

The Literature

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ENDOSCOPIC CYCLOPHOTOCOAGULATION (ECP) IN THE MANAGEMENT OF UNCONTROLLED GLAUCOMA WITH PRIOR AQUEOUS TUBE SHUNT

Francis BA, Kawji AS, Vo NT, et al¹

ABSTRACT SUMMARY

Francis et al treated 25 eyes of 25 patients with various types of glaucoma and poorly controlled IOP with endoscopic cyclophotocoagulation (ECP). The study was prospective, with all patients having undergone previous glaucoma valve surgery and continued uncontrolled IOP. Patients had an IOP greater than 21 mm Hg and were on two or more tolerated topical medications, or they had an IOP of 21 mm Hg or lower with intolerance to medication or the use of an adjunct oral carbonic anhydrase inhibitor. All patients had vision of at least light perception. Dr. Francis performed ECP over 360° on ciliary processes with 250 to 350 mW on all patients. The treatment endpoint was shrinkage and whitening of the entire ciliary process. The patients were observed for a minimum of 6 months and up to 24 months, with 18 of the 25 patients completing more than 12 months of follow-up.

The main outcome measures were (1) reduction in IOP from baseline at 12 months after ECP and (2) the number of medications patients were taking 12 months postoperatively. The authors defined success as a reduction in IOP of 3 mm Hg or more or the discontinuation of intolerant medications. Treatment failure was defined as continued uncontrolled IOP (> 21 mm Hg), loss of vision to no light perception, or the need for either additional medications or surgical intervention.

The mean IOP dropped 12 months postoperatively, from 24.02 mm Hg to 15.36 mm Hg, a mean reduction of 7.77 mm Hg or 30.8% ($P < .0001$). The mean number of medications 12 months postoperatively was 1.47, a significant reduction from 3.2 preoperatively ($P = .0002$). The success rate 1 year after ECP was 88%. No serious complications (hypotony, phthisis, infection, loss of light perception, or strabismus) were reported. Complications noted included a decrease in vision, corneal graft failure, and cystoid macular edema (CME).

DISCUSSION

Managing glaucoma in patients who have undergone previous tube surgery and are on maximal tolerated

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medical therapy is challenging, as there are a limited number of viable options. As the authors point out, there is no consensus regarding the most appropriate next step in treatment. Performing a trabeculectomy is often difficult and unsuccessful, as the conjunctiva is frequently scarred from the glaucoma valve and possibly a previous trabeculectomy. Laser trabeculoplasty is unlikely to provide sufficient reduction in IOP and is often not an option, as the angle may be closed or compromised. Placing a second glaucoma tube is an option, however, some patients will object to the idea of undergoing another surgery that has not been successful previously. Furthermore, a second tube increases the risk of tube exposure and strabismus.

Cyclophotocoagulation is often employed at this stage of the treatment paradigm. Due to the risks of tissue damage and visual loss, transscleral cyclophotocoagulation (TS-CPC) has conventionally been reserved for eyes with uncontrolled IOP and poor visual potential. In a study of 21 eyes in patients (adults and children) with uncontrolled IOP in the presence of an aqueous tube shunt and maximally tolerated glaucoma medications, TS-CPC was effective in reducing the average IOP from 35.7 to 13.6 mm Hg.² Despite these favorable results, postoperative complications associated with TS-CPC, including visual loss, hypotony, and phthisis, limited the indications to eyes with poor visual potential.^{3,4} Unpredictable outcomes from TS-CPC could be attributed to the blind nature of tissue targeting, precluding the ability to precisely quantify the amount of damage to the ciliary processes in contrast to undesired collateral tissue damage.⁵ More recently, ECP using the E2 surgical laser endoscopy system (Endo Optiks) has emerged as a safe and effective method to precisely and directly visualize and target the ciliary processes.

The authors' criteria for treatment success seems

somewhat liberal, as a reduction in IOP of 3 mm Hg is often not sufficient control in patients with IOPs greater than 21 mm Hg. Furthermore, the sample size ($n = 25$) of the study is small, with a decrease in the study population at the 12-month end point ($n = 18$). With that said, a mean reduction in IOP of over 30% (7.7 mm Hg) provides compelling evidence that ECP is an acceptable treatment option in patients with uncontrolled glaucoma with previous aqueous tube shunt implantation. It bears further emphasizing that all competing treatment options come with their own set of adverse effects and complications.

The study showed no major complications. What are some of the possible complications associated with ECP?

