e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13(1); 334-338
Original Research Article

Comparative Analysis of Sub-Tenon's and Peribulbar Anesthesia in Manual Small Incision Cataract Surgery

Anuradha Manish Totey

Assistant Professor, Department of Ophthalmology, Dr. Rajendra Gode Medical College, Amravati

Received: 02-12-2022 / Revised: 28-12-2022 / Accepted: 14-01-2023
Corresponding Author: Anuradha Manish Totey
Conflict of interest: Nil

Abstract

Background: The most common cause of blindness worldwide is cataracts. In a growing nation such as India, where employment is the primary driver of advancement, cataract-related blindness presents a major public health, economic, and social challenge. The anesthetic used during cataract surgery has changed over time in an effort to lower risks and problems. These days, small incision cataract surgery is performed under shorter acting, less invasive anesthetic protocols. This is made possible by advancements in surgical techniques, such as smaller and self-sealing wounds, improved intraocular lens designs, and less tissue manipulation with modern instrumentation. Comparing it to the earlier retro bulbar procedure, it produces less akinesia but has a lower rate of optic nerve injury. There have been documented incidences of brainstem anesthesia following peribulbar block, despite the fact that the peribulbar approach is thought to be safer than retrobulbar block. One of the most dangerous side effects of this method is globe perforation. The symptoms include rapid loss of vision, severe ocular discomfort, and hypotonicity of the globe. This condition needs to be surgically managed right away.

Aim: The aim of the study was to Comparison of peribulbar anesthesia with sub-Tenon's anesthesia in manual small incision cataract surgery in relation to the time of onset of akinesia of extraocular movements, pain at the time of administration, end of surgery, and complications.

Material and Method: Selected patients hospitalized to a hospital's ophthalmology department for cataract surgery participated in a randomized comparison research conducted within the hospital. Every patient who was part of the study gave written, informed consent. Each participant received comprehensive explanations regarding the research protocol, the administration of the consent form, the use of a numerical rating scale for pain assessment, the comfort score, and the satisfaction score during the visit. Patients with diabetes and hypertension under clinical control were given their medication the morning of surgery. The surgeon randomly divided the patients into two groups of thirty each.

Results: The mean age of patients was 43.28+ 7.4 years. There were 30 women (50%) and 30 men (50%) in the study cohort. The age distribution of the participants was not different for men and women. The peribulbar group had a significantly higher percentage of patients with mild pain, while the sub-tenons group had a higher percentage of patients who were pain-free during the block administration. Perioperative pain grade did not differ significantly between the two groups. The peribulbar group also had significantly higher baseline and postoperative pain scores. However, patients in both groups experienced similar levels of pain during the postoperative period.

Conclusion: We conclude that, with no technical challenge to the surgeon, sub-tenon anesthesia is equally successful a strategy for inducing analgesia and akinesia in MSICS as peribulbar anesthesia. Notably, it provides a different kind of safe anesthetic that causes the patient a lot less pain than peribulbar block. We did not include complex cataracts; therefore, further research is needed to determine whether the subtenon block is effective in those situations. We think that this procedure is relatively safe given the equipment and technique employed, and it should be taught to residents undergoing training.

Keywords: Akinesia, Peribulbar anesthesia, Sub-Tenon's Anesthesia and Cataract surgery

Introduction

One of the main avoidable causes of blindness in the globe is a cataract. This is due to the fact that one of the most successful surgical techniques is cataract extraction combined with intraocular lens (IOL) implantation. [1] In order to block the nerve during ocular procedures, a local anesthetic drug is injected into the surrounding tissue. This procedure is known as local anesthesia. Ophthalmic surgeons frequently utilize local anesthesia due to its broad range of safety, high success rate, and expedited patient recovery. Under local anesthetic, patients with several comorbidities can have surgery in the safest

possible settings with improved patient comfort. [2] Numerous issues arise from both retrobulbar and peribulbar anesthesia. [3] The most common surgical operation in ophthalmology is cataract surgery, which also happens to be the most economical surgical procedure overall. There have been reports of a good safety profile for cataract surgery. [4] Suture-less cataract surgery is now available to the general public through manual small incision cataract surgery (MSICS), which is less expensive than phacoemulsification and has additional benefits like machine independence, safety, a more comfortable learning curve, and wider applicability. This is especially true in a country like ours. [5] Different types of anesthetic were used in cataract procedures in the past, but they came with a lot of drawbacks and difficulties. An effective anesthetic regimen is essential to any successful eye operation. [6]

