ARTICLE

Phacoemulsification and endocyclophotocoagulation in uncontrolled glaucoma: Three-year results

Michael Smith, FRCOphth, Daniel Byles, FRCOphth, Lei-Ai Lim, FRCOphth

Purpose: To describe the 3-year outcomes of combined cataract surgery and 360-degree endocyclophotocoagulation (ECP) in eyes with uncontrolled glaucoma and no previous glaucoma drainage surgery.

Setting: University Hospital Eye Department, Exeter, United Kingdom.

Design: Retrospective case series.

Methods: The study included patients who had combined cataract surgery and 360-degree ECP. The primary outcome measure was intraocular pressure (IOP) reduction at 3 years postoperatively. Secondary outcome measures were the cumulative probability of failure of the surgical procedure at 3 years and the complications of surgery. Failure was defined by 1 of 2 criteria: (1) IOP higher than 21 mm Hg or lower than 6 mm Hg or not reduced by 20% from baseline at the 1-, 2-, or 3-year timepoint and (2) further laser or other surgery to reduce IOP at any timepoint.

Results: The study comprised 84 patients (84 eyes). The mean IOP dropped from 18.7 mm Hg preoperatively to 13.3 mm Hg, 13.8 mm Hg, and 14.0 mm Hg at 1, 2, and 3 years postoperatively, respectively. By the 3-year timepoint, 58.3% had met the criteria for failure. The mean number of glaucoma medications was similar at 2.5 at 3 years postoperatively compared with 2.6 preoperatively. Nine patients (10.7%) had a significant complication, but all resolved without long-term sequelae.

Conclusions: At 3 years postoperatively, combined cataract surgery and 360-degree ECP achieved a modest but significant drop in IOP in phakic patients with uncontrolled glaucoma and no previous drainage surgery. There was a low incidence of serious side effects but nearly 60% were classified as failures by 3 years.

J Cataract Refract Surg 2018; ■:■–■

Over the last decade, the number of laser and surgical treatment options available for glaucoma patients has increased. In addition to longstanding treatments such as trabeculectomy and laser trabeculoplasty glaucoma, specialists have reduced their threshold for glaucoma drainage devices and in recent years, the term microinvasive glaucoma surgery (MIGS) has been introduced to cover several new surgical devices.[1,2]

All these procedures target the outflow of fluid from the eye, whereas cyclodestructive procedures lower intraocular pressure (IOP) by reducing the production of aqueous fluid within the eye. Although various types of cyclodestruction have been used to reduce IOP since the 1930s, the semiconductor diode laser (810 nM) has been the standard of care for cyclodestruction since the 1990s.[3] Although its efficacy and safety profile represented an improvement over previous methods of cyclodestruction, the risk for vision loss and hypotony after transscleral diode laser cyclodestruction mean most glaucoma specialists limit its use to eyes with poor visual potential or situations in which other surgical treatments have failed. Endocyclophotocoagulation (ECP), where the laser is applied under direct visualization to the ciliary processes, does not cause complete destruction of the ciliary processes and results in less "collateral damage." As far back as 2001, an American Academy of Ophthalmology report concluded that ECP was safer than transscleral diode.[4]

Since then, there has been an increasing number of reports on the safety and efficacy of ECP.[3] Many of these publications describe the use of ECP for secondary glaucoma or cases that have been resistant to other surgical approaches, thus limiting the applicability to less severe glaucoma. Although in recent years several publications have examined the place of ECP in milder glaucoma,

Submitted: March 22, 2018 | Final revision submitted: June 7, 2018 | Accepted: June 11, 2018

From the West of England Eye Unit (Smith, Byles), Royal Devon and Exeter Hospital, Exeter, and the Ophthalmology Department (Lim), Musgrove Park Hospital, Taunton, United Kingdom.

Corresponding author: Michael Smith, FRCOphth, West of England Eye Unit, Royal Devon and Exeter Hospital, Exeter, United Kingdom EX4 4SD. Email: smith.mic73@gmail.com.

0886-3350/$ - see frontmatter
https://doi.org/10.1016/j.jcrs.2018.06.025

many reports include limited follow-up data and often include patients who have medically controlled glaucoma, but simply require cataract surgery for visual reasons, with the ECP being added as an adjunct. Comparison of the literature is further confused by the variability in whether treatment covers 360 degrees or less and by whether glaucoma drops are stopped postoperatively. Reports of the long-term outcomes of ECP and phacoemulsification cataract surgery combined with ECP (phaco–ECP) are limited, with most studies only reporting 1- or 2-year results. Long-term outcomes are important because the ciliary body can regenerate and re-perfuse, and this might be more likely after ECP than transscleral diode laser.[5,6]

As a result of the above limitations a recent review article looking at the evidence for ECP concluded that despite its obvious efficacy, the exact place of ECP in the spectrum of glaucoma treatment remains to be defined.[2] The aim of this paper is to describe the 3-year outcomes of combined phacoemulsification and ECP in patients with uncontrolled glaucoma who have not had previous glaucoma surgery, and we hope that this contributes to the understanding of which glaucoma patients are most likely to benefit from ECP.

