

# Effects of Intra-cameral Dexamethasone after Uncomplicated Phacoemulsification

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## ABSTRACT

**Purpose:** Postoperative inflammation is very common following phacoemulsification. We conducted this study to compare the effectiveness of intra-cameral dexamethasone injection with traditional topical steroids following phacoemulsification.

**Study Design:** Quasi experimental

**Place and Duration of Study:** Jinnah Postgraduate Medical Center, JPMC, Karachi from February 2022 to July 2022.

**Methods:** A total of 60 patients were divided into two equal groups of 30 each. One group was treated with prophylactic intra-cameral dexamethasone at the end of phacoemulsification and the other group was given Balanced Salt Solution in its place. Both the groups were examined at post-operative day 1 and 7 for following parameters; best corrected visual acuity (BCVA), intra-ocular pressures (IOP), anterior chamber cells and flare.

**Results:** The dexamethasone group showed statistically significant improvement in anterior chamber cells and flare as compared to the placebo group at postoperative day 1 and 7 (p-value of 0.042 and 0.029 respectively for cells; p-value of 0.038 and 0.002 respectively for flare). However BCVA and IOP showed no statistically significant differences between the two groups at postoperative day 1 and 7 (p-value 0.67 and 0.46 respectively for BCVA and 0.22 and 0.08 respectively for IOP).

**Conclusion:** Intra-cameral dexamethasone is an effective way to control postoperative inflammation following phacoemulsification with reduced anterior chamber cells and flare. However, its effects on BCVA and IOP were comparable to topical steroids.

**Key Words:** Phacoemulsification, Dexamethasone, Flare, Cells.

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## INTRODUCTION

Phacoemulsification is one of the most commonly performed ophthalmic procedure resulting in decreased serious complications and shortened operating and recovery time.<sup>1</sup> However, one complication that is commonly seen after cataract

surgery is postoperative inflammation, which results from surgical trauma, and in turn pulls the cascade of inflammatory mediators into motion. If this goes on unchecked and uncontrolled, it can lead to ocular irritation, raised intraocular pressure (IOP) and cystoid macular edema.<sup>2,3,4</sup>

Steroids have been in use in ophthalmology for the last 70 years to reduce ocular inflammation. They are used both as injections and topical drops and there have been abundant instances of steroid injections during or at the end of the cataract surgery.<sup>5</sup> Many surgeons choose to inject a steroid preparation at the end of phacoemulsification to achieve adequate anti-inflammatory effect and provide rapid and long-term

relief to the patients. There were several steroid preparations to choose from and different surgeons prefer different drugs. We chose Dexamethasone as our drug of experiment, keeping in mind its low adverse effect profile and higher patient acceptance rate.<sup>6</sup>

We tried to ascertain whether there were any sizeable differences in the postoperative inflammation in patients who were given intra-cameral dexamethasone as compared to those who were given topical post-operative steroids.

## METHODS

This prospective study was conducted at the Department of Ophthalmology, Jinnah Postgraduate Medical Center, JPMC, Karachi, Pakistan, from February 2022 to July 2022. The study included 60 patients, between the ages of 55 and 80 years, who underwent phacoemulsification under topical anesthesia. Patients were recruited through convenient sampling during the study period. Study was approved by hospital's Ethical Committee. The patients enrolled in the study were admitted to the ward after being comprehensively informed about the study and the surgical procedure and a written informed consent was taken. A detailed questionnaire was filled, which included biodata and medical history of the patient along with pre and postoperative ophthalmic examination. The examination was conducted prior to surgery and at day 1 and 7 postoperatively. Biometry was done 1 week prior to the surgery.

Patients with cataract ranging from Nuclear Sclerosis grade 2 to grade 4, with a Visual Acuity (VA) of 6/12 or worse and intraocular pressures within normal limits were included. Patients with any other ocular disease, previous ocular surgery, steroid responders, patients using NSAIDs, steroids or immuno-suppressants of any sort (ocular or systemic), were excluded.

After taking informed consent, the patients were prepared for surgery. The appropriate eye was marked and topical anesthesia, which consisted of Proparacaine Hydrochloride 0.5% ophthalmic solution was instilled in the eye an hour before surgery. After appropriate anesthesia was achieved, standard phacoemulsification with an acrylic soft IOL implantation was performed.

At the end of surgery, group 1 was injected with injection dexamethasone sodium phosphate

0.4mg/0.1ml intra-camerally and group 2 was injected with Balanced Salt Solution 0.1ml at the end of the surgery as control. Post-operative topical antibiotics and steroids were given to patients in both groups. All surgeries were performed by the same surgeon with no intraocular complications occurring during surgery.

