

Intraocular Pressure Rise Following Post-Operative Corticosteroid Eye Drops

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Abstract:

Background : The main aim of this article to study the incidence of rise in intraocular pressure with topical prednisolone acetate (1%) eye drops in patients undergoing cataract surgery.

This prospective study was undertaken in a tertiary care center, 100 eyes which underwent uncomplicated cataract surgery were studied for IOP rise up to six weeks of usage of prednisolone acetate (1%) eye drops, following cataract surgery.

Results: Out of 86 patients, 10(12%) patients had a rise of IOP more than 25 mm of Hg on first postoperative day. Out of these, 8 (80%) patients had a rise of IOP between 25-30 mm of Hg. 29 (35%) patients had an IOP rise of more than 6 mm of Hg, of which 4(5%) patients have more than 16 mm of Hg after 6 weeks of cataract surgery.

At the end of 6 weeks of cataract surgery, 65%(57) of the patients had an IOP of less than 20 mm of Hg- low steroid responder, 30%(25) had between 20-30 mm of Hg – intermediate steroid responder, and 5%(4) of the patients had IOP more than 30 mm of Hg- high steroid responder.

Conclusion : At the end of six weeks of steroid therapy, 35 % patients had persistently raised IOP of which all the patients had their IOP return to baseline after omission of steroids for 6 weeks.

Key Word: Steroids; Cataract; Intraocular pressure.

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I. Introduction

Topical steroids are used post operatively after every cataract surgery to control intraocular inflammation. Steroids are known to cause elevation of IOP when given by topical, periocular or systemic routes. The degree of IOP elevation depends upon the specific drug, the dose, the frequency of administration, and the individual patient.

Topical, intraocular, periocular or systemic corticosteroid administration can cause a decrease in aqueous outflow and an increase in intraocular pressure. This tends to occur more commonly in the eyes of genetically predisposed individuals. The theories regarding the rise in intraocular pressure associated with steroids are:

1. Steroids affect the MYOC gene in trabecular meshwork cells which codes for the protein myocillin, thus causing altered expression of myocillin production
2. Corticosteroids stabilize lysosomal membranes and thus inhibit the release of hydrolases. GAGs (glycosaminoglycans) in the trabecular meshwork cannot depolymerize and they retain water in the extracellular space which leads to narrowing of the trabecular openings.
3. Steroids inhibit the synthesis of both prostaglandins E and F which normally increase the outflow facility. Thus when they are inhibited the intraocular pressure rises.
4. Endothelial cells in the trabecular meshwork act as phagocytes of debris in aqueous humour. When steroids suppress the endothelial activity, there is a further blockage of the trabecular meshwork as a result of which the outflow is decreased.

II. Material And Methods

This study included 100 patients operated for cataract surgery during the period of 4 months from Sep 2019 to Dec 2019 who undergone cataract surgery in our institute by routine Sics. Out of 100 patients, 86 patients completed the routine follow up of 3 months. Patients with Family history of glaucoma, patients with high myopia greater than 6 D, patients with diabetes, hypertension, complicated cataract, traumatic and

displaced cataract are excluded. Explanation and consent regarding the procedure and study was taken from all the patients one day prior to surgery.

Detailed history of all patients including chief complaints, history of present and past illness, family history of steroid responsiveness, systemic history and ocular history were taken. Best corrected visual acuity with Snellen's chart, detailed ocular examination of both eyes under slit lamp biomicroscope, measurement of intraocular pressure using non-contact tonometry, posterior segment examination using direct and indirect ophthalmoscopy were done. All the patients who had the above examination within normal ranges are included in the study. All patients underwent uneventful surgery, on first post-operative day, vision, routine slit lamp biomicroscopy, IOP measurement by non-contact tonometry and fundus examination are done and noted. After 12 hours the patients were examined again. Those whose IOP, confirmed by Goldmann applanation tonometry, was between 24 mm of Hg and 30 mm of Hg are given oral tab. Acetazolamide 250 mg 2 times a day. Those whose IOP was >30 mm of Hg are given oral tab. Acetazolamide 250 mg 2 times a day along with topical 0.5 % Timolol eye drops twice a day.

TABLE 1 : Classification of steroid responders on the basis of final IOP after 6 weeks of use of topical steroid eye drops.

Type of responder	Rise in IOP (mm of Hg)	Patients (%)
Low	< 5 mm of Hg	57 (65%)
Intermediate	6-15 mm of Hg	25 (30%)
High	>16 mm of Hg	4 (5%)

Inclusion criteria:

1. Patient with cataract between age group of 10-80 years
2. Pre operative normal intraocular pressure of 10-21mm Hg

Exclusion criteria:

1. Patients with family history of glaucoma
2. Patients with high myopia greater than 6 D
3. Patients with diabetes and hypertension
4. With complicated cataract, traumatic and displaced cataract

Statistical analysis

Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL). Student's *t*-test was used to ascertain the significance of differences between mean values of two continuous variables and confirmed by nonparametric Mann-Whitney test. In addition, paired *t*-test was used to determine the difference between baseline and 2 years after regarding biochemistry parameters, and this was confirmed by the Wilcoxon test which was a nonparametric test that compares two paired groups. Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. The level $P < 0.05$ was considered as the cutoff value or significance.

