The Egyptian Journal of Hospital Medicine (January2023) Vol. 90, Page 601- 606

Comparison of Anti-inflammatory Effect between Intracameral Triamcinolone Acetonide and Topical Dexamethasone after Phacoemulsification

Nashwa Mohamed Mohamed Elkhodary*, Zeinab Sayed Hasan, Nermin Salah El-Din Mohamed
Department of Ophthalmology, Faculty of Medicine (for Girls), Al-Azhar University, Egypt
***Corresponding author:** Nashwa Mohamed Mohamed Elkhodary, **Mobile:** 01016976242,
Email: Nashwa_kh90@yahoo.com

ABSTRACT

Background: Despite better surgical methods and intraocular lenses, phacoemulsification has emerged as the most widely used and gold standard in cataract surgery today. One of the most typical surgical consequences is postoperative inflammation. Surgical trauma damages the blood aqueous barrier, allowing proteins and inflammatory cells to flow into the anterior chamber. **Objective:** The aim of the current study is to compare the effectiveness of a single intracameral dose of triamcinolone and topical dexamethasone in controlling inflammation following phacoemulsification.

Patients and methods: The current clinical trial included 60 eyes divided into two equal groups; *Group A* included 30 eyes which received single intracameral injection of triamcinolone acetonide (ICTA) 1 mg at the end of surgery, and *Group B* included 30 eyes which was given topical dexamethasone eye drops 5 times per day for 1 week and the dose decreased gradually. **Results:** It is found that there was no statistically significant difference between the two studied groups regarding corneal edema, anterior chamber (AC) cells at 1 day and 1 week after surgery. All cases of the two groups were found negative for corneal edema, AC cells at 1 month and 3rd month postoperative. There was no significant difference between the two groups in terms of mean BCVA or intraocular pressure (IOP) at any time point (P >0.05) postoperatively. Our results show that there was highly significant difference between the two studied groups regarding conjunctival irritation at 1 day, 1 week and 1 month and there is non-significant difference at 3rd month. No significant complications like endophthalmitis were observed.

Conclusion: Intracameral triamcinolone injection was demonstrated to be a promising safe alternative to topical dexamethasonen with comparable efficacy in terms of the management of postoperative inflammation after phacoemulsification and was associated with minimal complications and higher compliance.

Keywords: Cataract, Inflammation, Phacoemulsification, Triamcinolone.

INTRODUCTION

The most common form of curable blindness worldwide is cataract [(1)]. The most frequent treatment performed by ophthalmologists globally is cataract surgery, which is carried out on about 18 million patients per year and is predicted to rise as the world's population and life expectancy rise [(2)]. Although better surgical methods and intraocular lenses have made phacoemulsification the most widely used and gold standard in cataract surgery, postoperative inflammation remains one of the most frequent postoperative consequences [(3)].

Surgical trauma damages the blood aqueous barrier, allowing proteins and inflammatory cells to flow into the anterior chamber. Increased recovery time, increased intraocular pressure (IOP), synechiae development, and cystoid macular edoema are all consequences of uncontrolled postoperative inflammation [(4)]. After cataract surgery, topical steroids are frequently used to reduce postoperative inflammation. Injections into the anterior chamber, sub-tenon, sub-conjunctiva, also intravitreal injections are other methods of administering steroids to the eye [(5)]. Although topical steroids are useful for reducing postoperative inflammation, they have several drawbacks, such as poor compliance from daily dosages that must be repeated, disturbance of the tear film, and discomfort [(6)].

The aim of this study was to compare the effectiveness of a single dose intracameral triamcinolone injection and topical dexamethasone in controlling post-operative inflammation after phacoemulsification.

PATIENTS AND METHODS

This study was a prospective, non-randomized, controlled clinical trial. This clinical trial was conducted on 60 patients admitted from Al Zahraa University Hospitals in the period from January 2019 to April 2021 with age ranging from 30 years to 70 years.

Inclusion criteria were participants with age 30-70 years old, both sexes, clear ocular media and catractous lens.

