

Original Research Article

Cataract surgery and intraocular pressure: perspective from the developing world

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ABSTRACT

Background: Cataract surgery has an IOP lowering effect. Aim of the study was to analyses and evaluate the effect of cataract surgery [phacoemulsification] for senile cataract on IOP.

Methods: This prospective observational study was carried out at two private specialized ophthalmology centers at India over a period of one year from Jan 2015 to Dec 2015. Cataract surgery (phacoemulsification) was performed on single eye of all the test subjects presenting to the out-patient departments with senile cataract without any comorbidity. Preoperative intraocular pressure (IOP) readings were noted and then compared to the post-operative IOP readings. All the data was collected and analyzed.

Results: Cataract surgery reduced the IOP by a mean of 1.6 mmHg. Eyes with a higher preoperative IOP had a much greater IOP reduction post cataract surgery. Patients having a shorter axial length had more IOP reduction after cataract surgery with a mean value of 2.4 mmHg, which was statistically significant with a p value of 0.02. Older patients had a greater decrease in IOP after cataract surgery and it was noted that the relationship between IOP and increasing age was statistically significant having a p value of 0.001.

Conclusions: Cataract surgery (phacoemulsification) has a significant IOP lowering effect and it is more in eyes having higher pre-operative IOP, shallower anterior chamber and those of the elderly.

Keywords: Phacoemulsification, Cataract, IOP, Axial length

INTRODUCTION

Cataract surgery is one of the most commonly performed surgical procedures worldwide.¹ With increasing age an increase in the incidence of both cataract and elevated IOP, with or without glaucoma, has been noted.² A lot of research work has been reported about the reduction of IOP after cataract surgery.^{3,4} This is probably due to the reason that the anterior chamber becomes wider and deeper after cataract surgery.⁵ As IOP is the only known modifiable primary risk factor in the development and progression of glaucoma so measures involved in lowering IOP assume significant importance.⁶ Many studies have also analyzed the IOP elevation, IOP spike,

in the immediate post-operative period.⁷⁻⁹ Therefore in order to analyses and evaluate the effect of cataract surgery on IOP in a country from the developing world, we undertook the present surgery.

Aim of the study was to analyses and evaluate the effect of cataract surgery (phacoemulsification) for senile cataract on IOP.

METHODS

This prospective observational study was carried out at two specialized private ophthalmology centers at India, namely, Manzoor eye center and ASG eye hospital in

Srinagar Jammu and Kashmir. It was carried over a period of one year from Jan 2015 to Dec 2015 and all the patients presenting to the out-patient departments of the above said hospitals, diagnosed to be having senile cataract without any comorbidity (ocular or otherwise) were enrolled in the present study after taking an informed written consent. The study design was a prospective observational one and conformed to the guidelines of the declaration of Helsinki. Only a solitary eye, for each patient, was chosen randomly for the study. All the study subjects were subjected to a detailed history, general physical examination and an ophthalmic examination. The ophthalmic examination included visual acuity (Snellen's chart), slit lamp examination, fundus examination (direct ophthalmoscopy), tonometry (Goldman's applanation tonometer), pachymetry (specular microscope-Topcon SP-IP, Tokyo, Japan), visual field (Humphrey field analyser-750i, Carl Zeiss, Meditec, Germany), autorefractometry (PRK-70000, Germany), axial length (Lenstar, LS 900 biometer, Haag-streit, Switzerland) and optical coherence tomography (Cirrus 5000 spectral domain OCT, Carl Zeiss Meditec, USA).

Reduced vision due to senile cataract was the indication for cataract surgery. After the cataract surgery patients were followed up for 1, 2 and 6 weeks. Patients who had any complications during the cataract surgery were excluded from the present study. Phacoemulsification was the standard procedure performed for cataract surgery in all the study subjects, it was done using the Alcon centurion vision system. Three pre-operative readings of IOP were taken randomly on three separate visits of the patient to the hospitals and the mean of these three pre-operative IOP readings was taken as the pre-operative IOP. Patients who were not able to have their three preoperative readings taken on three separate visits to the hospital or were not able to complete their scheduled three post-operative follow up visits were not included in the study.

The standard operative technique was followed as under at all the three hospitals/centers as following. Topical anesthesia in the form of proparacaine hydrochloride 0.5% w/v. A 2.75 mm temporal clear corneal incision was and anterior capsular staining was done using trypan blue 0.06% under air bubble. Visco-elastic in the form of hydroxy methyl propyl cellulose (HPMC-2%, Surgitech innovation India) was used to maintain the anterior chamber. A continuous curvilinear capsulorrhexis measuring approximately 5mm was made on the anterior capsule using a 26-gauge bent needle. Phacoemulsification of the nucleus and aspiration of the cortex were performed after doing hydro-dissection and hydro-delineation. Capsular bag was inflated by HPMC and a foldable acrylic hydrophobic intra-ocular lens (with a central and peripheral thickness of 0.75 mm and 0.35 mm) was implanted in the capsular bag. HPMC was removed by bimanual irrigation aspiration completely. Wound site incisions were secured with hydration and no

sutures were placed. Moxifloxacin 0.5% (Vigamox, Alcon laboratories, India) one drop-thrice daily eye drops and prednisolone acetate 1% (Predforte, Allergan, India) one drop-four drops daily for one week followed by tapering the dosage of each drug weekly was done for three weeks post-operatively and then stopping the drugs completely. The IOP was measured at 1, 2 and 6 weeks post-operatively.

