

IOP-Lowering Procedures *for* Cataract Surgeons

A look at both traditional and newer ideas in combination therapy.

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With age being a major risk factor for glaucoma and cataract, both diseases often are seen together. This poses the question of how to ideally treat both diseases. The surgical options include cataract surgery alone, combined glaucoma and cataract surgery and two-stage surgery in which the glaucoma procedure is typically performed first, followed by the cataract removal and IOL implantation.

Cataract surgery alone **can** be considered if the intraocular pressure is well controlled on one or two medications and there is little optic nerve or visual field (VF) damage. In these cases, laser trabeculoplasty **can** be used as an adjunct if IOP is not well controlled after surgery. It is advisable to preserve the conjunctiva by using a temporal deep-cornea approach in case filtering surgery is later required. Studies have shown that cataract surgery by phacoemulsification may lower pressure in selected cases, especially if the IOP is higher to start with.

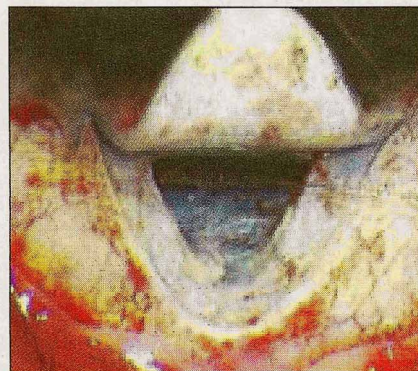
Consider a combined procedure if there is uncontrolled pressure or if IOP is controlled on two or more medications. It is appropriate in patients with moderate to severe optic nerve or VF damage. It is also employed in advanced disease, even if IOP is controlled, in order to prevent IOP spike in precarious eyes.

Assessing the Options

Theoretically, the ideal glaucoma procedure with cataract extraction is one with no additional complications such as bleeding, inflammation/cystoid macular edema, hypotony, flat anterior chamber, infection or bleb-related problems. It would require minimal additional operating time, using the same incision or approach as the cataract procedure, and have a short learning curve for the surgeon. It would add minimal additional visual recovery time and lower IOP to physiologic levels or lower (but again without the risk of hypotony).

Although no procedure meets this ideal, there are many options for combined surgery.

Aqueous inflow **can** be reduced by limiting aqueous humor production via



Canaloplasty: After exposing Schlemm's canal, a fiber-optic tube is inserted 360° through the canal and sutured in place.



The Trabectome ablates a portion of the meshwork to improve aqueous outflow.

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endoscopic cyclophotocoagulation (ECP) of the ciliary processes.

Several procedures are at your disposal to improve outflow of aqueous. These can be divided into external and internal filtering surgery, depending on the formation of an external aqueous drainage site or bleb. The former group of procedures consists of trabeculectomy, ExPress "mini" shunt, aqueous tube shunt, viscocanalostomy/deep sclerectomy and Fugo blade transcliliary filtration. The latter category includes the Solx gold suprachoroidal shunt and the trabecular surgeries such as Trabectome (trabeculotomy internal approach), iStent (trabecular stent) and canaloplasty.

The gold standard for glaucoma surgery is still trabeculectomy. Its utility as a combined procedure was analyzed in a landmark evidence-based review summarized below.¹ The authors posed several questions with regards to combined glaucoma and cataract surgery and rated the supporting evidence from A to C.

• **Short-term results.** The first group of questions centered around short-term IOP control within the first 24 hours after surgery.

(1) *What is the effect of cataract surgery alone on short-term IOP in glaucoma patients?* The data are insufficient to determine the impact of phacoemulsification cataract extraction (PCE), but extracapsular cataract extraction (ECCE) alone increases short-term IOP [evidence level C].

(2) *What is the effect of combined cataract and glaucoma operations on short-term IOP control?* PCE combined with glaucoma surgery decreases IOP [evidence level C] whereas ECCE combined with glaucoma surgery decreases IOP on postoperative day 1 [evidence level C].

(3) *Do combined cataract and glaucoma operations lower short-term IOP more than CE alone in glaucoma patients?*

Data were insufficient to determine.

• **Long-term results.** The group next looked at long-term IOP control (>24 hours after surgery). Questions and conclusions are as follows:

