaucoma. Eyes with risk factors need aggressive treatment. The challenge we face is to improve the detection rates and treat all detected cases effectively. One model which may be suitable for glaucoma care.

Pediatric glaucoma in India: The unmet needs

1.Spectrum of pediatric glaucoma in India is wide with equal proportions of primary and secondary glaucoma.

2.Should use standard classification system for diagnosis.

3.For early diagnosis there is a need to improve awareness among healthcare professionals to ensure early referral.

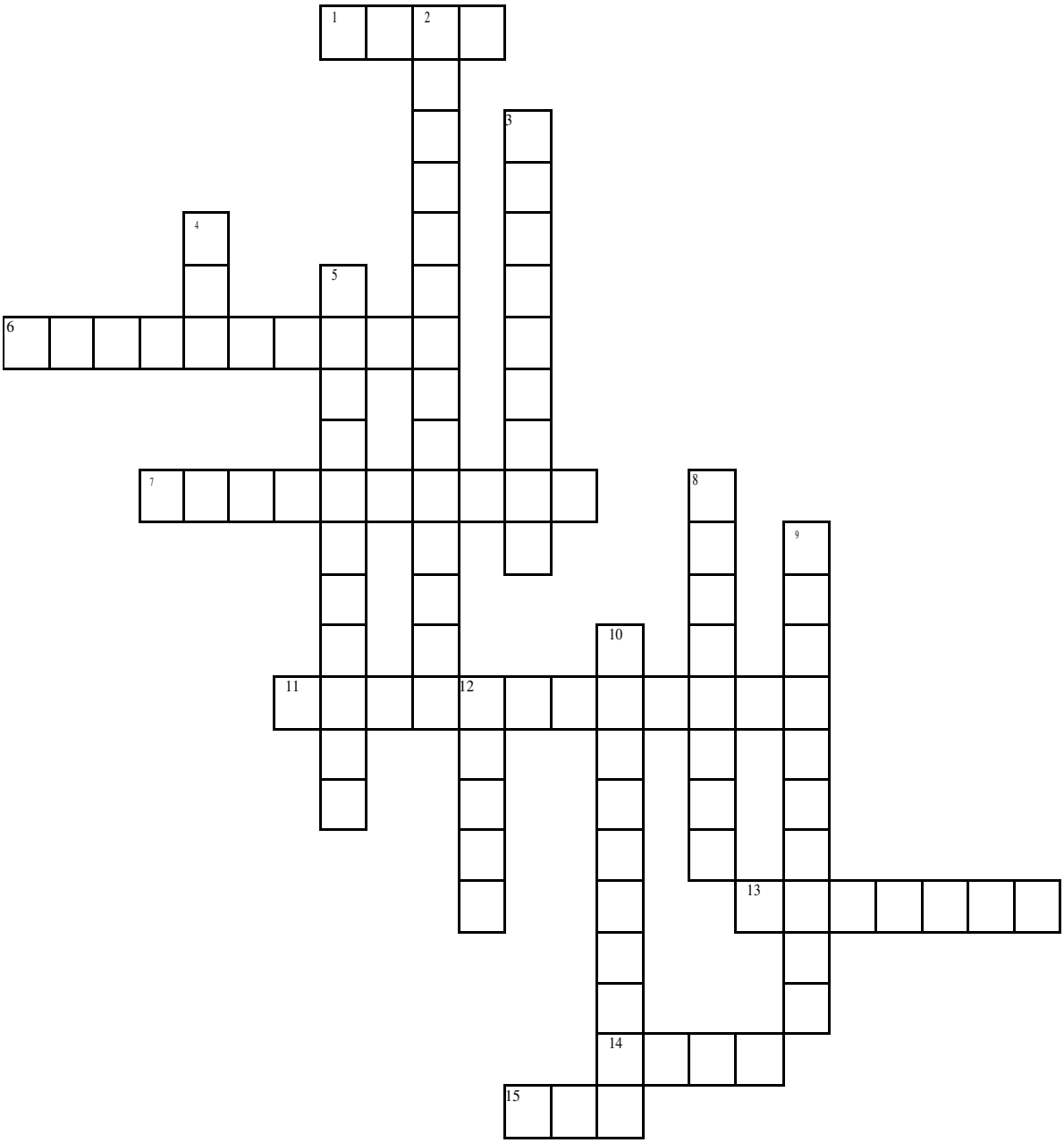
4.Should use the available genetic knowledge in guiding parents.

