A UK Case Series of Phaco-ECP

Abstract

Aims: Cataract surgery with combined endo-cyclophotocoagulation (phaco-ECP) remains a relatively new procedure for glaucoma specialists. Problems associated with trans-scleral photocoagulation and a lack of long-term data can cause reluctance to introducing the procedure. However, published data has shown that phaco-ECP is a valuable additional treatment for patients with concomitant cataract and glaucoma being low risk, quick and cost effective. Our retrospective case study reviews the outcome of a cohort of patients treated in one UK hospital from 2009-2013.

Methods: All patients undergoing combined phaco-ECP at one UK hospital between September 2009 and November 2013 were included. All glaucoma subtypes were included as was previous surgery. We reviewed electronic and paper notes. Details collated include age, gender, glaucoma subtype, pre-operative intraocular pressure (IOP) and number of topical glaucoma agents. Post-operative IOP and number of agents were collected at specified time points. The main outcome measures were IOP and number of agents used. We also report intraoperative and post-operative complications and further glaucoma operations needed.

Results: 328 eyes were included of 207 patients. The mean age of participants was 78.8 years [SD +-10 years, range 62-100]. The group consisted of 52% males and 48% females. The longest follow-up was 48 months. The mean follow-up was 24 months. 154 eyes were followed up for 12 months and 105 for 24 months or more. 69 eyes were followed up for less than a year. Two of these had just two follow ups (due to passing away). The remainder were patients who had recently had surgery at the time of the audit and 9 people lost to follow-up. Two patients who passed away after the first post-op visit were excluded from the results. All eyes who had measurements available at any specific timepoint were included in the data for that part of the study. Pre-operatively, patients used a mean of 1.72 agents [SD 1.07, range 0-4] and pre-operative IOP mean was 17.1 [SD 5.3, range 15-41]. The one patient who had a starting pressure of 15mmHg was on maximum tolerated medical treatment and had progressing visual field changes despite this. All the patients included in the treatment were clinically considered to be requiring additional treatment to their current tolerated medical regime due to progressive glaucoma changes. 134 patients included in the study had a pre+op IOP of <21 mm Hg but were all considered uncontrolled clinically.

One year post-operatively the patients used a mean of 0.77 agents [SD 0.66, range 0-3] and IOP mean was 13.2 [SD 3.06, range 5-21]. The overall reduction in IOP at 24 months was 24.0% and the overall reduction in the number of agents used at 24 months was 38.0%. This is the biggest reported UK cohort. There were no contraindications found to perform this procedure on any of our patients. Sub-group analysis of the different glaucoma subgroups will follow as well as a further case-controlled study of phaco only patients.

Keywords: ECP; Endocyclophotocoagulation; Phacoemulsification; Intraocular Pressure; Glaucoma; Phaco-ECP

Research Article

Volume 2 Issue 2 - 2015

Pieter Gouws and Line Langsaeter*
Conquest Hospital, UK

***Corresponding author:** Line Langsaeter, Conquest Hospital, East Sussex Healthcare Trust, The Ridge, St Leonards-on-sea, East Sussex TN37 7RD, UK, Tel: 447977120062; Email: line.langsaeter@doctors.org.uk

Received: August 28, 2014 | **Published:** April 06, 2015

Abbreviations: ECP: Endocyclophotocoagulation; Phaco: Phacoemulsification; IOL: Intraocular Pressure; IOP: Intraocular Pressure; POAG: Primary Open Angle Glaucoma

Introduction

The aim of this study was to establish the effect of phaco-ECP on management of glaucoma patients. The main outcome measures are effect on intraocular pressure and drop requirement as well as complications related to the procedure. There are an estimated 66 million people with glaucoma worldwide [1] and glaucoma remains an important cause of blindness with a reported 12.5 million people blind from glaucoma. Glaucoma is classified as the leading cause of avoidable blindness worldwide together with cataract [2]. In England there are approximately 480,000 people diagnosed with primary open angle glaucoma (POAG) having over a million glaucoma related outpatient visits in the hospital eye service annually [3]. The approximate corresponding figures for the USA suggests 10 million visits yearly [4].

