

THE HIGHEST IOP I EVER MEASURED

Which type of surgical intervention is most appropriate?

BY DEVESH K. VARMA, MD, FRCSC; STEVEN J. GEDDE, MD; JOSEPH F. PANARELLI, MD; AND OLUWATOSIN U. SMITH, MD

CASE PRESENTATION

A 52-year-old myopic woman of Caribbean descent presented 15 months after undergoing her second selective laser trabeculoplasty (SLT). The patient had ocular hypertension and a family history of glaucoma. IOP had been well controlled for 2 years with a combination of medication (timolol and travoprost) and SLT.

Upon examination, IOP was 14 mm Hg OD and 43 mm Hg OS. New visual field and optic nerve changes were consistent with moderate open-angle glaucoma (Figure 1). Ultrasound biomicroscopy did not demonstrate significant reverse pupillary block (Figure 2), and no iris transillumination defects were evident. Marked trabecular meshwork pigmentation was present in each eye, and a Krukenberg spindle was observed in the left eye. Pigment dispersion was therefore thought to be a factor in the IOP elevation.

Adding brinzolamide and brimonidine to the medical regimen for the left eye lowered the IOP to 28 mm Hg. A third SLT procedure was performed on the left eye. One month after the procedure, IOP was 17 mm Hg OD and 74 mm Hg OS. Although there was no corneal edema and the patient reported no ocular pain, visual acuity had decreased from 20/20 to 20/80 OS. In addition, the eye had a new relative afferent pupillary defect, 3+ pigment and flare in the anterior chamber, and an optic disc hemorrhage. An anterior chamber paracentesis was performed, which reduced the IOP to 10 mm Hg. Four classes of topical ocular hypotensive medications and acetazolamide were instilled. Eighty minutes later, IOP was 46 mm Hg. A second paracentesis was performed, after which pilocarpine, acetazolamide, and five classes of topical ocular hypotensive medications were instilled. IOP settled at 38 mm Hg.

What form of glaucoma surgical intervention would you perform and when?

—Case prepared by Devesh K. Varma, MD, FRCSC

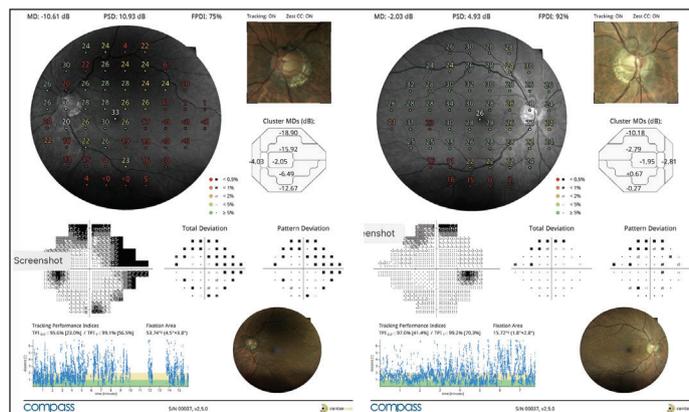


Figure 1. Fundus perimetry shows moderate loss in the left eye's visual field and a lid artifact in the right eye's visual field. Fundus photography shows tilted myopic nerves and inferior thinning of the optic nerve in the left eye.

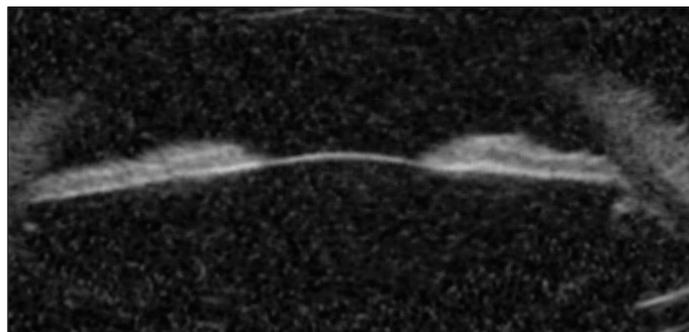


Figure 2. Ultrasound biomicroscopy of the left eye shows minimal reverse bowing of the iris.



STEVEN J. GEDDE, MD

Based on the presence of a Krukenberg spindle, marked

trabecular meshwork pigmentation, and elevated IOP, the likely diagnosis in this case is pigmentary glaucoma. Radial midperipheral transillumination defects of the iris are pathognomonic for pigment dispersion syndrome and pigmentary glaucoma, although these signs are frequently absent (especially in eyes with dark irides).¹ The patient's age

and myopic refractive error support a diagnosis of pigmentary glaucoma. There are other causes of secondary open-angle glaucoma with markedly elevated IOP such as Posner-Schlossman syndrome, trauma, and pseudoexfoliation glaucoma. These etiologies were excluded by a careful ophthalmic examination.

“GIVEN ALL OF THESE FACTORS, THE MAIN QUESTION IS WHETHER IT WOULD BE BETTER TO START WITH ANGLE SURGERY OR TO PROCEED DIRECTLY TO TRADITIONAL GLAUCOMA SURGERY. I RECOMMEND THE LATTER BECAUSE OF THE VOLATILITY OF THE IOP AND THE EXISTING DAMAGE TO THE OPTIC DISC.” —JOSEPH F. PANARELLI, MD

Marked IOP elevation occurred in the left eye after repeat SLT. In a case series published by Harasymowycz and colleagues, patients with heavily pigmented trabecular meshwork experienced a significant IOP elevation after SLT, and three of the four patients had pigmentary glaucoma.² Three of the patients eventually needed a trabeculectomy. Harasymowycz and colleagues suggested that patients with heavily pigmented trabecular meshwork are at significant risk of experiencing an IOP elevation after SLT. Modifying SLT treatment by using lower energy settings (0.4–0.6 mJ), delivering fewer applications, and/or treating less of the angle (90°–180°) may reduce the risk.