In the past, cataract extraction frequently involved the use of retrobulbar anesthesia. Due to the major needle-related risks connected with it, including retrobulbar bleeding, optic nerve injury, and globe perforation, peribulbar anesthesia increasingly supplanted it. [7] Sub-Tenon anesthesia is becoming more and more popular in this situation because it offers improved analgesia, a speedier start of anesthetic, more consistency and effectiveness, better patient compliance, and a quicker rate of patient rehabilitation. [8] With a subtenon space block, the local anesthetic is injected beneath the Tenon's capsule. [9] Other terms for subtenon block include medial episcleral block, para bulbar block, and pinpoint block. [10] The subtenon block is becoming more and more popular due to its ease of use, lack of need to put a needle into the orbit, low reported complication rates, high patient satisfaction, and sufficient anesthetic. [11]

These days, ophthalmologists are investigating sub-tenon anesthesia, which involves injecting a local anesthetic straight into the sub-tenon's space. A tiny hole is produced in the conjunctiva and tenon's capsule after topical anesthetic drops are inserted into the conjunctival fornix. A blunt cannula is placed through this incision to introduce the anesthetic drug into the sub-tenon's space. Due to its ease of use and reduced risk of needle-related injuries and complications due to the avoidance of injecting into a blind region, it is gaining popularity.

Though they most likely happen less frequently, major problems are still there with peribulbar anesthesia. Because of the orbit's divided multicompartmental structure, the diffusion of the local anesthetic agent can occasionally be non-homogenous and partial, which might result in poor blocks, the need for multiple injections, or occasionally excessive injectable volumes. Researchers have concentrated on anesthetic procedures that guarantee patients' comfort, safety, and compliance because patients undergoing cataract surgery frequently have several comorbidities and utilize multiple medications. The anesthetic from Sub Tenon had a speedier onset, improved akinesia, consistency, efficacy, and patient compliance.1. An anesthetic technique should ideally be totally safe, straightforward, easy to administer, and achieve maximum benefit with the least amount of anesthetic drug and difficulties. [12] This study is taken to compare the efficacy and complications encountered between sub-Tenon's anesthesia and peribulbar anesthesia in manual small-incision cataract surgery.

Material and Methods

Selected patients hospitalized to a hospital's ophthalmology department for cataract surgery participated in a randomized comparison research conducted within the hospital. Every patient who was part of the study gave written, informed consent. Each participant received comprehensive explanations regarding the research protocol, the administration of the consent form, the use of a numerical rating scale for pain assessment, the comfort score, and the satisfaction score during the visit. Patients with diabetes and hypertension under clinical control were given their medication the morning of surgery. The surgeon randomly divided the patients into two groups of thirty each. A thorough anterior segment examination under a slit lamp, encompassing the lids and adnexa, visual acuity testing, and a fundus examination were all part of the pre-operative evaluation. Prior to the procedure, intraocular pressures, sac syringing, and standard tests like blood pressure and random blood sugar readings were assessed. Following patients who were planned for SICS were assigned to the peribulbar (P) or subtenant (ST) block groups, according on the assessment of the ophthalmologist and the patient's needs, respectively.

Inclusion Criteria

- Cataract cases posted for surgery with age >40 who agreed to informed consent.

Exclusion Criteria

- Age –70 years
- Signs of chronic ocular inflammation – uveitis
- History of ocular trauma
- History of convulsion and epilepsy
- Sensitivity to xylocaine
- Clotting abnormalities
- Inability to give informed consent
- Inability to understand the visual analog pain scale

One day prior to the procedure, the eyes that will be operated on received QID loxifloxacin 0.5% eyedrops. The eyes to be operated on received phenylephrine 5% and tropicamide 0.8% eyedrops

one drop per ten minutes until the pupil was fully dilated, one hour before to the procedure. Before the block was administered, the eyes were treated with 5% povidone iodine eye drops. The anesthetic agent was a 30 mL vial of 2% lidocaine with adrenaline 1:200,000 combined with a vial of lyophilized hyaluronidase (1500 I.U.).

