WHEN ONE MIGS PROCEDURE FAILS, WHAT'S NEXT?

The presence of keratoconus adds to the complexity of this case.

BY EDWARD N. BURNEY, MD, FAAO, FACS; JOANN GIACONI, MD; THOMAS PATRIANAKOS, MD; ANGELA TURALBA, MD; AND DOUGLAS J. RHEE, MD

CASE PRESENTATION

A 71-year-old woman of European ancestry is referred for uncontrolled IOP. The patient has contact lens–dependent keratoconus in each eye (Figure 1), and she had undergone gonioscopy-assisted transluminal trabeculotomy (GATT) 4 months ago for uncontrolled IOP. She states that her IOP has not improved since the procedure and that her visual field damage has progressed.

On examination, visual acuity is 20/30- OD and 20/40- OS. IOP is 17 mm Hg OD and 19 mm Hg OS. Central corneal thickness measures 480 µm OD and 495 µm OS. Glare testing, on the medium setting, reveals a visual acuity of 20/50 OD and 20/60 OS. The slit-lamp examination is significant for mixed nuclear and cortical cataracts in each eye. Gonioscopy is D40r 1+ pigmented trabecular meshwork (TM) in the right eye and D20r, with Schlemm canal exposed for 360º, in the left eye and no peripheral anterior synechiae. Diagnostic testing shows glaucomatous damage to the visual field and retinal nerve fiber layer in the left eye (Figures 2 and 3).

The patient is using latanoprost 0.005% at bedtime and timolol 0.5% twice daily in each eye, and she is administering apraclonidine twice a day in her left eye. She has a sulfa allergy. How would you proceed?

—Case prepared by Douglas J. Rhee, MD

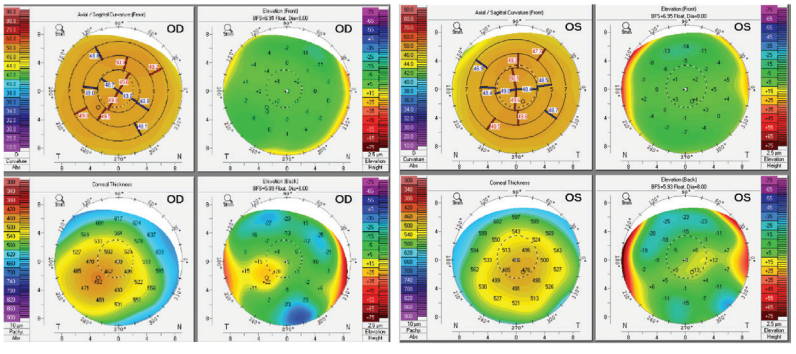

Figure 1. Corneal topography shows keratoconus in each eye.

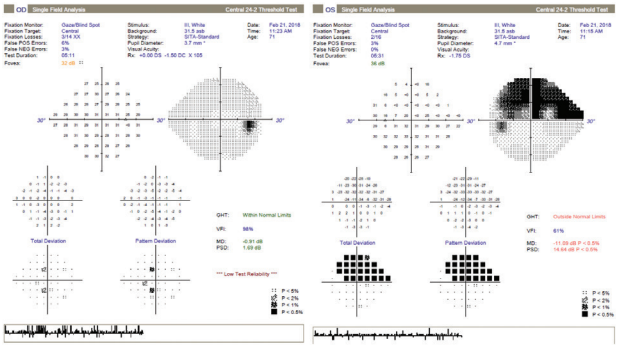

Figure 2. Automated achromatic visual field testing shows a dense superior arcuate scotoma (near superior altitudinal) in the left eye.

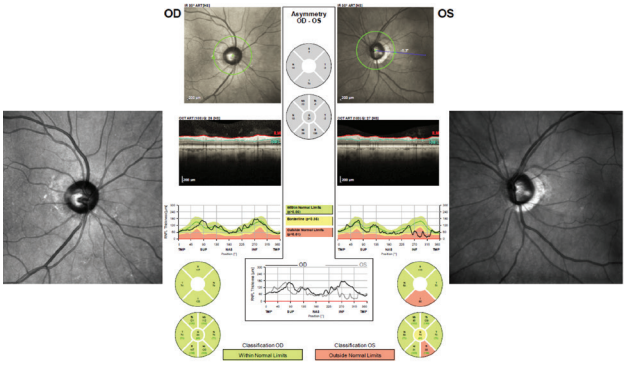

Figure 3. False color images of the optic nerve and retinal nerve fiber layer thickness demonstrate loss in the inferior bundle in the left eye.

