

Trabeculectomy Following Failed Primary Tube Shunt for the Management of POAG

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CASE PRESENTATION

A 37-year-old white man with a 3-year history of gradually worsening blurry vision was referred to the Glaucoma Service at the Medical College of Georgia in Augusta by an outside ophthalmologist after initial management of primary open-angle glaucoma. At the first visit, the patient's BCVA was hand motions OD and 20/300 OS. His medical regimen for both eyes included latanoprost q.h.s., timolol 0.5%-dorzolamide 2% b.i.d., and brimonidine 0.15% t.i.d. His IOP measured 37 mm Hg OD and 29 mm Hg OS, and his cup-to-disc ratio was 0.99 OD and 0.95 OS (Figure 1). His average central corneal thickness by ultrasound pachymetry was 534 μ m OD and 536 μ m OS. A gonioscopic examination revealed open and normal angles. The patient's past ocular history was negative for any trauma, and he had no positive family history of blindness or glaucoma.



Figure 1. Fundus photography of the patient's disc prior to trabeculectomy in the left eye reveals advanced cupping of the discs.

He was diagnosed with open-angle glaucoma, and a magnetic resonance imaging scan revealed no other etiology of vision loss or changes in the optic disc. At a 2-week follow-up visit, the patient's IOPs remained elevated, measuring 38 mm Hg OD and 28 mm Hg OS. The decision was made to proceed with primary glaucoma device implantation in both eyes. Tube shunts were placed, and medical therapy was discontinued.

On postoperative day 1, the patient's IOP measured 20 mm Hg OD and 27 mm Hg OS. He was started on dorzolamide 2% t.i.d. and timolol 0.5% q.a.m. At the 1- and 3-month follow-up visits, his IOP remained at 30 mm Hg OD and 22 mm Hg OS. By 8 months postoperatively, his IOP was 31 mm Hg OD and 24 mm Hg OS. Dorzolamide and timolol were discontinued and

TABLE 1. THE PATIENT'S IOP COURSE BEFORE AND AFTER TRABECULECTOMY IN THE LEFT EYE

Event	IOP OS
Pretube	28 mm Hg
Posttube	27 mm Hg
1 month posttube	22 mm Hg
3 months posttube	22 mm Hg
9 months posttube (pretrab)	27 mm Hg
Posttrab	13 mm Hg
1 month posttrab	12 mm Hg
3 months posttrab	16 mm Hg
6 months posttrab	10 mm Hg
8 months posttrab	10 mm Hg

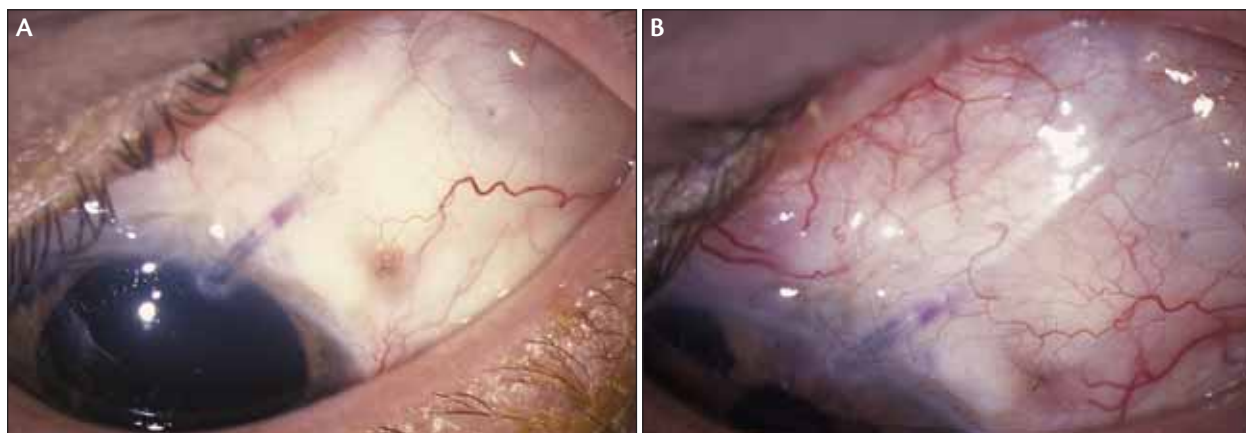


Figure 2. A slit-lamp photograph of the patient's left eye demonstrates the appearance of the tube implant prior to trabeculectomy (A) and after trabeculectomy (B).