III. Result

Patients are discharged and instructed to come back for review 1 week. At 1st week, the patients are again examined in detail. Out of 86 patients, 10(12%) patients had a rise of IOP more than 25 mm of Hg on first postoperative day. Out of these 8 (80%) patients had a rise of IOP between 25-30 mm of Hg. They were treated with oral tab. Acetazolamide 250 mg 4 times a day alone, and 2(20%) patients had a rise of IOP more than 30 mm of Hg were treated with oral. Tab. Acetazolamide 250 mg 4 times a day along with topical Timolol 0.5% 2 times a day. On one week follow up, only 3 patients had persistently raised IOP after the treatment.

29 (35%) patients had an IOP rise of more than 6 mm of Hg, of which 4(5%) patients have more than 16 mm of Hg after 6 weeks of cataract surgery. Thus the percentage of steroid responders is 5%.

At the end of 6 weeks of cataract surgery, 65%(57) of the patients had an IOP of less than 20 mm of Hg- low steroid responder, 30%(25) had between 20-30 mm of Hg – intermediate steroid responder, and 5%(4) of the patients had IOP more than 30 mm of Hg- high steroid responder.

At the end of omission of steroids, that is after 6 weeks of stoppage of steroids, IOP of the high steroid responder patients (4) was less than 20 mm of Hg.

Thus in the study of 100 patients operated for cataract surgery by SICS, 86 patients came for follow-up up to 6 weeks. 10(12%) patients had raised IOP on 1st post-operative day. The probable causes are retained

viscoelastic substance or retained lens matter. After 6 weeks of steroid usage, raised IOP was found in 29 (35%) patients. All patients who were followed up to 3 months after cataract surgery, had IOP below 20 mm of Hg.

Table 2: rise of IOP

Time interval	Patients (%)
First post-operative day	10(12%)
First week	3(4%)
6 weeks	29(35%)
6 weeks of omission of steroids (3 months after surgery)	0

IV. Discussion

Cataract surgery is followed by administration of topical steroids. Elevated intraocular pressure is a common problem. It is transient and harmless in most patients. But, some patients may exhibit ocular discomfort and corneal edema with resulting decreased vision. These should be attended in the postoperative care. The increase in intraocular pressure may be marked and is a frequent post-operative complication requiring specific treatment. Numerous studies have evaluated the risk of increase in IOP with steroid usage following cataract surgery. Based on the demographics, the etiology of the increase, and the most effective way to treat it both short and long-term. Treatment options include preoperative and postoperative use of IOP lowering agents, surgical techniques to ensure open outflow channels, and surgical decompression of the anterior chamber.

Although nearly all patients IOP returns to baseline with or without treatment, some individuals may experience ocular pain, corneal edema and even sight-threatening complications such as retinal vascular occlusion, progressive field loss due to advanced glaucoma, and anterior ischemic optic neuropathy (AION) in susceptible patients.

In most patients, postoperative increase in IOP following cataract surgery is transient. As many as 25 % of patients experience an IOP spike >30 mm of Hg, 4-6 hours after uncomplicated phacoemulsification according to a recent study. At 24 hours postoperatively, the incidence of IOP spikes decreased significantly to 10% and in all cases, IOP was within normal limits (< 21 mm of Hg) three weeks later. Another study found >18% of non-glaucoma patients had an IOP >28 mm of Hg, 3 to 7 hours postoperatively, which decreased to below preoperative levels by four days in most individuals. The clinical data suggests that as a general rule, patients with healthy eyes can tolerate a transient post-operative rise in IOP with no detectable effect on visual function.

Risk factors include pre-existing primary open angle glaucoma, a family history of glaucoma, high myopia, diabetes mellitus, and history of connective tissue disease (rheumatoid arthritis).

Steroid induced IOP elevation typically occurs in a few weeks of beginning steroid therapy. In most cases, the IOP lowers spontaneously to the baseline within a few weeks to months upon stopping the steroid. In rare instances, the IOP remains elevated.

In our study, topical administration of 1% prednisolone acetate eye drops following cataract surgery by SICS were studied for rise of IOP in 86 patients. Raised IOP is a frequent complication following usage of topical steroid eye drops after cataract surgery. 12% patients had a rise in IOP on first post-operative day (POD), which is comparable to a previous study which showed 10 %.

The probable causes of rise in IOP on 1st POD are retained viscoelastic substance or retained lens matter. One week following the surgery, 96% patients had normal IOP. 35% of the patients showed rise in IOP of more than 6 mm of Hg after six weeks of steroid usage, which is comparable to the other studies. Steroid responders (more than 15 mm of Hg) constituted 5% of the total patients, which is similar as observed by other studies. In present study, steroid eye drops were given for 6 weeks and 100 % patients had normal IOP after omission of steroids for 6 weeks.

V. Conclusion

At the end of six weeks of steroid therapy, 35 % patients had persistently raised IOP of which all the patients had their IOP return to baseline after omission of steroids for 6 weeks.

References

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