Cataract Surgery combined with Excimer Laser Trabeculotomy to lower Intraocular Pressure: Effectiveness on different IOP Levels

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Abstract

Background:
Cataract surgery combined with excimer laser trabeculotomy (Phaco-ELT) can reduce IOP. The aim of this study was to evaluate the effect of Phaco-ELT on IOP in patients as a function of preoperative IOP.

Methods:
12-months after Phaco-ELT 73 eyes of 64 patients were assigned based on preoperative IOP to the study (≤21mmHg) or control (≥22mmHg) group in this IRB approved consecutive case series.

Results:
Across the two groups, IOP was reduced by 4.29±5.87mmHg (-21.78%, p<0.001) and AGD by 0.97±1.39 (-41.81%, p<0.001). For group 1 IOP was reduced by 1.77±4.37mmHg (-10.89 %, p=0.020) and AGD by 1.05±1.36 (-45.06%, p<0.001), and for group 2 (preoperative IOP ≥22mmHg) by 8.80±5.16 mmHg (-34.87%, p<0.001) and AGD by 0.84±1.49 (-37.50%, p=0.010). Cataract surgery increased visual acuity from an average of 0.43±0.24 to 0.76±0.27 (Snellen).

Conclusions:
ELT is easily combined with cataract surgery. The resulting reduction in IOP is favorable for both groups, and remained constant over the course of the follow-up period.

Key Words:
Cataract; Cataract Surgery; Extracapsular cataract extraction; Phacoemulsification; Glaucoma; Glaucoma Surgery; Excimer Laser Trabeculotomy; Excimer Laser Trabeculostomy; Trabecular meshwork; Primary Open Angle Glaucoma
Background

Glaucoma is a widespread disease leading to progressive loss of visual function. It is still one of the leading causes of irreversible blindness around the world and the number one cause of blindness in industrialized countries. Glaucoma is a chronic and progressive neurodegenerative disorder causing loss of retinal ganglion cells and their axons. Characteristic cupping of the optic disc is seen clinically, often with a corresponding visual field defect. In most cases the intraocular pressure (IOP) is elevated above the normal range. IOP is the major risk factor for glaucoma. Besides IOP, some other risk factors are well known, e.g. age, family history and race (e.g. African descent).

In managing glaucoma patients, the goal of IOP reduction remains the only therapeutic approach supported by a significant evidence base. Medical reduction of IOP is the first line therapy in most cases. If medical treatment proves insufficient to arrest progression of the disease, there are several well-established surgical procedures to reduce IOP.

Trabeculectomy (TE) as it is performed today was introduced in 1968 by Cairns. It remains the gold standard in glaucoma surgery. Following TE, aqueous humor flows via a scleral flap from the anterior chamber into the subconjunctival space. TE is very effective in long-term reduction of IOP. The use of antimetabolites during surgery provides even better long-term IOP control. Other surgical options are e.g. argon laser trabeculoplasty (ALT), or selective laser trabeculoplasty (SLT), cyclophotocoagulation (CPC), ab interno trabeculectomy with the Trabectome, canaloplasty, or shunt systems. All of these and other surgical glaucoma procedures have substantial disadvantages. The effects of ALT and SLT reduce significantly over time. In many patients CPC must be repeated to reach target pressure. TE has many potential complications, especially in the first few weeks after surgery, and accelerates cataract formation after surgery.

Aqueous humor is formed by the ciliary processes and leaves the eye mainly through the trabecular meshwork into Schlemm’s canal and subsequently the episcleral veins. This is called the trabecular outflow (83-96% of aqueous humor outflow).
addition 5-15% of the aqueous humor is drained via the uveoscleral pathway.\textsuperscript{22,28} Usually an increased drainage resistance is the reason for elevated IOP\textsuperscript{22-30}, while aqueous humor production is nearly constant\textsuperscript{31-33}. The main location of outflow resistance is likely to be the juxtacanalicular tissue of the trabecular meshwork.\textsuperscript{34,35}