Exclusion criteria were previous intraocular surgical intervention, history of trauma, anterior uveitis, glaucoma, complications during surgery, and presence of systemic diseases or conditions as diabetes mellitus.

All subjects in our study were subjected to demographic data as age, gender, history of presence of systemic diseases and history of trauma or previous ophthalmic interference, and full ophthalmological preoperative examination including slit lamp examination for anterior chamber cells, corneal edema, visual acuity by Snellen chart, IOP measurements by air-puff and fundus examination.

Received: 15/10/2022
Accepted: 15/12/2022

All the patients were operated by limbal incision (clear corneal) and surgery was performed by the same surgeon by phacoemulsification procedure under local anesthesia, foldable intraocular lens was implanted in the capsular bag. Phaco-machine, phaco-power, viscoelastic, irrigation fluid and type of intraocular lens were kept constant in all patients. Intracameral triamcinolone was prepared with concentration of 1mg / 0.1ml for intracameral injection after I/A step at the end of surgery in *Group A*. Topical dexamethasone 0.1% eye drops were given to the patients postoperatively in *Group B* 5 times/day for 1 week and the dose decreased gradually.

Ethical consent

This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Al-Azhar University. Written informed consent was obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical analysis

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 23 for windows. Qualitative data were defined as numbers and percentages. Chi-Square test and Fisher's exact test were used for comparison between categorical variables as appropriate. Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as means and SD, and independent sample t-test was used for comparison between groups. P value ≤0.05 was considered to be statistically significant.

RESULTS

This study conducted on 60 patients admitted from Al Zahraa University Hospitals with age ranged from 30 years to 70 years with mean of 57.68 (SD 10.5). They were 25 (41.7%) females and 35 (58.3%) males with 34 (56.7%) right affected eye and 26 (43.3%) left affected eye. Table 1 compares topical group with Intracameral triamcinolone group.

Table 1: Comparison between the two studied groups regarding demographic data and affected eye of the studied cases.

Variable		Topical group	Intracameral triamcinolone group	Test value	P-value	Sig.
		No. = 30	No. = 30			
Age	Mean ± SD	56.03 ± 11.44	59.33 ± 9.37	-1.222•	0.227	NS
	Range	30 – 70	35 – 70			
Sex	Female	15 (50.0%)	10 (33.3%)	1.714*	0.190	NS
	Male	15 (50.0%)	20 (66.7%)			
Eye	Right	16 (53.3%)	18 (60%)	0.271*	0.602	NS
	Left	14 (46.7%)	12 (40%)			

*: Chi-square test; •: Independent t-test.

Table 2 demonstrates that while there was a highly statistically significant difference in conjunctival irritation between the two investigated groups, there was no statistically significant difference in V/A, IOP, corneal edema, AC cells, or dryness at 1 day postoperatively.

Table 2: Comparison between the two studied groups regarding postoperative examination at 1 day.

1 day		Topical group	Intracameral triamcinolone group	Test value	P-value	Sig.
		No. = 30	No. = 30			
V/A (logMAR)	Mean ± SD	1.08 ± 0.26	0.93 ± 0.23	1.325•	0.190	NS
	Range	0.5 – 2.2	0.5 – 1.5			
IOP	Mean ± SD	14.70 ± 3.12	14.47 ± 2.70	0.310•	0.758	NS
	Range	12 – 24	10 – 22			
Corneal edema	Negative	18 (60.0%)	18 (60%)	0.253*	0.881	NS
	I	9 (30.0%)	10 (33.3%)			
	II	3 (10.0%)	2 (6.7%)			
AC cells	Negative	10 (33.3%)	18 (60%)	4.987*	0.083	NS
	I	8 (26.7%)	3 (10%)			
	II	12 (40.0%)	9 (30%)			
Conjunctival irritation	No	12 (40.0%)	26 (86.7%)	14.067*	0.000	HS
	Yes	18 (60.0%)	4 (13.3%)			
Dryness	No	19 (63.3%)	24 (80%)	2.052*	0.152	NS
	Yes	11 (36.7%)	6 (20%)			

*: Chi-square test; •: Independent t-test

Table 3 shows, after one week postoperative, there was no statistically significant difference between the two examined groups in terms of V/A, IOP, corneal edema, or AC cells, however there was a difference in terms of conjunctival irritation and dryness.

