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Options for Glaucoma Surgical Management

Two less-invasive techniques work well in conjunction with cataract surgery.

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There is an old saying: When the only tool you have is a hammer, everything looks like a nail. In the not-too-distant past, when glaucoma patients were not sufficiently controlled on maximal medical therapy, the surgical tool that ophthalmologists generally turned to was trabeculectomy because it was considered the only tool we had for first-line surgical management of glaucoma.

Today, glaucoma surgeons and their cataract and refractive colleagues have an array of surgical therapeutic options for glaucoma patients whose intraocular pressures (IOPs) are not low enough with medical therapy alone. First-line surgical options include endocyclophotocoagulation (ECP) with the E4 Ophthalmic Endoscopy System (Endo Optiks, Little Silver, New Jersey) and canaloplasty (iTrack microcannula system; iScience Interventional, Menlo Park, California).

Availability of these devices allows us to customize our surgical approach more than we could in the past. Rather than using the same nail for all patients, we can balance the required IOP-lowering against the appropriate amount of surgical risk. For instance, patients with existing glaucomatous damage who need very low IOPs might still be candidates for a traditional trabeculectomy, and those with less risk of visual field loss with one of these less-invasive procedures.

Because of their relative ease and improved complication rates, these procedures have also lowered the bar for glaucoma surgical intervention, especially when combined with cataract surgery. If a patient with coexisting cataract and glaucoma is ready for cataract surgery, either procedure can be combined in the same session without adding unduly to the surgical time or the surgeon's stress level.

This article reviews some of the advantages and disadvantages of these newer procedures and discusses why cataract and refractive surgeons might consider adding one or both to their surgical armamentarium.

ECP

ECP has been around for several years, but it has gained more popularity in recent years as the instrumentation has evolved. In earlier years, those not familiar with the endoscopic procedure often lumped it together with transcleral cyclophotocoagulation, but it has become clear that ECP is entirely different. In transcleral procedures, the cyclodestructive energy is broadly dispersed, and significantly great, as it must travel through sclera, blood vessels, muscle, and other tissues in order to achieve its desired effect. This results in collateral tissue damage, as well as discomfort for the patient. ECP is a kinder, gentler form of cyclodestruction. Applied to the target tissue under direct visualization, the laser affects only the ciliary epithelium, leaving surrounding structures unharmed.

The learning curve for ECP is short; for anterior segment surgeons, the skill set is similar to that of phacoemulsification, with a handheld probe inserted through a clear corneal incision. The biggest adjustment lies in looking at the video screen instead of through the microscope, which nonglaucoma ophthalmologists generally are not used to.

Once this aspect is mastered, however, the procedure is easily performed in combination with cataract surgery under topical anesthesia, adding perhaps 10 minutes at the end of the case. It can be performed with the laser/endoscope inserted through the existing cataract wound to treat 270? of the ciliary epithelium and through a second clear corneal incision to treat the remaining quadrant of processes.

In one study,[1] investigators evaluated the efficacy of ECP in 17 eyes (12 patients) with ultrarefractory glaucoma (ie, glaucoma uncontrolled despite maximal medical therapy and at least one prior surgical procedure). With a mean of 2.5 previous surgeries—including trabeculectomies, tubes, and transcleral cyclophotocoagulation—and an average of 3.8 glaucoma medications, these eyes had a mean preoperative IOP of 25.1 mm Hg. After ECP (mean follow-up, 17.5 months), mean IOP decreased to 10.5 mm Hg and mean number of medications to 0.9. These differences were statistically significant. If ECP can lower IOP so dramatically in refractory glaucoma, one can imagine how effective it could be in conjunction with cataract surgery to reduce the medical regimen in a patient with mild coexisting glaucoma.