replaced with brimonidine, travoprost, and brinzolamide in both eyes (Table 1).

One month later, the patient presented to the Glaucoma Service. His BCVA measured light perception in the right eye and count fingers at 2 feet in the left eye. The IOP measured 32 mm Hg OD and 27 mm Hg OS, despite medical therapy. The fundus examination showed significant optic atrophy in both eyes, with no reserve for an IOP spike or continued elevation of the IOP (Figure 1).

HOW WOULD YOU PROCEED?

- Would you continue medical therapy?
- Would you revise the tube?
- Would you perform cyclophotocoagulation?
- Would you perform a trabeculectomy?

CLINICAL MANAGEMENT

Due to the history of the patient's inability to maintain a normal IOP with medical therapy and primary tube shunt placement, he was taken to the OR for a trabeculectomy in the left eye. The procedure was augmented with mitomycin C 0.2 mg/mL for 2 minutes in the superior nasal quadrant (Figure 2).

OUTCOME

One day after the trabeculectomy was performed in the left eye, the patient's vision was counts fingers at 1 foot, and his IOP measured 13 mm Hg OS. He completed a standard postoperative course of moxifloxacin t.i.d. for 2 weeks and prednisolone acetate 1% beginning at six times a day in the left eye, with a 6-week taper and an eye shield q.h.s.

One month after the trabeculectomy, the patient's IOP measured 12 mm Hg. At the 2-, 3-, 6-, and 8-month follow-up visits, the patient's IOP measured 18 mm Hg,

16 mm Hg, 10 mm Hg, and 10 mm Hg, respectively (Figure 3). The elevated IOP of 18 mm Hg was thought to be secondary to postoperative steroids, and the IOP did respond to a cessation of the prednisolone drops. During the entire course of treatment after the trabeculectomy, the patient did not take any pressure-lowering eye drops. His BCVA remained counts fingers at 1 foot.

DISCUSSION

Medical Management

Based on data from the Advanced Glaucoma Intervention Study (AGIS), we set a target IOP of less than 14 mm Hg. The AGIS suggested a correlation with lower mean IOPs and minimal-to-no progression of visual field defects during the follow-up period. In contrast, patients who had an average IOP of more than 17.5 mm Hg during the first 6 months after primary surgical intervention were shown to experience higher mean IOPs and progression of visual field defects during the follow-up period.¹ Based on The Tube Versus Trabeculectomy (TVT) Study, which defined failure of primary tube placement and trabeculectomy as an IOP of more than 21 mm Hg or less than a 20% reduction below baseline levels on two consecutive follow-up visits after 3 months, our patient's primary tube placement was not successful. Nine months after primary tube placement, this patient's IOP measured 27 mm Hg. In addition to documented progression of his glaucoma via central vision loss, he only experienced a 3.5% IOP reduction from baseline, despite being treated with medical therapy after a primary tube placement. He therefore qualified for additional treatment of his primary open-angle glaucoma besides medical therapy. His IOP was poorly controlled on three topical medications, and we deemed it unlikely that adding a miotic,

restarting timolol, or initiating the long-term use of an oral carbonic anhydrase inhibitor would bring his IOP into the target range.