In addition, cataract surgery is the most common operation performed on the NHS with 340,809 cataract operations performed in UK 2012/2013 (50 per cent increase since 1998/1999) [5]. Finally, there is a growing trend to combine cataract extraction in patients with glaucoma with a procedure

to lower pressure such as phaco-stenting, phaco trabectome or phaco-trabeculectomy. In terms of cyclophotocoagulation of the ciliary body in order to lower IOP, the trans scleral approach was initially used with cryotherapy and diathermy as well as the more recent Nd:YAG and diode laser. However, this blind approach to treating the

ciliary body is associated with a number of complications including pain, inflammation, sight loss and phthisis and thus is usually reserved for blind and painful eyes, eyes with poor visual potential and for whom surgery is unsuitable or unsuccessful. Many glaucoma surgeons have now started using external cyclodiode much earlier due to significantly reduced complications with modern lasers.

The first documented ciliary body laser was in 1986 [6] with the first endoscopic treatment in 1992 by Uram who developed an endoscope and successfully treated rubeotic glaucoma [7]. Chen et al. [8] published successful treatment of 68 cases of refractory glaucoma with endocyclodiodelaser (ECP) in 1997. The biggest cohort with longest follow-up is by Berke's group in Westbury, New York, with over 2000 patients and the longest follow-up in some patients of 13 years. There is also a collaborative ECP group with a cumulatively 5824 eyes with follow up 1 to 13 years [9,10]. There are also some UK studies [11, 12].

Materials and Methods

This was a retrospective case series review of all phaco-ECP procedures between November 2009 and Nov 2013. Previous interventions were not excluded and all glaucoma subtypes included. All laser procedures (ECP) were performed by one consultant. All data gathered was entered onto a proforma and subsequently entered into EXCEL. Data gathered included hospital number, gender, age, date of operation, pre-operative IOP and number of agents used, post-operative IOP and number of agents used. The timepoints for post-operative data included 1 week, 1 month (range depending on actual follow up date 21-37 days), 3 months (2-4 months), 6 months(4-8 months), 12 months (10-14 months), 24 months (20-28 months) and the date and details of the last recorded visit during the audit period. Any intra or post-operative complications were also noted as well as any further interventions required. Phaco-ECP combines phacoemulsification and intraocular lens implant (IOL) with ciliary body endo-cyclophotocoagulation.

Indications for performing the surgery are

Progression of glaucoma on maximum tolerated topical treatment with co-existing cataract inability to tolerate or instil glaucoma drops (elderly,tremor,dementia,arthritis etc) and co-existing cataract. The endo-cyclophotocoagulation is usually performed towards the end of the procedure either after insertion of the IOL or immediately prior to this.

The most important aspect to bear in mind whilst performing the procedure is to avoid any contact with the iris as this usually results in a very brisk uveitis with fibrin dump postoperatively. Always ensure the sulcus remains fully inflated with visco-elastic and always remove all the visco-elastic from the bag first at the end of lens implantation as this will allow a much fuller view and treatment area of the ciliary processes. The main corneal incision is used to insert the laser probe into the anterior chamber after inflating the ciliary sulcus with visco-elastic. The probe is advanced forward under the iris and pointing towards the ciliary processes. The laser, which is not in the visible spectrum, has a guiding Xe-Ne beam. The laser is set to 'painting' mode allowing a continuous 'painting' of the ciliary processes whilst the effect of the treatment is observed on a monitor adjacent to the operating table showing the view through the fiber optic video cable of the laser probe (Figure 1). The operating microscope is only used in order to visualize the insertion of the viscoelastic and a safe insertion of the laser probe. The effect of the laser on the ciliary bodies is a visual change in the shape and colour of the processes. They shrink and turn from a brownish colour to white in eyes without pseudo-exfoliation (PXE) (Figure 2). There is a marked difference both in the visual appearance as well as the reaction to the laser in patients with PXE with minimal shrinking and colour change (Figure 3). The author enlarges the side port used in the phacoemulsification to allow for a full 360 degrees treatment.

Figure 1: Operating theatre set-up.