EDWARD N. BURNEY, MD, FAAO, FACS

Visual field testing suggests significant optic nerve damage, greater in the left than the right eye. IOP readings, corrected after pachymetry, are too high at approximately 21 and 23 mm Hg in the right and left eyes, respectively. Based on the results of recent clinical studies,[1,2] an IOP reduction of at least 20%—or to a range of 10 to 13 mm Hg—is advisable. After confirming that the patient was adhering to prescribed medical therapy, I would adjust her regimen. I would decrease the dosing to a once-daily fixed combination of timolol 0.5% and latanoprost 0.005%, and I would substitute twice-daily brimonidine 0.2% for the shorter-acting apraclonidine. If these steps did not achieve the target IOP, adding netarsudil ophthalmic solution 0.02% (Rhopressa, Aerie Pharmaceuticals) dosed daily would be an option.

If the elevated IOP proved refractory to medication, laser or filtration surgery would be my next consideration. Laser treatment, if appropriate, however, presumably would have been applied prior to GATT. I would therefore consider filtration surgery such as trabeculectomy, placement of an Ex-Press Glaucoma Filtration Device (Alcon), or implantation of a glaucoma drainage device. Potential benefits of a filtration procedure include a greater and more immediate IOP reduction than with any of the microinvasive glaucoma surgical procedures available in the United States, the filtration procedure's potential for combination with cataract surgery, and an opportunity to flush cytokine-containing aqueous from the anterior chamber. Several studies have found an association between elevated IOP and an increase in inflammatory cytokines in the aqueous.[3] In addition, research has linked hard contact lens wear, eye rubbing, and tear film abnormalities associated with keratoconus to aqueous cytokine elevation.[4] I would therefore use adjunctive mitomycin C during filtration surgery.

"THIS PATIENT HAS MULTIPLE CONCURRENT PROBLEMS THAT MUST BE ACCOUNTED FOR: PROGRESSIVE GLAUCOMA AFTER UNSUCCESSFUL ANGLE SURGERY, CATARACT, AND KERATOCONUS."

—JOANN GIACONI, MD

JOANN GIACONI, MD

This patient has multiple concurrent problems that must be accounted for: progressive glaucoma after unsuccessful angle surgery, cataract, and keratoconus. First, I would discuss with the patient all her options, which at this point are surgical. Additional topical medication or laser therapy that acts on TM outflow is unlikely to help because 360° of the TM has been removed. Oral medications are contraindicated because of the patient's presumably real sulfa allergy. Surgery is her best option.

Cataract and glaucoma surgery, performed either simultaneously or separately, could be considered. Keratoconus influences the choice of glaucoma procedure because the patient may require contact lenses postoperatively, making a trabeculectomy bleb at the limbus undesirable. If she is experiencing functional loss from the cataract, I would discuss with her combining phacoemulsification with implantation of a Xen Gel Stent (Allergan), which would produce a posterior bleb. If the device failed, a traditional tube shunt could be implanted at a later date, after postoperative inflammation subsided. If the cataract is not functionally affecting the patient, I would recommend implantation of a traditional glaucoma drainage device, and my preference would be a Baerveldt 350-mm^2 glaucoma implant (Johnson & Johnson Vision) in hopes of achieving an IOP in the low teens. I would remove the cataract later, when it became more functionally significant.

THOMAS PATRIANAKOS, MD

This patient has several risk factors for glaucomatous progression, including her age, exfoliation glaucoma, and thin central corneal thickness requiring IOPs in the low teens. A TM-ablative procedure failed to control her IOP adequately, which demonstrates that the pathology is posterior to the TM. Unfortunately, because the TM has been removed, canal-based surgery is no longer a possibility.