ECP may not be appropriate in patients with chronic inflammation because it works by causing low-grade thermal damage, which can exacerbate inflammation. Likewise, it requires visualization of the target tissues, so eyes with extensive scarring from previous surgeries or an otherwise distorted anatomy may not be good candidates. But in most patients, it can be used as a safe and effective primary glaucoma surgical procedure and as an adjunct to cataract surgery in patients with both cataract and glaucoma.

CANALOPLASTY

Canaloplasty is a newer procedure that may be less familiar to cataract and refractive surgeons. In the past year, it has become probably my primary glaucoma surgical procedure because of its safety. Like nonpenetrating filtering techniques, it does not involve entering the eye, but unlike those procedures, it is relatively straightforward to perform.

The goal of canaloplasty is to restore aqueous outflow through Schlemm's canal. It begins like a nonpenetrating procedure (eg, viscocanalostomy) but instead of requiring an intrascleral space, it

involves threading a microcatheter through Schlemm's canal and subsequently placing a suture through the canal. When tied with adequate tension, this suture applies slight tension to keep the canal open.

When done correctly, the eye is not entered, so there is no possibility of a sudden IOP drop, which subsequently decreases the risk of suprachoroidal hemorrhage and its complications. The IOP decrease is much more controlled, with postoperative pressures typically in the mid-teens. There is no bleb, and therefore no bleb-related complications. As with ECP, the safety of the procedure lowers the threshold for glaucoma surgery, particularly in patients already taking one or two topical medical agents who are ready to undergo cataract surgery.

The downside of canaloplasty is that it involves the use of new skills, such as threading the microcatheter and suture through the canal, and therefore there is a learning curve of approximately 10 surgeries. Once these new steps are mastered, canaloplasty is ideal as a primary standalone glaucoma surgical procedure or in combination with cataract surgery.

One challenge we encountered at first with canaloplasty was achieving a quick watertight closure. We have overcome this by using fibrin glue. I use a minimal number of sutures, resulting in tight closure, decreased operating time, and better comfort for patients postoperatively.

From the surgeon's perspective, the procedure is longer than some other options, but the follow-up time is minimized. I might see trabeculectomy patients once or twice per week until their condition stabilizes, but canaloplasty patients need to be seen only a few times postoperatively.

A recent presentation[2] reviewed the experience with canaloplasty at four European centers. Included were 120 eyes with baseline IOP of at least 16 mm Hg and a history of IOP of 21 mm Hg or more, with less than two laser trabeculoplasty procedures and no previous incisional surgery. In 20 eyes, the procedure was combined with cataract surgery.

Of the 120 eyes, the canal dilation and suture placement were performed successfully in 109. One eye was converted to trabeculectomy. IOP decreased from a mean of 23.2 mm Hg at baseline (109 eyes) to 15.3 mm Hg at 3 months (89 eyes) and remained at that level until 18 months. Medication use decreased from a mean 1.8 at baseline to 0.3 at 3 months, rising gradually to a mean of 0.6 at 18 months.

Whether it is worthwhile for the nonglaucoma specialist to adopt either or both of these procedures is up to the individual surgeon. It depends on case load, surgical volume within the practice, and patient population. Each procedure requires the purchase of dedicated equipment, but, at least in my experience, when the equipment is available, the procedure is more often considered an option. I find I am doing fewer trabeculectomies and more of these procedures.

If a patient can undergo topical anesthesia and has no contraindications, and if a dramatic drop in IOP is not required, I tend to perform ECP if I am also doing his cataract surgery. For a patient who requires IOPs in the mid-teens, I would perform canaloplasty; for patients who need IOPs in the single digits, trabeculectomy is still the standard option, especially now that results are more consistent with the ExPress Mini Glaucoma Shunt (Optonol, Neve Ilan, Israel).

We now have the ability to customize our approach to surgery depending on the patient's needs. In the past, because of the risks of trabeculectomy, we might have kept a patient on medical therapy longer even though we were uncomfortable with his IOP control. These newer options lower the bar for proceeding to surgery, which may be the best choice to achieve IOP control and prevent further glaucomatous optic nerve damage.

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