All 60 patients were examined on postoperative day 1 and 7. A detailed examination was conducted which included, visual acuity using Snellen chart (converted to LogMar), intraocular pressure measured with Goldman Applanation Tonometer and slit lamp examination for anterior segment examination, including examination of anterior chamber for cells and/or flare and fundus examination. As the main signs of intraocular inflammation after cataract surgery are anterior chamber cells/flare and raised IOP, these parameters were given particular importance. Anterior chamber cells were graded according to the Standardization of Uveitis Nomenclature (SUN) Working Group Grading of Anterior Chamber Cells and was determined using the narrowest slit beam (1 mm) at a height of 1 mm, with highest illumination and magnification of the slit-lamp, where: 0 =  $\leq 5$  cells; 1 = mild (6 – 15 cells); 2 = moderate (16 – 25 cells); 3 = marked (26 – 50 cells) and 4 = severe ( $> 50$  cells). Aqueous flare scale was scored according to SUN Working Group Slit Lamp Grading Scheme for Anterior Chamber Flare: 0 = none; 1 = faint (just detectable); 2 = moderate (iris and lens details clear); 3 = marked (iris and lens details hazy), and 4 = intense (with fibrin or plastic aqueous).

Statistical analysis was performed using SPSS software (version 9.0, SPSS Inc., Chicago, III, USA). Group comparisons of the postoperative patients were done using independent sample test. P value  $\leq 0.05$  was considered significant.

## RESULTS

All the 60 patients were divided into two equal groups of 30 each, with both groups having patients of comparable age and sex with no consequential differences in either ( $P > 0.05$ ). The first group (Group 1) consisted of 17 males and 13 females and had an average age of  $71 \pm 9.4$  years, whereas the other group (Group 2) consisted of 12 males and 18 females and had an average age of  $69.8 \pm 10.5$  years.

It is evident from Table 1 that for both groups the mean visual acuity values, pre and postoperatively were comparable ( $P > 0.05$ ) with no statistically

significant difference. Anterior chamber cells scores at day 1 in group 1 were (None = 0; Mild = 07; Moderate = 13; Marked = 10; Severe = 0) and in group 2 they were (None = 0; Mild = 0; Moderate = 08; Marked = 20; Severe = 02). Anterior chamber cells scores were statistically significant between both the groups at day 1 with  $P = 0.042$ . Whereas, at day 7 anterior chamber cells scores in group 1 were (None = 15; Mild = 12; Moderate = 03; Marked = 0; Severe = 0) and in group 2 they were (None = 03; Mild = 17; Moderate = 10; Marked = 0; Severe = 0). At day 7 Anterior chamber cells scores were also statistically significant between both groups with  $P = 0.029$ .

As demonstrated in Table 2, anterior chamber flare scores at day 1 in group 01 and group 02 were statistically significantly different with  $P = 0.038$ . At day 7, the difference was also statistically significant between both the groups with  $P = 0.002$ .

IOP is the last parameter which was assessed in our study with regard to post-operative inflammation

**Table 1:** Visual Acuity (Log Mar) values of both groups.

	Group 1	Group 2	P Value
Preoperative mean (Range)	0.73 (0.5 – 1.0)	0.74 (0.5–1.0)	0.74
Postoperative day 1 mean (Range)	0.30 (0.00 – 0.6)	0.39 (0.0–0.6)	0.67
Postoperative day 7 mean (Range)	0.18 (0.00 – 0.4)	0.23 (0.00 – 0.6)	0.46

Log MAR = Logarithm of the minimum angle of resolution

**Table 2:** Comparison of Inflammation Scores (Anterior Chamber Flare) between the two groups.

Grading	Flare			
	Day 1		Day 7	
	Group1	Group 2	Group1	Group 2
None	0	0	24	8
Faint	17	8	6	20
Moderate	12	18	0	2
Marked	1	3	0	0
Intense	0	1	0	0
P Value	0.038		0.002	

**Table 3:** Intraocular Pressure values of both groups.

	Group 1(n=30) Mean IOP (mmHg)	Group 2(n=30) Mean IOP (mmHg)	P Value
Preoperative	15.7	15.6	0.87923
Postoperative Day 1	15.4	15.2	0.22558
Postoperative Day 7	14.4	14.8	0.08972

after phacoemulsification and both groups showed comparable mean IOP values ( $P > 0.05$ ) preoperatively. Postoperatively, at day 1 and day 7, both groups had statistically insignificant difference in IOP with P value of 0.225 and 0.089 respectively (Table 3).

## DISCUSSION

Postoperative inflammation is very common after phacoemulsification and the reason behind conducting this study was to find out whether intracameral dexamethasone, used at the end of phacoemulsification, was superior to conventional postoperative topical treatment (antibiotics and steroid combination). Traditionally, intraocular triamcinolone has been used to treat inflammation in eyes, but the resultant cataract formation (if used in phakic eyes) and more importantly, raised IOP has always complicated its use.<sup>7,8</sup> Therefore the crystalline nature of triamcinolone and the concern with increased IOP made us use dexamethasone instead.