At this point, I would consider combining cataract extraction with either an ablative procedure for the ciliary body or subconjunctival surgery. The MicroPulse P3 Glaucoma Device with the Cyclo G6 Glaucoma Laser System (Iridex) offers the benefits of rapid postoperative recovery and no bleb formation. In my experience, however, postoperative IOP control tends to be short-lived, and repeat treatment may be required.

In my estimation, subconjunctival surgery offers a better chance of reducing this patient's IOP to the low teens, but the procedure is associated with a longer postoperative course and a higher chance of complications. Also, this bleb-forming procedure could make contact lens wear problematic. That said, I have had patients who were able to resume contact lens wear after receiving a glaucoma drainage device if I carefully positioned the tube 2 to 3 mm posterior to the limbus. Theoretically, the low profile of the Xen Gel Stent should increase the chances that this patient could wear contact lenses after subconjunctival surgery.

She has more viable options for surgical glaucoma treatment than she would have had a couple of years ago. A detailed discussion of the risks, benefits, and possible complications of each option will help guide her surgical plan.

ANGELA TURALBA, MD

This patient has uncontrolled advanced glaucoma in her left eye despite maximally tolerated medical therapy. Given the extent of visual field loss, I would set a low target IOP and therefore would recommend a filtration procedure rather than microinvasive glaucoma surgery.

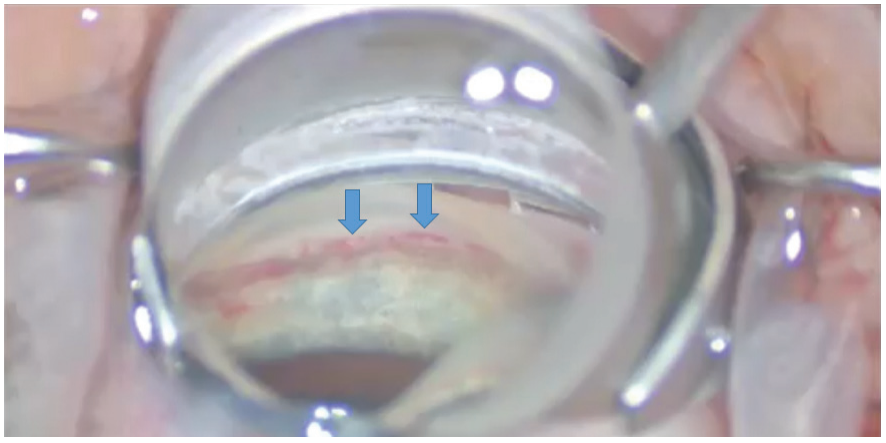

Figure 4. Intraoperative direct gonioscopic view of the nasal angle in the left eye. The blue arrows indicate the outer wall of Schlemm canal with some blood reflux. Schlemm canal had been unroofed by a GATT procedure.

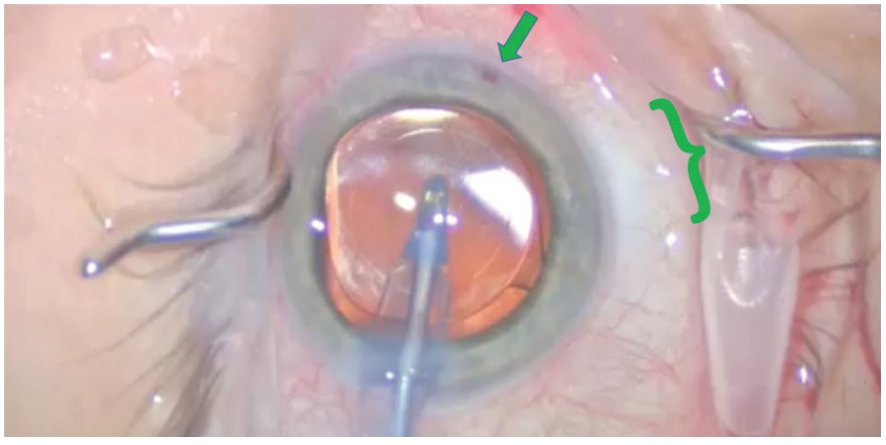

Figure 5. Intraoperative direct gonioscopic view during irrigation and aspiration shows a nasally positioned CyPass (green arrow). The green bar indicates one area of episcleral vessel blanching. That only one sector is blanched suggests that closure of the remaining distal outflow, possibly from wound healing, is the likely cause of the GATT failure.