5.Iatrogenic causes such as steroid misuse and trauma needs to be addressed in larger context to propose better guidelines.

How to improve surgical training of glaucoma in India?

1.Aging population is increasing, with better medications number of glaucoma surgeries are dwindling.
2.Seventy percent of our population lives in rural areas with poor access to health care
3.Socioeconomic considerations, problems with compliance and adherence to treatment makes glaucoma surgery an important choice to prevent blindness from glaucoma
4.Trabeculectomy is the gold standard guarded filtration surgery which is cost effective, do not need special equipment/ no additional investment is needed, however needs great skill
5.Trabeculectomy has a very narrow tolerance to intraoperative error, smaller mistakes can lead to irreversible adverse events, hence we need improved training of our residents and fellows to help with tackling the burden of glaucoma blindness in our country
6.Structured curriculum for residents helps transition to surgery on a live patient, with improved patient safety. Glaucoma surgical curriculum should include, preoperative training, intraoperative teaching and postoperative

Crossword No 1



Across

1. Triad in PACD
6. My colour varies
7. Beyond corneal thickness
11. Better pH than companion
13. Stenopic test
14. Size V stimulus used
15. Repetition possible

Down

2. Lens opacities
3. Obtained from Streptomyces caespitosus
4. Frozen form
5. Type of PACD
8. Associated with POAG
9. Physics principle
10. First preservative free analogue
12. Useful for indentation

(Compiled by : Dr Purvi Bhagat)

Answer will appear in next issue

Useful Resources

www.glaucomasociety.in for all information about the Glaucoma Society of India, future meetings and Glaucoma India education programmes.

www.nice.org.uk/guidance/ng81 for NICE guidelines - Glaucoma

www.eugs.org for Terminology and guidelines for glaucoma (European Glaucoma Society – 4rth edition)

www.wga.one/wga/subscribe-to-newsletter which is the official newsletter of the World Glaucoma Association and provides access to the International Glaucoma review at www.e-IGR.com

Obtain Free access to Journal of Glaucoma (JOG) online which is available when you are logged into your WGA#One account. The Journal of Glaucoma (JOG) has become the official journal of the World Glaucoma Association (WGA). This collaboration joins together the world's premier journal for glaucoma research and the largest international society for glaucoma, representing over 11,000 members and 89 glaucoma societies from around the world.

Gonioscopy.org is a site dedicated to teaching gonioscopy through the use of photos/diagrams and videography. It covers the basic examination techniques and more advanced techniques, such as indentation and the corneal wedge. There are video examples of most glaucoma-related diseases

Look up www.apglaucomasociety.org for information and glaucoma guidelines provided by the Asia pacific glaucoma society.

Glaucoma events/meetings to attend and participate in 2020-21

American Glaucoma society - Feb 26 - Mar 02, 2020, Maryland, USA
World glaucoma week – March 8th-14th 2020 www.worldglaucomaweek.org
European Glaucoma Society - 30 May - 2 June 2020, Brussels, Belgium
GlaucoLuit 2020 – Guwahati, India www.glaucomasociety.in
World Glaucoma Congress 2021 – 24/03 - 27/03, Kyoto, Japan