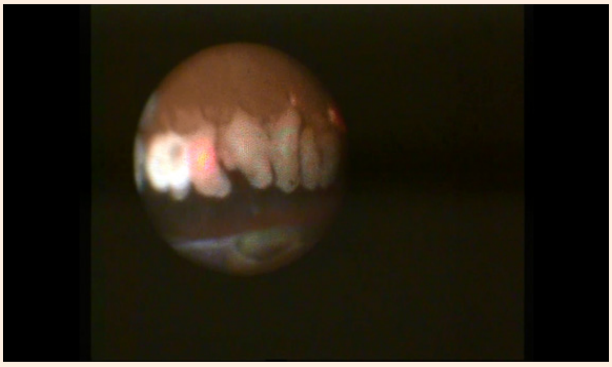

Figure 2: View of ciliary processes.

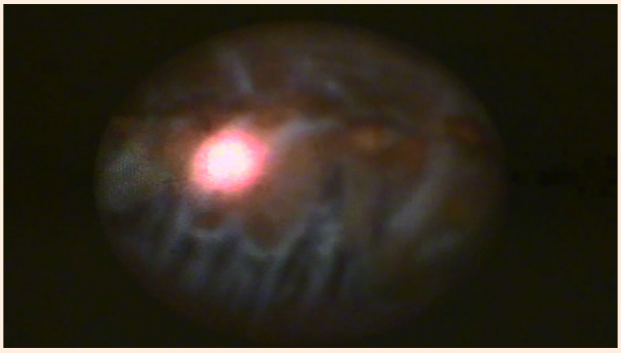

Figure 3: Note the iris, processes and zonules coated in pseudo exfoliative material.

The probe consist of a Xenon light source, a fibre optic video cable, a visible aiming beam from a Xe-Ne laser and the laser itself, an 810nm wavelength diode laser (Figure 4). The laser is operated via a foot pedal. Because of the increased risk of a brisk uveitis, including a fibrin dump, all patients receive intra cameral dexamethasone 0.2ml (0.8mg)-drawn from intravenous dexamethasone preparation 4mg/ml at the end of the procedure after the standard intracameral Cefuroxime 0.1ml (1mg). Two hourly topical steroids and 4x daily antibiotic drops are prescribed. The first follow-up appointment is 1 to 3 days post procedure with the main aim of ensuring that fibrin dump or pressure spikes are identified early. Pressure spikes are treated with a paracentesis 'burping the wound' with repeat pressure check in 24 hours. Fibrin dump is treated with subconjunctival dexamethasone (4mg in 1ml) and reviewed in 2 to 3 days. The vast majority of eyes in this series required no intervention and the two hourly drops are reduced to 4x/day and stopped 4 weeks later (5 weeks total). Patients were told to stop all glaucoma drops in the operated eye until review.

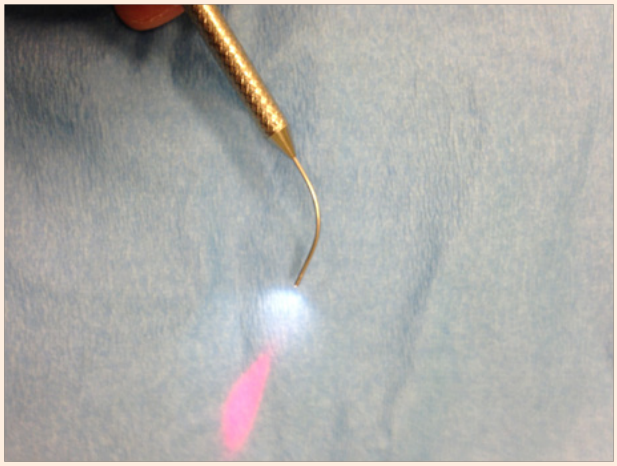

Figure 4: laser probe.

Results and Discussion

The study included 328 eyes of 207 patients. The mean age of participants was 78.8 [SD +-10 years, range 62-100]. The group consisted of 53% males and 48% females. The longest follow-up was 48 months. The mean follow-up period was 24 months. 154 eyes were followed up for 12 months and 105 for 24 months or more. The glaucoma subtypes included were as per (Figure 5).

