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A Single Dose Intracameral Triamcinolone Injection Following Phacoemulsification

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ABSTRACT

Background: The most frequent cause of treatable blindness in the world is cataract. The gold standard procedure for cataract surgery is phacoemulsification. Steroids are used to alleviate postoperative inflammation. Steroid administration can be done in a variety of ways. **Objective:** to evaluate the efficacy, safety and tolerability of 1mg/0.01 triamcinolone acetonide (TA) to control inflammation in eyes undergoing cataract extraction with phacoemulsification.

Patients and methods: It is a prospective non-randomized interventional study. It included 30 patients who are undergoing phacoemulsification surgery. Preoperative evaluation included visual-acuity testing, external-eye examination, slitlamp biomicroscopy, tonometry, and dilated-fundus examination. At the end of the phacoemulsification, triamcinolone (TA) 1mg /0.01 was injected into the anterior chamber. Patients were examined on the first day postoperative, one week one month and 3 months after surgery. Postoperative evaluations included Snellen visual acuity (VA), slit-lamp examination, and IOP measurement. Corneal edema, anterior chamber cells and conjunctival hyperemia were checked.

Results: There was no significant difference in the IOP before and after TA injection. While, there were significant differences in corneal edema, AC cells, conjunctival hyperemia and dryness from first day post- operative and through the study period.

Conclusion: A single dose intracameral triamcinolone injection, instead of topical steroid, was found to be safe, effective and avoids the side effect of topical steroid

Keywords: Intracameral injection, Triamcinolone, Postoperative inflammation.

INTRODUCTION

The most frequent cause of treatable blindness in the world is cataract. It is responsible for 51.5 percent of blindness cases. The increase in population age is due to new improvements in health care and living conditions throughout the world. As a result, the incidence of cataract cases rises with time. Cataract is the leading cause of visual loss in both developed and developing countries [(1)]. In addition, cataract surgery is the most common procedure performed by ophthalmologists all over the world. According to studies, over 18 million cataract surgeries are conducted each year, and this number is anticipated to rise as the population and their average age rise [(2)].

Phacoemulsification is the gold standard in cataract surgery. Modern improvements in cataract surgery, such as instruments, procedures, and foldable intraocular lenses, minimised the physical stress associated with the procedure (IOLs).

Despite these advancements, most patients still experience postoperative ocular irritation following cataract surgery. Proteins and inflammatory cells leak into the anterior chamber (AC) as a result of surgical disruption to the blood-aqueous barrier. Uncontrolled inflammation can cause increased intraocular pressure (IOP), cystoid macular edema, synechial development, secondary glaucoma, and posterior capsule opacification [(3)]. Since the early 1950s, corticosteroids have been utilised to treat intraocular inflammation. They decrease fibroblast growth and granulation tissue development by reducing inflammatory exudation and inhibition of fibroblast proliferation [(3)]. They can be used either topically as eye drops, locally by means of subconjunctival or sub-tenon's or peribulbar and retrobulbar injections, or systemically as oral medications or intramuscular or intravenous injections [(4)]. Topical steroid eye drops have numerous disadvantages, notwithstanding their effectiveness in reducing inflammation following cataract surgery. As a result of the numerous applications required, a compliance issue arises. Topical medicines also have a negative impact on the cornea, resulting in aberrant tear film and discomfort. Furthermore, the expense of the drops may be significant. As a result, different approaches have been employed to overcome these drawbacks [(5)].

The aim of this clinical study was to evaluate the efficacy, safety and tolerability of 1mg/0.01 intracameral triamcinolone acetonide (TA) in eyes undergoing cataract extraction with phacoemulsification followed by posterior chamber IOL implantation.

PATIENT AND METHODS

It is a prospective non-randomized interventional study. It was performed on 30 eyes of 30 patients in the period from September 2018 to April 2020 with age ranged from 35 years to 70 years.

Inclusion criteria: Presence of a cataract that was suitable for phacoemulsification, visual acuities 0.3 or lower and intraocular pressures of 21 mmHg or lower.

Exclusion criteria: Diabetes mellitus, current use of oral or topical anti-inflammatory agents (steroidal or non-steroidal up to 1 week before surgery), history of

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steroid responsiveness, glaucoma, uveitis, pseudoexfoliation syndrome, pigment dispersion syndrome, corneal disease, age-related macular degeneration, a history of cystoid macular edema and previous ocular surgery. **Preoperative evaluation** included testing of visual-acuity, external-eye examination, slitlamp biomicroscopy, tonometry, and dilated-fundus examination.

