

Comparison of Effect of Sub-Tenon's and Peribulbar Local Anesthesia on Intraocular Pressure (IOP) for Cataract Surgery

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ABSTRACT

Objective: to determine the change in intraocular pressure after sub-Tenon's vs peribulbar local anesthesia in patients undergoing cataract surgery.

Study Design: Randomized controlled trial

Place and Duration of Study: Department of Ophthalmology, Allama Iqbal Memorial Teaching Hospital, Sialkot from 28th December 2020 to 27th June 2021

Methodology: Total 60 patients (30 in each group) were enrolled in the study. Patients were divided randomly into 2 groups by method of lottery. In group A, sub-Tenon's anesthesia was used, and in group B, peribulbar anesthesia was used. Digital pressure was started after administration of anesthesia and continued for ten minutes with 10 seconds interval after every two minutes.

Results: In this study there were 33(55%) were male and 27(45%) were females. At baseline the mean IOP of the patients with peribulbar anesthesia was 14.83±2.00 mmHg while in patients with sub-Tenon's anesthesia it was 14.27±1.59 mmHg (p-value =0.230). after 1 minute mean IOP of patients with peribulbar anesthesia was 23.10±4.39 mmHg while in patients with sub-Tenon's anesthesia, it was 18.50±1.94 mmHg (p<0.001). after 15 minutes mean IOP was 19.53±3.02 mmHg in patients with peribulbar anesthesia and 15.57±1.35 mmHg in patients with sub-Tenon's anesthesia (p<0.001).

Conclusion: This study concluded that there is significantly more mean change in IOP with peribulbar anesthesia noted as compared to sub-Tenon's anesthesia for cataract surgery.

Keywords: Cataract surgery, sub-Tenon's anesthesia, peribulbar anesthesia.

INTRODUCTION

Cataract surgery is the communal surgeries performed in advanced countries. In addition to its substantial effect on visual acuity, phacoemulsification considered as a procedure that potentially reduces intraocular pressure.^{1,2}

Although the available evidence suggests a significant and sustained overall IOP reduction after cataract surgery, the specific characteristics of the eye that may help predict which patients may benefit from the IOP lowering effect remain unclear³⁻⁴. Cataract surgery has been recognized as the best glaucoma surgery because of its IOP-lowering effect⁵.

Sub-Tenon's anesthesia is effective and reliable in producing both akinesia and anesthetic for cataract surgery. A single injection of a local anesthetic to block the tendon subcapsule with lignocaine with a mixture of epinephrine, bupivacaine and hyaluronidase was found to be effective in inducing akinesia of the ocular muscles.⁶⁻⁷

One study found significant decrease in IOP with sub-Tenon's local anesthesia i.e from 21.04±4.79 mmHg to 18.12±4.75 mmHg (mean change= 2.92±2.27 mmHg, p<0.001)⁸. But another study found insignificant decrease in IOP with sub-Tenon's local anesthesia i.e from 19.8±3.8 mmHg to 19.68±19mmHg (mean change=0.12±1.39mmHg, P=0.911)⁹ however regarding peribulbar anesthesia one study found mean IOP change from 12.11±1.22 mmHg to 17.37±1.28 mmHg.¹⁰⁻¹² mean change was 5.26±0.06.¹⁰

Aim of this study is to determine the change in IOP with sub-Tenon's and peribulbar local anesthesia among patients enduring cataract surgery. Literature showed that sub-Tenon's local anesthesia reduces IOP significantly as compared to peribulbar local anesthesia. But controversial data has been retrieved from literature. Therefore, we would like to conduct this study to obtain local evidence and to administer local anesthesia under the tendon capsule in patients who will undergo cataract surgery.

MATERIALS AND METHODS

This randomized controlled trial was held in the Ophthalmology department of Allama Iqbal Memorial Teaching Hospital, Sialkot for 6 months i.e. 28th December 2020 to 27th June 2021. Sampling technique was non-probability, consecutive sampling.

A total 60 (30 in each group) sample size was calculated with 95% CI, 80% power test, d=0.05, 30 for group A taking mean change in IOP i.e 2.92±2.27mmHg with sub-Tenon's and 5.26±0.06 mmHg with peribulbar local anesthesia for cataract surgery.