Moderate glaucoma was present at the time of this patient’s initial presentation. The disease progressed when the IOP rose to 74 mm Hg, as evidenced by the development of a new relative afferent pupillary defect and an optic disc hemorrhage. The IOP remains inadequately controlled on five glaucoma medications, including an oral carbonic anhydrase inhibitor.

I would recommend a prompt trabeculectomy with mitomycin C. I would place multiple flap sutures intraoperatively, and I would plan to perform sequential laser suture lysis postoperatively and titrate the

IOP to a low normal range. This surgical approach offers several advantages. Patients with markedly elevated IOP are at increased risk of a suprachoroidal hemorrhage.³ Using suture lysis to gradually reduce IOP avoids a sudden drop in IOP after surgery, thereby ameliorating the risk of this potentially devastating complication. Moreover, young myopic patients are at increased risk of hypotony maculopathy, so a procedure that allows postoperative adjustment of aqueous outflow is desirable. Trabeculectomy is the only titratable glaucoma procedure, and no other operation is more effective at reducing IOP.



JOSEPH F. PANARELLI, MD

This patient’s glaucoma is likely progressing at a rapid pace because of the extreme elevations in IOP. In order to select an appropriate surgical approach, it would be best to have a clear understanding of what is going on inside this eye, but that is not easy to achieve based on the details presented. There is underlying

primary open-angle glaucoma with a secondary process possibly superimposed. The release of pigment is atypical but cannot be ignored. Although the patient is myopic, this does not seem like a classic case of pigmentary glaucoma. Given her age, I would make sure that the pigment release is not owing to the presence of a uveal melanoma or melanocytoma, although the bilateral nature of the trabecular pigment deposition makes these entities less likely. Another possibility is an underlying uveitic process.

Given all of these factors, the main question is whether it would be better to start with angle surgery or to proceed directly to traditional glaucoma surgery. I recommend the latter because of the volatility of the IOP and the existing damage to the optic disc. (Visual field damage may lag and look considerably worse after several more months elapse.) I would presume that the entire outflow system is diseased and that the pigment collection at the level of the trabecular meshwork might have exacerbated the situation.

Tube shunt surgery and trabeculectomy are both reasonable choices in this case, and the better option is likely the one with which the surgeon is more comfortable. I would favor a tube shunt procedure (250-mm² Baerveldt glaucoma implant, Johnson & Johnson Vision) because of this patient’s relatively young age and Caribbean descent and the possibility of an inflammatory component to her disease.



OLUWATOSIN U. SMITH, MD

This myopic patient has uncontrolled pigmentary glaucoma on maximal medical therapy

after three SLT procedures. The pathophysiology and severity of the disease in her left eye would guide my decisions on management. Trabecular meshwork obstruction from pigment dispersion is a contributing factor in the sustained IOP elevation after SLT. I would therefore consider a trabecular meshwork stripping or bypass procedure to achieve an IOP in the mid- to upper teens.

The sudden decline in visual acuity without corneal edema after an acute elevation in IOP warrants repeat visual field testing to look for a new paracentral defect if no improvement in visual acuity was observed after a paracentesis and medical therapy. If a defect is found, that might change my choice of surgical procedure. If a cataract is the cause of the change in visual acuity, I would discuss a combined procedure with the patient. My preference in this case would be a gonioscopy-assisted transluminal trabeculotomy, which is effective at lowering IOP in patients who have secondary open-angle glaucoma, based on available tests.⁴ If a new paracentral defect is discovered, I would consider subconjunctival filtration surgery depending on the extent of visual field damage. Because of the patient's myopia, a procedure such as

the implantation of a Xen Gel Stent (Allergan) would be an excellent choice. Based on her age and race, however, my inclination would be to perform a trabeculectomy with a tight flap to achieve a target IOP in the mid- to low teens.



WHAT I DID:
DEVESH K. VARMA, MD, FRCS

This patient required an immediate reduction in IOP. If an Ahmed Glaucoma Valve (New World Medical) were to be implanted, this patient's age and race would put her at high risk of hyperencapsulation, but that device could have been a reasonable option if accompanied by prophylactic aqueous suppression and possibly serial injections of an antimetabolite. A Baerveldt glaucoma implant was more likely to achieve the target pressure, but IOP control during the first 6 weeks after surgery could have been a challenge. Although tube fenestrations might have helped, their effect likely would

not have lasted beyond the first 2 weeks, so a sentinel trabeculectomy or a Xen Gel Stent at the time of tube shunt surgery might have been required. This addition could, however, have increased the risk of hypotony and its complications when the Baerveldt ligature opened. A standard Xen Gel Stent (diameter, 45 μ m) might not have lowered the IOP adequately. Fortunately, another model of this device with a diameter of 63 μ m (Xen63, not FDA-approved) was available and was ultimately selected.

Surgery was uneventful. At 1 week, IOP was 3 mm Hg. At 1 month, IOP was 14 mm Hg off medication, and the bleb was diffuse. The steroid is being tapered slowly, and the patient is being observed. ■

Editor's note: This article contains discussion of off-label uses of mitomycin C and the Xen Gel Stent.

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