Phacoemulsification as a Primary Treatment Modality for Chronic Angle Closure Glaucoma

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Abstract: Purpose: to study the efficacy and safety of phacoemulsification with intraocular lens implantation for controlled angle closure glaucoma. Design: prospective non randomized comparative study. Methods: 50 eyes of 36 patients were included in the study. 25 eyes were treated by primary phacoemulsification with IOL implantation (IOL group) and 25 eyes were treated by laser iridotomy (LI group). IOP, number of antiglaucoma medications, corneal endothelial cell counts were assessed in each group. Results: in IOL group, IOP was significantly reduced from preoperative mean of 16.01±0.27 mmHg to a 6 months postoperative mean of 11.68±0.12 mmHg (P=0.001). However in LI group, the mean preoperative IOP was 15.99±0.003 mmHg and the 6 months postoperative IOP was 15.95±0.20 (P=0.264). In IOL group, no cases used antiglaucoma medications 6 months postoperatively while in LI group the mean number of antiglaucoma medications was 0.23±0.04 (P=0.0001). There were no significant differences in preoperative and postoperative corneal endothelial cell counts between IOL & LI groups (P=0.63). Conclusion: phacoemulsification with intraocular lens implantation for controlled CACG is a safe and effective method in reducing IOP, so the procedure could be the treatment of choice for controlled CACG with cataract.

Keywords: phacoemulsification- chronic angle closure glaucoma (CACG) - cataract- laser

Aim of the work
To study the efficacy and safety of phacoemulsification plus IOL implantation for controlled CACG.

2. Patients and Methods
Prospective study of 50 eyes of 36 patients were treated for CACG between Sept. 2009 and April 2011.

Patients with cataract, no history of previous ocular surgeries, and whose IOP was controlled with or without anti-glaucoma medications were included in the study.

The eyes with uncontrolled CACG were excluded from the study due to the possibility of additional glaucoma surgery that may be needed.

All patients underwent comprehensive examination which included:
- Slit lamp examination that showed peripheral anterior chamber as narrow as one third of the corneal thickness or less, using the van Herick method.
- Gonioscopic examination that revealed Shaffer lor2 and peripheral anterior synchia without iritis and inflammatory nodules.
- Fundus examinations reveal glaucomatous optic disc excavation.
- Visual field examination showed field defect that led to diagnosis of CACG.

Following informed consent, 25 eyes were treated by primary phacoemulsification plus IOL implantation (IOL group) and 25 eyes were treated by laser iridotomy as a method to relieve pupillary block (LI group).
Operative procedures were as follows: under periocular anesthesia, 2.8 cm corneal incision was made after Continuous curvilinear Capsulorhexis using a 25-gauge bent needle, standard phacoemulsification was performed.

A foldable hydrophilic acrylic posterior chamber IOL with 6.0 mm optic was implanted through 3.2 mm corneal tunnel.

Mean while, LI using combined argon and Nd YAG laser surgery was performed as follows: several shots of green laser light (power 0.15-0.2w, spot size 300µm, and duration 0.2s). 50-100 shots with power of 0.85-1w, 50 µm spot size, and 0.02-0.2s duration were done.

Next, several pulses of Nd: YAG laser with power of (1.3-2.3mj) were repeated until a patent iridotomy was formed.

IOP and number of antiglaucoma medications were assessed in each group preoperatively and 1, 3, 6 months postoperatively. IOP was measured using a Goldman applanation tonometer. Preoperative and postoperative corneal endothelial cell counts were compared between each group.

3. Results

Preoperative patients' demographics including age, sex did not significantly differ between the two groups (Table 1).

Table 1. Mean IOPs before treatments and 1, 3, 6 months after treatment are shown in table 2.

<table>
<thead>
<tr>
<th>Group</th>
<th>Sex (men/women)</th>
<th>Mean age (years)</th>
<th>Range (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOL</td>
<td>3/17</td>
<td>71.3±2.8</td>
<td>(58-83)</td>
</tr>
<tr>
<td>LI</td>
<td>4/12</td>
<td>70.2±5.2</td>
<td>(53-82)</td>
</tr>
</tbody>
</table>

Comparison included mean IOP in mmHg, mean number of antiglaucoma medications and mean corneal endothelial cell count.

Table 2 shows mean number of antiglaucoma medications before and after treatment.

Table (2) shows mean number of antiglaucoma medications before and after treatment. LI group, mean number of anti-glaucoma medications decreased to 0.23±0.04 (p=0.0001). Both groups showed a 6 months postoperatively significantly reduced numbers of medications. There were no significant differences in preoperative & postoperative corneal endothelial cell counts between IOL & LI group (P= 0.63) (Table 2).

Comparison included mean IOP in mmHg, mean number of antiglaucoma medications and mean corneal endothelial cell count.

* By using independent samples t test

![Graph showing IOP changes over time](image-url)
4. Discussion

Angle closure glaucoma is an ocular anatomical disorder characterized by closure of drainage angle by oppositional or synchial approximation of iris against the trabecular meshwork, blocking its access to aqueous humor.

Pupillary block is the most frequent and important mechanism responsible for angle closure but in many cases it is not the only mechanism involved (6,9-11).

These pathologic mechanisms exist because of primary anatomic variations in size, position and relationship of the anterior segment structures. Treatment of primary angle closure glaucoma and cataract involves the relief of pupillary block using either laser iridotomy or phacoemulsification with IOL implantation.

Also glaucoma surgery alone or combined glaucoma with cataract surgery may be beneficial.

Many studies described that cataract surgery with IOL implantations deceased IOP in eyes with angle closure glaucoma (1,5,7,8,12-14), only fewer studies on phaco & IOL implantations for CACG before relief of pupillary block (5,12-14).

We found that primary phacoemulsification with IOL implantation significantly deceased IOP at 6 months postoperatively (Figure 2, Table 2),
indicating that IOL implantation not only relieved pupillary block but also reduced IOP. While LI did not reduce IOP within 6 months.

The explanation of such effect is that IOL implantation make anterior chamber wide and deep which may lead to decease of IOP as described by Hayashik et al. (6)

Also IOL implantation can relieve pupillary block completely while LI may not relieve it completely. (9-11)

Both groups in our study showed significantly reduced number of anti-glaucoma medications (Table 2).

So both IOL implantation and laser iridotomy improved CACG. Moreover, 3 and 6 months postoperatively, no cases used anti-glaucoma medications in phaco & IOL group.

This indicates that IOL implantations are more effective in decreasing the number of anti-glaucoma medications than LI.

To evaluate the safety of phaco & IOL implantations, we compared pre operative & postoperative corneal endothelial counts between the two groups (Table 2).

There was no significant difference between the phaco & IOL group and LI group indicating that phaco and IOL implantations were as safe as LI.

Conclusions
Phacoemulsification with intraocular lens implantation for control of CACG is a safe and effective method in decreasing IOP.

So this procedure could be the treatment of choice for controlled CACG with cataract.

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