

Post-operative Reduction in Intraocular Pressure after Small Incision Surgery

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ABSTRACT

Introduction: This study aims to compare pre-operative and post-operative intraocular pressure (IOP) after small incision cataract surgery (SICS). **Materials and Methods:** A total of 120 eyes of as many patients above the age of 40 years were operated for cataract through SICS. IOP was recorded preoperatively and postoperatively on 1 week, 2 weeks, 1 month, and 3 months with Goldmann applanation tonometer. The above data were statistically analyzed using paired "t-test." **Results:** There was a statistically significant decrease in IOP after SICS as compared to mean pre-operative IOP. IOP decline started at 1 week, decreasing further at 2 weeks, 1 month, and 3 months, respectively. **Conclusion:** IOP starts to decrease significantly after SICS at 1 week and keeps on decreasing till 3 months.

Keywords: Intraocular pressure, Post-operative intraocular pressure, Small incision cataract surgery
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INTRODUCTION

Manual small incision cataract surgery (SICS) is a safe and cost-effective technique for tackling the huge backlog of cataract blindness in the developing world.^[1,2] Besides removing the opacified lens, cataract surgery has been suggested to reduce intraocular pressure (IOP) in eyes either with or without glaucoma, although with variable magnitude and influenced by several factors, including anterior chamber anatomy and angle configuration (open angle vs. angle closure).^[3] Besides angle anatomy, many other factors were independently related to IOP reduction of cataract surgery including aqueous humor dynamics, ocular comorbidities, and, most importantly, pre-operative IOP.^[4-18] Furthermore, there is an increase in anterior chamber depth, angle opening distance, and anterior chamber area.^[19-21] IOP decrease may not only depend on anatomical factors relating to narrow angles. Lens removal allows the posterior capsule to move posteriorly, dislodging the zonula over the ciliary body with a consequent widening of Schlemm's canal, and aqueous humor drainage improvement.^[18] Pre-operative IOP is the best predictor of post-operative IOP. Higher pre-operative IOPs have been associated with greater IOP reductions,^[21] and eyes with gonioscopically narrow angles experience greater reduction in IOP compared to those with open angles.^[22,23] In the 1970s, Bigger and Becker reported a lower IOP after cataract extraction in glaucoma patients.^[5] Since then, and particularly in the past decade, many studies have consistently shown a variable IOP decrease after cataract surgery. There are many studies over the effect of phacoemulsification on post-operative IOP but very few on SICS. This prospective study was carried out to evaluate post-operative IOP changes after SICS.

MATERIALS AND METHODS

A prospective study with 3 months follow-up period was conducted from May 2016 to March 2017. A total of 120 eyes of 120 patients visiting the hospital for undergoing cataract surgery were recruited for the study after obtaining approval of the ethics committee. Patients of either sex above 40 years of age with uncomplicated senile cataract with IOP ≤ 21 mmHg were recruited. The exclusion criteria were patients with intraoperative and post-operative

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complications, corneal opacity, previous ocular surgery history, significant eye trauma history, congenital, developmental and complicated cataract, ocular diseases like glaucoma, inflammatory conditions like iridocyclitis, retinal pathology like diabetic eye disease, and hypertensive retinopathy. Informed consent was taken from the patients in their own language in a prescribed bilingual format. Three readings of IOP were measured using a Goldmann applanation tonometer attached to a slit lamp, and the mean was recorded. All IOP measurements were taken between 10 and 12'O clock to minimize the effect of diurnal variations. Pupils were dilated with phenylephrine 5% and tropicamide 1% topical drops administered 2-3 times every 10 min along with flurbiprofen 0.03% drops to prevent intraoperative miosis. All surgeries were done by a single surgeon who was well adept in SICS. All the patients underwent SICS under peribulbar anesthesia. After lid retraction and globe stabilization, a fornix-based conjunctival flap was made from 10'O clock to 2'O clock position, bleeding vessels were cauterized. A 6-6.5 mm long straight or frown incision of 300 microns depth was given 1.5 mm away from the superior limbus, the center of which lay at 12'O clock limbus. A triplanar sclerocorneal tunnel was created. Capsulorhexis was performed using a 26-gauge needle. A 3.2 mm keratome was used to enter the anterior chamber to create a self-sealing corneal valve and the internal opening was extended with the same

keratome up to 7 mm, which was slightly larger than the external one. Hydrodissection and hydrodelimitation were performed. The nucleus was prolapsed into the AC and delivered through viscoexpression or sandwich technique. Irrigation and aspiration were done. In the presence of a viscoelastic solution, a rigid posterior chamber 6 mm × 12.5 mm PMMA intraocular lens was implanted. AC wash was done. No sutures were applied to close the section. Subconjunctival gentamycin and dexamethasone injection were given at the end of the surgery. Postoperatively, moxifloxacin (0.5%) and prednisolone acetate (1%) eye drops were given 2 hourly for 1 week and gradually tapered over the next 6 weeks. Oral antibiotics and analgesics were administered postoperatively but IOP-lowering agents were avoided. The patients were followed up at 1 week, 2 weeks, 1 month, and 3 months post-surgery and IOP was recorded using applanation tonometer. Pre-operative IOP was compared to post-operative intraocular pressure at various intervals by applying paired t-test. Analysis was done on SPSS version 21 for MacOs.