PATIENTS AND METHODS

Because this study is a retrospective case note review, the local ethics committee confirmed that formal ethics approval was not required. The study adhered to the tenets of the Declaration of Helsinki.

Patients who had phaco–ECP surgery between January 2013 to October 2013 were identified by operating room computer records. A chart review was then performed. Information collected included details of the surgical procedure and any intraoperative or postoperative complications.

Intraocular pressure and glaucoma medication details were recorded preoperatively and at 1, 2, and 3 years postoperatively. Finally, any further surgical or laser procedures were noted.

With respect to complications, any event or clinical finding that would be likely to affect the IOP or the visual acuity in the short or long term was recorded.

Inclusion criteria were all eyes that had phaco–ECP for uncontrolled glaucoma during the aforementioned period. Glaucoma was considered uncontrolled when there was evidence of glaucomatous progression despite maximally tolerated medical therapy.

Exclusion criteria were previous glaucoma drainage surgery or cyclodestruction in the eye that had phaco–ECP. Previous laser trabeculoplasty or laser iridotomy was permitted. If a single patient had phaco–ECP in both eyes during the study period, the second eye was excluded in fitting with the World Glaucoma Association recommendations on the design and reporting of glaucoma surgical trials.[7] The primary outcome measure was IOP reduction at 3 years postoperatively. Secondary outcomes measures were the cumulative probability of failure of the surgical procedure and the complications of surgery. Failure was defined by 1 of 2 criteria: (1) IOP higher than 21 mm Hg or lower than 6 mm Hg, or not reduced by 20% from baseline at the 1-, 2-, or 3-year timepoint and (2) further laser or other surgery to reduce IOP at any timepoint.

Medications were not considered as part of the success criteria because it is not the study authors' practice to stop glaucoma medications after phaco–ECP. The number of glaucoma medications included both topical and oral agents.

Surgical Technique

All cases were performed by 1 of 2 glaucoma subspecialists (MS, DB) or glaucoma fellows under their direct supervision.

All patients had cataract surgery through a 2.2 mm incision using the standard ophthalmic viscosurgical device and acrylic intraocular lens (IOL) used in the unit for routine cataract cases. After IOL insertion, the main incision was enlarged to 2.5 mm and an additional 2.5 mm incision was made at 180 degrees to the main incision. The 360-degree ECP was then performed using a curved ECP probe (Endo Optiks, Inc.) connected to an 810 nm diode laser (Oculight SL, Iridex Corp.). A standard 250 mW power setting was used, with the power increased or decreased depending on the laser reaction. The exposure time and therefore total power delivered was varied to achieve whitening and contraction of all accessible ciliary process tissue and the ciliary epithelium between the processes. Intracameral dexamethasone (0.66 mg in 0.2 mL) and 1.0 mg in 0.1 mL of intracameral cefuroxime was administered to all patients (please note dexamethasone is not licensed for intracameral use).

Postoperatively, patients received 250 mg of acetazolamide SR twice daily for 2 days and chloramphenicol 0.5% drops for 7 days. Dexamethasone 0.1% drops were used every two hours in the initial postoperative period and then tapered depending on the degree of postoperative inflammation present at clinical reviews, with most patients using topical steroids for 6 to 8 weeks postoperatively. Unpreserved chloramphenicol and dexamethasone drops were used in patients considered to be intolerant to preservative-containing drops. Patients were instructed to continue their usual glaucoma medications postoperatively.

Statistical Methods

The data were entered into Excel software (Microsoft Corp.) and the statistical analysis was performed using Graphpad Prism (version 7.0c, Graphpad Software, Inc.). Shapiro-Wilk tests were used to test for presence or absence of normal distribution in the data. Comparisons between preoperative and postoperative data were performed by using the Wilcoxon test, with a P value less than 0.05 considered statistically significant. If the patient had further laser or other surgery for glaucoma in the same eye, data were censored at the date of the additional procedure. Patients who died or who were lost to follow-up by the 24- and 36-month timepoints were omitted from the IOP and glaucoma medication analysis at these timepoints and censored for the purpose of the survival analysis.

RESULTS

Operating room computer records identified 106 eyes of 99 patients who had phaco–ECP between January 2013 and October 2013. Thirteen eyes were excluded because of previous glaucoma drainage surgery and a further 6 eyes were excluded as the second eyes of patients who had bilateral surgery during this period. A further 3 patients were excluded because of less than 1 year of follow-up data being available (2 died and 1 was lost to follow-up). Therefore, 84 eyes of 84 patients were included in the study. Table 1 shows the preoperative characteristics of the study patients.

Data were available for 84 patients at the 12-month timepoint; however, that number had reduced to 78 and 73 by the 24-month and 36-month timepoints, respectively. For the 11 patients with no 36-month data, 6 had died and 5 had been lost to follow-up. The mean follow-up was 33.6 months.

Table 2 shows the study outcomes. The mean IOP dropped by 28.8%, 26.2%, and 25.1% at 12, 24, and