

## **Glaucoma - The Present Scenario**

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Our discernment of the pathogenesis as well as the treatment of glaucoma has undergone lot of changes in the last two decades. We have a much better understanding of Open-angle glaucoma, with the publication of OHTS (Ocular Hypertension treatment Study), EMGT (Early manifest Glaucoma treatment study), CIGTS (collaborative initial glaucoma treatment trial) CNTGS (Collaborative Normal Tension Glaucoma Study), AGIS (Advanced Glaucoma Intervention Study) and the EGPS (European Glaucoma prevention study).

CCT (Central Corneal Thickness) measurements are required for proper management of ocular hypertension and Normal tension Glaucoma. We have realised that there is a large inter-individual variation in the relationship between IOP reduction and the rate of progression of glaucoma. Patients with advanced glaucoma may need greater reduction in IOP, if the rate of progression is likely to affect the quality of vision and or life. Progression of glaucoma is generally the rule but progression of glaucoma does not always mean threat to quality of vision or quality of life.

Primary angle closure glaucoma is a very important cause of blindness in our region and our concepts have improved considerably. We have new epidemiological data from Tamil Nadu, which is very significant in giving us an idea about enormity of the problem and how often it is missed due to non-performance of gonioscopy. The international society for geographical and epidemiological Ophthalmology (ISGEO) has come out with standardised classification of primary angle closure, resulting in revision in terminology and includes the mechanism of glaucoma. This results in using standardised definition across studies, so that the data are comparable.

As regards the diagnostic techniques, measurement of intraocular pressure (IOP), Slit lamp evaluation, Gonioscopy, Optic disc evaluation as well as Visual fields forms the basic examination. The Goldmann

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Applanation Tonometer is still the gold standard but we have understood it's limitations in post-Lasik eyes and in patients with abnormal corneal properties. The new Dynamic Contour Tonometer (DCT) is not influenced by the corneal thickness and is said to be more accurate in post-Lasik eyes. However the DCT tends to overestimate the IOP compared to Applanation tonometer. The DCT also gives the ocular pulse amplitude, which is the difference between the mean systolic and diastolic IOP. The significance of the ocular pulse amplitude is still under investigation. The advances in gonioscopy using the compression gonioscopy with the 4-Mirror gonioscope have been widely accepted. The new addition to our diagnostic armamentarium is Ultrasound Bio microscopy (UBM), the anterior segment OCT, which would help us objectively assess the anterior chamber angle. This UBM technique which employs high frequency ultrasound can delineate the anterior chamber structures and help us solve some puzzles. The presence of shallow anterior choroidal detachment causing a pushing mechanism and angle closure can be diagnosed. Malignant glaucoma and plateau iris syndrome can be diagnosed. Rare causes for recalcitrant uveitis due to misplaced haptics of intraocular lens causing glaucoma can be appreciated with this technique. The anterior segment OCT has better resolution but the UBM has better penetration.

The clinical evaluation of the optic disc has undergone lot of changes. There has been a shift from direct ophthalmoscopy to the use of one of the high power lenses on the slitlamp like the 78 D or the 90 D lens. The advantages are the stereopsis, illumination and the magnification the slitlamp optics offer,

to diagnose the subtle early optic disc changes. The other advantages are the nerve fibre layer which is affected early in glaucoma, can be clinically evaluated with this technique.

While stereo or monocular disc photos are useful for documentation, a plethora of optic disc analysers are being marketed. These expensive equipments

generate data which are still hard to interpret. The problems with these machines are that the variability and the overlap noted between glaucoma patients, glaucoma suspects and normal. The reference plane for measurement has still got to be worked out. The normal age related ganglion loss has to be incorporated and more longitudinal studies are needed to arrive at numbers to diagnose glaucoma early.

Ophthalmologists should agree on a definition which will be a cut off between normals and glaucoma based on the quantification of axonal loss before this technique is widely accepted. The HRT (Heidelberg Retinal Tomography) is a Confocal scanning laser ophthalmoscope provides quantitative measurements of ONH such as disc size, Cup size, rim area together with 3-dimensional topography of the disc and surface retina. This is the only technique with software to analyse glaucoma progression in the optic disc. A new software upgrade the glaucoma probability score, gives an assessment of the ONH without need for a contour line. The OCT; Time domain as well as Spectral domain, provides a quantitative assessment of the RNFL thickness. The GDx is a scanning laser polarimeter which quantifies NFL thickness using the principle of retardation of polarized light in the peripapillary retina. The newer GDx VCC has a variable compensator to adjust for patient specific corneal polarization and the newer upgrade GDx ECC, is useful in myopic eyes and eyes with pale fundus. When interpreting reports from any imaging technique, the ophthalmologist should consider the quality of the image and use the imaging results for clinical management only in the overall context of other clinical data. One should not diagnose glaucoma based solely on imaging data.