Therefore, the most physiologically feasible goal of any surgical procedure to reduce IOP is to improve the trabecular outflow. Excimer laser trabeculotomy (or excimer laser trabeculostomy, ELT) ab interno is one minimally invasive surgical technique to reduce IOP in patients with glaucoma or ocular hypertension by creating pores from the anterior chamber into Schlemm’s canal through the TM and inner wall of Schlemm’s canal.\textsuperscript{36-49} It is known from previous studies that ELT could easily be performed at the end of a clear cornea phacoemulsification and has the ability to reduce IOP for a long period of time with a low rate of complications.\textsuperscript{42,44-47}

ELT enhances aqueous humor outflow into Schlemm’s canal and its drainage against the episcleral vein pressure. It is not usually possible to reduce IOP to the same level as achieved through fistulating surgery. However, ELT is a procedure, which technique can be acquired by ophthalmic surgeons especially cataract surgeons fast. Furthermore, ELT is a safe procedure to combine with cataract surgery in order to lower IOP to a greater degree than that achieved by cataract extraction alone. The potential to reduce IOP in patients with higher pre-operative IOP has been previously investigated. However, the comparative effectiveness of combined phacoemulsification and ELT in patients with lower pre-operative IOP remains unclear. The aim of this study was therefore to evaluate whether Phaco-ELT is also effective in lowering the IOP in eyes with IOP \(\leq\) 21mmHg. Therefore, two groups of patients were evaluated: one with a preoperative IOP of \(\leq\) 21mmHg (study group, group 1), and a second with a preoperative IOP of \(\geq\) 22mmHg (control group, group 2).

**Methods**

73 eyes of 64 patients were examined 12 months \(\pm\) 2 weeks after clear cornea extracapsular cataract extraction by phacoemulsification and intracapsular lens
implantation combined with ELT (Phaco-ELT). All subjects were recruited from the ophthalmological out-patient department. Intraocular pressure (using Goldmann applanation tonometry), best corrected visual acuity (BCVA, Snellen charts), slit lamp biomicroscopy of the anterior and posterior segment as well as glaucoma medication history were documented by one examiner (M. T.-H.). The indications for a combined Phaco-ELT intervention were the presence of a visually significant cataract (visual acuity less than or equal to 0.5 Snellen) and a moderately elevated IOP in the absence of medical therapy, or a moderate cataract (visual acuity less than or equal to 0.8 Snellen) and uncontrolled IOP despite medical therapy.

Inclusion criteria were a diagnosis of ocular hypertension or manifest glaucoma with typical glaucomatous cupping of the optic disc, visual field changes, or both, together with an open iridocorneal angle (grade III or IV on the Shaffer scale). Patients with advanced glaucoma (i.e., fixation-threatening visual-field defects) or with an IOP ≥35mmHg were excluded. Patients with a history of optic neuropathies other than glaucoma were also excluded.

All surgeries were performed by the same surgeon (J. F.). A standard clear-cornea phacoemulsification and intracapsular lens implantation (Alcon MA 50 BM, Alcon Inc., Huenenberg, Switzerland) was performed. Immediately afterwards, a medical miosis was induced by acetylcholine chloride (Miochol) and the anterior chamber was deepened with viscoelastic (sodium hyaluronate, Healon). An endoscopically-guided photoablative laser operating at a wavelength of 308 nm (excimer laser, AIDA, TUI-Laser, Munich, Germany) was used to create ten microperforations into the trabecular meshwork spread over an area of 90°. Each microperforation was approximately 0.2mm in diameter. Further details of the laser device are provided in Table 1. In order to transmit adequate sub-threshold energy of the laser to the target tissue, the instrument tip had to touch the trabecular meshwork (TM, Fig. 1). After laser application a formation of bubbles was seen together with a small retrograde bleeding, indicating the perforation of the trabecular meshwork and the inner wall of Schlemm’s canal (Fig. 2). In all patients the bleeding resolved spontaneously. At the end
of the surgical procedure, the viscoelastic was washed out of the anterior chamber and the
globe was pressurized to approximately 15 mmHg. The paracentesis and clear corneal
incision were hydrated with sterile balanced salt solution (BSS). There was no intracameral
antibiotic prophylaxis during surgery, but Cefazolin and Dexametasone were injected
subconjunctivally at the end of the procedure. Combined Tobramycin and Dexamethasone
ointment was applied and the eye was covered with an eye patch overnight. From the first
postoperative day, Tobramycin and Dexamethasone eye drops q.i.d. and Tobramycin and
Dexamethasone ointment at bedtime were applied for 2 weeks. Eye drops were reduced
weekly by one drop.

