Challenges in the Management of Glaucoma coexistent with Cataract

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Glaucoma and cataract are both well recognized causes of preventable and curable blindness respectively. A general ophthalmologist, very often encounters situations where the two coexist. Despite extensive literature published on this subject, lot of gray areas and unanswered questions abound, about the combined management of cataract and glaucoma. There are no formula based or rule of thumb approaches. Knowledge of management nuances and tailoring one’s approach to a situation can help management of these problems, when coexistent.

**Evaluation of a patient with both cataract and glaucoma**

The key to effective management lies in appropriate and comprehensive evaluation of the patient, pre operatively. Failing to diagnose glaucoma, in a patient with cataract can spring unwelcome surprises in the post operative period, and prove disappointing, both to the surgeon, as well as the patient.

**Evaluation of the cataract**

- **Type and location of lens opacity**
  
  As in the routine evaluation of any patient with cataract, the type of cataract, and its location should be evaluated pre operatively. Certain types of localized posterior sub capsular cataracts can give rise to localized defects on visual fields, which can mimic glaucomatous defects.

- **Pupil dilation and other pupil related issues**
  
  Pupil related issues often coexist with glaucoma, and are very relevant when planning cataract surgery. Pre operatively, it helps to assess the extent of pupil dilation. Posterior synechiae may be present, due to previous use of pilocarpine, or inflammation. Inadequate pupil dilation may necessitate the usage of pupil stretching techniques, iris hooks, or pupil expanders.¹

  Use of these techniques invariably results in more pigment dispersion in the AC, multiple clear corneal/ limbal incisions, more inflammation than usual post operatively, and can have an effect on the post operative outcome of a combined trabeculectomy. Loss of sphincter tone can leave the iris floppy, and post operatively predispose to peripheral anterior synechiae, and posterior synechiae formation.

  It would also be prudent to stop pilocarpine pre operatively if it is being used, as usage of pilocarpine, in addition to its miotic effect, can affect the blood ocular barrier and lead to more severe and prolonged post op inflammation.

  - **Zonular integrity**

  An assessment of the zonular integrity pre operatively, after dilating the pupil is mandatory in all eyes with glaucoma and cataract. Pseudo exfoliation and coexisting zonular weakness can be easily missed if slit lamp examination is not done with dilated pupil.² In the presence of weak zonules one should have a plan to deal with it, by the use of endcapsular rings, or segments. Possibility of having to make additional conjunctival incisions and scleral flaps, for fixation of capsule tension rings, and scleral fixated intraocular lenses should be kept in mind.

  - **Pseudo exfoliation:** Presence of typical powdery pseudoexfoliative material on the pupil edge and lens capsule aid in the diagnosis. Examination of the eye after dilation is mandatory, as sometimes PXS can be missed in the undilated state. The implications for cataract management include non dilating pupils, and zonular instability. The glaucoma associated with PXS can have more IOP fluctuation, and also progress at a faster rate compared to POAG, and has to be managed appropriately. Post cataract surgery, capsular phimosis, and contracture occur in a slightly higher rate than expected. For this reason silicone foldable lenses are not recommended in eyes with pseudoexfoliation.² There is also a recommendation to consider cataract surgery early in such eyes, as surgery in the presence of very dense nuclear sclerosis, and zonular instability very frequently tends to become complicated.²

  - **Anterior chamber depth, presence of issues like relative anterior microphthalmos/ nanophthalmos**

  Many eyes with angle closure glaucoma also have shallow anterior chambers and this is a factor which has to be taken into consideration when planning cataract surgery. Use of highly retentive viscoelastics like Healon-5TM may help anterior chamber maneuvers in the presence of a very shallow AC.

  Relative Anterior Microphthalmos ( RAM) ³: This is a clinical entity characterized by horizontal corneal diameter < 11mm, Axial length >/= 20 mm, with no visible malformation in the anterior chamber. These eyes have normal axial length, but a disproportionately small anterior chamber. Clinically RAM patients have a high incidence of glaucoma, (77%) and also may have associated guttate changes in the corneal...
endothelium, as well as Pseudo exfoliation and poorly dilating pupils. Combinations of such factors make cataract surgery in such eyes very challenging.

Cilio lenticular block post operatively is also more common in such eyes. Proper pre operative evaluation and identification of such eyes can help us plan cataract surgery and minimize complications.\textsuperscript{3} IOL power calculation in short eyes and in eyes with RAM, is better done with formulae designed for the same- e.g Haigis, Holladay II formulae for high hypermetropia, and nanophthalmos. Higher IOL powers may sometimes be required and necessitate piggy back IOLs.\textsuperscript{4}

Nanophthalmos is a well recognized clinical entity. The corneal diameter ranges from 9-11mm, total axial length in the range of 14- 17 mm (less than 20 mm). Patients typically have high hypermetropia, and an abnormally thick sclera. One can also describe such eyes as having a “normal” sized lens in a small eye. Cataract Surgery, in addition to being technically challenging in such eyes, is complicated by serous retinal detachments, and choroidal detachments, post operatively. Dissection of partial thickness scleral windows near the vortex veins helps in preventing development of such effusions. Proper pre operative evaluation can help detection of this condition pre operatively, and planning the surgery can help us achieve good results.\textsuperscript{5,6}

**Evaluation of Glaucoma**

Preoperative assessment of Glaucoma, and the extent of disc and fields damage, is central to the management of a patient with both cataract and glaucoma.