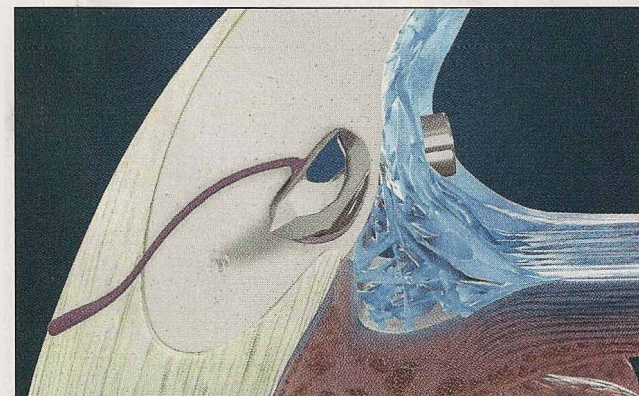
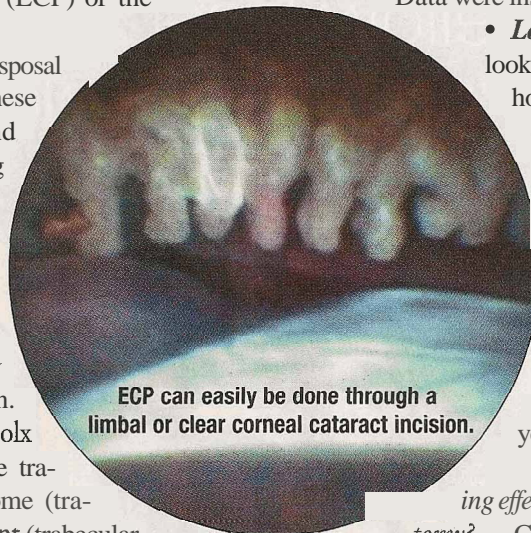
(1) *What is the long-term IOP lowering effect of cataract extraction alone in glaucoma patients?* There are no studies with untreated controls, but consistent evidence does show that both ECCE and PCE decreased IOP in glaucoma patients 2-4 mm Hg, one to two years after surgery [evidence level C].

(2) *What is the long-term IOP lowering effect of cataract extraction and trabeculectomy?* Combined phaco-trabeculectomy decreased IOP approximately 8 mm Hg for one to two years [evidence level C], while ECCE trabeculectomy decreased IOP 6-8 mm Hg for one to two years [evidence level C].

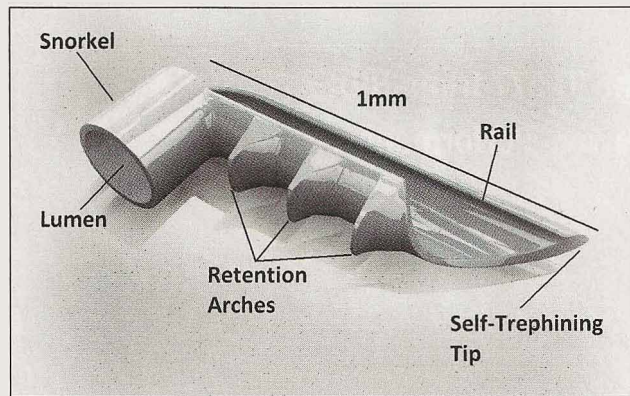
(3) *Is long-term IOP control better with combined surgery than cataract extraction alone?* Long-term IOP control is significantly better with combined glaucoma and cataract procedures (PCE and ECCE) than with CE alone [evidence level A]. Randomized, controlled trials showed lower IOP and reduced medication use in the combined surgery group. However, the CE-alone groups showed a decrease in IOP of approximately 3-4 mm Hg.

(4) *Does combined cataract and glaucoma surgery lower intraocular pressure as much as does trabeculectomy alone?* Trabeculectomy alone lowers IOP slightly more than phaco-trabeculectomy [evidence level C] and more than ECCE trabeculectomy [evidence level B].

(5) *Does CE in patients with functioning filtering blebs negatively impact IOP control?* The data are inconclusive, with some studies showing no difference and some showing mild to high rates of bleb failure.



The iStent allows aqueous to flow directly into Schlemm's canal, bypassing the trabecular meshwork. It is awaiting FDA clearance.



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• **Impact of technique.** The same authors also studied the effect of technique on IOP lowering after combined cataract and glaucoma surgery.² Results were as follows:

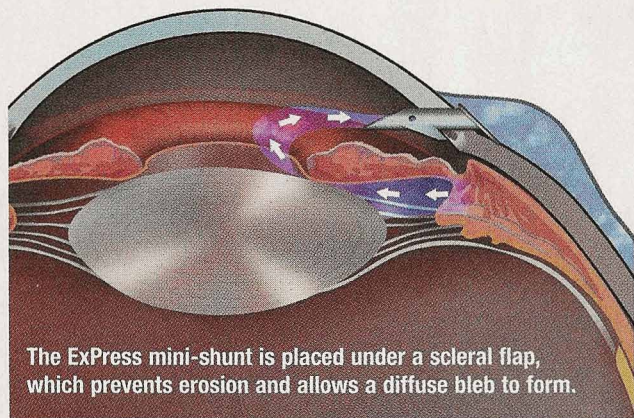
(1) *What is the effect of mitomycin C (MMC) and 5-fluorouracil (5-FU) in combined surgery on IOP control?* MMC use results in 2-4 mm Hg lower IOP in combined surgery [evidence level B]; however, 5-FU use does not improve IOP outcomes in combined surgery [evidence level B].

