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 antiglucoma medications, corneal endothelial cell counts were assessed in each group. **Results:** in IOL group, IOP was significantly reduced from preoperative mean of 16.014±0.27mmHg to a 6 months postoperative mean of 11.68±0.12mmHg (*P*=0.001). However in LI group, the mean preoperative IOP was 15.99±0.003mmHg and the 6 months postoperative IOP was 15.95±0.20 (*P*=0.264). In IOL group, no cases used antiglucoma medications 6 months postoperatively while in LI group the mean number of antiglucoma 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.
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1. Introduction:

Chronic angle closure glaucoma (CACG) is a leading cause of blindness and is potentially preventable

The lens plays an essential and pivotal role in the pathogenesis of primary and secondary angle closure glaucoma [1,2]

Clinical studies suggest that lensectomy and posterior chamber intraocular lens (IOL) implantation for Controlled chronic angle closure glaucoma (CACG) or primary angle closure (PAC) patients may offer successful IOP control, and maintenance of improved vision

Lensectomy eliminates pupillary block, widens the angle to lessen angle crowding, thus reducing the iridotrabecular proximity, and is the only treatment alternative that reduces if not corrects the responsible anatomic predisposition to angle closure [6]

Medical management and laser irodotomy (LI) remain the most common modes of treatment of an acute attack and controlled chronic angle cloture glaucoma.[1]

Newer approaches including early lens removal are gaining popularity because of their potential long term success in intraocular pressure (IOP) control.[1-4]

For eyes with CACG and cataract, treatment involves either LI followed by cataract surgery or primary phacoemulsification and IOL implantation.

Many studies described that phacoemulsification with PC-IOL implantation decreased IOP in eyes with angle closure glaucoma. [1-5]

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:

Stit lamp examination that showed peripheral anterior chamber as narrow as one third of the corneal thickness or less, using the van Herick method.

Goniscopic 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, 2.8cm 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 irodotomy 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.

	IOL group	LI group
Sex (men/women)	3/17	4/12
Mean age ± SD (years)	71.3±2.8	70.2±5.2
Range (years)	(58-83)	(53-82)

Figure (1) there was no significant differences in mean preoperative IOPs between the 2 groups. Following treatment, mean IOPs in the IOL group were significantly reduced from a preoperative mean of 16.014±0.27 mmHg to a 6 month postoperative mean of 11.68±0.12 mmHg (p=0.001).

In LI group, no significant difference in IOP was found between pre-and postoperative time (15.99±0.03 mmHg preoperatively and 15.95±0.20 mmHg at 6 month postoperatively) (P=0.264).

There was significant difference between 6 month postoperative IOP between the two groups (P= 0.0001).

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

There was not significant difference in preoperative mean numbers between the 2 groups.

No cases used anti- glaucoma medications 6 months postoperatively in IOL group whereas in the 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).

Table (2) comparison between laser (n=25) &IOL (n=25) groups*

	Group	Mean	Std. Deviation	t	p-value
Number of Antiglaucoma medications (preoperative)	IOL	.6514	.0124	0.726	.471 Not significant
	laser	.6540	.0129		
Number of Antiglaucoma medications (1month postoperative)	IOL	.0832	.0497	22.918	.0001 Significant
	laser	.3260	.0182		
Number of Antiglaucoma medications (3month postoperative)	IOL	.0852	.0564	14.654	.000 Significant
	laser	.2813	.0359		
Number of Antiglaucoma medications (6month postoperative)	IOL	.00026	.0003	28.898	.0001 Significant
	laser	.23080	.0398		
IOP (preoperative)	IOL	16.0148	.27356	.342	.734 Not significant
	laser	15.9960	.03000		
IOP (1month postoperative)	IOL	12.4424	.03689	397.488	.0001 Significant
	laser	16.0136	.02564		
IOP(3month postoperative)	IOL	12.1160	.09014	138.469	.0001 Significant
	laser	15.9876	.10686		
IOP(6month postoperative)	IOL	11.6840	.12453	88.010	.0001 Significant
	laser	15.9480	.20779		
Corneal endothelial cell count (preoperative)	IOL	2646.80	37.58	.557	.580 Not significant
	laser	2641.24	32.77		
Corneal endothelial cell count (postoperative)	IOL	2623.64	39.76	0.482	.632 Not significant
	laser	2628.60	32.568		

