

Overfiltration Following Trabeculectomy

BY AMISH B. DOSHI, MD; KOUROS NOURI-MAHDAVI, MD, MS; SUNIL DEOKULE, MBBS, MS; RIGBY SLIGHT, MD; AND ROBERT N. WEINREB, MD

CASE PRESENTATION

A 60-year-old white female presents with a best corrected visual acuity (BCVA) of 20/30 OD and 20/40 OS. Her IOP measures 15 mm Hg OU, and she has central corneal thicknesses of 401 μ m OD and 404 μ m OS. Dilated funduscopy reveals moderate bilateral nuclear sclerosis with normal retinas and vitreous. Upon examination, her optic nerves have small discs with diffuse loss of the retinal nerve fiber layer (RNFL). Scanning laser polarimetry (GDx ECC; Carl Zeiss Meditec, Inc., Dublin, CA) confirms extensive RNFL loss, and standard automated perimetry (Humphrey 24-2; Carl Zeiss Meditec, Inc.) reveals biarcuate scotomata with a mean deviation of -23.8 in the patient's left eye (Figure 1). The patient is using maximal IOP-lowering therapy and has undergone laser trabeculoplasty. She has no history of incisional or other laser surgery.

The patient undergoes a trabeculectomy on her left eye with intraoperative 5-fluorouracil (5FU; 5.0 mg/0.1 mL applied with a sponge for 2 minutes). On postoperative

day 1, she is comfortable with a visual acuity of 20/400, an IOP of 12 mm Hg, and a diffuse bleb. The surgeon administers a sub-Tenon's injection of 7.5 mg 5FU and initiates hourly prednisolone acetate and topical antibiotics. Four days following surgery, the patient's visual acuity is 20/200, and her IOP measures 1 mm Hg. The anterior chamber is shallow centrally, and there is peripheral iridocorneal touch. The patient feels no discomfort, and there is no leakage (Seidel negative) or choroidal effusion. The macula is flat.

Due to the presence of a shallow chamber and iridocorneal touch, the surgeon positions a 22-mm-diameter bandage contact lens (Westcon Contact Lens Company, Inc., Grand Junction, CO) over the patient's eye and tapers the steroid to every 2 hours. The next day, the physician notes moderate corneal edema and moderate iridocorneal touch. There is no lens/cornea touch. The surgeon places a torpedo patch and prescribes Tobradex ointment (Alcon Laboratories, Inc., Fort Worth, TX) and homatropine 2%.

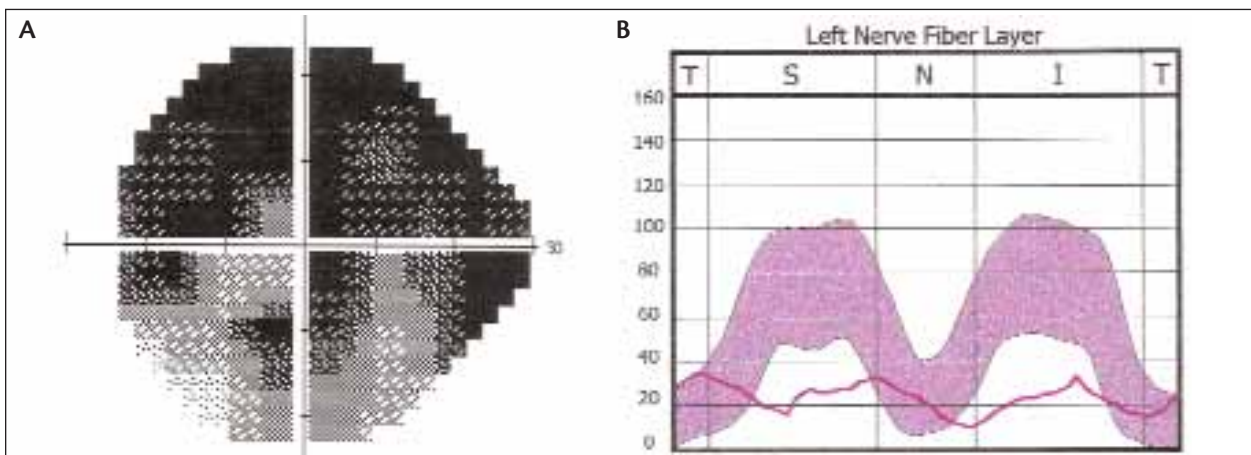


Figure 1. Standard automated perimetry and scanning laser polarimetry (GDx ECC) of the patient's left eye prior to surgery shows a biarcuate scotoma (A) with diffuse RNFL loss in both the superior and inferior quadrants (B). The nerve fiber index (not shown) was 98.