All operations were performed under topical anesthesia. Phenylephrine 2.5% and tropicamide 1% eye drops were instilled 1-2 hours before surgery. After peribulbar anesthesia, a 3.2 mm clear corneal incision was made. Then, methyl cellulose was injected and 5.0 mm capsulorhexis was done. The phaco-chop technique was performed. The capsular bag was expanded and a foldable intraocular lens was implanted in the capsular bag. A vigorous removal of viscoelastic substance from the bag, the capsular fornix, and the anterior chamber was done an irrigation/aspiration system. At the end of the phacoemulsification, TA 1mg /0.01 was injected into the anterior chamber through a paracentesis using a 27-gauge cannula. Moxifloxacin 0.5% (eye drop) was prescribed 6 times a day for 1 week postoperatively.
Patients were examined on the first day postoperative, one week one month and 3 months after surgery. Postoperative evaluations included Snellen visual acuity (VA), slit-lamp examination, and IOP measurement. Corneal edema, anterior chamber cells and conjunctival hyperemia were checked.

Ethical consent:

An approval of the study was obtained from Al-Azhar University Academic and Ethical Committee. Every patient signed an informed written consent for acceptance of the operation. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test (χ^2) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean ± SD. Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value ≤ 0.05 was considered significant.

RESULTS

The mean age of the patients was 59.33 ± 9.37 (ranged 35 to70) years old. Twenty patients were males while 10 were females. Eighteen eyes were right while 12 were left. The mean pre-operative VA (log MAR) was 1.00 ± 0.61 (ranged 0.3 to 2.2). The mean IOP was 14.60 ± 2.54 (ranged 10 to 20) mmHg (Tables 1 & 2).

Table (1): The demographic data of the study group

		Total no. = 30
Age	Mean ± SD	59.33 ± 9.37
	Range	35 – 70
Sex	Female	10 (33.3%)
	Male	20 (66.7%)
Eye	Rt	18 (60.0%)
	Lt	12 (40.0%)

There was no significant difference in the IOP before and after TA injection (Figure 1). While, there were significant differences in corneal edema, AC cells, conjunctival hyperemia and dryness from first day post-operative and through the study period (Table 2). There were 10 cases with persistent TA particle precipitations lasted for 2 weeks leaving no harm (No iris atrophy). No cases of endophthalmitis were reported.

Table (2): The effect of intracameral triamcinolone after phacoemulsification

		Intracameral triamcinolone					**Test value**	**P-value**	**Sig.**
		Pre	**1 day**	**1 week**	**1 month**	**3 months**			
V/A (logMAR)	Mean ± SD	1.00 ± 0.61	0.93 ± 0.33	0.54 ± 0.20	0.35 ± 0.16	0.31 ± 0.15	48.285•	0.000	HS
	Range	0.3 – 2.2	0.5 – 1.5	0.3 – 1	0.2 – 0.8	0.2 – 0.8			
IOP (mmHg)	Mean ± SD	14.60 ± 2.54	14.47 ± 2.70	14.60 ± 2.01	14.63 ± 2.72	14.53 ± 2.50	0.052•	0.987	NS
	Range	10 – 20	10 – 22	11 – 21	12 – 20	12 – 22			
Corneal edema	Negative	–	5 (16.7%)	28 (93.3%)	30 (100.0%)	30 (100.0%)	85.670*	0.000	HS
	I	–	20 (66.7%)	2 (6.7%)	0 (0.0%)	0 (0.0%)			
	II	–	5 (16.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)			
AC cells	Negative	–	4 (13.3%)	29 (96.6%)	30 (100.0%)	30 (100.0%)	33.090*	0.000	HS
	I	–	24 (80.0%)	1 (3.3%)	0 (0.0%)	0 (0.0%)			
	II	–	2 (6.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)			
Conjunctival hyperemia	No	–	4 (13.3%)	29 (96.7%)	30(100%)	30(100%)	29.384*	0.000	HS
	Yes	–	26 (86.7%)	1 (3.3%)	0 (0%)	0 (0%)			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant, *: Chi-square test; •: Repeated Measures ANOVA test