Because GATT failed, I believe that filtering to the subconjunctival space offers the best chance of achieving a low target IOP. I would recommend a tube shunt rather than a trabeculectomy because of the risk of bleb-related complications with contact lens use. I would use a 2-mm tunnel technique to insert the tube, which would produce a more favorable contour over the implant at the limbus and make the tube less prone to erosion, especially in a contact lens wearer. I would use a Baerveldt glaucoma implant in an effort to achieve a lower final IOP with fewer medications.[5] With this device, performing laser suture lysis to open the tube 4 to 6 weeks after implantation offers a controlled and predictable postoperative course.

In this case, I would combine tube shunt surgery with concomitant cataract surgery because of the likely progression of the visually significant cataract after incisional surgery. Although some surgeons might recommend a toric IOL to minimize this keratoconic patient's future need for a contact lens, I am less comfortable offering this option, with its out-of-pocket expense, given the unpredictability of astigmatism from keratoconus and the presence of the tube shunt.

TABLE. POSTOPERATIVE COURSE

Left Eye	Visual Acuity	IOP	Glaucoma Medication	
1 day	20/60 PH 20/25	9 mm Hg		
1 week	20/40 PH 20/30+2	8 mm Hg	Latanoprost	
1 month	20/100 PH 20/30	12 mm Hg	Latanoprost	Spherical equivalent -1.50 D
2 months	20/50 PH 20/20	11 mm Hg	Latanoprost	Spherical equivalent -1.50 D
Right Eye	**Visual Acuity**	**IOP**	**Glaucoma Medication**	
1 day	20/30 PH 20/20	11 mm Hg		
1 week	20/30 PH 20/20	10 mm Hg	Latanoprost	
1 month	c RGP 20/20	11 mm Hg	Latanoprost	Spherical equivalent -1.00 D

Abbreviations: PH, pinhole; c RGP, rigid gas permeable contact lens.

WHAT I DID: DOUGLAS J. RHEE, MD

Switching this patient from latanoprost to latanoprostene bunod ophthalmic solution 0.024% (Vyzulta, Bausch + Lomb) did not change the IOP. Although the experience described herein preceded the introduction of netarsudil ophthalmic solution 0.02%, the drug is unlikely to have worked, given her history of failed GATT (Figure 4).

We decided to proceed with surgery on her left eye. I instructed the patient to discontinue wearing rigid gas permeable contact lenses and to return in 1 month for biometry. Subsequent glare testing on medium demonstrated a visual acuity of 20/60. Because of her dependence on contact lenses, I recommended cataract extraction with implantation of a CyPass Micro-Stent (Alcon [no longer available]; Figure 5). Because of her possible future need for corneal transplantation, the refractive target was a spherical equivalent of -1.50 D. She achieved excellent visual acuity and IOP control (Table). Shortly after surgery on her left eye, the patient asked to undergo surgery on her right eye.

In August 2018, Alcon voluntarily withdrew the CyPass from the global market based on 5-year data from the COMPASS-XT long-term safety study, which raised potential concerns related to the corneal endothelium. This case highlights the potential benefits of supraciliary shunts. It is possible that Alcon will bring the CyPass back to market, and Glaukos has been working toward FDA approval of its own supraciliary stent.

Regarding refraction, it was interesting to note that, when edema was present in the temporal wound and possibly the paracentesis sideport incision during the first week after surgery in each eye, the corneal flattening resulted in better UCVA, which faded as the edema resolved. Preoperatively, the patient had monovision contact lens correction, and she chose to maintain monovision after surgery by wearing a contact lens in only her right eye. She stated that the refractive outcome in her left eye obviated the need for a contact lens. ■

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