

EFFECT OF TOPICAL DEXAMETHASONE ON INTRA-OCULAR PRESSURE WHEN USED AFTER PHACOEMULSIFICATION WITH INTRA-OCULAR LENS IMPLANTATION

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ABSTRACT:

OBJECTIVE: To determine the effect of topical Dexamethasone on intra-ocular pressure when used after phacoemulsification and intra-ocular lens implantation.

STUDY DESIGN: A Cross Sectional Study.

PLACE AND DURATION OF STUDY: At Eye "B" Unit Khyber Teaching Hospital Peshawar from 1st March 2009 to 1st March 2010.

METHODOLOGY: The study was carried out on patients who underwent phacoemulsification with intraocular lens implantation by same surgeon. Goldmann applanation tonometer was used to measure the intra-ocular pressure on 1st post-operative day. Patients were started on topical Dexamethasone (0.1%) along with Tobramycin (0.3 %) eye drops for control of postoperative inflammation. Follow up was at 7th and 30th postoperative days and at each visit intra-ocular pressure (IOP) was measured.

RESULTS: Among 59 patients the mean age was 61.45 ± 6.22 years with male to female ratio of 1.56: 1. Intra-ocular pressure measured on 1st post-operative day, ranged between 15.00 mmHg to 17.00 mmHg with a mean of 15.93 ± 0.583 . On 7th post operative day IOP ranged between 15.00 mmHg to 18.00 mmHg with mean of 15.89 ± 0.824 . On 30th post operative day in about 6 patients a clinically significant rise in IOP was noted. In about 6 patients IOP got increased above normal limit of 21 mmHg with a range between 15.00 mmHg to 24.00 mmHg with a mean of 17.08 ± 2.68 .

CONCLUSION: Use of topical Dexamethasone after cataract surgery is associated with a risk of raised intra-ocular pressure (IOP). We recommend further studies to compare other corticosteroids and NSAIDs to find out most safe drug.

KEY WORDS: Topical Dexamethasone, intraocular pressure, phacoemulsification, intra-ocular lens implantation.

INTRODUCTION

Any congenital or acquired opacity in the crystalline lens or its capsule is referred to as cataract.¹ Age-related cataract is one of the commonest cause of avoidable blindness in the world.² In the United States the number of people with cataract is estimated to increase from 20 million in 2000 to 30 million in 2020.³

Cataract extraction surgery is the most common surgical procedure in ophthalmology department performed on aging individuals.⁴ Trauma during surgery results in release of the arachidonic which in turn causes production of prostaglandins (PG) by activation of cyclooxygenase 1 (COX-1) and cyclooxygenase 2 (COX-2). Phospholipase A acts on phospholipids in the cell membrane to generate arachidonic acid which in turn results in production of chemically distinct

prostaglandins and leukotrienes. Prostaglandin E₁ (PGE₁) and prostaglandin E₂ (PGE₂) results in elevation of IOP by local vascular dilatation and increased permeability of the blood-aqueous barrier.⁵ Corticosteroids are one of these anti-inflammatory drugs which effectively control ocular inflammation.⁶ They block the action of phospholipase A₂, thereby inhibiting the release of arachidonic acid and the production of all its metabolites, including prostaglandins. Topical Dexamethasone is associated with adverse localized drug effects including raised intraocular pressure (IOP), cataract formation, retardation in wound healing and increased susceptibility to microbial infections.^{6,7}

The mechanism for elevation of intra-ocular pressure by steroids is that they slow down the degradation and increases the deposition of extracellular matrix material in the trabecular meshwork, hence decreases the outflow of aqueous humor. Also in the trabecular meshwork cells cross-linking of actin fibers are increased. As a result of these changes in the trabecular meshwork, intraocular pressure elevates.^{8,9} Dexamethasone causes induction of myocilin (TM-inducible glucocorticoid response or TIGR) within 2-3 weeks which elevates intraocular pressure by interfering with aqueous humor outflow.¹⁰

Topical Dexamethasone is routinely used after intraocular surgery for control of intra-ocular inflammation. The rationale of this study was to find out the effect of dexamethasone on intraocular pressure (IOP) when used after phacoemulsification with intra-ocular lens implantation so as to generate our own data regarding rise of IOP with topical dexamethasone and to direct the custom of using post-operative topical steroids towards safer drugs.