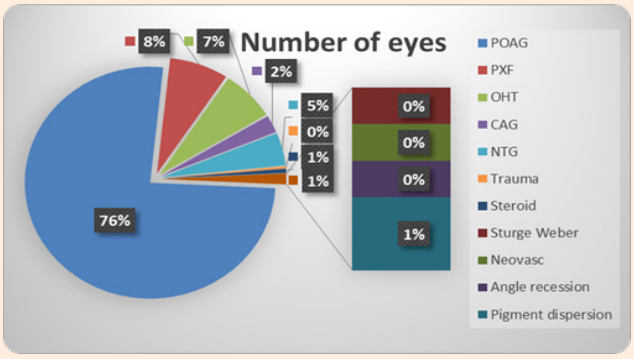

Figure 5: Glaucoma subtypes included in the study.

Pre-operatively, patients used a mean of 1.72 agents [SD 1.07, range 0-4] and pre-operative IOP mean was 17.1 [SD 5.3, range 15-41]. See also the attached charts for number of drops used and overall IOP change over time in (Figures 6-9). The overall reduction in IOP at 24 months was 24.0% and the overall reduction in the number of agents used at 24 months was 38.0%. See (Table 1 and 2) for details.

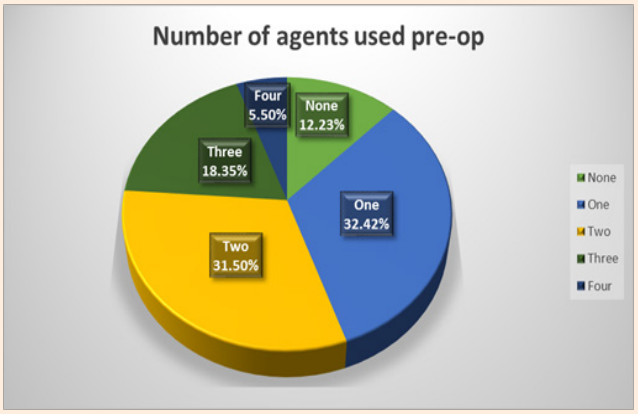

Figure 6: Pre-operative use of agents.

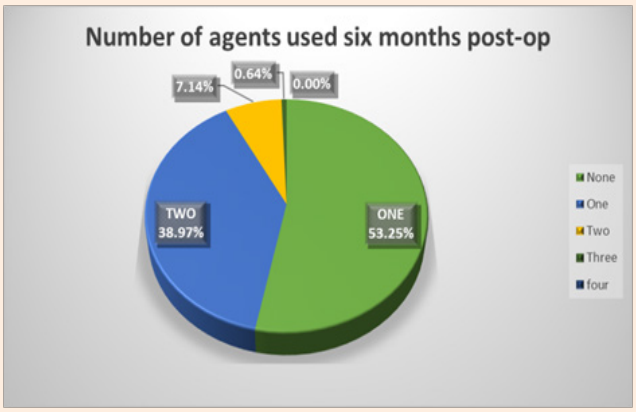

Figure 7: Number of agents used 6 months post operatively.

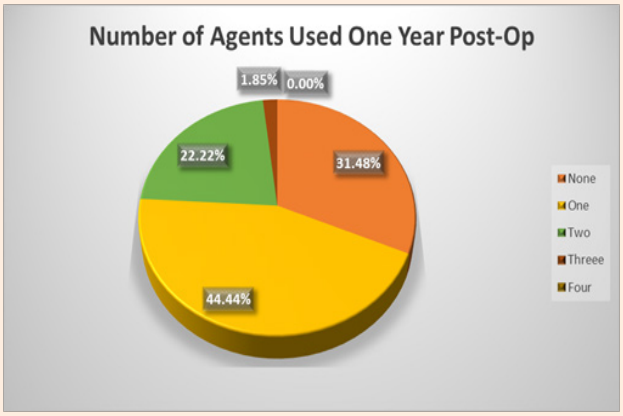

Figure 8: Number of agents used 1 year post operatively.