On the following day, the patient reports some ocular discomfort. The anterior chamber is centrally deep with mild peripheral iridocorneal touch (Figure 2). By postoperative day 7, the iridocorneal touch has resolved. The surgeon removes the contact lens on postoperative day 11. The patient has a visual acuity of 20/50 and an IOP of 9 mm Hg. A low bleb and moderate hyperemia are visible. The chamber is of normal depth with no choroidal effusion. The patient restarts prednisolone acetate q.i.d.

Comments on Risk Factors

RNW: First, let us consider whether this patient with thin corneas was more susceptible to a surgical complication.

SD: It has been suggested that patients with thin corneas may also have a thin sclera. A recent article by Oliveira and colleagues, however, indicated that central corneal thickness is not correlated to either anterior scleral thickness or axial length.¹ This patient was mildly hyperopic with an axial length of 22.35 mm and mean keratometry of 46.00 D. Given her history of no prior ocular surgery and her keratometry reading, it is unlikely that she had undergone refractive surgery.

RNW: In my experience, patients with very thin corneas are at increased risk of overfiltration, choroidal effusion, hypotony maculopathy, and corneal astigmatism. For this reason, I generally employ intraoperative 5FU rather than mitomycin C in such patients when they are undergoing trabeculectomy. The best way to deal with overfiltration, however, is to prevent it by means such as a fluid-tight closure. In an era of microsurgical incisions and microsuturing, sutures can be readily lysed or released in the early postoperative period. Perhaps all patients should have fluid-tight closure with trabeculectomy. This approach may require the use of additional scleral sutures. Of course, the technique may be problematic, because an eye with severe glaucoma may be more susceptible to snuffing out if the pressure is too high during the immediate postoperative period.

KN: Perhaps a large scleral flap would be safer, because it might be easier to place multiple sutures for a tight closure.

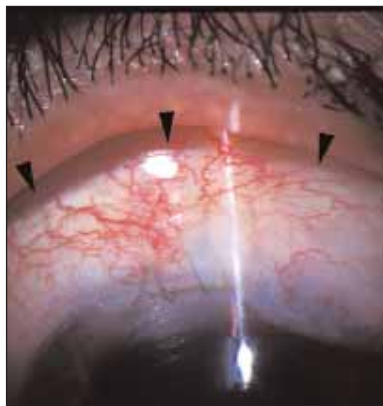


Figure 2. Slit-lamp photograph of the eye on postoperative day 5. With a large, 22-mm contact lens in place (arrowheads), the anterior chamber has deepened with mild peripheral iridocorneal touch and a low, diffuse bleb with moderate hyperemia. Even when the eye gazes downward, the lens' edge covers the anterior aspect of the bleb.

RS: The idea of a large flap is good, because it would allow for more sutures. Although the relationship of the sclerostomy to the flap may lead to different outcomes, the size of the sclerostomy itself is probably not related to this outcome.

Comments on Management

RNW: At what point should a clinician intervene when an eye has a shallow anterior chamber after trabeculectomy?

KN: A method for classifying shallow chambers exists.² Peripheral iridocorneal touch is present in milder cases, according to this classification system. Moderate shallowing involves iridocorneal touch near the pupillary border. Severe shallowing or a flat chamber exists when the lens is apposed to the cornea. With mildly shallow chambers, no change in management is required. If lenticular touch is present, intervention must be initiated within 24 hours to protect the corneal endothelium. Decisions on management tend to vary substantially with moderately shallow anterior chambers, as present in this case. Still, if I have a bandage contact lens available, I tend to intervene sooner.

SD: How did the contact lens change the morphology of the bleb?

RNW: It flattened the bleb and presumably increased resistance to flow. The greater resistance most likely contributed to an increase in IOP and deepening of the anterior chamber.

ABD: These large-diameter contact lenses are difficult to place and usually are most effective when covering the entire bleb. The diameter can be as great as 24 mm. Originally specially designed for the management of bleb leaks,³ these contact lenses need to be relatively flat to help compress the bleb.

KN: This particular lens has a base curve of 10 mm and a diameter of 22 mm, was made of methafilcon 55%, and is relatively inexpensive.

RNW: In addition to being useful for early overfiltration, these bandage contact lenses can be used later to

deepen the anterior chamber prior to surgical revision.

ABD: The patient in this case also had a torpedo patch placed over the superior sulcus. A torpedo patch can be very effective for controlling overfiltration if placed correctly. The patient should look straight ahead with his contralateral eye to allow the patch's placement directly over the bleb. The combined compressive effect of a contact lens and torpedo patch generally deepens the chamber within 24 hours.

