

Endoscopic Cyclophotocoagulation

Our current knowledge of this useful treatment option.

BY MINA B. PANTCHEVA, MD; LEONARD K. SEIBOLD, MD; AND MALIK Y. KAHOOK, MD

Endoscopic cyclophotocoagulation (ECP) involves laser ablation of the ciliary body epithelium under direct endoscopic visualization. The result is a lowering of IOP through a decrease in the production of aqueous humor. ECP can effectively treat most types of glaucoma. Often combined with phacoemulsification, ECP has been proven safe and effective at decreasing IOP while causing limited and infrequent side effects.¹⁻³

EQUIPMENT

The E2 Microprobe Laser and Endoscopy System (Endo Optiks, Little Silver, NJ) includes a diode laser that emits pulsed or continuous energy at a wavelength of 810 nm, a 175-watt xenon light source that provides illumination, a helium-neon laser aiming beam, and a fiber optic video camera (Figure 1). All four elements are transmitted via fiber optics to a 19- or 20-gauge probe, which can be inserted into the eye through a self-sealing clear corneal incision. A pars plana approach, combined with a limited pars plana vitrectomy, is also an option. The endoprobe has a 110° field of view and a depth of focus ranging from 1 to 30 mm. Recently, the manufacturer introduced a 23-gauge triple-function probe that fits through all 23-gauge trocar systems.

Unlike with transscleral cyclophotocoagulation, the endoscope offers the surgeon direct visual feedback to determine the exact placement of laser energy and the extent of ablation. This equipment thus minimizes the risk of overtreatment and, in our opinion, increases the likelihood of successfully lowering IOP.

TECHNIQUE

Patient Selection

The proper technique for ECP begins with selecting appropriate patients. We reserve ECP treatment for glaucoma patients in three specific categories. The first group includes individuals scheduled for cataract surgery who use two or more topical medications for IOP



Figure 1. The E2 Microprobe Laser and Endoscopy System.



Figure 2. The treated ciliary processes are shrunken and white in contrast to the adjacent untreated ciliary processes.

control and have problems adhering to their medical therapy. The second group comprises patients in whom maximal medical therapy has failed, those who have an IOP below 40 mm Hg, and those who have contraindications for filtering surgery (eg, cognitive deficits making follow-up difficult). The third group includes patients with advanced glaucoma in whom previous penetrating surgery has failed, leaving little conjunctival “real estate”

for further filtering surgery. Among the relative contraindications for ECP treatment are active uveitic glaucoma and an IOP higher than 40 mm Hg; eyes with extremely high IOPs generally have an inadequate response to ECP.

Anesthesia

Both the topical and retrobulbar delivery of an anesthetic is appropriate for ECP treatments. Retrobulbar anesthesia is administered when a pars plana approach is chosen and carries with it the same risks of retrobulbar hemorrhage and injury to the optic nerve as when used for other procedures. A peribulbar approach may also be used.

Surgery

Two surgical approaches are common—pars plana or clear corneal incision. We prefer the convenience of the latter. The incisions are often self-sealing and allow for 270° of treatment using a curved probe. The drawbacks of this method include possible injury to the cornea and iris as well as incomplete visualization of the ciliary processes. In our experience, performing ECP after cataract extraction and the implantation of an IOL improves our ability to visualize the targeted tissue and results in superior postoperative IOPs. We have also found that using a cohesive viscoelastic such as Healon GV (Abbott Medical Optics Inc., Santa Ana, CA) successfully raises the iris away from the laser energy and thus decreases the chance of injury.

The clinical endpoint for ECP treatment is visible shrinking and whitening of the ciliary processes (Figure 2). This goal is best achieved with a slow and deliberate “painting” of the laser energy along the peaks and valleys of the ciliary processes. One must allow the pigmented tissue to absorb the energy so that the laser treatment affects both external and internal tissue, including the vessels within each ciliary process. Treating the epithelium alone will only control the IOP temporarily; the surviving vessels and stroma will allow the ciliary epithelium to regenerate and resume aqueous production.⁴ At the conclusion of the procedure, the surgeon must remove all of the viscoelastic with irrigation and aspiration, inflate the anterior chamber with balanced salt solution, and hydrate all wounds to ensure their watertight closure. We instill one drop each of prednisolone acetate 1%, a nonsteroidal anti-inflammatory, and a fourth-generation fluoroquinolone. The postoperative drop regimen consists of q.i.d. dosing for each drop, with a slow tapering of the steroid over 1 to 2 months to control inflammation.

The most commonly reported problems are postoperative IOP spikes resulting from retained viscoelastic

“The procedure may not be appropriate for cataract patients with very mild or very advanced glaucoma.”