Peribulbar Anesthesia

A solution of 5% povidone-iodine was used to clean the eyelid and surrounding tissue. The patient was told to stare straight ahead in order to confirm that the eye was in the neutral posture of gaze. The anesthetic agent was placed into a 5 ml syringe that was fitted with an 11/4-inch 23G sharp needle that was put through the lid at the intersection of the lower orbital rim's middle and outer thirds, tangential to the globe and parallel to the orbit floor. Following a negative blood aspiration, two milliliters of 0.5% bupivacaine, 150 IU/ml of hyaluronidase, and three milliliters of 2% lignocaine combined with adrenaline were administered. With the needle pointed toward the orbital roof, a second injection of 2 ml was administered at the supraorbital notch.

Akinesia was assessed by one of the anesthetists who had previously been trained to measure the extent of ocular motility in the superior, inferior, nasal, and temporal quadrants with the aid of a transparent ruler using the limbus of the respective quadrant as a landmark. Movement of ≤2 mm or no movement from the primary position of gaze in three or more quadrants was regarded as "significant akinesia" while larger ocular movement (>2 mm) in two or more quadrants was regarded as "no significant akinesia" necessitating supplemental injection.

Pain Assessment

The pain and outcome were assessed by one of the anesthesiologists. A 10-point numeric rating scale (0–10) was used for pain assessment during surgery and at specific intervals in the postoperative period. If the patient complained of pain more than once during or after surgery, only the most severe was taken into consideration to determine the severity of the pain. No pain was described as 0, mild pain. Patients who experienced moderate-to-severe postoperative pain (score ≥5) received oral paracetamol 1000 mg; if the pain persisted thereafter, oral diclofenac 100 mg was administered.

Statistical Analysis

The data were analyzed by descriptive statistics. The comparison between the two groups was done using the Chi-square test and the student unpaired t-test. A statistical package SPSS version 25.0 was used to do the analysis.

Result: -

We included 60 eyes of 60 patients in this study who underwent MSCIS during the study period. Of these, they were divided into a group of 30 who underwent surgery under peribulbar anesthesia and the remaining 30 patients underwent surgery using the sub-tenon's anesthesia.

Table 1: Age and sex distribution of patients

	MEAN AGE (IN YEARS)	SD
PERIBULBAR	42.21	5.34
SUB-TENON'S	38.04	6.7
SEX DISTRIBUTION OF PATIENTS		
	PERIBULBAR	SUB-TENON'S
MALE	18 (30.0)	12(20.0%)
FEMALE	14 (23.3%)	16.(26.6%)
TOTAL	32 (53.3%)	28 (46.6%)

The mean age of patients was 43.28+ 7.4 years. There were 30 women (50%) and 30 men (50%) in the study cohort. There were no differences in age between men and women participants.

Table 2: Comparison of pain in the groups

Variable	Group	*n*	Mean	Std. Deviation
Baseline pain	Peribulbar	30	1.43	0.624
	Subtenon	30	0.04	0.215
Perioperative pain	Peribulbar	30	0.02	0.152
	Subtenon	30	0.04	0.289
Postoperativepain	Peribulbar	30	1.52	0.692
	Subtenon	30	1.15	0.548

A higher percentage of patients in the sub-tenons group reported not experiencing any pain during the block's administration, while the peribulbar group had a considerably higher proportion of patients experiencing minor pain. There was no discernible variation in the perioperative pain score between the

two groups. The peribulbar group had considerably higher baseline and postoperative pain levels. Nonetheless, both groups' postoperative pain levels were comparable for the patients.

Table 3: Comparison of time of onset of akinesia in both groups

Variable	Group	*n*	Mean(sec)	Std. Deviation
Akinesia onset	Peribulbar	30	176.32	55.804
	Subtenon	30	80.27	20.97

There was a notable variation in the meantime of akinesia start between the two groups: 176.32 for the peribulbar group and 80.27 for the sub-tenons group. Nonetheless, compared to the sub-tenons group of patients who only had partial akinesia, the peribulbar group had a much higher proportion of patients with complete akinesia.