Automated perimetry is the current gold standard for perimetry. Humphrey visual field analyser has been most widely used. The Octopus perimeter gives comparable results. While full threshold perimeter is considered a standard, it is very demanding on our patients and hence faster algorithms have been developed. Humphrey perimeter has a new software called SITA an acronym for Swedish Interactive Threshold Algorithm. This soft ware program uses artificial intelligence to individualise the test for each patient. Unlike the standard full threshold program, this threshold program is very quick and hence does

not cause patient fatigue. Early detection of field defect as well as its progression has been improved by new Short Wavelength Automated Perimetry the SWAP. This employs blue stimulus on a yellow back ground. Longitudinal studies have shown that defects due to glaucoma could be picked up earlier compared to standard white on white. The new SITA SWAP as well as the GPA (Glaucoma Progression analysis), which has incorporated the information from the randomized studies have enhanced our ability to diagnose and assess progression more objectively. The double frequency perimetry (FDT) is a rapid screening test to detect glaucoma.

The medical therapy for open angle glaucoma has been marked by newer drugs. The most exciting drug introduced since Timolol in late 70s is the prostaglandin inhibitor Latanoprost, marketed as Xalatan. This drug at a concentration of .005% once a day was found to be more effective than Timolol as a single drug in the treatment of open angle glaucoma. The addition of Bimatoprost and Travoprost has added new dimension in the medical treatment. The host of combination medicines which are now available enhances the efficacy as well as improve the patient compliance to medical therapy.

The technique of cyclophotocoagulation has been given a new impetus with the use of Diode laser which has greater penetration through the intact sclera. However the technique is reserved for end stage glaucoma, not amenable to conventional techniques. The selective laser Trabeculoplasty (SLT) is popular in the western world but appears less effective in Asian eyes and no long-term data on its efficacy is available in Indian eyes to use as primary therapy in Open-angle glaucoma.

The surgical techniques have witnessed a lot of changes with use of wound modulation using antimetabolites ; the 5- Fluorouracil and Mitomycin - C. The success rates of repeat filters as well as in complicated situations (Aphakic or Pseudophakic, Inflammatory, Neovascular etc) have been improved by this technique. But their routine use in primary surgeries is to be done with great caution. The only limiting factor is the risk of hypotonous maculopathy, a condition causing severe visual loss. This entity is common in young individuals and Myopic eyes. The postoperative filtration can be improved with laser suturelysis of the scleral flap suture using Argon laser

or with technique of surgical releasable suture. The incidence of postoperative shallow anterior chamber can be reduced to a great extent with this technique of tightly closing the suture and selectively releasing it in the postoperative period depending on the appearance of the bleb and the IOP. One of the newer advances in wound modulation is the application bioengineering technology to modify wound healing following filtration surgery. The use of Collagen matrix (Ologen) is promising in this regard. Used as an adjuvant to trabeculectomy, one can get healthy blebs with no risk of bleb leak or hypotony seen with antimetabolites. Further it can be used as a primary procedure in younger patients and in patients with high myopia, who would otherwise run the risk of hypotonous maculopathy with mitomycin or 5 FU.

Use of setons in complicated glaucomas is a viable option. The need for this has been considerably reduced with the advent of Mitomycin. The commonly used setons are the Molteno, Baerveldt, Krupin valve with disc and the Ahmed valve. These are useful if there is repeated failure of filtration surgery with absent mobile conjunctiva. This technique is recommended in patients with very anterior

synechiae as in neovascular glaucoma or pseudophakic or aphakic eyes where the filtration stoma would get occluded by iris. The postoperative management of setons are very intense, though the surgical technique is quite straight forward. The complication rate with setons are reduced with the introduction of valved devices like Ahmed valve, making it's use more acceptable. Recent comparative randomized study of tube versus Trabeculectomy as a primary procedure has established the safety of setons. In patients with extensive PAS like Pseudophakic secondary angle closure glaucoma or in conditions like ICE syndrome with anterior synechiae to cornea, setons should be used as a primary procedure.

As we enter a new decade, we can expect exciting new developments in the diagnosis and treatment of glaucoma. Use of optic nerve head protectors would decrease the importance of IOP and an objective method of quantifying axonal loss would make the diagnosis of primary open angle glaucoma straight forward. Surgical techniques also would undergo changes as we better understand the wound healing process in filtration surgery.