

TIPS AND TRICKS

Advice for experienced trabeculectomy and tube shunt surgeons.

BY JING WANG, MD, FRCSC, AND KEITH BARTON, MD, FRCP, FRCS



Despite the rapid emergence of many new surgical techniques, trabeculectomy and aqueous shunt implantation remain the cornerstones of the surgical management of advanced and complex glaucoma. This article shares

some tips for success with these procedures in different clinical scenarios.

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ADVANCED AND NORMAL-TENSION GLAUCOMA

In patients who have advanced or normal-tension glaucoma (NTG), trabeculectomy with adjunctive mitomycin C (MMC) is more likely to achieve lower IOPs without supplemental medication than is an aqueous shunt, especially if the patient has not previously undergone ocular surgery.¹ We typically perform a trabeculectomy via a fornix-based conjunctival flap with a large area of MMC application using three to four sponges. A broad, short, rectangular scleral flap is secured tightly with releasable 10-0 nylon sutures (Figure 1). We routinely perform a peripheral iridectomy to eliminate the risk of sclerostomy occlusion with the iris during postoperative suture manipulation.

The concentration of MMC is usually 0.2 mg/mL, with a maximum exposure time of 3 minutes.² Many surgeons use higher concentrations of MMC in patients of West African descent because of their higher risk of a failed trabeculectomy, but in low-risk NTG patients who require postoperative IOPs in the single digits, the key is aggressive postoperative management rather than high doses of MMC. During the first month after surgery, we perform aggressive massage and remove flap sutures to encourage flow, while minimizing inflammation with topical corticosteroids and 5-fluorouracil injections. The aim is to obtain a single-digit IOP at as many postoperative visits as possible.

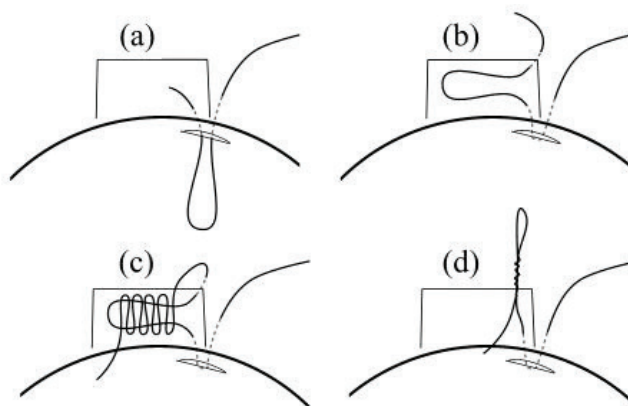
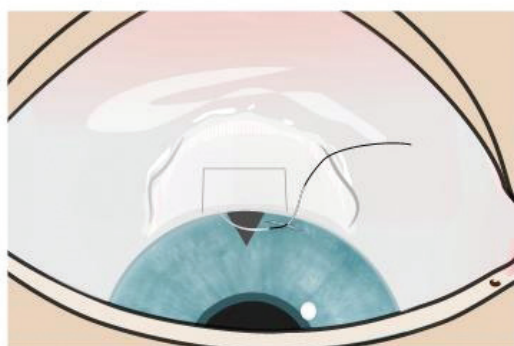


Figure 1. Technique for the releasable sutures used to close the scleral flap. The peripheral corneal loop is buried so that there is no exposed suture material.

