



## A STUDY OF CHANGE IN INTRAOCULAR PRESSURE AFTER CATARACT SURGERY IN MYOPIC AND EMMETROPIC PATIENTS IN THE IMMEDIATE POSTOPERATIVE PERIOD

### Ophthalmology

**Rajkumar Chopra** MS ophthalmology.

**Manish Sharma** MS ophthalmology.

**Shashidhar Harvyasi** MS ophthalmology.

**Kavita Gahanoliya\*** MS ophthalmology. \*Corresponding Author

**Kishor Kumar** MS ophthalmology.

### ABSTRACT

**Purpose:** This observational study aim to determine how myopic and emmetropic individuals' intraocular pressure changed following cataract surgery in the immediate postoperative period. **Methods:** This was a hospital based prospective observational study. Hundred subjects with myopia and emmetropia each who underwent cataract surgery were included in the study based on appropriate inclusion and exclusion criteria. Baseline characteristics, visual acuity and IOP were measured at different time interval. Data was analysed using SPSS version 25. **Results:** Intraocular pressure (IOP) initially was raised at post-operative day 1 from baseline in both study groups and then it starts declining at post-operative day 7, day 30 and day 90 in both groups. IOP of subjects with myopia was slightly higher in post-operative period ( $p>0.05$ ). **Conclusion:** The study results show that irrespective of any refractory conditions, cataract surgery had a lowering effect on IOP. Patients with extreme myopia, however, displayed a slower rate of IOP reduction.

### KEYWORDS

Cataract Surgery, Intraocular Pressure, Myopia, Emmetropia

### INTRODUCTION

A cataract is an opacification or clouding of the eye's normally clear lens or its capsule, which prevents light from passing through the lens and onto the retina.<sup>1</sup> Any age group can develop cataracts, but the elderly are more likely to develop them.<sup>2</sup> According to data on persons aged 50 years or more, 295 million people have moderate to severe visual impairment and 43.3 million people were blind in 2020, globally.<sup>3</sup>

The most common surgeries performed on cataract patients are small incision cataract surgery and modern phacoemulsification, both of which are minimally invasive ocular procedures with quick recovery times.<sup>9</sup> Complications that arise during or after the surgery have an impact on the final visual outcome. Unavoidable early transient IOP rises are among the most frequent consequences. After cataract surgery, the IOP may considerably increase during the first 24 hours and returns back to normal within three days. Ocular discomfort, corneal oedema, and optic nerve damage are effects of high IOP. Although postoperatively increased IOP is typically temporary, it might raise a patient's risk of problems that could result in blindness, including as retinal vascular occlusion, progressive visual field loss in advanced glaucoma, and anterior ischemic optic neuropathy.<sup>10</sup>

The most prevalent refractive disease of the eyes is myopia, and patients who are severely myopic frequently get cataracts. Sclera, choroid, vitreous, and retinal degenerative alterations are frequently seen in these eyes. Therefore, concomitant ocular diseases such retinal tears and lattice degeneration may be more frequent in severely myopic eyes.<sup>11</sup> Myopia was a significant risk factor for cataract development. According to several studies, persons with high myopia are more likely to develop nuclear cataracts and posterior subcapsular cataracts (PSC) than cortical-type cataracts.<sup>12</sup> Low levels of autoregulation and IOP fluctuation caused by abnormal anatomical structures in high myopia eyes have been shown to be risk factors for the evolution of glaucoma.<sup>13</sup> As a result, a glaucomatous symptom of very myopic eyes may potentially be an early postoperative IOP increase. Although there has long been evidence linking myopia to elevated IOP, its exact contribution to the IOP increase following cataract surgery is still unknown.<sup>14,15</sup>

It has been demonstrated that high IOP can occur after cataract surgery. IOP elevation was discovered to be temporary and benign. With or without treatment, the pressures of almost all patients returned to normal.<sup>16</sup> Only a few population studies have been conducted to investigate post-cataract surgery consequences, particularly changes

in intraocular pressure, in India. The goal of the current study was to determine how myopic and emmetropic individuals' intraocular pressure changed following cataract surgery.

### MATERIALS AND METHODS

#### Sample size

A sample of 76 cases in both study group was calculated at 95% confidence and 80% power to verify the expected difference of  $1.3 \pm 2.8$  mm of Hg in IOP at day 90 after the cataract surgery between myopic and emmetropic cases with cataract.<sup>17</sup> Considering nonresponse rate and to increase the generalisability of the study, sample size was further enhanced to 100 cases in each group.