RESULTS

The final analysis was undertaken on 120 eyes of 120 patients. The patients age varied from 43 to 80 years, maximum number of subjects were between 51 and 60 years of age. Overall, 58.33% were male and 41.33% were female [Table 1]. There was a decrease in IOP after 1 week of SICS. The IOP kept on decreasing progressively at 2 weeks, 1 month, and 3 months.

DISCUSSION

The scleral tunnel incision was introduced in the early 1980s in an attempt to provide better healing with less surgically induced astigmatism. This led to the development of modern manual small incision sutureless cataract surgery by Blumenthal who is now widely practiced because it leads to early rehabilitation, has less learning curve in comparison to phacoemulsification technique, and is cost effective. Therefore, this method of cataract surgery has become very popular in developing countries such as India. Therefore, a long-term comparative analysis of post-operative IOP in SICS is required to prognosticate in patients of glaucoma or ocular hypertension.

In our study, the mean pre-operative IOP was 15.52 ± 2.204 mm of Hg. The mean IOP at 1 week decreased to 13.34 ± 2.226 mm of Hg postoperatively. Thereby, the mean post-operative IOP kept on decreasing and decreased to 12.91 ± 1.975 mm of Hg at 2 weeks, 12.57 ± 1.969 mm of Hg at 1 month, and, at 3 months, mean IOP was 12.28 ± 1.911 mm of Hg as shown in Figure 1.

We calculated difference between pre-operative IOP and post-operative IOP at various intervals of 1 week, 2 weeks, 1 month, and 3 months, the difference in pre- and post-operative IOP was 2.075

± 1.839 , 2.608 ± 1.721 , 2.95 ± 1.758 , and 3.233 ± 1.804 mm of Hg, respectively. On applying paired t-test, the difference in IOP in the above-mentioned intervals was found to be statistically significant ($p = 0.000$) [Table 2]. Hence, it implies that there was a significant progressive IOP reduction after MSICS at noted intervals with maximum reduction found at 3 months interval.

Our results are comparable with the study done by Gupta *et al.*^[22] who reported that IOP was lower than baseline (mean 14.4 mmHg) at 1 month (mean 12.3 mmHg) and 3 months (mean 11.3 mmHg) after SICS. Sharma *et al.*^[23] also observed post-operative IOP reductions after SICS. They reported that there was a considerable decrease in IOP (16.95 ± 2.71 mm Hg) at 1 month post-operative. Thereafter, IOP continued to decline similarly till 3 months and remained static thereafter till the follow-up period of 6 months. However, they observed higher IOP at 1 week as opposed to our study. This may be attributed to inflammation in the immediate post-operative period.

Various studies have been done studying the effect of phacoemulsification on post-operative IOP^[4-20,18,24,25] There are very few reports studying the effect of SICS on post-operative IOP. If reduction in IOP after phacoemulsification was the result of structural changes in angle configuration or another mechanism shared by SICS and phacoemulsification, then one would expect a similar degree of IOP lowering from both procedures. Comparison of changes in IOP between phacoemulsification and MSICS will allow one to determine whether the IOP-lowering effect of cataract removal is the result of the cataract extraction itself (independent of the method of lens removal) or ultrasonic energy on the trabecular meshwork structures.

The scleral tunnel in SICS may cause a microleak of aqueous or its filtration through scleral bed, so as to lead to its IOP lowering effect. Calissendroff *et al.*^[26] are of the opinion that there could be a leakage through the tunnel, which is not visible clinically, leading to lower post-operative IOP in SICS. This suggests that SICS is beneficial and safer in glaucoma or glaucoma suspects undergoing cataract surgery.

Table 2: Comparison of mean IOP in pre-operative and post-operative follow-ups

Change in IOP	Mean	Standard deviation
Pre-operative IOP-post-operative IOP (1 week)	2.075	1.839
Pre-operative-post-operative IOP (2 weeks)	2.608	1.721
Pre-operative-post-operative IOP (1 month)	2.95	1.758
Pre-operative-post-operative IOP (3 months)	3.233	1.804

Table 1: Age- and sex-wise distribution of cases

Age (years)	No. of patients	Percentage
40-50	26	21.66
51-60	43	35.83
61-70	48	40
71-80	3	2.5
Male	70	58.33
Female	50	41.66
Right eye	63	52.5
Left eye	57	47.5

Table 3: Δ IOP* at various intervals

IOP evaluation interval	Mean IOP (mmHg)	Standard deviation
Pre-operative	15.52	2.204
1 week	13.34	2.226
2 weeks	12.91	1.975
1 month	12.57	1.969
3 months	12.28	1.911

* Δ IOP=Pre-operative-post-operative IOP

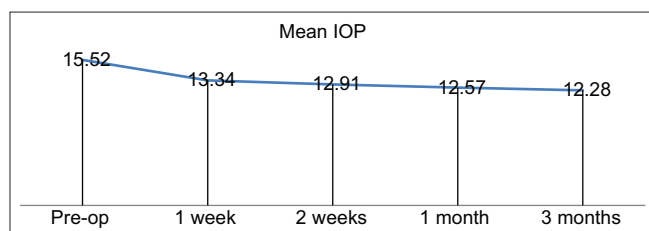


Figure 1: The reduction in intraocular pressure in post-operative period

Summary

There is a significant decrease in post-operative IOP after SICS. This decline in IOP starts 1 week after surgery and continues to decrease till 3 months. This study suggests that IOP decreases significantly after SICS. This may be beneficial to patients with glaucoma or ocular hypertension undergoing cataract surgery.

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3. Study approved by institutional ethical committee
4. Both verbal and written consent taken from the patient and patient party
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