Table 3: Comparison between the two studied groups regarding postoperative examination at 1 week.

1 week		Topical group	Intracameral triamcinolone group	Test value	P-value	Sig.
		No. = 30	No. = 30			
V/A (logMAR)	Mean ± SD	0.63 ± 0.15	0.54 ± 0.12	1.530•	0.132	NS
	Range	0.2 – 1.3	0.3 – 1			
IOP	Mean ± SD	14.80 ± 2.67	14.60 ± 2.01	0.328•	0.744	NS
	Range	12 – 23	11 – 21			
Corneal edema	Negative	28 (93.3%)	28 (93.3%)	0.000*	1.000	NS
	I	2 (6.7%)	2 (6.7%)			
	II	0 (0.0%)	0 (0.0%)			
AC cells	Negative	15 (50.0%)	21 (70%)	2.500*	0.114	NS
	I	15 (50.0%)	9 (30%)			
	II	0 (0.0%)	0 (0.0%)			
Conjunctival irritation	No	3 (10.0%)	20 (66.7%)	20.376*	0.000	HS
	Yes	27 (90.0%)	10 (33.3%)			
Dryness	No	15 (50.0%)	24 (80%)	5.934*	0.015	S
	Yes	15 (50.0%)	6 (20%)			
Endophthalmitis	No	30 (100.0%)	30 (100%)	–	–	–

*: Chi-square test; •: Independent t-test.

Table 4 shows, the two study groups did not vary statistically significantly in terms of V/A and IOP, with p-values of 0.070 and 0.725, respectively. Additionally, there was a statistically significant difference in conjunctival irritation and dryness between the two study groups, with p-values of 0.000 and 0.002, respectively. The data also reveals that after one month, all patients in the two groups tested negative for endophthalmitis, AC cells, and corneal edema.

Table 4: Comparison between the two studied groups regarding postoperative examination at 1 month.

1 month		Topical group	Intracameral triamcinolone group	Test value	P-value	Sig.
		No. = 30	No. = 30			
V/A (logMAR)	Mean ± SD	0.43 ± 0.10	0.35 ± 0.06	1.844•	0.070	NS
	Range	0.2 – 0.8	0.2 – 0.8			
IOP	Mean ± SD	14.90 ± 3.11	14.63 ± 2.72	0.353•	0.725	NS
	Range	12 – 23	12 – 20			
Corneal Edema	Negative	30 (100.0%)	30 (100%)	–	–	–
	I	0 (0.0%)	0 (0.0%)			
	II	0 (0.0%)	0 (0.0%)			
AC cells	Negative	30 (100.0%)	30 (100%)	–	–	–
	I	0 (0.0%)	0 (0.0%)			
	II	0 (0.0%)	0 (0.0%)			
Conjunctival Irritation	No	4 (13.3%)	24 (80%)	26.786*	0.000	HS
	Yes	26 (86.7%)	6 (20%)			
Dryness	No	10 (33.3%)	22 (73.3%)	9.643*	0.002	HS
	Yes	20 (66.7%)	8 (26.7%)			
Endophthalmitis	No	30 (100.0%)	30 (100%)	–	–	–

*: Chi-square test; •: Independent t-test.

With p-values of 0.068, 0.576, 0.067, 0.067, and 0.313, respectively, table 5 demonstrates that there was no statistically significant difference between the two examined groups for V/A, IOP, conjunctival irritation, dryness, or CME. The chart also reveals that after three months, all patients in the two groups tested negative for endophthalmitis, AC cells, and corneal edema.

Table 5: Comparison between the two studied groups regarding postoperative examination at 3 months.

