The Benefits of Transscleral Cyclophotocoagulation

This viable alternative to trabeculectomy should be considered in more moderate to severe glaucoma cases.

BY STEVEN D. VOLD, MD

Cyclophotocoagulation has a long history, with its origins in xenon arc optical energy as a cyclodestructive element in transscleral applications.[1] With the development of Nd:YAG and semiconductor diode laser systems, transscleral cyclophotocoagulation (TSCPC) became a much more attractive glaucoma treatment option. Historically, cyclodestructive treatments were last-ditch efforts in patients who had little remaining vision, and the imprecise treatments created a significant amount of trauma to the tissue. Advances in laser technology and treatment modalities, however, have continued to improve outcomes, and it is feasible to control and titrate the procedure in ways that were not possible previously. TSCPC is being reconsidered as a viable treatment option in a wider patient population.

TSCPC COMPARED WITH STANDARD TREATMENTS

Because TSCPC is generally implemented in challenging cases of recalcitrant glaucoma, study results are often skewed by the minimal visual potential of the patients who participate. Treatment outcomes and risks in TSCPC, however, are similar to trabeculectomy and with tube shunts, which are standards in glaucoma treatment. A study of 74 eyes that underwent TSCPC showed a mean reduction in intraocular pressure (IOP) of 43% at 12 months, and mean visual acuity was preserved in the subgroups with good vision.[2] Thirteen percent of patients lost vision due to progressive cataract or glaucoma, and there were no cases of hypotony or phthisis. These results are very similar to outcomes in the Tube Versus Trabeculectomy study where 212 eyes were randomized to receive either the 350 mm^2 Baerveldt glaucoma implant (Abbott Medical Optics Inc.) or a trabeculectomy. Results showed an average decrease in IOP of 48%, and a visual acuity loss of greater than 2 Snellen lines in 22% of tube patients and 27% of trabeculectomy patients.[3]

INCREASED PRECISION

The G-Probe (Iridex) handpiece is a 600-µm-diameter quartz glass fiber with a protruding, polished, hemispheric tip. By indenting the conjunctiva and centering the fiber optic tip 1.2 mm from the corneoscleral limbus oriented parallel to the visual axis, laser energy is directed to the most common location of ciliary processes. Although the design of the G-Probe is a significant aid in delivery of laser energy to the correct location, I also believe the use of transillumination is essential. By having a technician shine a fiber optic light source from the side, tangential to the lens, the globe is lit, and the surgeon can see exactly where the ciliary processes are.

Not all patients' ciliary processes are exactly 1.2 mm posterior to the limbus, and particularly in postcorneal transplant and myopic patients, ciliary processes may be more posterior than expected. Transillumination allows the surgeon to target them in a very precise manner. This technique also enables the surgeon to avoid critical vessels, postciliary arteries, and nerves. The use of transillumination dramatically reduces the amount of pain

TABLE. THE SURGICAL PARAMETERS LISTED IN THE G-PROBE's INSTRUCTIONS FOR USE			
Iris Color	**Power**	**Duration**	**Energy per Application**
Dark brown	1,250 mW	4,000 ms	5.00 J
All other	1,500 mW	3,600 ms	5.25 J

associated with the procedure and prevents putting the patient in an ocular ischemia situation.

In addition to instrumentation and the technique for targeting ciliary bodies, the delivery of laser energy has evolved as well. The slow coagulation technique described by Douglas Gaasterland, MD, uses a lower level of power for a longer duration of time, reducing the postoperative inflammatory response.[4]

BENEFITS OF TSCPC

The main advantages of TSCPC over filtration and drainage devices include the following: it is noninvasive; there is no risk of infection; it generally has a more rapid and easier postoperative recovery period; it has a reduced patient cost; and it is technically very easy to learn and straightforward to perform.

TSCPC is an office-based alternative to glaucoma surgery, which provides important time-management and economic benefits. When patients come in with uncontrolled glaucoma, it is not necessary that they wait for time in the OR, because the surgeon can perform this procedure quickly in the office, and most patients can resume normal activities the day after surgery. Patients pay less, as ambulatory surgical center or hospital charges are eliminated, and physicians require significantly less time to perform the procedure and follow-up. TSCPC can be repeated as necessary and does not limit future surgical options.

