

## Clear Lens Extraction: A Considerable Option in the Management of Angle Closure Glaucoma?

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Primary Angle-Closure Glaucoma (PACG) is a major cause of blindness worldwide. It is a disease of ocular anatomy characterized by appositional or synechial approximation of the iris against the trabecular meshwork, blocking its access to aqueous humor. The prime mechanisms involved are either pupillary block or crowding of the anterior chamber angle or a combination of both. The anatomical variations from normal eyes such as the shallow anterior chamber, narrow angles, decreased anterior chamber volume, small corneal diameter, short axial lengths and a thicker and more anteriorly placed lens has generated interest towards addressing these structures while treating PACG.

The crystalline lens contributes a larger bulk towards angle crowding and thus the concept of clear lens extraction has been challenged by researchers as a measure to completely remove the pupillary block & alleviate angle crowding. Removing the lens undoubtedly creates more space in the anterior chamber and widens the angle. Studies have shown that after phacoemulsification, the Anterior Chamber Depth (ACD) and angle width in angle closure glaucoma eyes approximated that of open angle glaucoma or control eyes without glaucoma and the authors have attributed this change of ACD and width as the cause of significant reduction in intraocular pressure (IOP) seen in the postoperative follow-up period at 12 months. A similar result was seen in chronic PACG eyes wherein a mean increase in ACD was observed from a baseline 2.04 mm to 3.44 mm after cataract extraction and Intraocular Lens (IOL) implantation with control of IOP postoperatively. Increase in ACD and angle width relates to the exchange of a thick PACG (avg 5mm) lens for a thin IOL (avg 1mm). Greve et al also reported a considerable fall in intraocular pressure following extracapsular cataract surgery in angle closure glaucoma patients who were not exposed to peripheral iridotomy earlier supporting the fact that removal of the crystalline lens induces an element of angle crowding in addition to the pupillary block.

Currently the preferred practice is to perform cataract extraction combined with filtration surgery in PACG patients who have a visually significant cataract in association with uncontrolled IOP. Cataract surgery in ACG eyes is more challenging owing to the presence of a shallow anterior chamber, large cataractous lens and atonic iris. Presently most of the studies report lens extraction in the presence of visually significant cataract in addition to PACG of different severity, chronicity, and Peripheral Anterior Synechiae (PAS), with various extents of IOP control under medications, previous filtration surgery, or laser procedures. A high proportion of these patients are reported to have normal IOP after cataract extraction on no or few antiglaucoma medications.

Primary lens extraction as a procedure have been reported in the studies by Gunning & Greve Roberts and coworkers, and Jacobi and associates where lens extraction was performed mainly for glaucoma control, and the lenses were removed even if they were clear and patients had good visual acuity. About 67-72% of patients were reported to have IOP control without medications postoperatively despite higher preoperative IOP in these cases of uncontrolled glaucoma. In a review, Freidman proposed to examine systematically the evidence regarding the effectiveness of lens extraction as a treatment for chronic PACG. In this Cochrane based review they included studies that compared lens extraction with other treatment modalities for chronic PACG including, but not limited to, laser iridotomy, medications, and laser iridoplasty. The author concluded that their analyses did not provide adequate evidence on the effects of lens extraction as a therapeutic modality for patients with chronic PACG. Extrapolating their outcome

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to clinical practice the authors further implied that there was not enough evidence to assess the superiority of lens extraction over any other means of controlling IOP or visual field loss in patients with PACG, although this approach was biologically plausible. Thus, clinical practice decisions according to them will have to be based on physician judgment given this lack of data in the literature.

PACG is a leading cause of irreversible blindness worldwide. Timely management potentially offers a realistic opportunity for a cure. If appropriate treatment is instituted early enough in the natural history of the disease before permanent synechial angle closure or secondary trabecular damage occurs, it would help prevent this potentially blinding condition. However, there are certain grey areas in the pathogenesis and management of this disease. Mechanism of disease progression in PACG remains unknown. Also, what proportion of eyes with occludable or appositionally closed angles will progress to have elevated IOP or PAS formation is not known. No consensus is available on the stratification of PACGs into meaningful categories to make selection of treatment modalities intuitively obvious. None of the currently available treatment alternatives are able to reverse or arrest the angle closure process consistently. Laser peripheral iridotomy for ACG eliminates pupil block, but not angle crowding and provides long term IOP control in only about one-half of the patients. It also does not appear to prevent progressive angle closure or PAS formation in some eyes. Iridoplasty alleviates angle crowding, but its effect is probably limited and temporary. Trabeculectomy is associated with more significant sight-threatening complications and increased need for surgical reinterventions. Removal of the crystalline lens relieves the pupillary block and widens the angle, thus reducing iridotrabecular proximity. Currently, it appears

the single treatment modality that reduces if not corrects the underlying anatomical predisposition to PACG. However, in the absence of a visually significant cataract, clear-lens extraction is a controversial issue. After a successful extraction of a clear lens with intraocular lens implantation, the greatest loss is that of accommodation. Thus, based on existing knowledge and evidence, a few recommendations with regard to the role of lens extraction would be that in the presence of a cataract, lens extraction should be performed early in the course of PACG. However, in the absence of a visually significant cataract, the intraocular pressure, status of the angle by indentation gonioscopy, and optic nerve head appearance should be monitored closely after a laser peripheral iridotomy. If the angle is widened with little or no appositional closure, in the presence of normal IOP and optic nerve after an initial acute angle-closure episode and peripheral iridotomy, an expectant approach can be adopted. When significant appositional closure persists, or progresses to early synechial closure associated with persistently elevated intraocular pressure or progressive glaucomatous optic neuropathy, lens extraction should be considered. When synechial angle closure is extensive (> 3 quadrants), lens extraction should be considered along with filtration surgery or Trabeculectomy may be performed later if needed in an eye with deepened anterior chamber with potentially fewer complications. This group of patients have less chance of benefiting from lens extraction alone. The role and place of lens extraction, especially clear-lens extraction, in the management algorithm is admittedly controversial, but its potential benefits for selected cases are unquestionable. The key to the treatment of angle closure glaucoma probably lies in the genes, but before these are unraveled, rethinking the role of lens extraction deserves consideration.