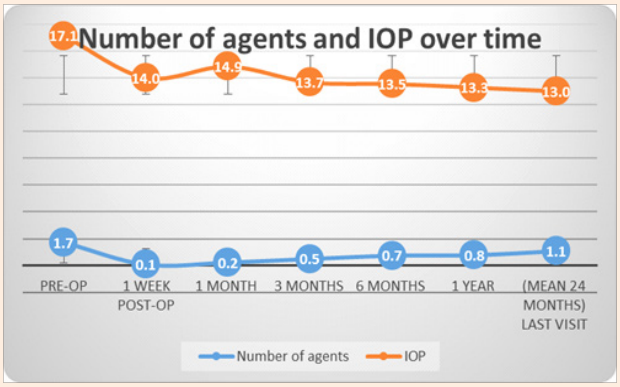

Figure 9: overall view of IOP and number of agents used over time.

Table 1: Overall view of number of agents and IOP over the time of follow Up. At every timepoint from surgery we have annotatet the number of eyes followed up for this length of period. p<0.05 at all time points using the t-test.

	Pre-op		**post-op**									
			1 week		1 month		3 months		6 months		1 year	
	Agents	IOP	Agents	IOP	Agents	IOP	Agents	IOP	Agents	IOP	Agents	IOP
	1.72	17.1	0.06	14.0	0.22	14.9	0.31	13.9	0.45	13.7	0.55	13.2
SD	1.07	5.31	0.27	5.67	0.45	5.35	0.57	4.35	0.63	3.93	0.66	3.06
CI	2.1	10.0	0.5	11.3	0.9	10.7	1.1	8.7	1.2	7.8	1.3	6.1
MIN	0	5	0	6	0	0	0	0	0	1	0	5
MAX	4	41	2	50	2	38	3	34	2	30	3	21
Number of patients at visit	328		244		174		199		183		154	
p value	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01

Abbreviations: PRE-OP: Preoperative; POST-OP: Postoperative; SD: Standard Deviation; CI: Confidence Interval; Min: Minimum Value; MAX: Maximum Value; IOP: Intraocular Pressure

Table 2: Details of the last visit recorded at time of audit. The last follow up recorded had 105 eyes at 2 years or more, where the longest follow-up was at 48 months post-operatively.

	Last visit		
	Time of last visit (months from operation)	Agents	IOP
MEAN	24.3	0.94	13.0
SD	9	0.78	3.0
CI	18	1.6	6.0
MIN	<1	0	7
MAX	48	3	22
Number of patients	105		
P VALUE		P<0.01	P<0.01

Abbreviations: SD: Standard Deviation; CI: Confidence Interval; Min: Minimum Value; MAX: Maximum Value; IOP: Intraocular Pressure

As expected with destruction of ciliary epithelium, the documented complications are all related to increased inflammation (Table 3). All complications resolved without sequelae. Intracameral steroid and intensive drops in the first week is crucial to ensure smooth recovery. Further surgery was required in 12 eyes (3.6%) and consisted of 9 MMC Trabeculectomies, 2 Ahmed valve implants and 1 external cyclodiode laser.

Table 3: Recorded complications.

Complication	Eyes
High IOP (>21mmHg) Week 1	34(10.3%)
Month 1	3
Corneal oedema	15(4.5%)
Fibrin dump (→ iris bombe → PI) (Only in 1st 3 mnths, likely related to learning curve)	3
Cystoid macular oedema	11(3.3%)
Suprachoroidal effusion	1
Hypotony/ciliary body stasis	0

Abbreviations: IOP: Intraocular Pressure; PI: Peripheral Iridotomy; mnths: Months

Conclusion

We are aware of a number of limitations of this study. First of all, there is a presumed and previously reported improvement in IOP following phacoemulsification alone [13,14]. This study did not include any phaco alone controls. However, the effects of phaco alone, according to published studies as referenced, appears to be short-lived, with IOP increasing again after about one year. The effects of phaco-ECP appears consistent over the time of this study. A further case controlled study is planned. Furthermore, we are aware of an observer bias in measuring IOP both pre and post-operatively. There was no blinding during this study, but IOP was measured by any member of the team who saw patients during follow-ups and many of the observers were not officially part of the study nor briefed on desired outcomes but managed the patients as per their clinical judgment. We are also aware that a longer term follow-up is advisableA randomized, controlled trial would be able to prove more accurately the outcomes from this fairly new procedure.