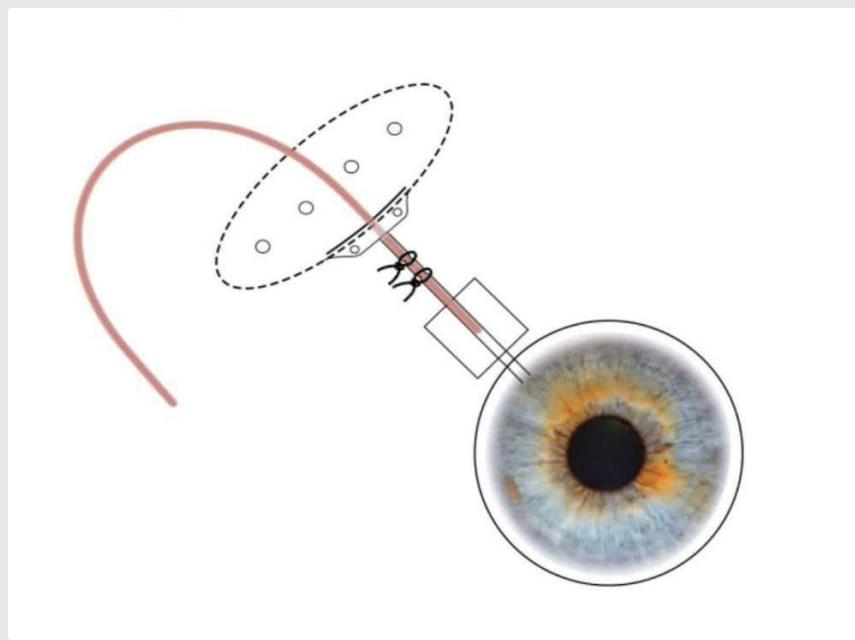


Figure 2. The Baerveldt glaucoma implant is partially occluded with an intraluminal 3–0 nylon suture (Supramid Extra), which is then augmented with one or more 10–0 nylon external ligatures to gently occlude the remaining flow. They can be lasered sequentially to re-initiate flow without a sudden drop in pressure.

Aqueous shunts usually require the use of glaucoma medications to achieve a low IOP.¹ The devices are more successful than trabeculectomy, however, in patients with a high failure risk such as those with a history of retinal surgery, keratoplasty, or failed trabeculectomy and those with ocular surface disease, certain uveitic glaucomas, and iridocorneal endothelial (ICE) syndrome.

EYES AT HIGH RISK OF SCARRING

In general, aqueous shunt surgery is the first choice for managing secondary glaucoma after keratoplasty or vitreoretinal surgery or in the presence of other significant ocular surface inflammation or scarring. The surface area of the shunt plate correlates with the final IOP.³ We routinely use a Baerveldt BG 101-350 glaucoma implant (Abbott) with adjunctive MMC 0.4 mg/mL applied for 5 minutes to the equatorial Tenon capsule. To prevent early hypotony, we use an intraluminal stent suture (3–0 Supramid Extra; Jackson) supplemented by one or more external ligatures (10–0 nylon), which squeeze the tube over the stent suture (Figure 2). In our experience, this technique prevents postoperative hypotony while permitting a staged reduction in pressure during the first 3 months. Intraoperatively, we initially place the stent suture the whole way along the tube

and then gradually withdraw it until we observe very slow aqueous flow at the back of the plate. The 10–0 nylon ligatures are used to gently eliminate any remaining flow. In the postoperative period, the ligatures are lysed by argon laser when required. The intraluminal suture is left in place for 8 to 12 weeks if possible and then removed in a staged fashion, allowing the IOP to equilibrate in between withdrawal attempts. Hypotony can largely be prevented by only completely removing the suture if absolutely necessary.

The tube should always be placed posteriorly to avoid the corneal endothelium. In eyes with a corneal graft, the tube will ideally be placed behind the host rather than donor cornea. Sulcus placement of the tube is less likely to cause corneal decompensation than anterior chamber placement.⁴ When the tube is to be placed in the sulcus, we recommend that the tip be visible through either a peripheral iridectomy or the pupillary axis if the pupil is large. In ICE syndrome,

tubes tend to be more successful than trabeculectomies, because the latter are at risk of failure from occlusion with ICE cells. Again, it is advisable to try to avoid contact between the tube and the already compromised corneal endothelium.