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METHODOLOGY

This cross sectional study was carried out at Department of Ophthalmology Khyber Teaching Hospital Peshawar from 1st March 2009 to 1st March 2010. Patients who had an uneventful phacoemulsification surgery with intraocular lens implantation by same surgeon were included in the study. All complicated cataracts including cataracts with pseudoexfoliation, uveitis, lens related glaucoma i.e. phacolytic and phacomorphic glaucoma, pigment- dispersion syndrome and patients with hypersensitivity to Dexamethasone were excluded from the study.

An informed consent was obtained from all patients for including them and using their data in the study. All patients underwent detailed anterior segment and fundus examination with slit lamp and indirect ophthalmoscopy.

On 1st post-operative day intra-ocular pressure (IOP) was measured with Goldmann applanation tonometer. To control post-operative inflammation, topical Dexamethasone (0.1%) drops were started four times daily along with Tobramycin (0.3 %) eye drops four times daily.

All patients were examined on 7th and 30th postoperative days and at each visit intra-ocular pressure (IOP) was measured using Goldmann tonometer by same ophthalmologist who measured the IOP on 1st post-operative day to avoid inter-observer variation. Increase of >6 mm Hg in intraocular pressure (IOP) had considered clinically significant.

All the statistical analysis was carried out using software SPSS 10.0. Quantitative variable was age and IOP. Qualitative variable was gender. Descriptive statistics like mean, standard deviation and maximum and minimum values had calculated for quantitative variable and descriptive statistics like percentage had calculated for qualitative variables.

TABLE I: AGE DISTRIBUTION AMONG THE PATIENTS (n= 59)

Age in years	50 - 55	56 - 60	61 - 65	66 - 70	71 - 75
No of patients	15	13	15	11	5
Percentage	25.42%	22.03%	25.42%	18.64%	8.47%

Mean age: 61.45 ± 6.22 years.

TABLE-II: IOP DISTRIBUTION ON 1ST, 7TH ON 30TH POSTOPERATIVE DAY (n= 59)

IOP (mm Hg)	15.00	16.00	17.00	18.00	22.00	23.00	24.00
1st Postoperative Day							
No of patients	12	39	8	-	-	-	-
Percentage (%)	20.34%	66.10%	13.56%	-	-	-	-
7th Postoperative Day							
No of patients	20	28	8	3	-	-	-
Percentage (%)	33.90%	47.46%	13.56%	5.08%	-	-	-
30th Postoperative Day							
No of patients	13	29	9	2	2	3	1
Percentage (%)	22.03%	49.15%	15.26%	3.39%	3.39%	5.08%	1.70%

Operational definition:

Clinically significant rise in IOP: Increase of >6 mm Hg in intraocular pressure (IOP) over baseline as measured on 1st postoperative day, should be considered clinically significant after 30 days of topical Dexamethasone use.

RESULTS

Total 59 patients underwent phacoemulsification surgery. The mean age was 61.45 ± 6.22 years. Age distribution is shown in table I. Out 59 patients, 36 were males and 23 were females with male to female ratio of 1.56:1. No patient was withdrawn from the study.

On first post-operative day before starting the topical drops, all patients were having equal amount of postoperative inflammation in the anterior chamber. Intra-ocular pressure was measured by Goldmann tonometer by same ophthalmologist in all cases. IOP ranged within normal limits, between 15.00 mmHg to 17.00 mmHg with a mean of 15.93 ± 0.583 on 1st postoperative day. IOP distribution on first post operative day is shown in table II.

On 7th post operative day all the patients still had IOP within normal limits, IOP ranged between 15.00 mmHg to 18.00 mmHg with mean of 15.89 ± 0.824. IOP distribution on 7th post operative day is shown in table II.