Primary study endpoints were IOP and number of antiglaucoma drugs (AGD) taken.
Secondary study endpoints were BCVA, intra- and postoperative complications, and the
requirement for subsequent glaucoma surgery.

Descriptive statistics for quantitative variables such as mean, standard deviation, 95%
confidence interval and relative frequencies for qualitative variables were calculated for all
study eyes (without dropouts) and the two study groups separately – one with a preoperative
IOP of ≤21 mmHg (group 1) and one with a preoperative IOP of ≥22 mmHg (group 2). Data
are given as arithmetic mean ± standard deviation. A student’s t test was used for testing
significant changes in IOP, BCVA and number of AGD. The significance level was defined
by p<0.05. For statistics (e.g. percentage change) BCVA was transformed to logMAR values
and retransformed into Snellen for reporting of the results. Additionally, the number of
patients that met the criteria of success was calculated.

Success was defined based on the criteria from the tube versus trabeculectomy
study (TVT study) as postoperative IOP below or equal to 21 mmHg and IOP reduction of
at least 20%. In addition, the number of AGD postoperatively had to be less than or equal to
that recorded preoperatively. Subsequent surgery due to insufficient IOP reduction at the
initial intervention was classified as treatment failure.

Statistical analyses were conducted in SPSS software version 19.0.0 for
Macintosh (IBM Corporation, New York, NY, USA). All subjects gave prior informed consent.
The study was approved by the local ethics committee (Ethics Committee of the Canton Zurich, KEK-ZH-Nr. 881, 06/07/2009) and adhered to the tenets of the Declaration of Helsinki and local law. The study is registered in the clinical trials registry of the U.S. National Institutes of Health (http://www.clinicaltrials.gov, NCT01194310).

Results

In total, data from 73 eyes of 64 patients with a mean age of 76.51 ± 9.36 years were analysed. The demographical data for all study eyes and the two groups is shown in table 2. Seven eyes needed further glaucoma surgery to control the IOP within the 12 month follow-up period (Tab. 3). This group were classified as treatment failures when calculating the success-rate. In order not to overestimate the effect of Phaco-ELT when calculating mean IOP and percentage changes in IOP and AGD, the data of these patients in whom treatment was unsuccessful were excluded from statistical analysis. Only a few patients showed a mild anterior chamber reaction, as is often seen after cataract surgery. There were no serious postoperative complications such as endophthalmitis or a severe fibrinous reaction of the anterior chamber.

Preoperative BCVA was 0.43±0.24 Snellen and improved for all study eyes and both groups significantly (p<0.001) to 0.76±0.27 Snellen after cataract surgery (see Tab. 5).

For all study eyes mean preoperative IOP was 19.70±5.22mmHg (95% confidence interval (CI) 18.41 – 20.98) and the mean number of prescribed AGD was 2.32±1.11 (95% CI 2.04 – 2.59). After Phaco-ELT, mean IOP was 15.64±4.26mmHg (95% CI 14.36 – 16.46) and an average of 1.35±1.34 AGD (95% CI 1.02 – 1.68) were prescribed. Comparing the preoperative and postoperative IOP, there was a reduction of 4.29±5.87mmHg (-21.78%, 95% CI 2.85 – 5.73, p<0.001) and a reduction in the number of required AGD of 0.97±1.39 (-41.81%, 95% CI 0.63 – 1.31, p<0.001).