A total of 60 patients (30 in each group) fulfilling the selection criteria were included from the wards of Ophthalmology Department, Allama Iqbal Memorial Teaching Hospital, Sialkot. Written informed consent was obtained. Demographic information (name, sex, age, duration of cataract) was also obtained. Patients with glaucoma, uveitis, previous ocular surgery (on medical record) and history of trauma were omitted. Patients were divided randomly into 2 groups by method of lottery. In group A, sub-Tenon's anesthesia was used, and in group B, peribulbar anesthesia was used. Digital pressure was started after administration of anesthesia and continued for ten minutes with 10 seconds interval after every two minutes. All surgeries were completed by one experienced surgeon. IOP was assessed with a manual tonometer in the supine position just before and 15 minutes after anesthesia, and the change in IOP (according to operational definitions) was recorded.

Collected data were analyzed and entered through SPSS version 20.0. The quantitative variables like age, duration of cataract, IOP at baseline and 15-minutes of anesthesia and change in IOP was presented as mean±S.D. The qualitative variables like gender and anatomical side were presented as percentage and frequency. For mean change in IOP, paired samples t-test was applied. P value <0.05 was taken as significant. Data was stratified for gender, age, duration of cataract, anatomical side (left/right). Post-stratification t-test was used taking p-values≤0.05 as significant.

RESULTS

Total 60 patients were selected. The patients mean age in the peribulbar anesthesia group was 56.4±9.2 years while the patients mean age in the sub-Tenon's anesthesia group was 55.6±8.6 years (Table-1). There were 33(55%) male and 27(45%) were females. Among them there were 15(50%) males and 15(50%) females in peribulbar anesthesia treated group and 18(60%) were males and 12(40%) females in sub-Tenon's anesthesia treated group (Table 2).

Table 1: Distribution of patients by age

Age	Peribulbar	Sub-tenon's	Total
≤ 60	18(60.0%)	20(66.7%)	38(63.3%)
> 60	12(40.0%)	10(33.3%)	22(36.7%)
Total	30 (100%)	30 (100%)	60(100%)
Mean±SD	56.4±9.2	55.6±8.6	

Table 2: Distribution of patients by gender

Gender	Peribulbar	Sub-tenon's	Total
Male	15(50%)	18(60%)	33 (55%)
Female	15(50%)	12(40%)	27(45%)
Total	30 (100%)	30 (100%)	60(100%)

Left anatomical side was noted in 13(43.3%) patients with peribulbar anesthesia while in 17(56.7%) patients with sub-Tenon's anesthesia. Similarly, right anatomical side noted in 17(56.7%) patients with peribulbar anesthesia and 13(43.3%) patients with sub-Tenon's anesthesia (Table 3).

At baseline the mean IOP of the patients with peribulbar anesthesia was 14.83±2.00 mmHg while in patients with sub-Tenon's anesthesia it was 14.27±1.59 mmHg (p-value =0.230). after 1 minute mean IOP of patients with peribulbar anesthesia was 23.10±4.39 mmHg while in patients with sub-Tenon's anesthesia, it was 18.50±1.94 mmHg (p<0.001). after 15 minutes mean IOP was 19.53±3.02 mmHg in patients with peribulbar anesthesia and 15.57±1.35 mmHg in patients with sub-Tenon's anesthesia (p<0.001) (Table 4).

Table 3: Frequency of anatomical sides involved

Side	Peribulbar	Sub-tenon's	Total
Left	13(43.3%)	17(56.7%)	30(50.0%)
Right	17(56.7%)	13(43.3%)	30(50.0%)
Total	30 (100%)	30 (100%)	60(100.0%)

Table 4: Mean IOP at different stages

IOP (mmHg)	Peribulbar Mean(n=30)	Sub-tenon's Mean (n=30)	P value
Baseline	14.83±2.00	14.27±1.59	0.230
At 1 min	23.10±4.39	18.50±1.94	<0.001
At 15 min	19.53±3.02	15.57±1.35	<0.001

DISCUSSION

Cataract surgery is the communal surgeries performed in advanced countries. Previously, most cataract surgeries were accomplished under GA. Over time, there have been new advances and developments in cataract surgery. Surgery time has been shortened and the incision has been reduced, and most operations are now performed using safe and effective local anesthesia methods, thus avoiding the undesirable effects of general anesthesia using local anaesthesia.^{13,14}

The mean age in this study treated with peribulbar anesthesia were 56.4±9.2 years while the patients mean age treated with sub-Tenon's anesthesia was 55.6±8.6 years. Among 60 patients there were 33(55%) were male and 27(45%) were females with.