Tube Revision

Excessive fibrosis represents the most common cause of primary tube shunt failure, with thickening around the reservoir leading to increased IOP. The proposed mechanisms for failure include limitations inherent in the device's structural design, end-plate size, and the fibrogenic biomaterials used.² Shah et al compared the success of tube revision versus placement of an additional tube shunt after a failed primary tube shunt. Sixty-two percent of patients who received an additional tube shunt achieved qualified success with a final mean IOP of 25.3 mm Hg versus 42% of patients whose tube was revised and achieved qualified success with a final mean IOP of 17.7 mm Hg.³ Additionally, tube revision is inherently associated with a risk of excessive bleeding and the formation of scar tissue.

Godfrey et al also investigated the efficacy of implanting a tube shunt after a failed primary tube shunt. Eighteen patients with a mean preoperative IOP of 29.5 mm Hg achieved a mean postoperative IOP of 19.6 mm Hg at the 20-month follow-up visit, which illustrates a successful long-term reduction of IOP.⁴ Taking into consideration the more successful long-term results for IOP control, the placement of a second tube would be a more favorable option than medical therapy for managing this patient's failed primary tube. However, the results from Godfrey cited earlier do not suggest that our patient's IOP would decrease to a level that would stabilize his glaucoma with a second tube implant.

Cyclophotocoagulation

Transscleral diode laser cyclophotocoagulation is an option for the treatment of patients with refractory glaucoma and failed trabeculectomies or tube shunts. Other indications include eyes with no visual potential that need pain relief and eyes with severe conjunctival scarring. Despite reports of efficacy in IOP lowering, studies

have documented visual loss following cyclophotocoagulation, particularly in glaucomatous eyes with limited visual acuity prior to operation.⁵ Weeks can pass before the IOP-lowering effects of transscleral diode laser cyclophotocoagulation are realized. Given the tenuous condition of our patient's optic disc and his advanced disease, rapid lowering of his IOP was desired. Furthermore, cyclophotocoagulation can be associated with an IOP spike, which could leave a patient like this one blind.⁶ Due to reports of visual loss, delayed IOP lowering, and IOP spikes, a cycloablative procedure was not chosen to manage his failed primary tube placement.

Trabeculectomy

The TVT study compared placement of a tube shunt to trabeculectomy for patients with uncontrolled glaucoma who had undergone cataract extraction with the implantation of an IOL and/or failed filtering surgery. Preoperatively, each group of patients had a mean IOP of 25 mm Hg and was being treated with three glaucoma medications. Results indicated no significant difference in mean IOP 3 months postoperatively. Patients in the tube group achieved a mean decrease in IOP of 48%, and the trabeculectomy group achieved a mean decrease in IOP of 47%. Despite these equally efficacious results in IOP lowering, the trabeculectomy group achieved a successful reduction in IOP at a much quicker rate than the tube group.⁷

After the placement of a tube shunt, our patient achieved only a modest decline in IOP of approximately 4 mm Hg. Since a further decrease of 10 mm Hg was