3 Months		Topical group	Intracameral triamcinolone group	Test value	P-value	Sig.
		No. = 30	No. = 30			
V/A(logMAR)	Mean ± SD	0.39 ± 0.07	0.31 ± 0.05	1.858•	0.068	NS
	Range	0.2 – 0.8	0.2 – 0.8			
IOP	Mean ± SD	14.87 ± 2.06	14.53 ± 2.50	0.563•	0.576	NS
	Range	12 – 18	12 – 22			
Corneal Edema	Negative	30 (100%)	30 (100%)	–	–	–
	I	0 (0.0%)	0 (0.0%)			
	II	0 (0.0%)	0 (0.0%)			
AC cells	Negative	30 (100%)	30 (100%)	–	–	–
	I	0 (0.0%)	0 (0.0%)			
	II	0 (0.0%)	0 (0.0%)			
Conjunctival Irritation	No	14 (46.7%)	21 (70%)	3.360*	0.067	NS
	Yes	16 (53.3%)	9 (30%)			
Dryness	No	9 (30%)	16 (53.3%)	3.360*	0.067	NS
	Yes	21 (70%)	14 (46.7%)			
Endophthalmitis	No	30 (100.0%)	30 (100%)	–	–	–
CME	No	29 (96.7%)	30 (100%)	1.017*	0.313	NS
	Yes	1 (3.3%)	0 (0.0%)			

*: Chi-square test; •: Independent t-test.