Institutes offering various glaucoma training/fellowship opportunities in India

	Hospital/Institute Name	Contact email
1.	Ahalia foundation eye hospital, Palakkad (Kerala)	administrator@afeh.org
2.	Aravind postgraduate institute of ophthalmology, Madurai (Tamilnadu)	aravind@aravind.org
3.	B W Lions super speciality hospital, Bengaluru (Karnataka)	lionseye@vsnl.com
4.	CU Shah ophthalmic PG training centre (Sankara Netharalya) Chennai (Tamilnadu)	academics@snmail.org
5.	Chaithanya eye hospital & research institute, Thiruvanathapuram (Kerala)	chaithanyaeye@gmail.com
6.	Divyajyoti trust, Mandvi (Gujrat)	divyajyoti.icare@gmail.com
7.	LV Prasad eye institute, Hyderabad	education@lvpei.org
8.	Laxmi eye institute, Panvel (Maharashtra)	hr@laxmieye.org
9.	Lotus eye hospital, Mumbai (Maharashtra)	lotuseyehospital@mtnl.net.in
10.	Narayana Nethralaya, Bengaluru (Karnataka)	fellowship@narayananethralaya.com
11.	National institute of Ophthalmology,Pune(Maharashtra)	administrator@nioeyes.com
12.	Nethradhama super speciality eye hospital, Bengaluru (Karnataka)	hrd@nethradhama.org
13.	Regional institute of ophthalmology, Sitapur (UP)	madhu.bhadauria@gmail.com
14.	Sankar foundation eye hospital & institute of ophthalmology, Vishakhapatanam (AP)	training@sankarafoundation.in
15.	Sankara eye foundation, Coimbatore	carriers.seci@sankaraeye.com
16.	Shanti Saroj nethralaya, Miraj (Maharashtra)	sharadbhomaj@gmail.com
17.	Shri Ganpati nethralaya, Jalna (Maharashtra)	abhishekh.desai@netralaya.org
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Combination of Simple Diagnostic Tests to Detect Primary Angle Closure Disease in a Resource-constrained Region

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Purpose: To report on diagnostic accuracy of van Herick (vH) technique performed by a vision technician (VT) as well as on efficacy of a combination of vH technique and central anterior chamber depth (ACD) in detection of primary angle closure disease. Methods: Data was obtained from two cohorts; rural clinic setting (n = 111), and rural population-based research setting (n = 888). Van Herick grading was performed by a VT in first cohort and a glaucoma specialist in second cohort. A reference standard four-mirror gonioscopy was performed by a glaucoma specialist in both cohorts. Cut-off levels for vH technique and central ACD were grade 2 and 25th percentile value, respectively. Data from one eye per participant was analyzed. Results: Three hundred and forty (34%) eyes were gonioscopically occludable. Area under receiver operating characteristic curve (95% confidence interval) for vH test was 0.83 (0.76, 0.9) and 0.81 (0.78, 0.84) in first and second cohorts, respectively. Simultaneous testing achieved sensitivity of 87.8% while sequential testing achieved specificity of 99.3%. Negative predictive value* of simultaneous testing was 98.3% compared to 96.6% of vH technique while positive predictive value* of sequential testing was 86% compared to 49.3% of vH technique. (*at 10% prevalence of gonioscopically occludable angle) Conclusions: Diagnostic accuracy of vH grading was similar when performed by a VT and a glaucoma specialist. While test combination was effective to rule in, vH technique may suffice to rule out the disease. Implications of these findings for resource-constrained regions are discussed.

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Steroid-induced glaucoma and blindness in vernal keratoconjunctivitis.

Senthil S, Thakur M, Rao HL, Mohamed A, Jonnadula GB, Sangwan V, Garudadri CS

PURPOSE: To report the clinical features, treatment outcomes and blindness associated with steroid-induced glaucoma in vernal keratoconjunctivitis (VKC). MATERIALS AND METHODS: Records of patients with VKC, who visited our tertiary centre from 1992 and 2009, were reviewed and those with steroid-induced glaucoma were included in the study. Glaucoma was diagnosed based on intraocular pressure (IOP) ≥22 mm Hg on two consecutive visits (ocular hypertension) and/or glaucomatous optic disc damage. Blindness was defined as best corrected visual acuity of ≤20/400 or visual field <10°. RESULTS:
Of the 4062 VKC subjects, 91 (157 eyes) had steroid-induced glaucoma (SIG), showing a prevalence of 2.24%. Of these 87% were men. The median (IQR) age at onset of VKC was 12 years (7-17). At presentation, the median duration of VKC was 48 months (24-72) and the median duration of steroid usage was 24 months (12-36). The median cup-to-disc ratio (CDR) was 0.9 (0.7-0.9) and median mean deviation was -21.9 dB (-30.0 to -10.2). IOP was medically controlled in 66% eyes (104/157) and 34% eyes (53/157) needed glaucoma surgery. High presenting IOP (OR: 1.04; p=0.05) and increased duration of steroid usage (OR: 1.07; p=0.02) were significantly associated with need for glaucoma surgery. At

presentation, 29/91 subjects (31.8%) were bilaterally blind due to SIG. Higher CDR at presentation was significantly associated with blindness in this cohort (p=0.02). CONCLUSION: In this cohort of VKC with SIG, the disease predominantly affected adolescent males. Glaucoma was severe with one-third needing surgery and one-third blind due to SIG.