Analyzing the study group (group 1, preoperative IOP ≤21mmHg), the mean preoperative IOP was 16.26±3.00mmHg (95% CI 15.28 – 17.23) and a mean of 2.33±1.06 AGD (95% CI 1.99 – 2.68) was recorded before treatment. After Phaco-ELT mean IOP was
14.49±3.61 mmHg (95% CI 13.32 – 15.66) and an average of 1.28±1.34 AGD (95% CI 0.85 – 1.72) were required. Comparing the preoperative and postoperative IOP there was a reduction of 1.77±4.37 mmHg (-10.89%, 95% CI 3.19 – 3.19, p=0.020), and a reduction in the number of prescribed AGD of 1.05±1.36 (-45.06%, 95% CI -0.61 – 1.49, p<0.001).

Analyzing the control group (group 2, preoperative IOP >21 mmHg) the mean preoperative IOP was 25.24±2.83 mmHg (95% CI 24.07 – 26.41) and a mean of 2.24±1.23 prescribed AGD (95% CI 1.73 – 2.75). After Phaco-ELT the mean IOP in this group was 16.44±4.87 mmHg (95% CI 14.43 – 18.45) and an average of 1.40±1.38 AGD (95% CI 0.83 – 1.97) were required. Comparing the preoperative and postoperative IOP there was a reduction of 8.80±5.16 mmHg (-34.87%, 95% CI 6.67 – 10.93, p<0.001), and a reduction in the number of required AGD of 0.84±1.49 (-37.50% 95% CI 0.23 – 1.46, p=0.010).

After the follow-up period of 12 months, 35 eyes from 73 (47.94%) met the criteria of success. When analysed according to preoperative IOP, 16 eyes from 39 (41.03%) in group 1 and 19 from 25 (76.00%) eyes in group 2 met the criteria of success.

**Discussion**

Excimer laser trabeculectomy is easy to perform at the end of a clear-cornea extracapsular cataract extraction by phacoemulsification. Duration of cataract surgery is only prolonged by 2 to 3 minutes for the excimer laser trabeculotomy and, as the same clear corneal incision as for phacoemulsification is also used for ELT, no additional incision is required.

At the wavelength of 308 nm, the trabecular meshwork is gently ablated. Microperforations between the anterior chamber and Schlemm’s canal are created. There are nearly no thermal side effects or damage of the outer wall of Schlemm’s canal. Ablation of the TM tissue is vaporized into gas. The expanding gas cools the tissue and limits thermal damage.

The punctual ablation of TM by an excimer laser was first developed and evaluated under laboratory conditions in 1987 by Berlin and colleagues. Later in 1996 results of the
technique in humans were published by Vogel et al.\textsuperscript{41} Vogel and colleagues used a laser prototype and the laser application was monitored using a contact glass. The ELT technique differs substantially from other minimally invasive anti-glaucoma laser techniques like ALT or SLT. The latter techniques induce tissue alterations by means of heat or a tissue remodelling, respectively. This is the reason, why the IOP-lowering effect of ALT and SLT is fading within month to years. After ELT, the edges of the openings are found to be very smooth\textsuperscript{41,43} thus minimizing wound healing and contributing to a long-lasting IOP reduction over years.

If needed subsequently, filtering surgery is not compromised after ELT because there is no conjunctival touch during surgery and therefore no scarring or inflammation of the conjunctiva is induced that would adversely influence the outcome of subsequent trabeculectomy. In addition, ELT treats only 90° of the TM. It is possible to repeat treatment in the remaining three quadrants of the TM when primary treatment is not sufficient.

In a previous study, we showed the success of Phaco-ELT in a smaller sample size only with a preoperative IOP >21mmHg.\textsuperscript{56} We found an IOP decrease of 8.79±5.28 mmHg (-34.70%, p<0.001) and AGD could be reduced by 0.79±1.50 (-62.70%, p=0.017) medications at the same time. This is in accordance with other studies.\textsuperscript{44-46} In this study we investigate if Phaco-ELT is also a feasible and effective option in patients with lower preoperative IOP.