Discussion

Phacoemulsification cataract surgery with a clear corneal incision differs significantly from manual small incision cataract surgery, which necessitates a scleral incision, dissection, and conjunctival peritomy. Typically, a manual minor incision cataract procedure uses a superior rectus bridle suture. With additional globe handling and the uncomfortable bridle suture application, manual small incision cataract surgery is slightly more painful for the patient. This is because the muscle belly is gripped with teeth forceps during this step. This justifies the use of preoperative anesthetic, which, in contrast to clear corneal phacoemulsification, gives a much deeper analgesia during manual small incision cataract surgery. Therefore, more intrusive types of anesthetics are required for manual small incision cataract surgery, even though topical anesthesia has evolved into the standard of care for clear corneal phacoemulsification. There are various local anesthetic methods available for cataract surgery. A good anesthetic approach should be safe from major side effects and efficient in producing both good akinesia and analgesia. [12] Topical anesthetic has no side effects, yet it doesn't cause akinesia. Excellent analgesia and akinesia are provided by needle blocks, such as peri and retrobulbar anesthesia, but they are also associated with major and perhaps fatal consequences. [13]

Parkar et al.2005 [11] observed that 64.8% of the patients in their group P had absolute akinesia and none of the subjects in group ST attained absolute akinesia. This difference between the studies, especially the greater akinesia using sub-tenons achieved by us, may be due to the amount of anesthetic i.e. **Parkar et al.2005 [**11] injected only 1ml of 2% lignocaine combined with 1:10 000 adrenaline in the sub-tenon's space whereas we injected 3-4ml in our patients. **Adekola et al.2018 [2**] conducted a study to compare peribulbar and subtenon anesthesia for MSICS among 462 patients. They reported significantly lower pain scores in group ST than the group P, significantly higher chemosis in group ST (3.2%) than in group P (0%), and a very small proportion of patients with complete akinesia (only 10 eyes in group P and 1 eye in group ST). **Ashok et al.2018 [**1] conducted a similar randomized controlled trial (RCT) study with 113 patients. They reported that the average time to akinesia with sub-tenon's technique was significantly shorter (2.78 ± 0.9 minutes) compared to the peribulbar technique (9.96 ± 2.2 minutes). Higher pain score with peribulbar technique (5.12 ± 1.255) as compared to sub tenon's anesthesia (3.77 ± 1.716) at the time of injection.

Datti et al.2013 [14] conducted a prospective and RCT to compare the two techniques among 500 patients who underwent MSICS with rigid polymethyl Methacrylate (PMMA) IOL implantation. Similar to our study, they reported that there was a significant difference in the pain scores at the time of administration of anesthetic between the two techniques, being more for group P.

Al-Yousuf 2003 [15] observed that intraoperative pain perception was similar in both groups; however, the subtenon block reduced ocular movement during surgery. The author came to the conclusion that subtenon anesthesia is superior to peribulbar anesthesia in terms of ocular motility. Similarly, **Mushtaq et al.2013 [**16] reported no significant difference in pain during and 4h after surgery between sub-tenon and peribulbar block.

In contrast to subtenon anesthesia, which only caused a third of patients to report pain and discomfort during administration, peribulbar anesthesia caused over half of the patients to experience pain throughout the procedure. With the exception of a slight tingling feeling or discomfort around the eyes in patients who received a peribulbar block as the anesthesia wore off, there was no difference in the postoperative pain perception between the groups. In group P, the need for an extra top-up anesthetic injection was less frequent. Though this difference was only marginally significant, eyes under peribulbar anesthesia had a much reduced incidence of chemosis, SCH, and a little lower percentage of surgeons experiencing PP during surgery. The two groups' patient comfort levels were identical, and regardless of the anesthetic method employed, doctors felt equally at ease throughout surgery. When it comes to low-income individuals in a nation

like India, MSICS presents an alluring low-cost, high-volume substitute. When compared to sub-Tenon's anesthesia, the peribulbar approach requires the administration of significant amounts of the anesthetic substance extra-only, and it takes longer for the anesthetic effect to take effect. In the sub-Tenon group, surgery was initiated right away following the administration of anesthetic. Sub-Tenon's anesthesia also uses fewer anesthetic drugs overall. Therefore, it is less time-consuming and more cost-effective in a bigger hospital or community eye care setting. Compared to peribulbar block, sub-tenon block produced better patient comfort and reduced intraoperative and postoperative pain scores. Sub-tenon block, however, was associated with a higher incidence of chemosis and sub-conjunctival hemorrhage. For SICS in low-risk patients, we advise using subtenon block; for individuals using anticoagulants, peribulbar block is advised because bleeding episodes were less common.