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Clinical, ultrasonographic and optical coherence tomography correlation of optic nerve head cupping in glaucoma patients

Pujari A, Swamy DR, Selvan H, Agarwal D, Sihota R, Gupta S, Gupta N, Dada T

PURPOSE: To ascertain if ultrasound (USG) B-scan examination of the optic nerve head (ONH) can be a useful tool to diagnose and quantify glaucomatous cupping.METHODS: A cross-sectional observational study of 48 eyes of 48 patients with clear ocular media and cup-disc ratio of (CDR) ≥0.6 were included. The disc was studied by + 90D examination, USG B-scan and ONH Optical coherence tomography (OCT) by three masked observers. Observer-1 assessed the clinical CDR, observer-2recordedopticcup diameter on USG B-scan and observer-3performed ONH OCT to note the software computed average CDR. Measurements of cupping obtained by these 3 methods were compared and their relative strengths determined. The interdependency between variables was further studied using regression analysis. RESULTS: Clinically assessed disc ratios of 0.6, 0.7, 0.8, 0.9, and total corresponded to USG cup measures of 1.02 ± 0.11 mm, 1.23 ± 0.14 mm, 1.35 ± 0.072 mm, 1.45 ± 0.084 mm, 1.75 ± 0.15 mm and OCT average CDR of 0.62 ± 0.087, 0.68 ± 0.060, 0.75 ± 0.078, 0.81 ± 0.036, 0.89 ± 0.038, respectively. There was an excellent correlation between the three arms, with Pearson's co-efficient (r) of 0.87, $P < 0.001$ between clinical and USG cupping; $r = 0.89$, $P < 0.001$ between clinical and OCT cupping; and $r = 0.88$, $P < 0.001$ between USG and OCT cupping. A relation of $y = 1.64x + 0.03$ was obtained between them, where y stands for USG cup diameter and x stands for the observed clinical CDR. CONCLUSION: Ultrasonographic measurement of optic cup diameter corresponds well to clinical ONH cupping. Therefore, it can reliably be used in quantifying ONH cupping in cases of media opacities which preclude optic disc visualization.

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Beyond Intraocular Pressure: Visual Functioning and Quality of Life in Primary Congenital Glaucoma and Secondary Childhood Glaucoma.

Gothwal VK, Sharma S, Mandal AK.

PURPOSE: To compare the visual functioning (VF) and vision-related QoL (VRQoL) of children aged 8-18 years treated for primary congenital glaucoma (PCG) and secondary childhood glaucoma. DESIGN: Cross-sectional study .METHODS: 309 children aged 8-18 years treated for PCG and secondary childhood glaucoma between 2000 and 2010 by a single pediatric glaucoma specialist were prospectively enrolled at L V Prasad Eye Institute, Hyderabad, India. Children completed two questionnaires, the L V Prasad Functional Vision Questionnaire -II (LVP-FVQ-II), and Impact of Vision Impairment- Children (IVI-C) questionnaire. Rasch-calibrated scores from both these questionnaires were used to compare the VF and VFQoL between the two groups. RESULTS: Mean age of the children was 12.2 and 12.6 years in the PCG (53%, median age at diagnosis = 5 months) and secondary glaucoma groups (47%, median age at diagnosis =3 years),

respectively. Majority (80%) of children had bilateral glaucoma and underwent filtering surgery (83%). Mean better eye logMAR visual acuity (VA) was comparable between PCG and secondary childhood glaucoma groups (0.49 vs 0.52; p=0.59).Children with PCG reported significantly better VF and VRQoL than secondary childhood glaucoma. Unadjusted and adjusted childhood glaucoma group comparisons revealed secondary childhood glaucoma to be associated with worse VF and VRQoL as compared to PCG (difference for VF, -0.83; 95% CI, -1.34 to 0.31, p=0.002; 0.39; 95% CI, 0.16 to 0.62, p=0.001 for VRQoL). CONCLUSIONS: Results show that children with treated PCG experience significantly better VF and VRQoL than those with secondary childhood glaucoma, despite comparable VA and IOP.