On 30th post operative day IOP ranged between 15.00 mmHg to 24.00 mmHg with a mean of 17.08 ± 2.68. In about 6 patients IOP got increased above normal limit of 21 mmHg, out of which two patients had IOP of 22 mmHg, three had IOP of 23 mmHg and one had IOP of 24 mmHg (Table II).

Clinically significant rise in IOP on 30th post-operative day was observed in 6 patients who had IOP rise of >6 mmHg from their base line IOP as measured on first postoperative day (Table III).

TABLE-III: CLINICALLY SIGNIFICANT RISE IN IOP (>6mm Hg) POSTOPERATIVELY (n= 6)

IOP (mm Hg) on 1st Post-op day	15.00 mmHg	15.00 mmHg	16.00 mmHg	16.00 mmHg	16.00 mmHg	17.00 mmHg
IOP (mm Hg) of same patient on 30th post-op day	22.00 mmHg	22.00 mmHg	23.00 mmHg	23.00 mmHg	23.00 mmHg	24.00 mmHg

DISCUSSION

After uneventful cataract surgery topical steroids are used for approximately 1 month in order to reduce anterior chamber reaction. However because of nonspecific immunosuppressive effect which leads to increased susceptibility to microbial infections, and delayed epithelial wound healing and because of danger of secondary glaucoma topical steroids must be avoided after internal ocular surgery.¹¹

In our study the mean age was 61.45 ± 6.22 years. Postoperatively the final analysis had made on 30th postoperative day. IOP above normal limit of 21mm Hg was noted in about 6 patients. Same results with rise in intra-ocular pressure in few cases was also noted in study conducted by Holland EJ and his colleagues.¹²

Laurell and Zetterstrom¹³ compared the effect of dexamethasone, diclofenac, and placebo on intra-ocular pressure after phacoemulsification surgery in 180 patients. In the dexamethasone group a clinically significant rise in mean intraocular pressure was observed on 1st week and 1 month. This is in accordance to our study.

Becker in 1960s followed the criteria of absolute IOP, considering 20 mmHg the lower limit of a clinically significant response¹⁴. Armaly¹⁵ proposed the IOP response as a relative difference considering 6 mmHg difference between treated and untreated eye a clinically significant response. Stewart et al.¹⁶ in 1984 compared the effects of dexamethasone and fluorometholone in steroid responders. They considered a rise in IOP of >10 mmHg over baseline to be clinically significant. In our study we considered a rise of more than 6 mm Hg clinically significant and found that in 6 patients IOP got raised more than 6 mmHg on 30th postoperative day from their base line IOP as measured on first postoperative day as shown in table no V.

Certain factors modify the effect of topical steroids on intraocular pressure e.g. in steroid responders with low doses and short duration of topical steroids, high degree of IOP elevation has been noted.¹⁷ This steroid associated rise in IOP in such patients is however reversible; if the treatment is stopped, within 1–3 weeks IOP usually return to normal levels. These patients need close observation regarding IOP monitoring when treated with topical steroids. Eyes with axial length above normal are also at risk of ocular hypertension in response to topical steroids.¹⁹ In our study we had no data about steroid responsiveness of these patients and also we did not considered the axial length of the eyes treated.

It is a proven fact that stronger steroids like dexamethasone and prednisolone causes high degree of IOP elevation.¹⁷ It has been shown that rimexolone and loteprednol etabonate, which are newer generation corticosteroids, have comparable effect to older corticosteroids to control anterior chamber reaction without significantly raising the intra-ocular pressure. However,

further studies are recommended on newer corticosteroids to justify the logical results.¹⁷

CONCLUSION

Our study concludes that use of topical Dexamethasone after cataract surgery is associated with a risk of raised intra-ocular pressure so Dexamethasone therapy requires careful monitoring while using after cataract surgery.

RECOMMENDATIONS

We recommend further studies to compare other corticosteroids e.g. Loteprednol etabonate and Rimexolone and NSAIDs e.g. Flurbiprofen and Diclofenac sodium to find out most safe drug.

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