

Filtration Surgery: Indications and Improvements

The future of this intervention likely depends on the development of devices that communicate between the anterior chamber and the episcleral space.

BY MICHAEL STILES, MD

Filtration surgery, trabeculectomy more specifically, has been the gold standard of glaucoma surgery. Although effective at lowering IOP, the potential complications of the procedure have limited its use to patients whose IOP remains uncontrolled on maximal medications and in whom laser trabeculoplasty has failed. Even then, surgeons typically will not perform a trabeculectomy unless there is decisive disc damage with visual field loss. This article reviews recent changes in filtration surgery that maintain its efficacy while limiting potential vision-threatening complications.

PREVENTING AND TREATING HYPOTONY

The leading concern about filtration surgery is vision-threatening complications related to hypotony. Laser suture lysis of the flap and/or the use of releasable flap sutures has been the mainstay of glaucoma surgeons' attempt at titrating aqueous flow and limiting hypotony in the early postoperative period. Despite their best efforts, hypotony can still occur, and surgical techniques to reverse this course have been published. They include open repair of a leaky flap with multiple sutures, suture repair through intact conjunctiva, and bleb compression sutures.^{1,2}

Initially developed as a full-thickness filtration procedure, the Ex-Press Glaucoma Filtration Device (Alcon) has found a niche in glaucoma surgery since ophthalmologists began to place it under a guarded scleral flap (Figure 1). Potential advantages of the device over trabeculectomy include less tissue destruction and a more consistently sized opening into the anterior chamber. There has been debate over whether or not these theoretical advantages translate into better safety and efficacy, thus justifying the additional cost of the shunt.³ Two-year results of a randomized, multicenter, comparative trial comparing the Ex-Press and trabeculectomy (XVT Study) were recently published.

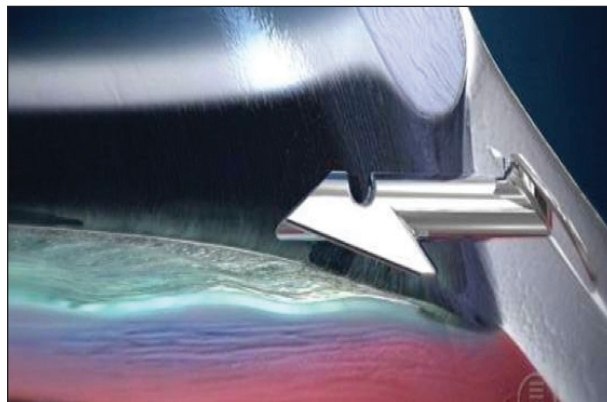


Figure 1. The Ex-Press Glaucoma Filtration Device under a scleral flap.

Although surgical success was similar between the two procedures, visual recovery was quicker in the Ex-Press group, and postoperative complications were less common.⁴ Longer-term data from this study and other ongoing prospective studies on the device will further define its proper role in filtering surgery.

BLEB MORPHOLOGY

Focal, cystic, anterior, and ischemic blebs are associated with bleb dysesthesia, late leaks, and bleb-related endophthalmitis. The off-label intraoperative use of the antimetabolite mitomycin C (MMC) greatly enhanced the success of filtration surgery at achieving a target IOP. Early on, however, surgeons typically applied high concentrations of MMC to the limited area of the scleral flap for an extended time. This approach seemed to increase the chance of the aforementioned bleb-related complications.⁵

In 2000, Peng Khaw, MD, PhD, popularized several modifications to promote more diffuse and posterior blebs

and avoid late bleb-related complications. These changes include a fornix-based flap to avoid posterior scarring from a suture line necessary for a limbus-based flap, a small sclerostomy relative to the size of the scleral flap, anterior dissection of the flap's side edges limited to the posterior limbus and not extending into the cornea, and a wide application of MMC, including the posterior sub-Tenon space (Figure 2). The intention is to exchange a high, focal, anterior aqueous flow rate for a low, more diffuse, posterior flow rate.⁶

Regarding MMC application, more surgeons are beginning to inject the antimetabolite preoperatively rather than apply it with a sponge. A potential advantage of MMC injection is greater predictability of the dose delivered. In addition, injection easily facilitates a diffuse application of the medication over a broad area, possibly promoting a more favorable bleb morphology. Lim and colleagues reported 3-year retrospective data comparing MMC injection and sponge application. They found a lower IOP, reduced dependence on medication, and less tense and vascularized blebs in the injection group.⁷ Randomized studies comparing these two MMC application methods are ongoing.

In addition, MMC is now available in an FDA-approved formulation for ophthalmic use (Mitosol Kit for Ophthalmic Use; Mobius Therapeutics), which ensures reliable efficacy and safety in glaucoma surgery applications. As a result, MMC can be stored at room temperature for extended periods of time and maintain stable potency and reliable dosing. The closed transfer afforded by the kit increases the safety of OR personnel. Moreover, MMC from the kit can be used in FDA studies comparing new filtration procedures to trabeculectomy.

FILTRATION SURGERY: CURRENT AND FUTURE INDICATIONS

Despite advances, vision-threatening complications from hypotony and bleb-related problems have not been eliminated. Although adherence and side effects are problematic with prescribed medical therapy, most physicians are reluctant to recommend filtration surgery unless more conservative treatments have been exhausted and there is clinical proof that a lower IOP is required. The options of canaloplasty and microinvasive glaucoma surgery as well as growing data on the IOP reduction achieved with clear corneal cataract surgery have further delayed filtration surgery.

On the other hand, for patients who have advanced glaucoma or aqueous outflow systems that cannot be repaired (eg, traumatic, angle-closure glaucoma), filtration surgery still has a vital role. Further analysis of data from the Advanced Glaucoma Intervention Study (AGIS) and the Collaborative Initial Glaucoma Treatment Study (CIGTS) illustrates that a low IOP (≤ 12 mm Hg) is necessary to avoid

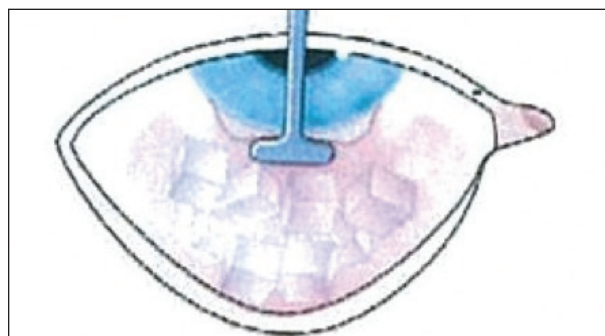


Figure 2. Broad area of MMC treatment.

visual field loss. Filtration surgery is the most efficacious method by which to achieve such levels in patients with advanced glaucoma.^{8,9}

CONCLUSION

The future of filtration surgery likely hinges on the development of devices that communicate between the anterior chamber and the episcleral space. The Xen Gel Stent (AqueSys) and the InnFocus MicroShunt (InnFocus) are currently under FDA investigation. Both are designed to provide more predictable aqueous outflow and avoid postoperative hypotony without succumbing to episcleral fibrosis and failure. They reportedly circumvent the variability of scleral flap thickness and tightness associated with trabeculectomy and direct outflow posteriorly, away from the limbus. These technologies exemplify the recent exciting and necessary efforts to improve the safety of filtration surgery, currently the most effective means of lowering IOP. ■

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