El-Haddad however, in his study, showed insignificant effect of intracameral triamcinolone on IOP as well with very effective anti-inflammatory result.<sup>9</sup> A study conducted by Shaheen et al, showed similar results to our study with intra-cameral triamcinolone, as compared to topical dexamethasone after routine phacoemulsification.<sup>10</sup> The authors however only commented on cells and flare in the anterior chamber and did not include IOP and VA in their study. Similar findings were elicited in another study by Elkhodary et al. It should be noted that both of these studies approved the use of intra-cameral triamcinolone, as it resulted in better compliance.<sup>11</sup>

The results of our study very evidently depicted a statistically significant difference as far as anterior chamber cells and flare were concerned, with P value for both of these being  $< 0.05$ , especially at 7<sup>th</sup> day. Visual Acuity and IOP however portrayed no significant relation with the P value of  $> 0.05$ . These results are in agreement with Albialy et al, that demonstrated significant effect on cells and flare but no significant effect as far as IOP was concerned.<sup>12</sup>

The same results were reported by Manzoor et al.<sup>13</sup> However, it focused on anterior chamber reaction only. Contrary to our results, Gungor et al, showed no significant difference in anterior chamber cells and flare between use of intra-cameral dexamethasone and topical steroid formulation.<sup>6</sup> The study was however consistent with our results in terms of effect on VA and IOP.

In a phase III FDA trial, subjects were divided into 3 groups; the first group (control) was given 5µl intracameral injection of placebo whereas the other two groups were given 5 µl intracameral injections of 342 and 517 µg of dexamethasone drug suspension. The subjects were later evaluated using an anterior chamber cells and flare scale and showed anterior chamber cell clearing in 25% of the eyes at 8th post-operative day, whereas the values were 63.1% and 66% in two dexamethasone drug delivery system groups respectively. The anterior chamber flare in this trial also showed similar findings. In placebo group, 63.8% eyes achieved flare clearance by day 8, as compared to 92.4% and 89.1% eyes in the two dexamethasone groups respectively.

A similar study was conducted by Tan et al, where they compared an intracameral dexamethasone drug delivery system with conventional dexamethasone eye drops and reported no statistically significant difference between the two groups.<sup>15</sup> However, when measured with a laser flare meter, there was a significant reduction in cells and flare in the intracameral dexamethasone group. The results were same when the study was repeated with dexamethasone pellets implanted in the anterior chamber and the ciliary sulcus a few years later.<sup>16</sup>

There are multiple studies, which showed the effect of intracameral dexamethasone on VA. Gungor et al, showed VA to be 0.08 in intracameral dexamethasone group and 0.07 in triamcinolone group with a p value of 0.54 one week postoperatively and similar values one month postoperatively.<sup>6</sup> Similar results were reported by Wadood et al.<sup>17</sup> Elgazzar AF, and Simaroj et al, also demonstrated no difference in the eyes where intra-cameral steroids were used versus the eyes in which only topical steroids were used postoperatively after phacoemulsification at day 7 and 30.<sup>18,19</sup> However, it might be worth mentioning here that both of these studies were done with intracameral triamcinolone instead of dexamethasone.

In a pediatric study conducted by Khan et al,<sup>20</sup> the researchers injected intracameral dexamethasone in half of the patients and sub-conjunctival dexamethasone in the other half. They reported differences in postoperative ocular inflammation, with the sub-conjunctival group displaying a much higher frequency of postoperative ocular inflammation (26.7%), as compared to intracameral group which showed much lower frequency (6.7%).<sup>20</sup>

IOP showed no statistically significant difference between intracameral dexamethasone group and the topical steroids group which was also reported by Gungor et al,<sup>6</sup> Elgazzar AF<sup>18</sup> and Simaroj et al.<sup>19</sup>

Limitations of our study are small sample size, single center study and short duration of follow up.

## CONCLUSION

Intracameral dexamethasone is effective in managing postoperative inflammation in patients with phacoemulsification, especially at reducing anterior chamber cells and flare. The efficacy, albeit, at one week is comparable with standard topical steroids as far as VA and IOP are concerned. Therefore, intracameral steroids are still an effective way to manage postoperative inflammation following surgery and can be used in patients prone to noncompliance in instilling drops properly after surgery or at the surgeon's discretion.

**Conflict of Interest:** Authors declared no conflict of interest.

**Ethical Approval:** The study was approved by the Institutional review board/Ethical review board (F.2-81/2022-GENL/1599/JPMC).

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### Authors' Designation and Contribution

Saad Jan; Postgraduate Trainee: *Literature Search, Data Acquisition, Manuscript Preparation.*

Muhammad Ali Tahir; Consultant Ophthalmologist and Vitreoretinal Surgeon: *Manuscript Editing, Manuscript Review.*

Syed Muhammad Faisal; Consultant Ophthalmologist: *Data Analysis, Statistical Analysis.*

Aziz-ur-Rehman Arain; Consultant Ophthalmologist and Administrative In-Charge: *Design.*

Alyscia Cheema; Head of the Department: *Concepts.*