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Predictors of Neovascular Glaucoma in Central Retinal Vein Occlusion

Rong AJ, Swaminathan SS, Vanner EA, Parrish RK

PURPOSE: To determine the risk factors for development of neovascular glaucoma (NVG) in patients after an acute central retinal vein occlusion (CRVO). DESIGN: Retrospective cohort study. METHODS: Review of medical records of 646 patients with a diagnosis of CRVO between 2013 and 2017 at the Bascom Palmer Eye Institute. INCLUSION CRITERIA: (1) CRVO onset to presentation <90 days; (2) absence of anterior segment neovascularization on presentation; (3) no intravitreal anti-vascular endothelial growth factor (anti-VEGF) injection before presentation. Patients meeting inclusion criteria were screened for potential risk factors for development of NVG. Risk of developing NVG was assessed with Kaplan-Meier survival analysis and Cox proportional hazards models. RESULTS: Thirteen of 98 patients (13%) who met inclusion criteria developed NVG. The mean adjusted time to NVG diagnosis from onset of CRVO-related symptoms was 212 days. Patients presenting with a worse initial visual acuity (P = .034), a relative afferent pupillary defect (RAPD) (P = .002), or a history of systemic hypertension (P = .026) had an increased risk of NVG compared to those who did not. Age, body mass index, history of glaucoma, history of diabetes, and central retinal thickness were not significantly associated with development of NVG. CONCLUSIONS: Risk factors for NVG development included history of systemic hypertension, worse visual acuity on presentation, and RAPD on presentation. Patients presenting with these findings should be followed at closer intervals and informed of the greater risk for neovascularization. Intravitreal anti-VEGF therapy delayed but did not prevent NVG.

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24-2 Visual Fields Miss Central Defects Shown on 10-2 Tests in Glaucoma Suspects, Ocular Hypertensives, and Early Glaucoma.

De Moraes CG, Hood DC, Thenappan A, Girkin CA, Medeiros FA, Weinreb RN, Zangwill LM, Liebmann JM.

PURPOSE: To investigate the prevalence of visual field defects in glaucomatous eyes, glaucoma suspects, and ocular hypertensives with 24-2 and 10-2 visual fields. DESIGN: Prospective, cross-sectional study. PARTICIPANTS: Patients with or suspected glaucoma tested with 24-2 and 10-2. Patients were classified into 3 groups on the basis of the presence of glaucomatous optic neuropathy (GON) and 24-2 visual field abnormalities: early glaucoma (GON and abnormal visual field, mean deviation >-6 decibels [dB]), glaucoma suspects (GON and normal visual field), and ocular hypertensives (normal

disc, normal visual field, and intraocular pressure >22 mmHg). For the classification of visual field abnormalities, 24-2 and 10-2 tests performed on the same visit were analyzed. MAIN OUTCOME MEASURES: Comparison of the prevalence of abnormal 24-2 versus 10-2 visual field results based on cluster criteria in each diagnostic group. RESULTS: A total of 775 eyes (497 patients) were evaluated. A total of 364 eyes had early glaucoma, 303 eyes were glaucoma suspects, and 108 eyes were ocular hypertensives. In the glaucoma group, 16 of the 26 eyes (61.5%) classified as normal based on cluster criteria on 24-2 tests were classified as abnormal on 10-2 visual fields. In eyes with suspected glaucoma, 79 of the 200 eyes (39.5%) classified as normal on the 24-2 test were classified as abnormal on 10-2 visual fields. In ocular hypertensive eyes, 28 of the 79 eyes (35.4%) classified as normal on the 24-2 were classified as abnormal on the 10-2. Patients of African descent were more likely to have an abnormal 10-2 result (67.3 vs. 56.8%, P = 0.009). CONCLUSIONS: Central visual field damage seen on the 10-2 test is often missed with the 24-2 strategy in all groups. This finding has implications for the diagnosis of glaucoma and classification of severity.