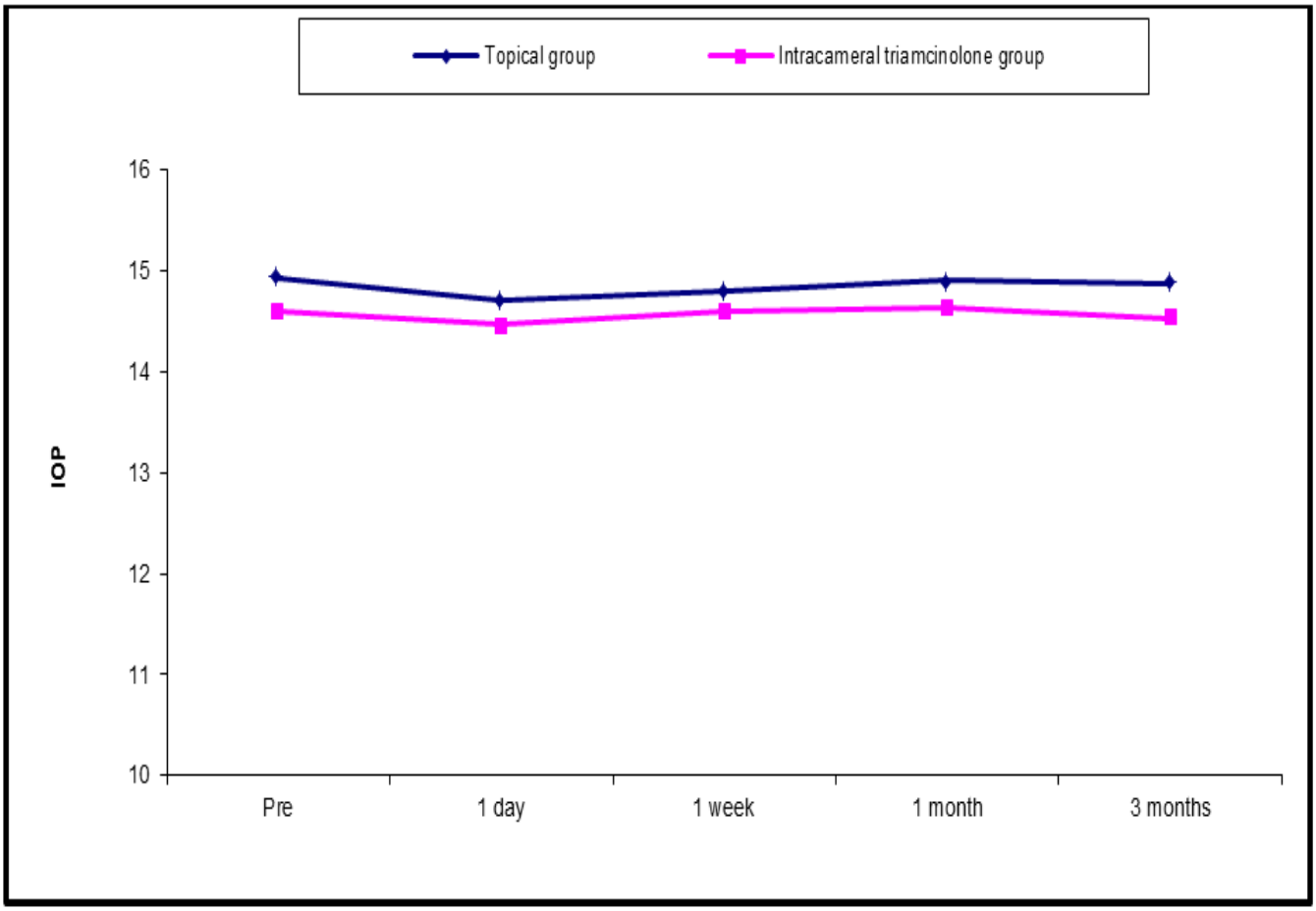

Figure (1): Comparison between the two studied groups regarding IOP at different times of measurement.

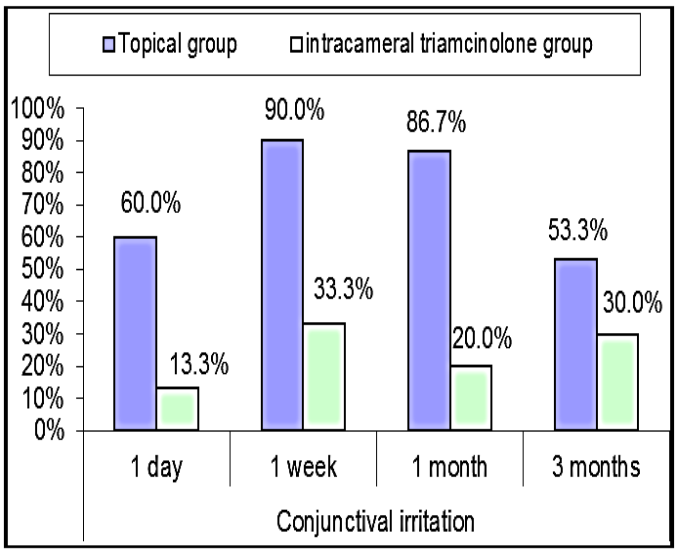

Figure (2): Comparison between the two studied groups regarding conjunctival irritation at different times of measurement.

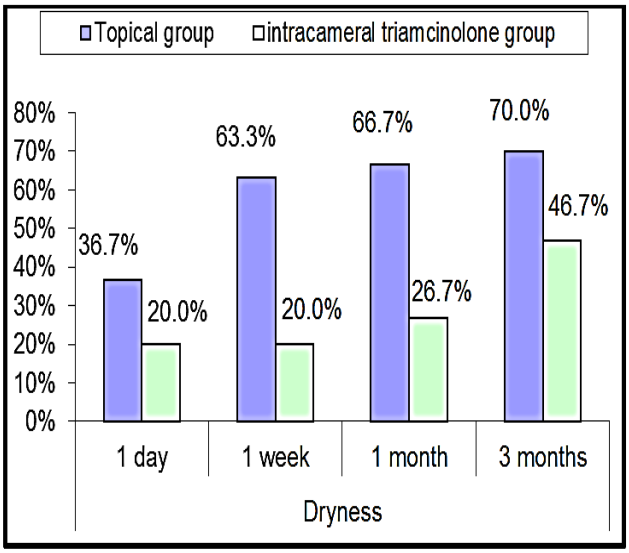

Figure (3): Comparison between the two studied groups regarding dryness at different times of measurement.