We found a satisfying IOP reduction in those eyes with lower IOP, although less than observed in those eyes with higher pre-operative IOP (-1.77mmHg, -10.89% in group 1 vs. -8.80mmHg, -34.87% in group 2). This could be explained by the pressure gradient between anterior chamber and episcleral venous pressures. Episcleral venous pressure is nearly constant. Therefore, the pressure gradient and the effect of Phaco-ELT is directly dependent on IOP.

It is known that phacoemulsification itself is able to lower IOP.\textsuperscript{57-61} The IOP reduction of Phaco-ELT is greater than that of cataract surgery alone. One likely explanation is the deepening of the chamber angle by extracting the thickened opaque lens, and subsequently enhanced drainage of aqueous humor. Considering this, the IOP reduction we found
following Phaco-ELT is a combined effect of both the phacoemulsification and the ELT. This has also been shown by prior studies comparing ELT alone with Phaco-ELT. Recently the Ocular Hypertension Treatment Study (OHTS) group analyzed their data to assess the IOP-lowering effect of cataract extraction. Their cataract group had an IOP comparable to our group 2. They found an IOP decrease of 4.1mmHg (16.5%) after cataract extraction, whereas the IOP remained unchanged in their control group of patients who did not undergo cataract extraction. We found an average IOP reduction of 8.80mmHg (34.87%) after Phaco-ELT. It was also possible to reduce the AGD by an average of 0.84 (37.50%). The combined effect of Phaco and ELT markedly exceeds that of cataract extraction alone as found by the OHTS group. IOP fluctuation is a risk factor for glaucoma progression. Phacoemulsification may lower IOP but may not have a substantial influence on IOP fluctuation whereas ELT probably have additional positive influence on IOP fluctuation. This should be evaluated in a further study by including diurnal IOP evaluation.

We found a success rate of 47.94% for Phaco-ELT after 12 months (76.00% for group 2). The success rate for group 2 is very similar to that previously published for trabeculectomy. This is remarkable considering the minimally invasive character of this technique, which is the main advantage of ELT. However, success rates after trabeculectomy are mostly reported without medication whereas our success rates are with or without medication. After trabeculectomy local antigloucamatous medication would potentially compromise the long-term efficacy of the filtering bleb by inflammation and scarring. After Phaco-ELT medications could by applied without that risk. Therefore, we do not classify medical treatment after Phaco-ELT as a treatment failure as long as the number of medications is equal or less compared to the preoperative number.

A weakness of our study is the absence of a group undergoing only phacoemulsification, to act as a control. The IOP-lowering effect of phaco has been widely investigated. A longer follow-up period of more than five years is currently ongoing and the results will be reported later when complete. Included in this study are patients with a range of glaucomas with different pathological mechanisms. The TM, especially the
juxtacanaliculc region of TM, is known to have the highest aqueous outflow resistance. This is the major cause of elevated IOP in primary open angle glaucoma. ELT is bypassing this outflow pathway. The aqueous humor is guided directly from the anterior chamber into the collector channels. Therefore, the underlying mechanism of the glaucoma is irrelevant as long as the elevated IOP is caused by an elevated outflow resistance in the TM.

Conclusion

For a selected collective of glaucoma patients with at least a moderate cataract and who do not need the lowest target pressures, and in particular for those with an IOP over 21 mmHg, the combined surgery of excimer laser trabeculotomy and phacoemulsification (Phaco-ELT) seems to be a good way to avoid or at least to delay trabeculectomy for some years. But also for patients with an IOP of 21 mmHg or lower, additional ELT at the same time as cataract surgery is a good option to lower IOP.
Competing interests

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper. No financial support was received.

Authors’ contributions

MTH, JVMH and JF contributed to the study design, the data analysis, interpretation of the data, the discussion, and manuscript writing.

MTH and JF contributed to ophthalmologic data collection.