- **IOP and target IOP**

The highest untreated IOP at which glaucoma damage occurred and the estimated target IOP should be known for all patients pre operatively. The number of antiglaucoma medications required to keep the IOP at target should also be factored, in the decision making process. If IOPs are well controlled with a single antiglaucoma medication, in the presence of mild to moderate disc and fields’ damage, cataract surgery alone may be considered. Use of multiple medication to achieve target IOP, and IOPs higher than target despite maximal medications will necessitate a combined trabeculectomy with cataract surgery. In the presence of very advanced glaucoma with threatened or split fixation, in the presence of very advanced glaucoma with threatened or split fixation, and IOPs not under control with maximal antiglaucoma medications, it may even be an option to just perform a trabeculectomy with antimetabolite, allow for control of IOPs and establishment of a good filtering bleb, and plan cataract surgery after 3-6 months.

- **Fields**

Visual fields evaluation is a must, by any standard threshold perimetry, pre operatively. Documenting the visual fields status pre operatively helps in preventing post operative surprises due to extensive glaucomatous disc damage. It is also a tool to counsel the patient regarding the extent of visual recovery to expect following removal of the cataract.

Visual fields helps us determine the extent of visual field loss due to cataract as compared to that from glaucoma damage. The total deviation probability plot usually can be correlated to the extent of cataract, and the pattern deviation plot, the extent of glaucoma damage. In very advanced glaucoma’s the glaucomatous loss itself is very extensive, and generalized. In such situations, the pattern deviation plot becomes meaningless. In such eyes using central fields testing by programmes like 10-2/ macular programmes can help prognosticate the extent of visual recovery.

- **ONH- clinical evaluation, relevance and utility of imaging techniques:**

A dilated stereoscopic assessment of the optic nerve head is mandatory in all eyes pre operatively. One must remember that in eyes with very dense nuclear sclerosis, the disc gets a pink/ reddish hue as a result of the dense nuclear sclerosis, and one must not use pallor to differentiate from cup and rim, while evaluating the optic nerve head. Contour clues to determine the extent of cupping are more accurate. Even a 0.9 cupped disc may misleadingly appear pink in such eyes, leading to underestimation of glaucoma damage. Disc findings must be correlated with the visual fields, to determine extent of glaucomatous damage.

There has been an emergence of imaging technologies which are useful in documenting and determining extent of structural loss. Most of these technologies however have limitations in the presence of a significant cataract. Poor quality images and falsely low RNFL thickness values are frequently encountered. Acquiring RNFL analysis/ ONH analysis images after pupil dilation can sometimes overcome errors due to minimal lens opacities.

- **Angle**

Pre operative Gonioscopy is also mandatory, to differentiate between open and closed angles in a newly diagnosed case. Presence of synechiae may have to be considered in planning incision sites for cataract and trabeculectomy.

- **Type of glaucoma and its relevance to formulating the management plan**

There is an ongoing debate about cataract extraction alone, in the management of angle closure glaucoma. The hypothesis proposed is that the removal of the lens widens the angle, and can help contribute towards control of IOPs without need for additional glaucoma surgery. Evidence in literature today is definitely not conclusive in this regard. There is some evidence that the amount of IOP reduction
with cataract extraction alone may be higher in ACG eyes in comparison to OAG eyes. However whether this amount of IOP reduction is enough in a particular patient is something that has to be answered on an individual basis. In presence of moderate to advanced glaucoma damage, and use of multiple medications for control of IOP, it may be prudent to plan a combined surgery, rather than err on the side of cataract surgery alone.

**Formulation of Management plan**

- **Combined surgery, or cataract surgery alone?**

There are many unanswered questions in the management of glaucoma combined with cataract. Conflicting reports in literature do exist. There is no consensus among glaucoma specialists as to when to recommend glaucoma surgery alone, and when to recommend a combined surgery.

A systematic review of literature commissioned by the American Academy of Ophthalmology, to answer these questions was published in Ophthalmology by Friedman et al.\(^7\)

*The findings of this systematic review are as follows.*

Cataract surgery alone and long term IOP control: Evidence was consistent that cataract extraction alone (both Phaco ECE and ECCE) decreased the IOP of glaucoma patients by an average of 2 to 4 mmHg at 1 to 2 years after surgery.

Combined surgery and long term IOP control: There is weak evidence that (1) PECE plus trabeculectomy decreased IOP by approximately 8 mmHg in individuals followed up for 1 to 2 years, and (2) ECCE and trabeculectomy combined decreased IOP by 6 to 8 mmHg in subjects followed up for 1 to 2 years.