DISCUSSION

The second most common cause of vision impairment and the primary cause of blindness worldwide is cataract. It is a frequent disorder in later age and is described as any opacity of the crystalline lens of the eye that impairs clear vision [(7)].

Phacoemulsification is the most widely used surgery for cataract extraction and the gold standard of treatment. But surgical inflammation can lead to eye issues including IOP, cystoid macular edema, longer recovery times, or synechiae development [(8)].

Topical steroids are the most commonly used form of therapy fort post-operative inflammation. In addition to the topical route, there are various ways to administer steroids to the eye, including subconjunctival, subtenon, intracameral, and intravitreal injections. After four weeks of phacoemulsification, triamcinolone, when administered intracamerally, has a 100% effect and is fully safe for treating postoperative inflammation following cataract surgery [(5)]. Steroids work on multiple intercellular inflammatory mediators to reduce inflammation. Steroids regulate the leaking of inflammatory cells and prevent the growth of granulation tissue and fibroblasts [(9)].

Topical corticosteroid eye drops help reducing post-operative irritation. They have a number of drawbacks, including low and unpredictable intraocular drug concentrations, a one-hour delay between instillations and peak concentrations, and concentration fluctuations. Additionally, the requirement for regular administration throughout the postoperative period reduces the compliance. Additionally, it has a negative impact on the cornea, disrupting the tear film and irritating the conjunctiva. The price of eye drops might be a further issue [(10)].

Dryness, discomfort, and pain are postoperative visual symptoms linked to inflammation that may impede healing and decrease patient satisfaction. As a result, controlling the inflammation is crucial for postoperative care [(11)].

Therefore, alternative methods of steroid administration have been tried[(12)]. TA has been used to control intraocular inflammation. It has longer half-life in intraocular fluids. This qualifies it for the management of inflammation when administered intravenously, intracamerally, or by sub-tenon injections. Even six months after intravitreal injection, TA traces have been discovered in AC [(13)].

The current study showed that there was no statistically significant change in IOP between the two examined groups in the preoperative period, one day after surgery, one week , one month , and three months later. Additionally, there was no statistically significant change in the TA group's preoperative and postoperative data for IOP. And the same findings were found in the Topical one. Our results are similar to those of **Shaheen *et al.*** [(8)] and **Manzoor and Moin** [(6)], as they used the same concentration of drugs that we used in both groups.

On the contrary**, Gungor *et al.*** [(14)] found that mean IOP values were substantially greater in group 2 than in group 1 at one postoperative day (P= 0.009), this may be due to the high dose of TA used (2mg/0.05). While, in current study a dose of 1mg/0.1 was used.

In this study, intracameral TA decreases postoperative corneal edema. In the same line, after injecting triamcinolone acetonide into the anterior chamber of a rabbit's eyes, **Oh *et al.*** [(15)] discovered no statistically significant decrease in the central corneal thickness or any variation in the endothelial cell count.

According to him, intracameral TA is found to be safe on corneal endothelum. That was also discovered by **Gills and Gills** [16], who used various dosages of triamcinolone acetonide injections in the anterior chamber to avoid corneal edema after cataract surgery. According to their hypothesis, triamcinolone acetonide reduced corneal edema.

The current study demonstrated that intracameral TA was effective in controlling the AC inflammation. This was in agreement with **Manzoor and Moin** [6], **Shaheen *et al.*** [8], **Coronel *et al.*** [13], **Gungor *et al.*** [14], **Gills and Gills** [16], and **Ellis** [17]. Intracameral TA has the advantage of stable aqueous level. Moreover, it doesn't depend on patient compliance.

Our results showed that TA was found to produce less conjunctival irritation and dryness than topical steroids. And this goes in line with **Karalezli *et al.*** [10]. ICTA is superior to topical steroid in avoiding 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 in diabetic patients to decrease the risk of macular edema and neovascularization, and in posterior-capsular rupture to avoid cystoid macular edema [13].

