

EVALUATION OF CHANGES IN IOP FOLLOWING PHACOEMULSIFICATION WITH PCIOL IMPLANTATION AND ITS CORRELATION WITH OCULAR BIOMETRIC PARAMETERS

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ABSTRACT

Background: Phacoemulsification with PCIOL decrease the intraocular pressure proportional to the intraocular pressure seen preoperatively. Various preoperative factors are associated with the reduction of IOP postoperatively.

Aim: The present study was conducted to assess the cataract surgery phacoemulsification with PCIOL implantation on intraocular pressure postoperatively and the to assess the relationship between preoperative ocular parameters including AL ACD, AL, and CCT with IOP change postoperatively.

Methods: In 262 subjects from both the genders with cataract were treated surgically with phacoemulsification and PCIOL implantation. Following surgery, all the subjects were followed up on 1st operative surgical day and 1 month postoperatively for ocular biometric parameters and reduction in IOP.

Results: BCVA in the study subjects via LogMAR chart was 1-0.76 preoperatively and was 0.16-0 postoperatively. BCVA using Snellen chart was 72% preoperatively which reduced to 67% postoperatively. ACD preoperatively was 3.25±0.26 which increased significantly to 3.64±0.29 (p<0.001). Mean IOP in the operated eyes was 13.42±1.98mm Hg which decreased postoperatively to 11.50±1.68 significantly (p<0.001). It was seen that mean IOP preoperatively was 13.46±1.96 mmHg which decreased postoperatively to 11.56±1.64 mmHg. The change in mean IOP at 1 month recall was 1.92±0.59 mmHg. The IOP change at 1 month in percentage was 14.11%. This change in mean Intraocular pressure was statistically significant with p<0.001.

Conclusion: The present study concludes that following phacoemulsification with PCIOL implantation results in reduced intraocular pressure significantly in normal eyes with cataract especially associated with age. Additively, compared to preoperative intraocular pressure, ACD

is associated significantly with the postoperative reduction in the intraocular pressure in subjects with Cataract.

Keywords: Cataract, Intraocular pressure, phacoemulsification, ocular parameters, PCIOL

INTRODUCTION

One of the oldest performed surgical intervention in ophthalmology is the cataract surgery performed and mentioned in literature since 15th century B.C. This surgery has passed through many stages before reaching its final face through Extra Capsular Cataract Extraction (ECCE), Intra Capsular Cataract Extraction (ICCE), couching, and Phacoemulsification. Phacoemulsification was introduced in Ophthalmology in the year 1967 by Dr. Charles Kelmen. Various previous literature data suggests the effectiveness of phacoemulsification and cataract surgery in reducing the IOP in glaucomatous and normotensive eyes which also helps in reducing antiglaucoma drugs number and in controlling IOP.¹

A large number of literature studies have suggested that cataract surgery with phacoemulsification in long term helps in decreasing the intraocular pressure (IOP). The mechanism that leads to decrease the intraocular pressure following cataract surgery with phacoemulsification is poorly understood. However, several hypotheses are considered behind this including improved trabecular outflow due to deepening of the anterior chamber, hyposecretion of aqueous humor due to production of free radicals or irritation, and/or or phacoemulsification-induced stress remodeling from the ultrasonic vibrations, which is an effect same as seen in laser trabeculoplasty.²

Precise assessment of the subjects to identify where decreased IOP will result following cataract surgery procedure can affect the inclusion of particular subjects in the surgery. It is indicated to assess whether only cataract surgery alone will decrease IOP adequately or whether an associated glaucoma procedure will be needed. It is usually seen that the subjects with high preoperative intraocular pressure shows greatest postoperative reduction in IOP in long-term.³

In the recent past, various literature studies have shown that Phacoemulsification with PCIOL decrease the intraocular pressure proportional to the intraocular pressure seen preoperatively. Various preoperative factors are associated with the reduction of IOP postoperatively. Various ocular parameters are assessed effectively both preoperatively as well as postoperatively with the use of Pachymeter, GoldmannApplanation Tonometer (GAT), and Optical Coherence Biometer (IOL Master), like modern and latest technologies.⁴

Various literature studies have assessed the effects of biometric ocular parameters on intraocular pressure reduction postoperatively after phacoemulsification surgery. Very few studies have assessed long-term IOP reduction.⁵ Hence, the present study was conducted to assess the cataract surgery phacoemulsification with PCIOL implantation on intraocular pressure postoperatively and the to assess the relationship between preoperative ocular parameters including AL (axial

length), ACD (anterior chamber depth), and CCT (Central corneal thickness) with IOP change postoperatively.