There is strong evidence that long-term IOP control is significantly better with combined glaucoma and cataract procedures (PECE and ECCE) than with cataract extraction alone.

There is weak evidence that trabeculectomy alone lowers long-term IOP slightly more than combined PECE and trabeculectomy and trabeculectomy alone lowers long-term IOP more than combined ECCE and trabeculectomy.

The data are inconclusive as to whether cataract extraction negatively impacts pre-existing filtering blebs.\(^7\)

**Technique of combined surgery, and the use of antimetabolites**

There is no consensus on recommended technique, and superiority of single site v/s two site approaches, when performing combined surgeries. A systematic review of literature to address this question, has been published by Jampel et al.\(^8\)

The findings of this systematic review are:\(^6\)

- There is moderate evidence that use of Mitomycin C results in lower IOPs (2-4 mmHg lower) when combined surgeries are performed, in comparison to not using an antimetabolite.
- There is no evidence that 5FU offers significant advantages in IOP control over not using an antimetabolite during combined surgery.
- There is moderate evidence that two site surgery results in slightly lower IOPs (by 1-2 mmHg) compared to single site surgery.
- There is weak evidence that phacoemulsification as the technique of cataract surgery, in combined surgery, is better and lowers IOP by 1-2 mmHg more, compared to lens expression techniques (non Phaco surgeries).
- There was insufficient evidence that staged / sequential trab followed by Phaco surgeries offer better control, in comparison to combined surgical approaches.
- There was insufficient evidence to evaluate the efficacy of alternate glaucoma surgeries (e.g. cyclodestruction, implants) in conjunction with cataract surgery.\(^8\)

**Surgical technique**

**Special aspects to glaucoma surgery, when combined**

- **Conjunctival flap**: A fornix based flap may be preferred due to better visualization when combined surgeries are done regardless of single site or two site approaches. Closure of the conjunctival flap should be meticulous with mattress sutures at the limbus to avoid post operative bleb leaks.

**Special aspects to cataract surgery**

- **Technique- Phaco/ non Phaco**: As earlier mentioned, due to the clear corneal approach, and smaller size, phacoemulsification may be the better technique of cataract surgery in combined surgeries.
- **Incision site**: Temporal clear corneal Phaco approach has been recommended, with superiorly situated trabeculectomy, by many surgeons. Some however perform phacoemulsification through superior temporal, and trabeculectomy through superonasal sites or vice versa. There is no evidence regarding the superiority of either technique.\(^8\)
- **IOL selection**: Foldable lenses offer advantages due to smaller cataract incision sizes. There is insufficient evidence in literature regarding the use of multifocals in a patient with glaucoma. Multifocals may influence visual fields results, and imaging techniques to estimate glaucoma damage may not be accurate in the presence of multifocals.
Pupil management: Small pupil can be managed with iris hooks or pupil expanding rings.

Zonule management: endocapsular rings/ segments can be used if zonular insufficiency is suspected.

Mid course corrections - what to do in case of complications?

Vitreous loss in combined surgery: If vitreous loss occurs during combined surgery, a thorough automated anterior vitrectomy must be done. Care should be taken that the internal ostium is not blocked by formed vitreous. Intracameral triocort can be used to delineate the vitreous and aid in complete anterior vitrectomy. However one should monitor IOPs closely, in the post operative period due to risk of steroid response.

Preexisting glaucoma with cataract

Cataract surgery in an eye status post trabeculectomy

A temporal clear corneal approach to cataract surgery is preferred in the presence of a functioning filtering bleb superiorly.

There are some reports in literature that the functioning of a filtering bleb decreases following subsequent cataract surgery.

Post operative management

IOP monitoring post surgery: Post operative management is very important in the case of combined surgery. These patients should be monitored, with more frequent post operative visits and IOP should be monitored at each visit. The frequency of visits can be determined based on the post operative bleb functioning and IOP.

Steroid responders: The incidence of steroid response if patients with glaucoma is higher compared to the general population. Therefore close IOP monitoring is mandatory. Raised IOP in the presence of a functioning filtering bleb may indicate contribution of steroid induced IOP response, and in such cases switching to a lower potency steroid like dexamethasone, or fluoromethalone may lower the IOP.

Aggressively Healing bleb post combined surgery: Aggressive healing of the bleb can contribute to failure of trabeculectomy between the first and third weeks after surgery. After the second week, the cataract incision usually would have healed, and digital massage can be advised, albeit with caution. Post operative 5 FU injections can also be used, and releasables if in place can be released. Laser suture lysis can also be considered.

Establishing the new baseline- Implications for long term management of Glaucoma: Lastly one should establish a new baseline after cataract surgery to aid the continued management of glaucoma. This requires visual fields and optic nerve imaging studies to be repeated after cataract surgery to document the new baseline. One should ensure that the patient understands that Glaucoma needs continued follow up, even after combined surgery.

A meticulous approach with through pre op evaluation, having an operative plan, and closely following up patients post operatively, can help in effective management of the combined problems of glaucoma and cataract.

References

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Fig 1: Flow chart for management of Cataract and Glaucoma