Conclusion:

Anesthesia can be given rather safely utilizing Sub-tenon's approach, which eliminates the risks associated with a sharp needle injection. In addition to having excellent analgesia and akinesia intraoperatively, the patient was more at ease during the administration period. Therefore, it can be suggested as a reasonably safe, effective, and smaller learning curve alternative to peribulbar anesthesia for cataract surgery involving small incisions. Notably, it provides a different kind of safe anesthetic that causes the patient a lot less pain than peribulbar block. We did not include complex cataracts, therefore further research is needed to determine whether the subtenon block is effective in those situations. We think that this procedure is relatively safe given the equipment and technique employed, and it should be taught to residents undergoing training. It's also a useful skill to learn and has applications in other surgical procedures.

References: -

1. Ashok A, Krishna Gopal S, Jha K. Comparison of peribulbar anesthesia with sub-tenon in manual small incision cataract surgery. TNOA J Ophthalmic Sci Res 2018;56:67.
2. Adekola O, Aribaba O, Musa K, Olatosi J, Asiyanbi G, Rotimi-Samuel A, et al. Regional anesthesia for small incision cataract surgery: Comparison of subtenon and peribulbar block. J Clin Sci 2018;15:1-7.
3. Kumar CM. Orbital regional anesthesia: Complications and their prevention. Indian J Ophthalmol2006;54:77-84.
4. Gogate P, Deshpande M, Nirmalan PK. Why do phacoemulsification? Manual small- incision cataract surgery is almost as effective but less expensive. Ophthalmology 2007;114:96 5-8.
5. Singh K, Misbah A, Saluja P, Singh AK. Review of manual small-incision cataract surgery. Indian J Ophthalmol 2017;65:1281-8.
6. Deshpande S, Deshpande SS, Reddy R, Reddy V. Comparing the effectiveness and safety of sub tenon anesthesia and peribulbar anesthesia in anterior segment surgery. Indian J Clin Exp Ophthalmol 2016;2:201-6.
7. Datta A, Ghosh K, Basu S. A Comparative evaluation of peribulbar, sub tenons and topical anesthesia. AIOC Proc 2008;82.
8. Paul-Dauphin A, Guillemin F, Virion JM, Briancon S. Bias and precision in visual analogue scales: A randomized controlled trial. Am J Epidemiol 1999;150:1117-27.
9. Kumar CM, Williamson S, Manickam B. A review of sub-tenon’s block: Current practice and recent development. Eur J Anaesthesiol 2005;22:567-77.
10. Guise P. Subtenon anesthesia: An update. Local Reg Anaesth 2012;5:35-46.
11. Parkar T, Gogate P, Deshpande M, Adenwala A, Maske A, Verappa K, et al. Comparison of subtenon anesthesia with peribulbar anesthesia for manual small incision cataract surgery. Indian J Ophthalmol 2005;53:255-9.
12. Reddy SC, Thevi T. Local anesthesia in cataract surgery. Int J Ophthalmic Res 2017;3:20 4-10.
13. Zhao LQ, Zhu H, Zhao PQ, Wu QR, Hu YQ. Topical anesthesia versus regional anesthesia for cataract surgery: A meta-analysis of randomized controlled trials. Ophthalmology 201 2;119:659-67.
14. Datti NP, Krishnappa K, Guha J, Bansal A. Efficacy and Safety of Sub-tenon’s and Peribulbar Anaesthesia in Manual Small Incision Cataract Surgery. J Clin Biomed Sci. 201 3;3(1):20–6.
15. Al-Yousuf N. Subtenon versus peribulbar anesthesia for cataract surgery. Bahrain Med Bull 2003;25:20-6.
16. Mushtaq A, Muhammad N, Lal M. Manual small incision cataract surgery, comparison of subtenon anesthesia with peribulbar anesthesia: Study on pain evaluation & surgical outcome. Ophthalmol Update 2013;11:124-7.