Khan et al¹⁵ showed that the two groups were comparable in terms of gender (p=0.73) and age (p-value=0.84). One study reported that patients mean age in control group was 60.16±15.2 years and 62.10±12.14 years in intervention group (p=0.507).⁹

In our study at baseline the mean IOP of patients treated with peribulbar anesthesia was 14.83±2.00 mmHg while with sub-Tenon's anesthesia it was 14.27±1.59 mmHg (p=0.230). After 1 minute the mean IOP of patients with peribulbar anesthesia was 23.10±4.39 mmHg while with sub-Tenon's anesthesia it was 18.50±1.94 mmHg (p<0.001). After 15 minutes mean IOP of patients treated with peribulbar anesthesia was 19.53±3.02 mmHg while with sub-Tenon's anesthesia it was 15.57±1.35 mmHg (p<0.001).

Khan et al. showed in their study that there was no change in mean IOP between the two groups just before injection

(p=0.73)¹⁵. There was high rise in mean IOP immediately post-injection in the periorbital anesthesia group than in the subtenon group (p<0.0001; mean IOP in both groups declined to baseline after injection) (p=0.52).

A study by Stevens et al showed that the periorbital injection was associated with a larger mean injection volume than the sub-tenon or retrobulbar technique, with a statistically significant (p<0.001) mean increase in IOP of 4.9 mmHg¹⁶.

Another study showed that IOP increased significantly (mean 7.97±8.80 mmHg) in the peribulbar group one minute after injection (p<0.05)¹⁷. There was no significant upsurge in the sub-tenon injection group (mean 0.12±3.09 mmHg). In both groups, IOP returned to pre-injection levels 10 minutes after treatment.

One study found significant decrease in IOP with sub-Tenon's anesthesia i.e. from 21.04±4.75 mmHg (mean change = 2.92±2.27, p<0.001).⁹ on the other hand one study found insignificant decrease in IOP with sub tenon's anesthesia i.e. from 19.8±3.8 mmHg to 19.68±19 mmHg (mean change = 0.12±1.39 mmHg, p=0.911).⁹

CONCLUSION

This study concluded that there is significantly more mean change in IOP with peribulbar anesthesia noted as compared to sub-tenon anesthesia for cataract surgery.