(2) *Does single-site or two-site combined surgery result in lower IOP?* Two-site surgery results in lower (1-2 mm Hg) IOP than single site combined surgery [evidence level B].

(3) *Does ECCE or PCE combined surgery result in lower IOP?* Pressure is lowered more (1-2 mm Hg) when PCE is used vs. ECCE in combined cataract and glaucoma surgery [evidence level C].

(4) *Does staged surgery lower IOP more than simultaneous cataract and glaucoma surgery?* The data are insufficient to conclude superiority, with no randomized, controlled trials and three observational trials showing similar IOP results in both scenarios.

(5) *Are other types of glaucoma surgery more effective than trabeculectomy in lowering IOP in combined surgery?* Studies of ECP and non-penetrating deep sclerectomy did not show



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superiority of either procedure or trabeculectomy as a combined procedure.

Putting It Into Practice

What have these evidence-based analyses of various surgical strategies for glaucoma and cataract taught us? In a patient with mild glaucoma, cataract extraction alone is a reasonable strategy. In moderate to severe glaucoma or highly uncontrolled IOP, combined surgery is advisable. When performing phaco-trabeculectomy, it is best to use a two-site incision with MMC. A staged procedure may not provide an advantage, and if performed, the surgeon must watch the bleb for possible fibrosis and failure. In analyzing these results, which center only on IOP, one must balance the findings against vision and quality-of-life issues.

Newer glaucoma procedures have been developed to reduce possible complications of external filtration. These are often combined with cataract extraction for the lowering of IOP or dependence on glaucoma medications. I recommend a patient-by-patient approach, with several factors deciding how to surgically manage glaucoma in the setting of cataract surgery. This tailored approach takes into account mainly glaucoma severity and diagnosis, target IOP and current IOP as well as glaucoma medications.

For mild to moderate open-angle glaucoma, defined as optic nerve damage with a C/D 10.8, mild to moderate visual field damage and a target IOP 15-16 mm Hg, I would recommend the following approach. Surgical management may consist of cataract surgery alone with the adjunctive use of medications and laser trabeculoplasty. Combined surgery may use trabecular surgery by an internal approach, such as Trabectome or iStent, or an aqueous inflow-reducing procedure (namely, ECP). These provide ease of surgical approach, as all are performed through the temporal cataract incision and also preserve the conjunctiva for future surgery.

Moderate open-angle glaucoma is defined as optic nerve damage with a C/D ≤0.9, matching visual field loss and a target IOP of 12-15 mm Hg. In these patients, one

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can consider trabecular surgery by an external approach such as canaloplasty or viscocanalostomy. With these procedures, a lower IOP may be possible, especially when used with antimetabolites with the possibility of external filtration after laser suture lysis or laser goniopuncture. However, these approaches create conjunctival scarring and the surgery is technically more difficult and more time-consuming.

Severe open-angle glaucoma is defined as optic nerve damage with a C/D 20.9, matching severe visual field damage and a target IOP of 10-12 mm Hg. In these cases, external filtering surgery, such as trabeculectomy with MMC or aqueous tube shunt (with aqueous suppressant medications), give the lowest IOP possible, but carry the risks of bleb surgery.

In chronic angle-closure glaucoma, I would consider goniosynechialysis with or without trabecular surgery if the scarring is relatively recent. If not, ECP, trabeculectomy or an aqueous tube shunt may be considered. The latter should be performed with a pars plana vitrectomy and tube insertion, or an anterior insertion between the iris and PCIOL.

There are certain special circumstances that require a different approach. In patients with a high risk for scarring, such as neovascular glaucoma or uveitis, I would recommend a tube shunt. In those who are at a high risk for hypotony, avoid trabeculectomy and take care if using a non-valved tube (such as a Baerveldt implant) when it opens. To avoid hypotony complications, consider staged tube surgery or laser opening of the ligature at 5-6 weeks with anterior chamber reformation if necessary. These may also be good candidates for internal filtration surgery.

In those patients unable to have external filtration surgery due to severe ocular surface disease, scarring or scleral thinning, perform internal filtration surgery or ECP, keeping in mind that these techniques can also be combined for more aggressive IOP lowering.

In conclusion, the treatment options for glaucoma and cataract are many and varied. A combined procedure should be tailored to the type and severity of glaucoma. In mild glaucoma, consider cataract extraction alone. In mild to moderate glaucoma, consider newer procedures of trabecular or aqueous inflow surgery. These newer procedures may expand the patient population for combined surgery. In severe glaucoma, standard external filtration, such as trabeculectomy or aqueous tube shunt, may be appropriate. OM

References

1. Friedman DS, et al. Surgical strategies for coexisting glaucoma and cataract: an evidence-based update. *Ophthalmology*.2002;109:1902-1915.
2. Jampel HD, et al. Effect of technique on intraocular pressure after combined cataract and glaucoma surgery. *Ophthalmology*.2002;109:2215-2224.

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