

## ORIGINAL RESEARCH

# STUDY OF STEROID INDUCED RISE IN INTRAOCULAR PRESSURE USING NON-CONTACT TONOMETER AFTER CATARACT SURGERY IN CAMP PATIENTS AT P.D.U. MEDICAL COLLEGE RAJKOT, GUJARAT

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## ABSTRACT

**Objectives:** To study the incidence of steroid induced rise in intraocular pressure following cataract surgery using non contact tonometer.

**Materials and Methods:** The study was undertaken in a tertiary care centre. 500 eyes which underwent uncomplicated cataract surgery were studied for IOP changes for up to six weeks following omission of steroid eye drops using non contact tonometer.

**Results:** At the end of six weeks of steroid therapy, 21% patients had persistently raised IOP of which 2% had raised IOP at the end of six weeks following omission of steroid therapy.

**Conclusion:** Non contact tonometry is equally effective for diagnosis and following up patients of drug (steroid) induced glaucoma.

**Key words:** steroids, intra ocular pressure

## INTRODUCTION

The noncontact tonometer reduces the risk of infection due to no direct contact with patient's eye, measures IOP in a very short interval and so can be used for mass examination, does not require topical anaesthesia and the readings correlate fairly with applanation tonometer<sup>1</sup>. However, accuracy of the readings from this tonometer is lower than applanation and Schiotz tonometry.<sup>2</sup>

Steroids are known to cause elevation of IOP when given by topical, periocular or systemic routes. IOP elevation is said to be maximum with periocular use and minimum with systemic use. The degree of IOP elevation depends on the specific drug, the dose, the frequency of administration, and the individual patient<sup>3</sup>.

Evidence supports three independent potential mechanisms of increased resistance to the outflow of aqueous humor that can act synergistically to produce corticosteroid-induced ocular hypertension: <sup>4</sup>

- Structural changes of the trabecular meshwork

- A mechanical obstruction of the trabecular meshwork by steroid particles
- The inhibition of phagocytosis by trabecular meshwork cells

Glucocorticoids exert their effect by increased expression of myociline gene (MYOC) located on locus GLC1A on chromosome 1q25.<sup>5</sup>

Trabecular cells exposed to glucocorticoids increase production of elastin, fibronectin and laminin and decrease production of tissue plasminogen activator, collagenase IV and stromelysin, which causes an accumulation of extracellular matrix (ECM) and increases resistance to aqueous outflow.

Cross-linked actin networks form within the trabecular cells treated with glucocorticoids, which inhibit their proliferation, migration and phagocytic activity and cause accumulation of cellular debris and clogging of the aqueous outflow channels.

## MATERIAL AND METHODS

This study was carried from July 2009 to April 2010. Out of 769 patients operated for cataract surgery during this period 500 patients who had completed routine follow-up of 3 months after surgery were selected.

Patients selected for this study was operated in the institute for cataract surgery by routine SICS and Phacoemulsification. Exclusion criteria were history/family history of glaucoma, myopia, complicated cataract, complicated cataract surgery and pediatric patients.

Informed consent of all patients was taken for the surgery and all patients were admitted in the hospital one day before the surgery.

Detailed history of all patients was taken including complaints, family history, ocular history and systemic history. Patients were then examined in detail which included torch light examination of the eye, Best Corrected Visual Acuity with Snellen's chart, Slit-lamp examination, Fundus examination and intraocular pressure measurement with non contact tonometer.

All patients admitted for cataract surgery was examined pre-operatively and patients were operated under local anesthesia by SICS and Phacoemulsification.

On first Post-operative day vision of all patients were taken with Snellen's chart, Slit-lamp examination, fundus examination was done and IOP was measured by non contact tonometer.

On discharge those patients who were having normal IOP were given antibiotic steroid eye drops (0.1% dexamethasone or 0.1% prednisolone) 6 times a day for 1 week and 4 times a day for 5 weeks.

Those patients who had IOP between 25 mmHg to 30 mmHg on first post-operative day were given tablet Acetazolamide 1QDS for 3 days.

Those patients who had IOP more than 30 mmHg on first post-operative day was treated with AC Decompression and tablet Acetazolamide 1 QDS for 3 days.

Patients were then followed up at one week after surgery, six weeks after surgery (patients were given antibiotic steroid eye drops during this period) and six week after omission of antibiotic steroid eye drops.

**RESULTS**

The medical records of 500 patients with cataract surgery by small incision cataract surgery and phacoemulsification was studied which showed that 60(12%) patients had a rise of IOP more than 25 mmHg on first post operative day. Out of these 48(80%) patients having IOP between 25-30 mmHg were treated with Oral Acetazolamide and 12(20%) patients having IOP more than 30 mmHg were treated with AC Decompression + Oral Acetazolamide. On one week follow up only two patients had persistently raise IOP after the above treatment.

105 patients (21%) had an IOP rise of more than 6mm of Hg of which 15(3%) had more than 15 mm of Hg after six weeks of cataract surgery. Thus, the percentage of steroid responders is 3%.

At the end of 6 weeks of cataract surgery, 75% (375) of the patients had an IOP of less than 20 mm of Hg (Low steroid responder), 23%(115) had between 20-30 mm of Hg (Intermediate steroid responder), and 2% (10) had IOP of more than 30 mm of Hg (High steroid responder) (Table 1)

At the end of six weeks of omission of steroids, two patients out of the ten had persistently raised IOP. They were then treated with anti-glaucoma drugs and none of them required any surgical treatment for glaucoma.