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

* By using independent samples t test

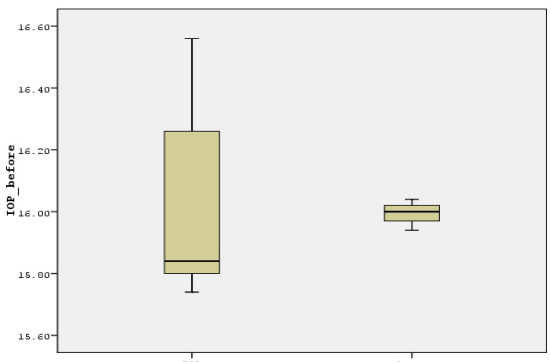

Figure (1) Showing comparison between IOL and laser groups regarding IOP (preoperative)

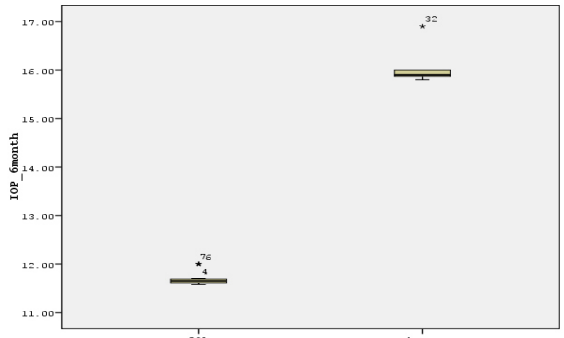

Figure (2) Showing comparison between IOL and laser groups regarding IOP (6 months postoperative)

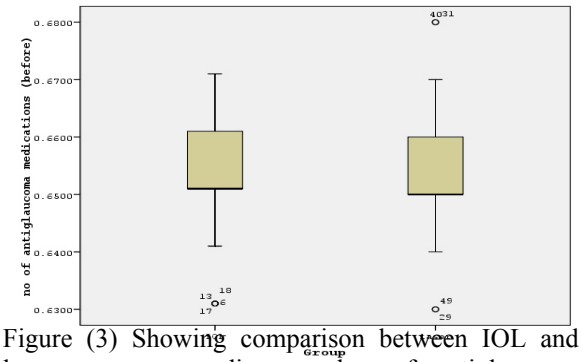

Figure (3) Showing comparison between IOL and laser groups regarding number of antiglaucoma medications (preoperative)

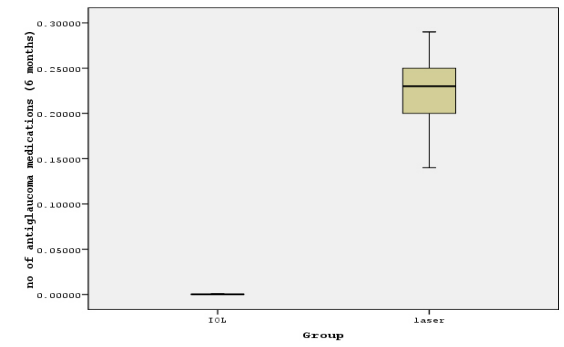

Figure (4) Showing comparison between IOL and laser groups regarding number of antiglaucoma medications (6 months postoperative)

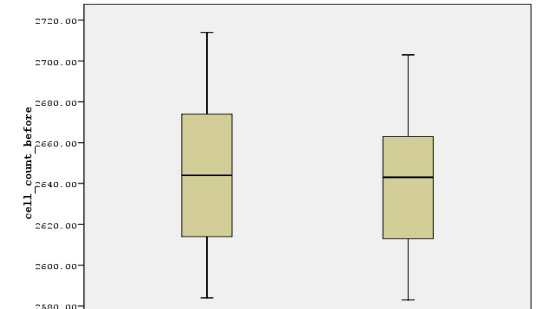

Figure (5) Showing comparison between IOL and laser groups regarding corneal endothelial cell count (preoperative)

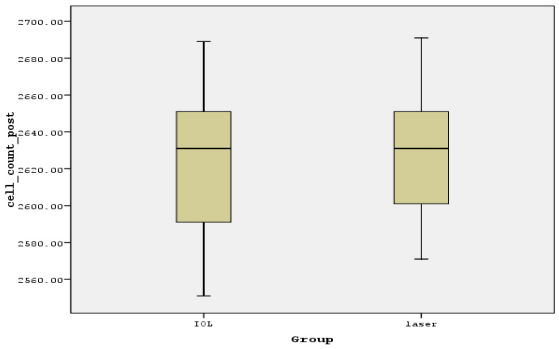

Figure (6) Showing comparison between IOL and laser groups regarding corneal endothelial cell count (postoperative)

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. [3,12-14]

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 (Table2).

So both IOL implantation and laser iridotomy improved CACG. Moreover, 3and 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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