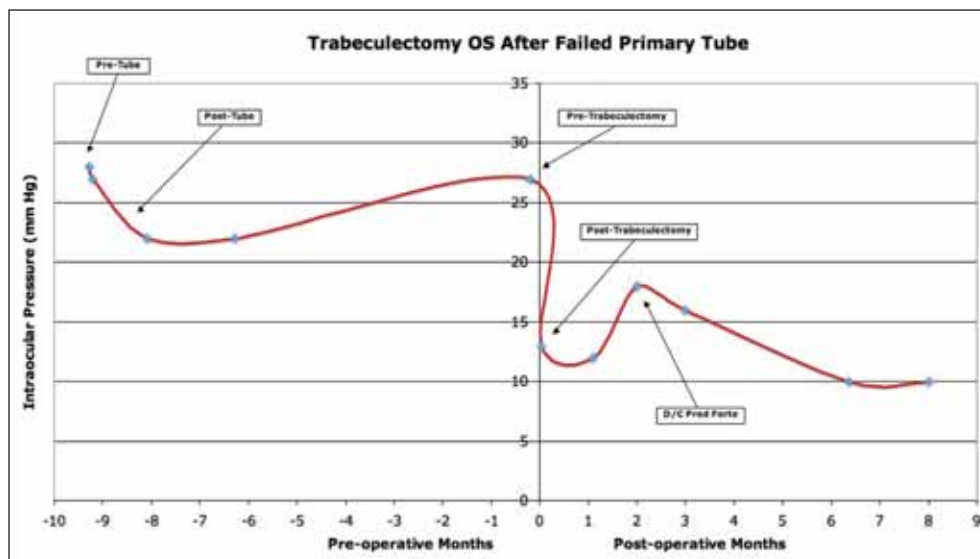


Figure 3. A plot of the patient's IOP course before and after trabeculectomy in the left eye.

“Based on the quicker IOP-lowering effects obtained in the trabeculectomy group and equal 3-year results compared to the tube group, we chose trabeculectomy as the most appropriate treatment for the patient.”

desired, a second tube implant was not chosen. Using a nonvalved implant was also not considered, since pressure lowering is delayed, due to the need for internal occlusion to avoid profound hypotony while a fibrous capsule forms and encapsulates the plate for some resistance to flow.^{2,8-10} Based on the quicker IOP-lowering effects obtained in the trabeculectomy group and equal 3-year results compared to the tube group, we chose trabeculectomy as the most appropriate treatment for the patient.

CONCLUSION

Often, when a patient has had a tube implanted, he or she has significant conjunctival scarring or inflammatory conditions that will likely lead to the failure of a trabeculectomy.⁶ In the new era of more frequent primary use of tube shunts, many patients are left with a quadrant of pristine conjunctiva, which permits consideration

of a trabeculectomy should the implant not provide adequate IOP control. □

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1. The Advanced Glaucoma Intervention Study (AGIS): 7. The relationship between control of intraocular pressure and visual field deterioration. *Am J Ophthalmol.* 2000;130(4):429-440.
2. Hong CH, Arosema A, Zurakowski D, Ayyala RS. Glaucoma drainage devices: a systematic literature review and current controversies. *Surv Ophthalmol.* 2005;50(1):48-60.
3. Shah AA, WuDunn D, Cantor L. Shunt revision versus additional tube shunt implantation after failed tube shunt surgery in refractory glaucoma. *Am J Ophthalmol.* 2000;129(4):455-460.
4. Godfrey DG, Krishna R, Greenfield DS, et al. Implantation of second glaucoma drainage devices after failure of primary devices. *Ophthalmic Surg Lasers.* 2002;33(1):37-43.
5. Pokroy R, Greenwalkd Y, Bukelman A, Zalish M. Visual loss after transcleral diode laser cyclophotocoagulation for primary open-angle and neovascular glaucoma. *Ophthalmic Surg Lasers Imaging.* 2008;39(1):22-29.
6. Contreras I, Noval S, González Martín-Moro J, et al. IOP spikes following contact transcleral diode laser photocoagulation. *Arch Soc Esp Oftalmol.* 2004;79(3):105-109.
7. Gedde SJ, Schiffman JC, Feuer WJ, et al. Three-year follow-up of the Tube Versus Trabeculectomy Study. *Am J Ophthalmol.* 2009;148(5):670-684.
8. Hoare Nairne JE, Sherwood D, Jacob JS, Rich WJ. Single stage insertion of the Molteno tube for glaucoma and modifications to reduce postoperative hypotony. *Br J Ophthalmol.* 1988;72(11):846-851.
9. Nguyen QH. Primary surgical management refractory glaucoma: tubes as initial surgery. *Curr Opin Ophthalmol.* 2009;20(2):122-125.
10. Rose GE, Lavin MJ, Hitchings RA. Silicone tubes in glaucoma surgery: the effect of technical modifications on early postoperative intraocular pressures and complications. *Eye (Lond).* 1989;3(5):553-561.

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