There is a great deal of variation in the type and percentage of complications reported in studies of ECP. Much of the data show limited catastrophic side effects such as hypotony (0%-3%) and phthisis bulbi (0%-3%) in comparison to reports of TS-CPC.⁶⁻⁹ Significant complications do exist, however, with the most frequent being vision loss (up to 16%), a fibrin reaction in the anterior chamber (up to 24%), hyphema (up to 18%), and CME (up to 18%).⁶⁻⁸ Less commonly reported but potentially visually significant complications associated with ECP include retinal detachment or choroidal detachment.^{9,10}

The study protocol consisted of 360° of ciliary process treatment with ECP. Are there data to suggest that there is greater efficacy with an increased area of treatment?

ECP has an effect on diminished aqueous production by supplying targeted laser energy to the pigmented ciliary epithelium. Histopathologic changes in Rhesus monkey eyes following ECP show variable degrees of epithelial disruption, intrastromal pigment clumping, and fibrosis.⁴ The IOP reduction likely results from a combination of ciliary process destruction leading to decreased aqueous production along with increased transscleral and/or uveoscleral outflow. In the only study of its kind to date, Kahook et al compared one-site (240° to 300° of ciliary process treatment) versus two-site (360° of ciliary process treatment) ECP in phacoemulsification-ECP combined procedures. There was a statistically significant IOP reduction at all time points and less dependence on glaucoma medications in the two-site group versus the one-site group.¹¹ Although further study is needed to elucidate this relationship, it is not unreasonable to believe that increased ECP treatment (ciliary process area and energy delivered) would produce a greater response. The

wide spectrum of reported efficacy and complications may be a function of the variability of protocols for ECP treatment in published reports.

ONE-SITE VERSUS TWO-SITE ENDOSCOPIC CYCLOPHOTOCOAGULATION

Kahook MY, Lathrop KL, Noecker RJ¹¹

ABSTRACT SUMMARY

Kahook et al conducted a retrospective consecutive case review of patients who underwent combined ECP and phacoemulsification. The investigators compared ECP combined with phacoemulsification through one clear corneal incision (group 1, 240°-300° of treatment) versus two clear corneal incisions (group 2, 360° of treatment). Both group 1 ($n = 15$) and group 2 ($n = 25$) consisted largely of patients with primary open-angle glaucoma with vision ranging from 20/40 to count fingers. The preoperative IOP was similar in group 1 (mean IOP, 23.60 mm Hg ± 3.89) and group 2 (mean IOP, 24.48 mm Hg ± 8.99). Additionally, there was similar use of preoperative ocular hypotensives in group 1 (2.47 ± 0.74) and group 2 (2.56 ± 0.71).

Treatment failure was defined as failure to decrease IOP by 3 mm Hg or failure to decrease the number of topical medications necessary to maintain IOP control. Both groups experienced a statistically significant decrease in IOP from baseline through 3 and 6 months of follow-up. Furthermore, there was a statistically significant difference in IOP reduction at all time points and less dependence on glaucoma medications in group 2 patients compared with those in group 1. Patients in group 1 had a mean IOP reduction of 5.27 mm Hg ± 4.85 from baseline versus 11.20 mm Hg ± 9.35 in group 2. Eight patients in group 1 and two in group 2 were considered treatment failures. All but two patients in group 1 and one patient in group 2 experienced at least 2 lines of improvement in Snellen visual acuity.

Neither group experienced serious complications for the duration of the follow-up period, including persistent hypotony, endophthalmitis, CME, or retinal detachment. No cases of phthisis or loss of vision occurred.

DISCUSSION

What is the relationship between the treatment area and serious complications?

This retrospective, nonrandomized case review by Kahook et al suggests there is a dose-response relationship between the amount of ECP ciliary process application and IOP reduction. Furthermore, despite the added benefit in IOP reduction, a greater laser application area did not add to the postoperative complication rate. No

serious complications were reported in the study. The lack of grave consequences such as retinal detachment or phthisis is encouraging, given the known postoperative complications of TS-CPC. We know, however, that ocular hypotony,⁸ retinal detachment,⁹ and phthisis,¹² have all been reported in the literature as postoperative complications of ECP. At this time, there are no identifiable risk factors for the development of these sight-threatening complications. Without larger randomized trials and longer follow-up periods, the most judicious applications of ECP are advised, especially in patients with well-controlled glaucoma and good visual potential. ■

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