The vast majority of patients with glaucoma in the United States are treated with topical medications that reduce IOP. Although eye drop therapy can be effective for some individuals, common issues such as expense, difficulties with instillation, and side effects decrease efficacy and lead to poor adherence. As a result, many patients on topical glaucoma therapy have poor IOP control, experience disease progression, and require additional therapy. The traditional glaucoma treatment algorithm calls for laser trabeculoplasty (LTP) when medications are inadequate. Studies have shown the safety and efficacy of LTP, although the response is generally moderate and of limited duration. Only after patients are on maximal medical therapy and have undergone LTP are they considered for incisional surgery, despite the evidence that surgery halts glaucomatous progression. Early and late complications of filtering and glaucoma drainage device surgery discourage and delay their choice in the algorithm. Faced with the prospects of hypotony, vision loss, bleb leaks, infection, choroidal effusion and hemorrhage, diplopia and surgical failure from bleb fibrosis or from encapsulation or exposure of the tube shunt, it is not surprising that patients and surgeons hesitate to pursue incisional surgery for glaucoma except as a “last resort.”

Microinvasive glaucoma surgery (MIGS) comprises a growing set of procedures and devices that avoid the manifold complications of traditional glaucoma surgery. The essential features of MIGS include an ab interno approach, minimal tissue disruption, restoration of physiologic outflow through aqueous veins or collector channels, rapid postoperative recovery, and a markedly improved safety profile compared with filtering surgery. Moreover, MIGS procedures do not disturb the conjunctiva, thus preserving this precious tissue for future filtering surgery, should it be required.

At present, three MIGS procedures are indicated for glaucoma patients in the United States: iStent Trabecular Micro-Bypass Stent (Glaukos), Trabectome (Neomedix), and gonioscopy-assisted transluminal trabeculotomy (GATT). Several clinical trials are also underway that allow select patients with mild to moderate glaucoma to undergo MIGS in conjunction with cataract surgery or as a standalone procedure: Hydrus (Ivantis), iStent inject...
and Supra (Glaukos), CyPass Micro-Stent (Compass Trial; Transcend Medical), and Xen Gel Stent (AqueSys). For the purpose of discussing the recent evolution of indications for MIGS, I focus on two of these procedures.

TRABECULAR MICROBYPASS STENT

The juxtacanalicular trabecular meshwork blocks aqueous outflow in primary open-angle glaucoma. The first device that physiologically bypasses this resistance was approved by the FDA 2 years ago. Somewhat as an intravenous catheter is inserted into a vein, the 1-mm titanium iStent is inserted into Schlemm canal, traversing blocked meshwork rather than skin and vein. In lieu of delivering saline or medication, the device facilitates anterior chamber aqueous humor outflow through Schlemm canal into aqueous veins. Initial studies in which the stent was placed immediately after phacoemulsification have shown modest IOP reductions and significant decreases in the number of topical glaucoma medications patients require. Preliminary studies have shown that the iStent, when performed as a standalone procedure, may significantly reduce both IOP and the number of medications necessary. Although randomized controlled studies are needed, these results suggest that the device may be indicated for all patients with primary open-angle glaucoma (POAG) independent of their phakic or pseudophakic status.

GONIOSCOPY-ASSISTED TRANSLUMINAL TRABECULOTOMY

Grover et al recently published a new technique termed gonioscopy-assisted transluminal trabeculotomy. Using an ab interno clear corneal approach, the surgeon threads a microcatheter or a suture around 360º of the lumen of Schlemm canal. Gently extracting the catheter or suture through the small corneal wound achieves a 360º trabeculotomy. Except for expected mild hyphema in the early postoperative period, the procedure was remarkably safe and well tolerated.

Grover and colleagues have successfully performed GATT on 85 patients with open-angle glaucoma, aged 24 to 88. The majority (58) of these patients had POAG. At 6 months, this group had a 30% IOP reduction and used one fewer medication. At 12 months, the POAG group showed a 40% IOP reduction and still used one fewer medicine than preoperatively. Patients with secondary glaucoma (including chronic angle closure, pseudofoliation, pigmentary, uveitic, traumatic, and steroid-induced glaucoma) showed similar reductions in IOP and the burden of medication. The investigators’ analysis of their preliminary results found IOP reductions as good or better than those published for trabeculotomy by the traditional ab externo method. Although the study is retrospective and the sample size limited, the results are encouraging. In addition to the obvious indications for pediatric glaucoma, this new MIGS procedure will find a broader application for the more common types of adult glaucoma.

THE FUTURE

Given its superior safety profile and the opportunity to intervene at an earlier stage than with filtering surgery, I believe that MIGS should be made available to the majority of glaucoma patients, not just those with concomitant cataracts. Randomized studies on standalone MIGS procedures with control arms such as selective laser trabeculoplasty (SLT) or even prostaglandin analogue therapy would serve two purposes. First, the efficacy of a given MIGS procedure could be established in the absence of cataract surgery, which is an effective IOP-lowering procedure itself. Second, results demonstrating the safety and efficacy of MIGS procedures relative to that of established therapies would better guide the decision-making process. Studies that compared SLT to a prostaglandin analogue and demonstrated essentially equal outcomes led to the evolution of SLT as a first-line therapy. If similar equality can be shown with MIGS, it is conceivable that glaucoma may truly become a surgical disease. The many benefits of reducing the burden of medications include improved adherence, elimination or reduction of side effects (eg, chronic hyperemia, pigmentary changes, hypertrichosis, etc.), and ultimately, an improvement in patients’ quality of life. Fewer medicines and less invasive surgeries are making more sense.

Robert Marquis, MD, PhD, is a glaucoma specialist at Texan Eye Glaucoma Service in Austin, Texas. He is an investigator for AqueSys, Glaukos, and Ivantis. Dr. Marquis may be reached at (512) 327-7000; rmarquis@swbell.net.