CONCLUSION

ICTA is effective in controlling the AC inflammation and has the advantage of stable aqueous level. Moreover, it doesn't depend on patient compliance. TA is superior to topical steroid in avoiding conjunctival hyperemia due to absence of preservative present in topical eye drops.

Financial support and sponsorship: Nil.
Conflict of interest: Nil.

REFERENCES

1. **Murthy G, John N, Shamanna B *et al.* (2012):** Elimination of avoidable blindness due to cataract: where do we prioritize and how should we monitor this decade? Indian Journal of Ophthalmology, 60(5):438-50.
2. **Pascolini D, Mariotti S (2012):** Global estimates of visual impairment: 2010. Br J Ophthalmol., 96(5):614-618-31.
3. **Khan M, Ahmad F, Ahsen M *et al.* (2022):** Examine the Comparison of Efficacy Between Intracameral and Sub Conjuctival Dexamethasone for the Prevention of Postoperative Inflammation in Patients with Cataract Surgery. Pakistan Journal of Medical & Health Sciences, 16(05):1435-45.
4. **Imdad T (2013):** Effect of Dexamethasone versus Diclofenac Sodium after Phacoemulsification with Intraocular Lens Implantation. Journal of Rawalpindi Medical College, 17(2):254-6.
5. **Patel A, Cholkar K, Agrahari V *et al.* (2013):** Ocular drug delivery systems: An overview. World Journal of Pharmacology, 2(2):47-50.
6. **Manzoor A, Moin M (2018):** Comparison of anti-inflammatory effect between intracameral triamcinolone acetonide and topical dexamethasone after phacoemulsification. Pakistan Journal of Ophthalmology, 34(1):201-10.
7. **Liu Y, Wilkins M, Kim T *et al.* (2017):** Cataracts. The Lancet, 390(10094):600-12.
8. **Shaheen K, Ullah M, Hussain S *et al.* (2020):** Intracameral Triamcinolone Acetonide Versus Topical Dexamethasone: A Comparison of Anti-inflammatory Effects After Phacoemulsification. Cureus, 12(4):34-50.
9. **Chen P, Han X, Zhu Y *et al.* (2016):** Comparison of the anti-inflammatory effects of fluorometholone 0.1% combined with levofloxacin 0.5% and tobramycin/ dexamethasone eye drops after cataract surgery. Int J Ophthalmol., 9(11):1619-23.
10. **Karalezli A, Borazan M, Akova Y (2008):** Intracameral triamcinolone acetonide to control postoperative inflammation following cataract surgery with phacoemulsification. Acta Ophthalmologica, 86(2):183-7.
11. **Shah T, Conway M, Peyman G (2018):** Intracameral dexamethasone injection in the treatment of cataract surgery induced inflammation: design, development, and place in therapy. Clin Ophthalmol., 12:2223-35.
12. **Dada T, Dhawan M, Garg S *et al.* (2007):** Safety and efficacy of intraoperative intravitreal injection of triamcinolone acetonide injection after phacoemulsification in cases of uveitic cataract. Journal of Cataract & Refractive Surgery, 33(9):1613-8.
13. **Coronel M, Co G (2008):** Safety and efficacy of intracameral triamcinolone in postcataract inflammation. Philipp J Ophthalmol., 33:22-6.
14. **Gungor S, Bulam B, Akman A *et al.* (2014):** Comparison of intracameral dexamethasone and intracameral triamcinolone acetonide injection at the end of phacoemulsification surgery. Indian J Ophthalmol., 62(8):861-4.
15. **Oh J, Wee W, Lee J *et al.* (2007):** Short-term effect of intracameral triamcinolone acetonide on corneal endothelium using the rabbit model. Eye, 21(6):812-8.
16. **Gills J, Gills P (2005):** Effect of intracameral triamcinolone to control inflammation following cataract surgery. Journal of Cataract & Refractive Surgery, 31(8):1670-1.
17. **Ellis O (1966):** Pharmacological effects of corticosteroids. Ellis PP Int Ophthalmol Clin., 6(4):799-819.