REFERENCES

- Melancia D, Abegão Pinto L, Marques-Neves C. Cataract surgery and intraocular pressure. *Ophthalmic Res.* 2015;53(3):141-8.
- Duan P, Liu Y, Li J. The comparative efficacy and safety of topical non-steroidal anti-inflammatory drugs for the treatment of anterior chamber inflammation after cataract surgery: a systematic review and network meta-analysis. *Graefes Arch Clin Exp Ophthalmol.* 2017;255(4):639-49.
- Chou J, Turalba A, Hogue A. Surgical innovations in glaucoma: the transition from trabeculectomy to MIGS. *Int Ophthalmol Clin.* 2017;57(4):39-55.
- Chang A, Fridberg A, Kugelberg M. Comparison of phacoemulsification cataract surgery with low versus standard fluidic settings and the impact on postoperative parameters. *Eur J Ophthalmol.* 2017;27(1):39-44.
- Zetterström C, Behndig A, Kugelberg M, Montan P, Lundström M. Changes in intraocular pressure after cataract surgery: analysis of the Swedish National Cataract Register Data. *J Cataract Refract Surg.* 2015;41(8):1725-9.
- Khan El, Mustafa J, McAdoo J, Shorten G. Efficacy of sub-Tenon's block using an equal volume of local anaesthetic administered either as a single or as divided doses. A randomised clinical trial. *BMC Anaesthesiol.* 2009;9:2.
- Ahn J, Jeong M, Park Y, Lee Y, Lee E, Kim S, Lee I, Seo K. Comparison of systemic atracurium, retrobulbar lidocaine, and sub-Tenon's lidocaine injections in akinesia and mydriasis in dogs. *Vet Ophthalmol.* 2013;16(6):440-5.
- Alwitary A, Koshy Z, Browning AC, Kiel W, Holden R. The effect of sub-Tenon's anaesthesia on intraocular pressure. *Eye (Lond).* 2001;15(Pt 6):733-5.
- Al-Ali N, Cheema RA, Abdelaziz MA, Khattak A. Randomized controlled trial to evaluate intraocular pressure following sub-Tenon's local anesthesia for cataract surgery: With and without hyaluronidase added to anesthetic solution. *Saudi J Anaesth.* 2014;8(Suppl 1):S63-6.
- Budd JM, Brown JP, Thomas J, Hardwick M, McDonald P, Barber K. A comparison of sub-Tenon's with peribulbar anaesthesia in patients undergoing sequential bilateral cataract surgery. *Anaesthesia.* 2009;64(1):19-22.
- Watkins R, Beigi B, Yates M, Chang B, Linardos E. Intraocular pressure and pulsatile ocular blood flow after retrobulbar and peribulbar anaesthesia. *Br J Ophthalmol.* 2001;85(7):796-8.
- Kumar CM, Dowd TC. Complications of ophthalmic regional blocks: their treatment and prevention. *Ophthalmologica.* 2006;220(2):73-82.
- Friedman DS, Reeves SW, Bass EB, Lubomski LH, Fleisher LA, Schein OD. Patient preferences for anaesthesia management during cataract surgery. *Br J Ophthalmol.* 2004;88(3):333-5.
- Hodgkins PR, Luff AJ, Morrell AJ, Botchway LT, Featherston TJ, Fielder AR. Current practice of cataract extraction and anaesthesia. *Br J Ophthalmol.* 1992;76(6):323-6.

15. Khan SA, Shah MA, Hussain I, Nawaz F, Alam M. Comparison of changes in intraocular pressure after subtenon and peribulbar local anaesthesia for phacoemulsification. *Pak J Ophthalmol.* 2017;33(4).
16. Stevens J, Giubilei M, Lanigan L, Hykin P. Sub-Tenon, retrobulbar and local anesthesia: the effect upon intraocular pressure. *Eur J Implant Refract Surg.* 1993;5(1):25-8.
17. Azmon B, Alster Y, Lazar M, Geyer O. Effectiveness of sub-Tenon's versus peribulbar anesthesia in extracapsular cataract surgery. *J Cataract Refract Surg.* 1999;25(12):1646-50.19.
18. Abd El-Galeel AM, Badr OI, Mohamed KG. Comparison between subtenon block and extraconal block during cataract surgery. *Scientific J Al-Azhar Med Faculty, Girls.* 2018;2(3):144.20.
19. Khokhar S, Gupta Y, Dhull C, Singh V. Intraoperative aberrometry in cataract surgery with topical versus peribulbar anesthesia. *Indian J Ophthalmol.* 2020;68(5):776-9.
20. Karimi A, Lindfield D, Turnbull A, Dimitriou C, Bhatia B, Radwan M, Gouws P, Hanifudin A, Amerasinghe N, Jacob A. A multi-centre interventional case series of 259 ab-interno Xen gel implants for glaucoma, with and without combined cataract surgery. *Eye (Lond).* 2019;33(3):469-477.
21. Akkaya S, Wang S. Local anesthesia techniques for ocular surgery. *Transl Perioper & Pain Med* 2018;5(1):14-18.
22. Carvalho B, Jantarada C, Azevedo J, Maia P, Guimarães L. Comparison of peribulbar block and general anaesthesia in mechanical vitrectomy: a prospective observational study. *Rev Esp Anestesiol Reanim (Engl Ed).* 2020;67(2):63-7.