Despite logistical obstacles, tube shunts can largely be successfully implanted in buckled eyes. A large conjunctival dissection and, sometimes, multiple traction sutures ensure ample exposure for proper equatorial placement of the plate. We still recommend placement in the supero-temporal quadrant when possible. Sometimes, the plate needs to be located over the buckle; this is often feasible with a Baerveldt glaucoma implant, which is thinner than an Ahmed Glaucoma Valve (New World Medical). We tend to recommend placing the tube in the anterior chamber, because successful implantation through the pars plana requires close shaving of the vitreous base. If pars plana placement is required, a thorough vitrectomy involving the anterior vitreous base is necessary prior to insertion of the tube.

Pars plana tube insertion is useful in nanophthalmic eyes, because space in either the anterior chamber or sulcus is often insufficient. In our experience, pars plana tube implantation with cataract surgery in nanophthalmic eyes offers IOP control without anterior chamber shallowing, and it minimizes the risk of aqueous misdirection.



AT A GLANCE

- In patients who have advanced or normal-tension glaucoma, trabeculectomy with adjunctive mitomycin C (MMC) is more likely to achieve lower IOPs without supplemental medication than is an aqueous shunt, especially if the patient has not previously undergone ocular surgery.
- In general, aqueous shunt surgery is the first choice for managing secondary glaucoma after keratoplasty or vitreoretinal surgery or in the presence of other significant ocular surface inflammation or scarring. The tube should always be placed posteriorly to avoid the corneal endothelium.
- Trabeculectomy can be very successful in uveitic patients without other risk factors for failure if the inflammation is well controlled, although extra sutures are often required in the scleral flap to prevent hypotony. In patients with additional risk factors for trabeculectomy failure, aqueous shunts are a better choice.

EYES AT HIGH RISK OF SUPRACHOROIDAL HEMORRHAGE AND HYPOTONY

Trabeculectomy has a poor track record in cases of aphakic glaucoma, with a high rate of failure from scarring. Although tube shunts offer better IOP control, hypotony in the single-chamber eye can lead to choroidal hemorrhage. The technique described earlier eliminates the risk of sudden hypotony associated with the traditional technique using a single absorbable ligature, and it is particularly useful in patients who have Sturge-Weber syndrome or high myopia in whom hypotony may be dangerous. In highly myopic patients with glaucoma, because of their younger demographic profile, hypotony can lead to permanent, visually significant maculopathy. As an additional benefit, we find that contact lens wear is more likely to be feasible after implantation of a tube shunt than after trabeculectomy in highly myopic patients.

UVEITIC GLAUCOMA

Patients with uveitic glaucoma are at increased risk of trabeculectomy failure and hypotony because of large IOP fluctuations. Uveitis is heterogeneous, but many patients require glaucoma surgery, especially those with juvenile idiopathic arthritis-related uveitis, Fuchs heterochromic iritis, Posner-

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Schlossman syndrome, sarcoid uveitis, and herpetic disease.

Trabeculectomy can be very successful in patients without other risk factors for failure if the inflammation is well controlled, although extra sutures are often required in the scleral flap. Suture removal or lysis should be performed cautiously because of the risk of hypotony. In patients with additional risk factors for trabeculectomy failure, aqueous shunts are a better choice. Despite the risk of hypotony, we still use the Baerveldt BG 101-350 glaucoma implant in most cases of uveitis, because the failure of IOP control is still the greatest concern. The main exceptions are patients with juvenile idiopathic arthritis-related uveitis and those who have had severe chronic uveitis since childhood; in these cases, we prefer the smaller surface area of the Baerveldt BG 103-250 glaucoma implant or, occasionally, the single-plate Molteno implant (Katena). ■

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■ financial disclosure: has received lecture honoraria from Allergan; on advisory boards of Alcon, Glaukos, and Ivantis; consultant to Alcon, AqueSys (bought by Allergan), Ivantis, and Santen; has received educational grants/research funding from Abbott, Alcon, Allergan, and New World Medical; held stock in AqueSys

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■ financial interest: none acknowledged