#### Methodology

All the patients admitted for the phacoemulsification of cataract in Department of ophthalmology, and fulfilling the inclusion and exclusion criteria were recruited in the study. Each eligible subject was explained about the purpose of the study by an investigator and informed consent was obtained, prior to inclusion. They were assured of complete confidentiality of information, and the option of withdrawing from the study at any point of time. A convenient sampling technique was used to enrol patients. Patients with senile cataract (50-70 years) of grade 1 and 2, who had normal fundus, at least 7 mm pharmacological pupillary dilation in a preoperative examination, and who received a phacoemulsification and intraocular lens (IOL) implantation and were successfully followed up for three months after surgery were included in our study. Patients with pre-existing glaucoma, ocular infection or inflammation, history of ocular trauma or surgery, with any corneal pathology, or uncontrolled systemic diseases were excluded from this study. First 100 patients with myopia during the study period, who got admitted for cataract surgery were enrolled in group A and in group B, initial 100 patients with emmetropia were enrolled in the study. Initially basic information was gathered including age, sex, place of IOL, pre-surgery examinations (refractive conditions and IOP), and post surgery examinations at each follow-up was done. Every patient underwent a thorough physical checkup, Keratometer and IOL master examination. All patients received a topical anesthesia twice in both eyes with an interval of 5 minutes, then applied with sodium fluorescein, and IOP was taken as an average of 2 readings by tonometry. IOP was measured at same time of the day before surgery, and at 1, 7, 30, and 90 days after surgery.

### RESULTS

The mean age in participants of group A was  $61.9 \pm 5.9$  years and of

group B was 61.2±5.9 years. Table I depicted that there was no significant difference in baseline variables between patients of both study groups (p>0.05). Table II represented the data of K1, K2 and axial length between both study groups and it was also found to be statistically insignificant (p>0.05). Table III reported the comparison of best corrected visual acuity (BCVA) between cases of both study groups at pre-operative time, post-operative day 1, day 7, day 30 and day 90. And difference was statistically insignificant (p>0.05). Table IV reported that Intraocular pressure (IOP) initially raised at post-operative day 1 from baseline in both study groups and then it starts declining significantly at post-operative day 7, day 30 and day 90 in both groups, analysed done using paired t test (p<0.05). IOP of cases of group A (with myopia) was slightly higher than cases with emmetropic in post-operative period. Although this difference in IOP between cases of myopia and emmetropic was statistically insignificant (p>0.05).

**DISCUSSION**

This hospital based prospective observational study was conducted to find out the changes of intraocular pressure after cataract surgery in myopic and emmetropic patients. Group A patients presented with myopia and group B patients presented with emmetropia, and both underwent cataract surgery.

In our study, mean age of study participants in group A and B was 61.9± 5.9 years and 61.2±5.9 years. Current study revealed that grade 1 of senile cataract in group A and group B were 47% and 55% respectively. These difference in baseline patients' characteristics was statistically insignificant between both groups. Similar results were reported by the Garg P et al<sup>19</sup> that mean age of myopic patients and emmetropic patients was 60.98±7.9 and 59.2±7.15 years respectively.

In our study, pre-op BCVA between 6/6 to 6/24 was found in 38% and 45% cases in group A and group B respectively while rest had BCVA <6/24 among both groups. In both groups, proportion of cases with BCVA between 6/6 to 6/24 increased to nearly 90% post operatively i.e. significant improvement was seen in both the study groups but the difference between both study groups were not statistically significant. In our study, results revealed that in Group A, mean pre-op IOP was 14.83mmHg and at post-op day 90 mean IOP was 11.65mmHg and in Group B mean pre-op IOP was 14.33mmHg and at post-op day 90 mean IOP was 11.64mmHg. Therefore, there was a mean fall in IOP of 3.17mmHg in Group A and 2.68mmHg in Group B. The decrease in the mean post operative IOP from baseline was statistically significant (P<0.05) in both groups. There was no statistically significant difference in post operative IOP at any visit between groups (P>0.05). In current study, early postoperative IOP spike was seen in patients of highly myopic as well as emmetropic eyes, although raise in IOP was more in myopic cases. Myopic eyes have longer axial lengths and vitreous chamber depths and eyes with an increased axial length seem to have a greater deformability of the lamina cribrosa. It is possible that the abnormal anatomic structures in high myopia eyes, especially the insufficient hemoperfusions on choroid and retina, result in small amounts of autoregulation and lead to IOP fluctuation which is a risk factor for glaucoma progression. These results were supported by the study Lv H et al<sup>17</sup> in this study, a lower IOP than baseline was observed at 7, 30, and 90 days after surgery in emmetropic and mild to moderate myopia, while in high myopia, IOP was instable from 1 to 30 days, and reduced only in 90 days after surgery. All patients with different refractive conditions showed a remarkably lower IOP at 90 days after cataract surgery.