All authors three authors read and approved the final manuscript.
References:


**Figure legends:**

**Figure 1**
Under endoscopic guidance, ten laser spots were applied into the trabecular meshwork spread over an area of 90°. Immediately before laser transmission, the probe is in direct contact to the trabecular meshwork.

**Figure 2**
After laser application a formation of bubbles could be seen together with a small retrograde bleeding.
Table legends:

**Table 1**
Technical data of the AIDA excimer laser

**Table 2**
Demographic Data

**Table 3**
Dropouts due to IOP-lowering surgery during follow up
(RE = right eye, LE = left eye, VA = Visual acuity, HM = hand movement, pre = before Phaco-ELT, post = 12 month ± 2 weeks after Phaco-ELT, CPC = trans-conjunctival cyclophotocoagulation, SLT = selective laser trabeculoplasty, TE = trabeculotomy, TA = triamcinolone acetate, IVI = intravitreal injection)

**Table 4**
Statistical data of BCVA (Snellen), IOP (mmHg) and AGD (numbers) pre and post Phaco-ELT
(G1 = group 1 or study group, G2 = group 2 or control group, pre = before Phaco-ELT, post = 12 month after Phaco-ELT, SD = standard deviation, CI = confidence interval)

**Table 5**
Increase in BCVA (Snellen) and reduction in IOP (mmHg) and AGD (numbers), comparing values pre to post Phaco-ELT
(pre = before Phaco-ELT, post = 12 month after Phaco-ELT, SD = standard deviation, SG1 = group 1 or study group, G2 = group 2 or control group, * = statistically significant)
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<th>Parameter</th>
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<td>Cooling</td>
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<td>Pulse duration</td>
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<td>Repetition rate</td>
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<td>Length of fiber</td>
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**Table 1**
Technical data of the AIDA excimer laser
Number of study eyes: 73 (31 right and 42 left eyes) from 64 patients
mean age: 76.51±9.36 years
gender: 22 males (34.38%) / 42 females (65.63%)

Diagnosis:
- Primary open angle glaucoma: 21 (32.81%)
- Pseudoexfoliative glaucoma: 37 (57.81%)
- Normal-tension glaucoma: 2 (3.13%)
- Ocular hypertension: 4 (6.25%)

Group 1 (IOP pre Phaco-ELT ≤21 mmHg):
Number of eyes: 39 (15 right and 24 left eyes)
mean age: 79.24±8.30 years
gender: 13 males (33.33%) / 26 females (66.67%)

Group 2 (IOP pre Phaco-ELT >21 mmHg):
Number of eyes: 25 (13 right and 12 left eyes)
mean age: 74.86±12.22 years
gender: 8 males (32.00%) / 17 females (68.00%)

Table 2
Demographic Data
<table>
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<th>Study-No.</th>
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<th>VA pre</th>
<th>IOP pre</th>
<th>AGD pre</th>
<th>VA post</th>
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<tr>
<td>55</td>
<td>S.H.</td>
<td>15/07/1941</td>
<td>F</td>
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<td>LE</td>
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<td>HM</td>
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<td>4</td>
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<td>38</td>
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<td>RE</td>
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<td>4</td>
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<td>28</td>
<td>3</td>
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<td>LE</td>
<td>PEX</td>
<td>0.1</td>
<td>17</td>
<td>3</td>
<td>0.4</td>
<td>22</td>
<td>3</td>
<td>CPC, 1x TA-IVI, 4x Avastin-IVI (due to Irvine-Gass syndrome)</td>
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</table>