Statistical analysis of the collected data was done using SPSS 2.0 (SPSS Inc., Chicago, IL).

RESULTS

During the study period we enrolled 558 patients (one eye per patient), out of these only 450 completed the requisite follow up of our study design. The final data was analyzed for 450 patients (single eye per patient only). There were 270 females and 180 males in our study group (Table 1). Amongst these the youngest and the eldest patients were 58 and 78 years old, respectively, with a mean age of 72 years (SD±2.2). The mean preoperative IOP was 17.2 mmHg (SD±1.2), ranging from 15-21.4 mmHg. The mean post-operative IOP was 15.6 mmHg (SD±1.3) (Table 1). Cataract surgery reduced IOP by a mean of 1.6 mmHg with the minimum and maximum reduction in IOP being 0.8-2.8 mmHg, respectively. The patients having a higher pre-operative IOP had greater IOP reduction after cataract surgery as compared to those having a lower pre-operative IOP, although this was not statistically significant with a p value of 0.08. The mean axial length of our test subjects was 22.8 mm (SD±2.4). It was further noted that patients having a shorter axial length had more IOP reduction after cataract surgery with a mean value of 2.4 mmHg, which was statistically significant with a p value of 0.02. Older patients had a greater decrease in IOP after cataract surgery and it was noted that the relationship between IOP and increasing age was statistically significant having a p value of 0.001. Although there was a greater reduction of IOP in females (mean 1.8 mmHg) than males (mean 1.4 mmHg), it was not statistically significant with a p value of 0.06.

Table 1: Demographic data and pre- and post-cataract surgery IOP measurements.

| | |
|--------------------------------------|--------------|
| Total number of patients | N=450 |
| Male | 270 |
| Female | 180 |
| Mean age (years) | 72±2.2 |
| Mean preoperative IOP (mmHg) | 17.2±1.2 |
| Mean postoperative IOP (mmHg) | 15.6±1.3 |

DISCUSSION

The IOP lowering effects of cataract surgery have been known since long.^{9,10} Overtime, the techniques and procedures for cataract surgery have evolved to less traumatic and minimally accessed surgeries like

phacoemulsification and clear cornea incisions. Although the exact mechanisms of IOP reduction by cataract surgery are not known but these may be due to the increase in the depth of the anterior chamber and the thinner IOL implantation.^{4,11} Optical coherence tomography tells us about the changes in the depth of the anterior chamber and the status of the angle.^{12,13} Shrivastava et al in their review have concluded that the mechanisms leading to IOP reduction following cataract surgery in patients with open angles remain poorly understood.¹⁴ We found that there was a mean 1.6 mmHg reduction in IOP following cataract surgery. Matsumura et al reported a 1.5 mmHg reduction in IOP after cataract surgery in their study having 93 patients.¹⁵ There have been numerous studies in the literature where the authors have reported no significant changes in pre-operative and post-operative IOP's in which the pre-operative IOP was less than 20 mmHg.¹⁶ The maximum reduction of IOP in our study was 2.8 mmHg. Pohjalainen et al reported a 3.5 mmHg reduction in IOP after cataract surgery by employing phacoemulsification.⁷ the mean age of our study subjects was 72 years (± 1.8). Zetterstrom et al had a mean age of 73.8 years in their retrospective study of 20437 eyes.² As is known that the thickness of the crystalline lens increases with advancing age which has been demonstrated by anterior chamber optical coherence tomography with an average lens thickness of 4.46 mm for ages between 60-75 years.¹⁷ The lens used in our study was a foldable acrylic hydrophobic lens with a thickness of less than 0.1 cm. The mean axial length in our study was 22.8 mm, we found that there was more IOP reduction in patients having a shorter axial length. Similar findings have been reported by Zhou et al, who concluded that shallower pre-operative anterior chambers become deeper after cataract surgery thereby widening the irido-corneal chamber and hence reducing the IOP.¹⁸ Huang et al have also reported that post-operative IOP reduction was directly proportional to the increase in the irido-corneal angle after cataract surgery and that there was a greater post-operative IOP reduction in eyes with previous narrow angle.¹⁹ We also found that there was a greater IOP reduction in eyes having a higher pre-operative IOP. Slabaugh et al have also concluded that the preoperative IOP was the most important and significant parameter affecting the post-operative IOP, meaning that higher the pre-operative IOP the greater is the reduction in post-operative IOP and lower the pre-operative IOP the lesser will be the reduction in the IOP post-operatively.⁹ Zetterstrom et al have reported a statistically significant higher post-operative IOP reduction in females compared to males after cataract surgery.² We also found that women had a much higher postoperative IOP reduction than men although this was not statistically significant.

Limitations

Limitations of the study is that exact mechanisms responsible for decrease in IOP post cataract surgery is not clearly understood as of yet, hence further research

needs to be carried out with bigger sample of eyes before reaching to any satisfactory conclusion.

CONCLUSION

Cataract surgery (phacoemulsification) has a significant IOP lowering effect and it is more in eyes having higher pre-operative IOP, shallower anterior chamber and those of the elderly.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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