Current study results were also supported by the study Pal VK et al<sup>20</sup> and revealed that there was a mean fall in IOP of 2.70 mm Hg in the ECCE group and 2.74 mm Hg in the phaco group. There was no statistically significant difference in post-operative IOP at any visit between groups (P < 0.05). After fourth month post-operatively, the IOP was mostly stable, but it was significantly lower than the pre-operative IOP. Mansberger SL et al<sup>21</sup> also supported this study and revealed that postoperative IOP was significantly lower than the preoperative IOP after cataract surgery. The postoperative IOP remained lower than the preoperative IOP for at least 36 months. An Israeli study of 2403 subjects documented a significant relationship between myopia and increasing IOP, particularly in persons of North African or Asian origin. Other studies have reported higher applanation pressures in myopic subjects, or in subjects with increased axial length.

and refractive conditions. A reduction of IOP in different refractive conditions was observed, and refractive conditions might influence the IOP fluctuation in first 90 days after surgery.

**CONCLUSION**

The results of the current study showed that irrespective of any refractory condition, cataract surgery had a lowering effect on IOP. The IOP score was not significantly higher in either group at post-op day 1 or was significantly lower in emmetropic as well as in myopic patients in the first 90 days after surgery. Patients with extreme myopia, however, displayed a slower rate of IOP reduction. Thus, by keeping eye on intraocular pressure in myopic cases we can prevent glaucomatous changes in the affected eye. Further studies should be focused on the relationship between anatomic changes of high myopic patients and their IOP after cataract surgery.

**Table I- Baseline Characteristics Of Participants In Both Study Groups.**

Variables		Group A	Group B	p value*
Age Group (Years)	51-60	48(48)	49(49)	1.000
	61-70	52(52)	51(51)	
Gender	Female	50(50)	56(56)	0.479
	Male	50(50)	44(44)	
Laterality	Left eye	55(55)	60(60)	0.567
	Right eye	45(45)	40(40)	
Senile cataract grade	Grade 1	47(47)	55(55)	0.322
	Grade 2	53(53)	45(45)	
IOL placement	Capsule	96(96)	96(96)	0.718
	Ciliary groove	4(4)	4(4)	

\*Analysis was done using Chi-square test.

**Table II- Distribution Of Cases According To K1, K2 and Axial Length In Both Groups**

Variables	Group A		Group B		p value
	Mean	SD	Mean	SD	
K1	44.28	1.28	44.06	1.05	0.185
K2	44.32	1.24	44.15	1.02	0.291
Axial Length	21.47	0.64	21.37	0.34	0.169

\*Analysis was done using student t test.

**Table III- Distribution Of Cases According To BCVA At Different Time Intervals In Both Study Groups**

BCVA		Group A	Group B	p value*
Pre-operative	6/6- 6/24	38	45	0.389
	<6/24	62	55	
Post-operative Day 1	6/6- 6/24	92	96	0.372
	<6/24	8	4	
Post-operative Day 7	6/6- 6/24	94	97	0.495
	<6/24	6	3	
Post-operative Day 30	6/6- 6/24	96	97	1
	<6/24	4	3	
Post-operative Day 90	6/6- 6/24	96	97	1
	<6/24	4	3	

\*Analysis was done using Fisher exact test.

**Table IV- Comparison Of Intraocular Pressure At Different Time Intervals In Both Study Groups**

Group	Intraocular Pressure					
	Pre-Op	Post-op day 1	Post-op day 7	Post-op day 30	Post-op day 90	
Group A	Mean	14.83	15.09	12.69	12.04	11.66
	SD	0.96	1.10	1.72	1.94	1.70
Group B	Mean	14.33	14.87	12.36	11.93	11.65
	SD	1.17	0.96	1.69	1.54	1.44
p-value* (between Group A and B)		0.001	0.133	0.173	0.657	0.964

\*Analysis was done using student t test.

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