For past five decades, the popular option considered for the first surgical approach to lowering significantly high intraocular pressure (IOP) remains trabeculectomy (trab). Techniques of trab have been refined to evolve as a fairly safe means of conquering glaucoma blindness. However, the variable and unpredictable immediate post operative course, including overfiltration and resulting hypotony and shallow AC in some eyes and underfiltration and high possibility of tissue scarring and resulting long term failure in some other eyes makes trabeculectomy an unpredictable surgery in best skilled hands. Hence, over the last few years, numerous techniques have been introduced as alternative to conventional trabeculectomy.

Trabeculectomy with Collagen
Deemed as an alternative to mitomycin (or an antimetabolite), the collagen matrix (available as ologenR) is hypothesized to make the healing response post trab, more appropriate and orderly. Though biodegradable, hyperemic blebs are reported and so also occasional enhanced risk of endophthalmitis. At present studies are ongoing to use in conjunction with mitomycin with half concentration and half the size of collagen.

Lens removal
Phacoemulsification has been shown to lower IOP. However, the effect in eyes with Open angle glaucoma (OAG) is small and may not be long lived, and will rarely deliver the low enough IOP that many surgeons desire for their glaucoma patients. In Angle Closure Glaucoma (ACG) situation, lens removal may obviate the need for laser PI, in a patient with significant cataract, planned for Phaco. In certain ACG patients, the lens complex bulk may itself be the cause of angle narrowing and in this situation, benefit of lens removal is definitive. But as a whole, for patients with bona fide glaucoma with visual field loss, cataract surgery alone is not the best option for lowering IOP.

Trabectome and Canaloplasty
Trabectome and Canaloplasty are recent techniques that can lower IOP without producing a filtration bleb-bleb considered the site of scarring and failure of most trabeculectomy. Trabectome surgery (Figure 1) removes trabecular meshwork and inner wall of Schlemm’s canal from an ab interno approach using a special device. It spares conjunctiva for possible future glaucoma surgery and can be done in phakic and pseudophakic eyes. However, it does not often result in IOP low enough and is not suitable for eyes beyond moderate glaucoma.

Canaloplasty (Figure 2), involves threading through the schlemm’s canal, a special probe like device that may be guided with light. Like trabectome, it does not produce a bleb, but does require conjunctival and sclera surgery, reducing virgin conjunctiva for future surgery. And is similar to trabectome, will not produce really low IOP.

Endolaser cyclophotocoagulation
Endolaser cyclophotocoagulation (ECP) (Figure 3) of the ciliary processes is a definite improvement over external
cyclophotocoagulation and cyclocryotherapy. ECP is not possible in phakic eyes, and in general currently is precluded as a primary first glaucoma intervention owing to its destructive and irreversible nature.

**Express mini shunt**

Express mini shunt (Figure 4) is really just a variation on trabeculectomy. One is still creating an opening in the sclera covered by a partial thickness scleral flap, and the formation of a bleb is an integral part of the operation. The Express mini shunt does eliminate the need to excise a piece of the sclera (inner sclerostomy) and the need to perform an iridectomy. Also in general, Express shunt eyes have a lower incidence of early postoperative hypotony and shallow AC.

Flip side is that we are introducing a metallic implant into the eye and the high cost. It is best avoided in patients with ACG and eyes requiring significant drop in IOP from pre-op levels.

**Glaucoma drainage device (Shunts)**

Glaucoma drainage device (GDD) surgery certainly merits consideration as the second glaucoma surgery if trab fails in primary glaucoma cases. It is considered ahead of trab in certain situations such as:

a. Neovascular Glaucoma with extensive rubeosis
b. Post Keratoplasty Glaucoma
c. Post Vitreo-retinal surgery Glaucoma
d. Post uveitic glaucoma (some cases)

Whether GDD or tube surgery could be the initial incisional surgery for glaucoma. To answer this, following on the heels of the Tube vs. Trabeculectomy (TVT) study, the Primary Tube vs. Trabeculectomy (PTVT) study is now underway to answer precisely the question i.e. which is the better primary operation, tube or trabeculectomy? Feel that until we have the results of the PTVT study, we should continue to regard trabeculectomy as our initial surgical approach for most types of glaucoma. Reservations about GDD surgery as initial surgery are:

a. There are unresolved concerns about the long-term effect of tubes in sustained IOP control and upon the cornea.

b. The ability to titrate by use of suture release techniques in trabeculectomy and post-operative use of antifibrosis agents gives the surgeon the power to modify a trabeculectomy after surgery, an opportunity not usually possible with GDD.
Two GDD currently available in India are the

a. **Ahmed Glaucoma Valve (AGV)** (Figure 5, 6): As the name suggests is a valved implant, so initial overdrainage is not seen in every case. There is a hypertensive phase that occurs due to scarring around the base plate, usually seen 4 weeks to 4 months after and lasts 3 weeks to 3 months.

b. **AADI (Aravind Aqueous Drainage Implant)** (Figure 7, 8): Developed in India by the Aravind group, this is a non-valved implant (on Baerveldt principle) and suffers from inevitable hypotony and shallow AC initially that needs to be controlled by ligating the tube for 6 weeks. So IOP remains high for that period but in the long term the IOP control is superior.

**Conclusions**

The procedures mentioned in this article are continually being further refined and hopefully in future will offer good choice glaucoma surgery that is predictable, reproducible, safe and effective. However, with the current state of the art, it is still trabeculectomy, that has the best risk/benefit ratio. For that reason, trabeculectomy still reigns high when it comes to the initial surgery treatment of glaucoma. Judicious use of Mitomycin C (MMC) 0.1-0.4% for 1-3 min depending on target IOP for that eye and augmenting Trab with releasable sutures is the current practise. Follow up needling and/or MMC in post-operative period for cases showing extravagant healing is recommended.

**References**