The glaucoma specialist who performed the phaco-ECP noted that a decrease in the number of trabeculectomies since the introduction of phaco-ECP. The overall reduction was approximately 50% since introduction of Phaco ECP. With the phaco ECP procedure there is a significant reduction in follow up appointments in the initial post operative period compared to glaucoma drainage surgery . There were on average only two post-operative visits required before normal glaucoma monitoring intervals where resumed. Overall 44% of patients were on 1 drop only after 1 year and 33.3% of eyes were drop free at 12 months. For those who manage glaucoma it is clear how this can have a significant impact on patients who often have comorbidities and may find drop administration difficult and also suffer side-effects from topical treatments. In addition, this may prove a significant cost benefit to the health economy.

No adverse effects were noted apart from increased inflammation (compared to phaco alone) with associated increase in corneal oedema and macular oedema – all resolved completely. Intracameral steroid and intensive drops in 1st week appears crucial to ensure a smooth recovery. No contraindications to treatment of any patients were identified from the patients included in this study. In our group, all patients were treated with 360 degree laser. We are aware that some groups may treat 360 degrees or less. We are unable to comment on any difference in outcome that this may have as all our patient were treated with the same protocol of 360 degree coverage.

Summary

This procedure could be seen as value added phaco as it is easy to do and addresses two pathologies in one operation. It leads to drop reduction and better, consistent IOP control and has a low complication rate with no documented cases of hypotony. It leaves the conjunctiva untouched in case of need for further drainage surgery and gives a unique view of anatomy. It is also a fun and interesting procedure once mastered! It is noted in this study that the needs for drops modestly increase over time .

References

1. Quigley HA, Broman AT (2006) The Number of people with glaucoma worldwide in 2010 and 2020. Br J Ophthalmol 90(3): 262-267.
2. Pascolini D, Mariotti SP (2012) Global estimates of visual impairment: 2010. Br J Ophthalmol 96(5): 614-618.
3. http://publications.nice.org.uk/glaucoma-cg85/introduction.
4. Center for Disease Control and Prevention/National Center for Health Statistics, 2010 & 1995.
5. Cataract Surgery Guidelines 2010 accessed 30/5/2014.
6. Patel A, Thompson JT, Michels RG, Quigley HA (1986) Endolaser treatment of ciliary body for uncontrolled glaucoma. Ophthalmology 93(6): 825-830.
7. Uram M (1992) Ophthalmic laser microendoscope ciliary process ablation in the management of neovascular glaucoma. Ophthalmology 99(12): 1823-1828.
8. Chen J, Cohn RA, Alvarado J, Cortes AE, Alvarado JA (1997) Endoscopic photocoagulation of the ciliary body for treatment of refractory glaucomas. Ophthalmology 124(6): 787-796.

9. Berke SJ, Cohen AJ, Sturm RT (2000) Endoscopic cyclophotocoagulation (ECP) and phacoemulsification in the treatment of medically controlled open angle glaucoma. J Glaucoma 9(1): 129.

10. Berke SJ, Sturm RT, Caronia RM (2006) Phacoemulsification combined with endoscopic cyclophotocoagulation (ECP) in the management of cataract and medically controlled glaucoma: A large, long term study. Presented at AGS Annual Meeting, Charleston, SC, USA.

11. Lindfield D, Ritchie RW, Griffiths MF (2012) 'Phaco-ECP': combined endoscopic cyclophotocoagulation and cataract surgery to augment medical control of glaucoma. BMJ Open 2(3).

12. Clement CI, Kampougeris G, Ahmed F, Cordeiro MF, Bloom PA (2013) Combining phacoemulsification with endoscopic cyclophotocoagulation to manage cataract and glaucoma. Clin Exp Ophthalmol 41(6): 546-551.

13. Shingleton BJ, Gamell LS, O'Donoghue MW, Baylus SL, King R (1999) Long-term changes in intraocular pressure after clear corneal phacoemulsification: normal patients versus glaucoma suspects and glaucoma patients. J Cataract Refract Surg 25(7): 885-890.

14. Mathalone N, Hyams M, Neiman S, Buckman G, Hod Y, et al. (2005) Long-term intraocular pressure control after clear corneal phacoemulsification in glaucoma patients. J Cataract Refract Surg 31(3): 479-483.