**Table 3**
Details of patients that required further IOP-lowering surgery during the follow-up period (failed interventions).
(RE = right eye, LE = left eye, VA = Visual acuity, HM = hand movements, pre = before Phaco-ELT, post = 12 months ± 2 weeks after Phaco-ELT, CPC = trans-conjunctival cyclophotocoagulation, SLT = selective laser trabeculoplasty, TE = trabeculotomy, TA = triamcinolone acetate, IVI = intravitreal injection)
<table>
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<tr>
<td></td>
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<td>post</td>
<td>pre</td>
<td>post</td>
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<td>post</td>
</tr>
<tr>
<td>Mean</td>
<td>± SD</td>
<td>95 % CI</td>
<td>Mean</td>
<td>± SD</td>
<td>95 % CI</td>
<td>Mean</td>
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<tr>
<td>All</td>
<td>0.43 ± 0.24</td>
<td>0.37 – 0.48</td>
<td>0.76 ± 0.27</td>
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<td>18.41 – 20.98</td>
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<td>G1</td>
<td>0.42 ± 0.23</td>
<td>0.34 – 0.49</td>
<td>0.76 ± 0.25</td>
<td>0.68 – 0.85</td>
<td>16.26 ± 3.00</td>
<td>15.28 – 17.23</td>
</tr>
<tr>
<td>G2</td>
<td>0.46 ± 0.25</td>
<td>0.35 – 0.56</td>
<td>0.78 ± 0.29</td>
<td>0.66 – 0.90</td>
<td>25.24 ± 2.83</td>
<td>24.07 – 26.41</td>
</tr>
</tbody>
</table>

**Table 4**
Statistical data of BCVA (Snellen), IOP (mmHg) and AGD (numbers) pre and post Phaco-ELT
(G1 = group 1 or study group, G2 = group 2 or control group, pre = before Phaco-ELT, post = 12 month after Phaco-ELT, SD = standard deviation, CI = confidence interval)
<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD</th>
<th>Percentage</th>
<th>Confidence Interval</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All eyes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>∆ BCVA (post-pre)</td>
<td>+0.33 ± 0.26</td>
<td>+76.74 %</td>
<td>-0.40 – -0.27</td>
<td>p&lt;0.001 *</td>
</tr>
<tr>
<td>∆ IOP (post-pre)</td>
<td>-4.29 ± 5.87 mmHg</td>
<td>-21.78 %</td>
<td>2.85 – 5.73</td>
<td>p&lt;0.001 *</td>
</tr>
<tr>
<td>∆ AGD (post-pre)</td>
<td>-0.97 ± 1.39</td>
<td>-41.81 %</td>
<td>0.63 – 1.31</td>
<td>p&lt;0.001 *</td>
</tr>
<tr>
<td>G1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>∆ BCVA (post-pre)</td>
<td>+0.35 ± 0.26</td>
<td>+83.33 %</td>
<td>-0.43 – -0.26</td>
<td>p&lt;0.001 *</td>
</tr>
<tr>
<td>∆ IOP (post-pre)</td>
<td>-1.77 ± 4.37 mmHg</td>
<td>-10.89 %</td>
<td>0.35 – 3.19</td>
<td>p=0.020 *</td>
</tr>
<tr>
<td>∆ AGD (post-pre)</td>
<td>-1.05 ± 1.36</td>
<td>-45.06 %</td>
<td>0.61 – 1.49</td>
<td>p&lt;0.001 *</td>
</tr>
<tr>
<td>G2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>∆ BCVA (post-pre)</td>
<td>+0.32 ± 0.27</td>
<td>+69.57 %</td>
<td>-0.43 – -0.21</td>
<td>p&lt;0.001 *</td>
</tr>
<tr>
<td>∆ IOP (post-pre)</td>
<td>-8.80 ± 5.16 mmHg</td>
<td>-34.87 %</td>
<td>6.67 – 10.93</td>
<td>p&lt;0.001 *</td>
</tr>
<tr>
<td>∆ AGD (post-pre)</td>
<td>-0.84 ± 1.49</td>
<td>-37.50 %</td>
<td>0.23 – 1.46</td>
<td>p=0.010 *</td>
</tr>
</tbody>
</table>

Table 5
Increase in BCVA (Snellen) and reduction in IOP (mmHg) and AGD (numbers), comparing values pre to post Phaco-ELT
(pre = before Phaco-ELT, post = 12 month after Phaco-ELT, SD = standard deviation, G1 = group 1 or study group, G2 = group 2 or control group, * = statistically significant)