MATERIALS AND METHODS

The present prospective observational study was conducted to assess the cataract surgery phacoemulsification with PCIOL implantation on intraocular pressure postoperatively and the to assess the relationship between preoperative ocular parameters including AL ACD, AL, and CCT with IOP change postoperatively. The study population was comprised by the subjects visiting the Department of Ophthalmology of the institute with the cataract.

The study included a total of 262 subjects from both the genders. After explaining the detailed study design, informed consent was taken from all the subjects. The exclusion criteria for the study were subjects having traumatic cataract and per operative complications, retinal disease, systemic disease, complicated cataract, glaucomatous eyes, and pediatric cataract. After final inclusion, a detailed medical history, family history, surgical history, drug history, and ophthalmic history was recorded for all the subjects. This was followed by detailed fundal examination in slit lamp examination. Day before surgery and 1-month postoperative BCVA (Best Corrected Visual Activity) was recorded using LogMAR chart and Snellen chart.

With appropriate sterilization and maintenance, Preoperative and postoperative IOP was measured with GAT between 10-12am in the morning. CCT was measured using Pachymeter, whereas, axial length and ACD was measured with Optical Coherence Biometer. Except for the dilating drop, subjects were refrained from using any topical medication prior to the surgery. Following surgery, all subjects were treated with 0.1% Diclofenac sodium, 1% Prednisolone acetate, and 0.5% Moxifloxacin eye drops for 6 weeks. At the same time, IOP was measured in the non-treated eye.

After final inclusion, prior to the surgery, pupillary dilatation was done using a combination of 2.5% Phenylephrine and 1% Tropicamide in topical drop form every 15 minutes for 45 minutes for the operated eye. Under sterile and aseptic conditions, peribulbar block was given using 2% Lignocaine and 0.5% Bupivacaine combination with a side-port incision. All the surgical procedures were performed by single expert surgeon in the field using micro-coaxial system using conventional approach. No sutures were given on incisions.

Following surgery, all the subjects were followed up on 1st operative surgical day and 1 month postoperatively. The collected data were subjected to the statistical evaluation using SPSS software 18.0 and one-way ANOVA for the results fabrication. A p-value of <0.05 was considered statistically significant.

RESULTS

The present study was conducted to assess the cataract surgery phacoemulsification with PCIOL implantation on intraocular pressure postoperatively and the to assess the relationship between preoperative ocular parameters including AL ACD, AL, and CCT with IOP change postoperatively. The study included a total of 262 subjects from both the genders. The ocular

parameters assessed in the study preoperatively and postoperatively are summarized in Table 1. It was seen that mean age of the study subjects was 63.86 ± 4.03 preoperatively as well as postoperatively.

There were 62% males and 38% females in the present study. BCVA in the study subjects via LogMAR chart was 1-0.76 preoperatively and was 0.16-0 postoperatively. This difference was statistically non-significant. BCVA using Snellen chart was 72% preoperatively which reduced to 67% postoperatively. This was statistically non-significant. CCT in μm was 549.59 ± 25 preoperatively which did not change postoperatively. AL WAS $23.55 \pm 0.75\text{mm}$ preoperatively which showed a very minor change postoperatively to 23.56 ± 0.75 . ACD preoperatively was 3.25 ± 0.26 which increased significantly to 3.64 ± 0.29 ($p < 0.001$). Mean IOP in the operated eyes was $13.42 \pm 1.98\text{mm Hg}$ which decreased postoperatively to 11.50 ± 1.68 significantly ($p < 0.001$), while change of IOP in non-treated eyes was non-significant.