(14.5% of eyes) and transient intraocular hemorrhage (3.8% of eyes).⁵

OUTCOMES

There are few prospective studies in the literature on the utility of ECP for decreasing IOP or the procedure's effect on patients' need for topical medication. Lima et al prospectively assigned 68 eyes of 68 patients to either pars plana ECP or the implantation of an Ahmed Glaucoma Valve (New World Medical, Inc., Rancho Cucamonga, CA) for refractory glaucoma. The investigators found that, after 24 months of follow-up, the IOP was 14.73 ± 6.44 mm Hg in the Ahmed group and 14.07 ± 7.21 mm Hg in the ECP group ($P = .7$).¹ Efficacy and postoperative complications were similar in both groups.

In a randomized, prospective study involving 58 eyes of 58 patients, Gayton et al compared the efficacy of combined phacoemulsification and trabeculectomy versus combined phacoemulsification and ECP. The investigators reported that 30% of subjects treated with ECP achieved IOP control (below 19 mm Hg) without medication and 65% achieved IOP control with medication. In the trabeculectomy group, 40% and 52% achieved IOP control without and with medication, respectively.²

A nonrandomized study compared the surgical results of patients with open-angle glaucoma who underwent phacoemulsification alone ($n = 81$) versus combined phacoemulsification and ECP ($n = 545$).⁶ Both groups had similar results at 1 year, but the phaco-ECP group maintained a lower IOP throughout the 3-year study period by a mean of 3.4 mm Hg (19.1-15.7 mm Hg). Seventy-nine percent of the phaco-ECP eyes achieved a long-term decrease in their IOP versus 38% of the phaco-alone group. Sixty-eight percent of phaco-ECP patients required fewer medications after surgery. In contrast, 89% of phaco-alone patients needed the same number of glaucoma medications or more long term.⁶ A study of more than 1,000 eyes confirmed these results and demonstrated no difference in the incidence of cystoid macular edema between eyes treated with combined phacoemulsification and ECP versus phacoemulsi-

(Continued on page 39)

(Continued from page 36)

fication alone (approximately 2% in both groups).⁷

CONCLUSION

ECP is a safe and effective method for treating various types of glaucoma. The procedure may not be appropriate for cataract patients with very mild or very advanced glaucoma, but it is a simple and easy surgical treatment to be combined with phacoemulsification in specific groups of patients. ■

Malik Y. Kahook, MD, is an associate professor of ophthalmology and director of clinical research in the Department of Ophthalmology at the University of Colorado, Denver. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Kahook may be reached at (720) 848-2500; malik.kahook@ucdenver.edu.



Mina B. Pantcheva, MD, is an assistant professor of ophthalmology in the Department of Ophthalmology at the University of Colorado, Denver. She acknowledged no financial interest in the products or companies mentioned herein. Dr. Pantcheva may be reached at (720) 848-2500; mina.pantcheva@ucdenver.edu.



Leonard K. Seibold, MD, is a clinical instructor of ophthalmology in the Department of Ophthalmology at the University of Colorado, Denver. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Seibold may be reached at (720) 848-2500; leonard.seibold@ucdenver.edu.



1. Lima FE, Magacho L, Carvalho DM, et al. A prospective, comparative study between endoscopic cyclophotocoagulation and the Ahmed drainage implant in refractory glaucoma. *J Glaucoma*. 2004;13:233-237.
2. Gayton JL, Van Der Karr M, Sanders V. Combined cataract and glaucoma surgery: trabeculectomy versus endoscopic laser cycloablation. *J Cataract Refract Surg*. 1999;25:1214-1219.
3. Weston J. Combining ECP with presbyopic correction. *Cataract & Refractive Surgery Today*. July 2009;9(7):34-37.
4. Lin SC, Chen MJ, Lin MS, et al. Vascular effects on ciliary tissue from endoscopic versus trans-scleral cyclophotocoagulation. *Br J Ophthalmol*. 2006;90:496-500.
5. Tyson F. The five year effect of endoscopic cyclophotocoagulation (ECP) on well controlled glaucoma patients undergoing cataract surgery. Paper presented at: The 26th Congress of the ESCRS; September 17, 2008; Berlin, Germany.
6. Berke SJ. Phacoemulsification combined with endoscopic cyclophotocoagulation in the management of cataract and medically controlled glaucoma: a large, long term study. Paper presented at: The American Glaucoma Society 16th Annual Meeting; March 4, 2006; Charleston, SC.
7. ECP Study Group. Comparison of phaco/ECP to phaco alone in 1,000 glaucoma patients: a randomized, prospective study including fluorescein angiography in all patients in both groups. Paper presented at: The ASCRS ASOA Symposium on Cataract, IOL and Refractive Surgery; June 4, 2002; Philadelphia, PA.