Thus, in this study of 500 patients operated for cataract surgery 60(12%) patients had raised IOP on first Post-Operative day due to retained viscoelastic substances and retained lens matter. These patients were treated and on first week after cataract surgery only 2(0.04%) patients had persistently raised IOP. All 500 patients were given steroid eye drops for 6 weeks and raised IOP after 6 weeks was found in 105(21%) patients. after omission of steroids for 6 weeks i.e. 3 months after cataract surgery only 2(0.4%) patients had persistently raised IOP. (Table 3)

**Table 1: Classification of steroid responders on the basis of final IOP after 6 weeks of use of tropical steroids eye drops**

Type of Responder	Final IOP (mmHg)	Patients (%)
Low	<20	375 (75)
Intermediate	20-30	115 (23)
High	>30	10 (2)

The study showed equal sex distribution of steroid responders with an average age of steroid responders being 60.6 years (Table 2)

**Table 2: Age distribution of steroid responders**

Age	Patients (%)
<40	3 (2.86)
41-50	14 (13.33)
51-60	35 (33.33)
61-70	35 (33.33)
71-80	15 (14.29)
>80	3 (2.86)

**Table 3: Rise of Intraocular Tension**

Time Interval	Patients (%)
First post-operative day	60 (12)
First week	2 (4)
6 week	105 (21)
6 weeks of omission of steroid(3 months after surgery)	2 (0.4)

**DISCUSSION**

Elevated intraocular pressure (IOP) is a common problem following cataract surgery. For most patients it is transient and harmless. However, some patients may experience ocular discomfort, increased corneal edema, and even sight-threatening complications demanding further intervention. Physicians involved in cataract postoperative care should be aware of these high-risk patients and know how to manage them appropriately. The increase may be marked and is the most frequent postoperative complication requiring specific treatment<sup>6,7</sup> Since then, numerous studies have evaluated the risks of an increase in IOP following cataract surgery, the demographics, the etiology of the increase, and the most effective way to treat it both short and long term<sup>8</sup>. Treatment options include preoperative and postoperative use of IOP lowering agents, surgical techniques to ensure open outflow channels, and decompression of the anterior chamber. Although nearly all patients' IOPs will return to baseline with or without treatment, some individuals with IOP spikes may experience ocular pain, corneal edema and even sight-threatening complications such as retinal vascular occlusion, progressive field loss in advanced glaucoma, and anterior ischemic optic neuropathy (AION) in susceptible patients<sup>9,10,11</sup>.

In most patients, postoperative increase in IOP following cataract surgery is transient<sup>12</sup>. As many as 25% of patients experience an IOP spike >30 mmHg, 4 to 6 hours after uncomplicated phacoemulsification according to a recent study<sup>13,14</sup>. At 24 hours

postoperatively, the incidence of IOP spikes decreased significantly to 10% and in all cases IOP was within normal limits (21 mmHg) three weeks later. Another study found >18% of non-glaucoma patients had an IOP of >28 mmHg, 3 to 7 hours postoperatively, which decreased to below preoperative levels by four days in most individuals<sup>15</sup>. The clinical data suggests that as a general rule, patients with healthy eyes can tolerate a transient postoperative rise in IOP with no detectable effect on visual function.<sup>16</sup>

Risk factors include preexisting primary open-angle glaucoma, a family history of glaucoma, high myopia, diabetes mellitus, and history of connective tissue disease<sup>17</sup> (especially rheumatoid arthritis).

Steroid-induced IOP elevation typically occurs within 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, 12% patients had rise in IOP on first post operative day (POD), which is comparable to a previous study which showed 10%.

Retained viscoelastic substance was the most common cause of rise in IOP of first POD. One week following the surgery, 96% patients had normal IOP. 21% of the patients showed rise in IOP of more than 6mm of Hg after six weeks of steroid usage, which is comparable to the other studies. Steroid responders (more than 15 mm of Hg) constituted 3% of the total population under study, which is similar as observed by other studies.

**Table 4: Treatment Strategy**

	Topical and systemic steroid.	Subtenon steroid.	Intravitreal steroid.
1 <sup>st</sup> line of R <sub>x</sub>	Discontinuation of steroids in all forms if possible. Medical control of IOP for the wash off period of steroids.	Excise steroid depot and send for histopathology. Medical control of IOP for the wash off period of steroids.	Medical
2 <sup>nd</sup> line of R <sub>x</sub>	Substitute with other nonsteroidal drugs or use minimal dose and duration of less potent steroid.	Medical management.	Vitrectomy with or without trabeculectomy.
3 <sup>rd</sup> line of R <sub>x</sub>	Medical treatment.	Laser or surgery.	
4 <sup>th</sup> line of R <sub>x</sub>	Laser or surgery.		

**Table 5: Patients responding to steroids (IOP change after 6 weeks of steroid use) in present and other study**

Study	% of pts. with rise of IOP after 6 weeks of steroid use	IOP change >6-15 mmHg in %	IOP change >15mmHg in %
Armaly et al	34	29	5
Becker et al	36	-	-
Biedner B.A et al	12.2	10	2.5
H.V. Nema et al	13.5	10.7	2.31
Present study	21	18	3

In present study steroid eyedrops were given for 6 weeks and 98.09% patients had normal IOP after omission of steroids for 6 weeks.

**CONCLUSION**

Non contact tonometry as such not accurate method for measure of Intra ocular pressure but because of

advantage of non contact is equally effective for diagnosis and follow up of drug induced rise of intra ocular pressure, for example steroid induced glaucoma comparable with Applanation tonometry.

**Table 6: IOP after 6 weeks of omission of steroids in present and other study.**

Study	Percentage of patients having normal IOP after omission of steroids (%)
H.V.Nema et al	100
V.P.Munjhal et al	85.7
Espilora et al	98
Present Study	98.09

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