The present study focused on assessing the changes in the mean IOP following phacoemulsification with PCIOL implantation. It was seen that in total 262 eyes considered in the study, it was seen that mean IOP preoperatively was $13.46 \pm 1.96\text{ mmHg}$ which decreased postoperatively to $11.56 \pm 1.64\text{ mmHg}$. The change in mean IOP at 1 month recall was $1.92 \pm 0.59\text{ mmHg}$. The IOP change at 1 month in percentage was 14.11%. This change in mean Intraocular pressure was statistically significant with $p < 0.001$ as shown in Table 2.

DISCUSSION

The present study was conducted to assess the cataract surgery phacoemulsification with PCIOL implantation on intraocular pressure postoperatively and the to assess the relationship between preoperative ocular parameters including AL ACD, AL, and CCT with IOP change postoperatively. Following surgery, all the subjects were followed up on 1st operative surgical day and 1 month postoperatively. The study included a total of 262 subjects from both the genders. It was seen that mean age of the study subjects was 63.86 ± 4.03 preoperatively as well as postoperatively.

There were 62% males and 38% females in the present study. BCVA in the study subjects via LogMAR chart was 1-0.76 preoperatively and was 0.16-0 postoperatively. This difference was statistically non-significant. BCVA using Snellen chart was 72% preoperatively which reduced to 67% postoperatively. This was statistically non-significant. CCT in μm was 549.59 ± 25 preoperatively which did not change postoperatively. AL WAS $23.55 \pm 0.75\text{mm}$ preoperatively which showed a very minor change postoperatively to 23.56 ± 0.75 . ACD preoperatively was 3.25 ± 0.26 which increased significantly to 3.64 ± 0.29 ($p < 0.001$). Mean IOP in the operated eyes was $13.42 \pm 1.98\text{mm Hg}$ which decreased postoperatively to 11.50 ± 1.68 significantly ($p < 0.001$), while change of IOP in non-treated eyes was non-significant. These results were consistent with the studies of Mensberger SL⁶ in 2012 and Majstruk L et al⁷ in 2019 where authors reported ocular parameters comparable to the present study.

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CONCLUSION

Within its limitations, the present study concludes that following phacoemulsification with PCIOL implantation results in reduced intraocular pressure significantly in normal eyes with cataract especially associated with age. Additively, compared to preoperative intraocular pressure, ACD is associated significantly with the postoperative reduction in the intraocular pressure in subjects with Cataract. Also, postoperative IOP reduction was significantly proportional to IOP preoperatively. However, the present study had a few limitations including small sample size, short study duration, and geographical area biases. Hence, more longitudinal studies with a larger sample size and longer monitoring period will help reach a definitive conclusion.

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TABLES

Variables	Preoperative	Postoperative	p-value
Mean Age (years)	63.86±4.03	63.86±4.03	-
Gender			Not significant
Males	62%	62%	Not significant
Females	38%	38%	Not significant
BCVA (LogMAR Chart)	1-0.76	0.16-0	Not significant
BCVA (Snellen chart)	72%	67%	Not significant
CCT μm	549.59±25	549.59±25	Not significant
AL mm	23.55±0.75	23.56±0.75	Not significant
ACD mm	3.25±0.26	3.64±0.29	<0.001
IOP mmHg (Eye treated)	13.42±1.98	11.50±1.68	<0.001
IOP mmHg (Eye not treated)	13.4±2.8	13.3±2.6	Not significant

Table 1: Ocular parameters in the study subjects preoperatively and postoperatively (BCVA: Best-corrected visual activity)

Eyes (n)	Mean IOP (preoperative)	Mean IOP (postoperative)	IOP change at 1 month	IOP change at 1 month (%)	p-value
262	13.46±1.96	11.56±1.64	1.92±0.59	14.11	<0.001

Table 2: Change in IOP following phacoemulsification with PCIOL implantation in the study subjects