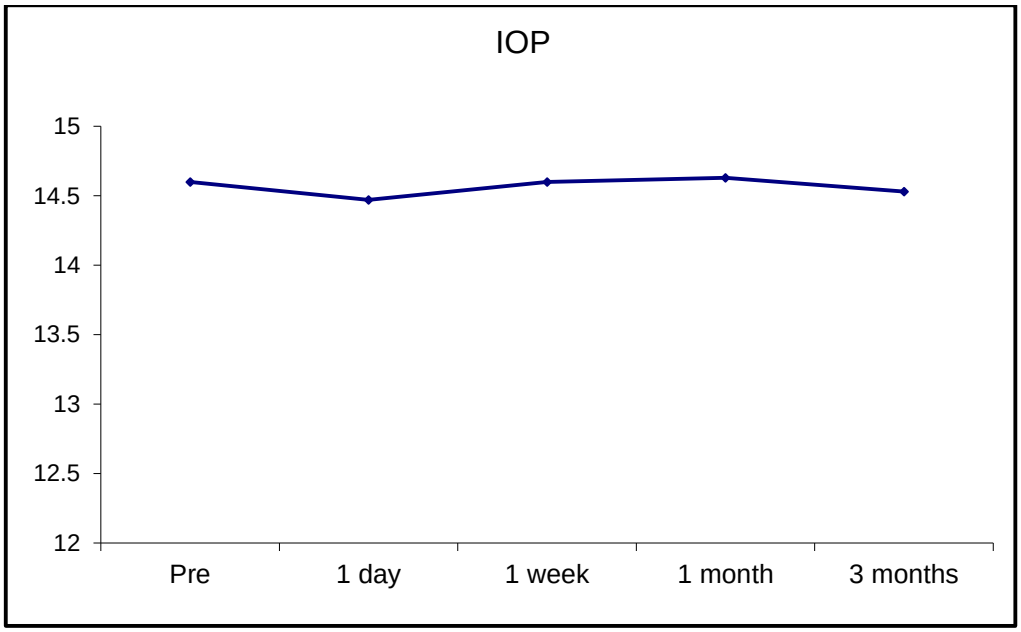

Figure (1): IOP before and after intracameral triamcinolone injection following phacoemulsification.

DISCUSSION

Topical steroids are the most common treatment used for postoperative inflammation. There are other methods of administration of steroids such as subconjunctival, subtenon, intracameral and intravitreal [(6)]. **Coronel and Co** [(7)] reported that intracameral TA has a 100% effect after four weeks of phacoemulsification and is completely safe for treating postoperative inflammation after surgery. Steroids gain their anti-inflammatory effect by acting on multiple intercellular inflammatory mediators. Steroids control the leakage of inflammatory cells and inhibit granulation tissue formation and fibroblasts propagation [(8)].

The post-operative inflammation can be controlled effectively by topical corticosteroid eye drops. They have several disadvantages: the low and unreliable intraocular levels of topically applied drops, fluctuation of concentrations from instillations till reaching peak concentrations taking approximately 1 hour after application. Also, loss of compliance as a result of frequent application needed at postoperative period. Moreover, it has an unfavorable effect on the cornea, resulting in of tear film disruption and later irritation. The cost of eye drops may be an additional problem [(4)]. Therefore, alternative methods of steroid administration have been tried [(9)].

TA has been used to control intraocular inflammation. It has longer half-life in intraocular fluids. This makes it suitable for controlling inflammation if used intracamerally, intravitreally, or via sub-tenon's injection. Traces of TA in AC have been found as long as 6 months after intravitreal injection [(7)].

In this study, there was no significant difference in IOP after TA injection throughout the study period.

This agrees with several studies [(2, 4, 5, 7, and 10)]. However, **Gungor *et al.*** [(11)] have reported an increase in IOP after TA injection in the first day. This may be due to the high dose of TA used in by **Gungor *et al.*** [(11)] (2 mg/0.05). While, in current study 1mg/0.1 was used. TA was effective in controlling the AC inflammation. Approximately, 97% of patients have no flare or cells in AC one week postoperatively. This agrees with **Shaheen *et al.*** [(2)]**, Manzoor and Moin** [(10)]**, Gungor *et al.*** [(11)]**, Karalezli *et al.*** [(4)] and **Karalezli *et al.*** [(5)]**.** TA has the advantage of stable aqueous level. Moreover, it doesn't depend on patient compliance.

In this study, intracameral TA decreases postoperative corneal edema. That was also found and by **Gills and Gills** [(12)]. TA is safe on corneal endothelium as reported by **Oh *et al.*** [(13)], who applied TA intracamerally into rabbit eyes to detect the effect of TA on the corneal endothelium. There were no statistically significant differences in endothelial cell counts and central corneal thickness following intracameral injection of TA.

As regards conjunctival hyperemia, intracameral TA injection decreases it effectively. This is also reported by **Karalezli *et al.*** [(4)]. TA is superior on topical steroid in conjunctival hyperemia due to absence of preservative present in topical eye drops. Also, most of topical steroid eye drops are suspension which may lead to foreign body sensation by the patient. Moreover, Intracameral injection of TA can reach the vitreous cavity by passing through the zonules. This has a benefit in certain circumstances, as and in diabetic patients to decrease the risk of macular edema and neovascularization, and in posterior-capsular rupture to avoid cystoid macular edema [(7)].

In conclusion, intracameral TA injection has been established in pediatric cataract surgery in association with topical steroid to decrease the postoperative inflammation. But in this study, a single dose intracameral injection, instead of topical steroid, was found to be safe and effective. That avoids the side effect of topical steroid listed before especially in old patients.

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