Several additional methods have been tried to manage overfiltration with shallow chambers. These include the injection of viscoelastics,⁴ air, or gas⁵ into the anterior chamber or the intra- and peribleb injection of autologous blood.⁶ Compression sutures have also been used. Some of these techniques are used in combination. Viscoelastics can reform the anterior chamber. Although sometimes effective, the effect of viscoelastics is usually temporary, lasting no more than 48 hours.

RNW: Autologous blood has received a substantial amount of attention. The principle behind autologous blood is that growth factors found in serum may induce wound healing.⁶ I have had little success with autologous blood and rarely even try it.

ABD: Inciting subconjunctival hemorrhage to induce wound healing is also the principle behind the use of high-energy pulses from an Nd:YAG laser.⁷ These treatments can lead to a number of side effects, including uncontrolled bleeding, hyphema, and a loss of vision. Gas injections may also cause a number of complications. Perfluoropropane gas has led to permanent corneal edema, and sulfur hexafluoride gas causes temporary edema. These gases prevent the transfer of nutrients to the corneal endothelium and lens, and they can induce cataract formation and corneal decompensation. One hundred percent sulfur hexafluoride has been used in a refractory case of a flat chamber, although the expansile properties of such a concentration might lead to substantial complications.⁵

RS: Ultimately, the patient in this case attained an excellent outcome. Complications can occur regardless of how well a trabeculectomy is performed. The bandage contact lens was quite effective in this case. The important things are that the patient was managed well and further complications were avoided.

CONCLUSION

Even with the following trabeculectomy seemingly appropriate closure, overfiltration can occur. The condition

can be minimized by achieving a fluid-tight closure intraoperatively, although this type of closure may lead to a significant elevation in IOP in the immediate postoperative period. Certain patients cannot tolerate such a high IOP and are at risk of a snuffing-out of their remaining visual field.

Fortunately, there are several measures for managing overfiltration in the presence of a shallow anterior chamber. Placing a large-diameter contact lens is a safe and effective way of compressing the bleb and restricting flow. Due to the natural healing process, flow becomes self-limited within 1 to 2 weeks, and the lens can be removed. While the contact lens is in place, other potentially sight-threatening complications from overfiltration can be avoided. The patient in this case has performed well postoperatively, and there is no evidence of long-term sequelae from overfiltration. □

Section editor Robert N. Weinreb, MD, is Distinguished Professor of Ophthalmology and Director of the Hamilton Glaucoma Center, University of California, San Diego. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Weinreb may be reached at weinreb@eyecenter.ucsd.edu.

Sunil Deokule, MBBS, MS, is an international fellow of the Shiley Eye Center and the Hamilton Glaucoma Center, University of California, San Diego. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Deokule may be reached at (858) 534-5334; spdeokule@gmail.com.

Amish B. Doshi, MD, is the Chief Fellow at the Hamilton Glaucoma Center, University of California, San Diego. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Doshi may be reached at (858) 534-3519; adoshi@glaucoma.ucsd.edu.

Kouros Nouri-Mahdavi, MD, MS, is a glaucoma specialist at the Hamilton Glaucoma Center, University of California, San Diego. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Nouri-Mahdavi may be reached at knourimahdavi@ucsd.edu.

Rigby Slight, MD, is Associate Clinical Professor of Ophthalmology at the Hamilton Glaucoma Center, University of California, San Diego. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Slight may be reached at kissamutt@aol.com.

1. Oliveira C, Tello C, Liebmann J, Ritch R. Central corneal thickness is not related to anterior scleral thickness or axial length. *J Glaucoma*. 2006;15:190-194.
2. Wright MM, Grajewski AL. Measurement of intraocular pressure with a flat anterior chamber. *Ophthalmology*. 1991;98:1854-1857.
3. Blok MD, Kok JH, van Mil C, et al. Use of the Megasoft Bandage Lens for treatment of complications after trabeculectomy. *Am J Ophthalmol*. 1990;110:264-268.
4. Osher RH, Cionni RJ, Cohen JS. Re-forming the flat anterior chamber with Healon. *J Cataract Refract Surg*. 1996;22:411-415.
5. Beigi B, O'Keefe M, Algawi K, et al. Sulphur hexafluoride in the treatment of flat anterior chamber following trabeculectomy. *Eye*. 1997;11(pt 5):672-676.
6. Okada K, Tsukamoto H, Masumoto M, et al. Autologous blood injection for marked overfiltration early after trabeculectomy with mitomycin C. *Acta Ophthalmol Scand*. 2001;79:305-308.
7. Ascaso FJ, Loras E, Cristobal JA. Combination of Nd:Yag laser-induced subconjunctival bleeding and intracameral viscoelastic injection to treat hypotony maculopathy. *Ophthalmic Surg Lasers*. 2002;33:504-507.