CASE STUDY

The versatility of this procedure can be seen in the following case. A 75-year-old white woman presented to my office complaining of decreased vision and throbbing pain in her left eye. She reported colored halos around lights in this eye and had developed a headache and nausea during the past 24 hours. Her previous ocular history was significant for primary open angle glaucoma, pseudophakia, and posterior vitreous detachments in both eyes. She had undergone tube shunt surgery in both eyes 3 years prior to her presentation. Current topical medications included the use of a dorzolamide-timolol combination twice a day and latanoprost once a day in both eyes.

On examination, BCVA was 20/20 in her right eye and 20/50 in her left. She had a mild relative afferent pupillary defect in her left eye. Visual field testing revealed an inferior arcuate defect on the right and superior and inferior arcuate changes on the left. Her IOPs measured 16 mm Hg and 48 mm Hg, respectively. The slit-lamp examination demonstrated well-placed posterior chamber IOLs with clear capsules in both eyes. Mild diffuse microcystic corneal edema was observed in her left eye. Gonioscopy showed grade 4 angles with no evidence of angle neovascularization, peripheral anterior synechiae, or angle recession in either eye. Optic nerve evaluation revealed a 0.7 cup-to-disc ratio with a superior notch on the right and 0.85 cup-to-disc ratio with diffuse rim thinning on the left. The remainder of her examination was fairly unremarkable.

In light of these findings, we discussed the following possible glaucoma treatments for her left eye: (1) additional glaucoma medication, (2) repeat incisional glaucoma surgery including possible repeat tube shunt surgery, and (3) diode TSCPC. After reviewing the risks and benefits of each option, the patient elected to proceed with diode TSCPC in the office. She understood the possible risks including failure of the procedure to lower IOP during the long term, vision loss, chronic inflammation, need for further surgery, neurotrophic cornea, choroidal effusion, cystoid macular edema, and potentially even sympathetic ophthalmia (rare).

My preferred laser settings are 2 to 4 seconds/burst and powers ranging from 1,000 mW to 2,500 mW. A total of 15 to 30 spots are applied to the ciliary processes transsclerally utilizing the G-Probe and transillumination technique. In this blue-eyed patient, I selected a power of 2,400 mW and 2-second laser pulse duration. I placed a total of 30 spots along the limbus. In patients with brown irises, lower powers (between 1,000-1,250 mW) with pulse durations of 4 seconds are often used due to increased laser absorption in these eyes (Table). The 3- and 9-o'clock positions are generally avoided to prevent damaging the long ciliary arteries. Local anesthesia utilizing an intraconal block is generally performed. At the conclusion of the procedure, a drop of atropine 1%, prednisolone acetate 1% (or difluprednate), and antibiotic ointment are placed on the eye, and the eye is patched for approximately 2 hours.

Postoperatively, patients are instructed to utilize prednisolone acetate 1% (or difluprednate) qid initially and asked to return within 1 week. Topical glaucoma

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medications are continued and then tapered off over the first few weeks following the procedure. Oral hypotensive agents are generally discontinued immediately. By utilizing transillumination routinely, collateral tissue damage is minimized. Using this method of improving laser treatment precision, I have found postoperative pain to be significantly reduced, and prescribing of narcotics has become only rarely necessary when compared to my previous experience of using TSCPC without transillumination.

This patient's IOPs dropped into the mid-teens within the first 24 hours postoperatively. Her vision returned to 20/20 within 1 week of the procedure. Her eye quieted nicely, and I tapered off her anti-inflammatory topical medication within 4 weeks. At a visit 1 year after the procedure, her visual acuities were outstanding, her eye continued to be quiet, and her IOP remained in the mid-teens on a single topical glaucoma medication. Her visual fields and optic nerve appearance were unchanged.

CONCLUSION

Without question, TSCPC is an effective procedure for acutely lowering IOP. In my practice, we see a high percentage of neovascular glaucoma patients, and TSCPC is an excellent treatment option. The use of the G-Probe and the transillumination technique enhances outcomes, there is no bleb, and no risk of endophthalmitis. Pseudophakic patients can be ideal for this procedure because they do not have to worry about cataract formation. Postcorneal transplant patients are particularly good candidates, because TSCPC likely reduces the risk of graft failure that may occur after a glaucoma surgical procedure. TSCPC is also an excellent choice for anyone who is not a candidate for incisional glaucoma surgery for any reason. In general, any moderate to severe glaucoma patient can be a candidate for TSCPC. It is a viable alternative to trabeculectomy and should be considered in a broader array of moderate to severe glaucoma cases. ■

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