

**A Prospective Comparative Study about the Efficacy of Sub Tenons versus Peribulbar Local Anesthesia in Small Incision Cataract Surgery****Smitha M<sup>1</sup>, Devika K<sup>2</sup>, A. M Raja<sup>3</sup>**

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**Abstract:****Aim:** The study aimed to compare the efficacy and safety of sub-tenon block to peribulbar block concerning analgesia, akinesia, and complications in small-incision cataract surgery (SICS).**Methods:** A comparative prospective study was conducted at Government hospital Palakkad. Sixty patients who reported to the ophthalmology OPD for small-incision cataract surgery (SICS) under local anaesthesia were included in the study. The participants were divided into two groups of 30. The pain was evaluated at the time of administration of the block and during the surgery. Lid & globe akinesia was noted in both the groups and any complications associated with the block such as chemosis or subconjunctival haemorrhage were also noted.**Results:** Sub-Tenon's anaesthesia was relatively less painful at administration, providing good analgesia. Despite incomplete akinesia, complications were minimal, indicating that it did not significantly impact the surgical process. It needed significantly lesser volume of anaesthetic agent, good comfort to surgeon and had only minor complications in the form of subconjunctival haemorrhage, chemosis.**Conclusion:** Sub-tenon block was found to be an effective and safer technique of ocular anaesthesia for SICS, making it a potential alternative to the conventional peribulbar block. Despite the reduced akinesia compared to peribulbar block, sub-tenon block demonstrated fewer complications and increased patient comfort.**Keywords:** Akinesia, Analgesia, Peribulbar Block, SICS, Sub-Tenons Block.

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**Introduction**

Cataract surgery, a common ophthalmic procedure, has witnessed significant advancements in both techniques and anaesthesia administration. Local anaesthesia has gained widespread acceptance in ophthalmic surgery due to its broad safety profile, impressive success rates, and the rapid recovery it affords patients. A key advantage is its suitability for patients with multiple comorbidities, offering them a personalized and secure environment for the procedure [1].

In current practice retrobulbar, peri-bulbar anaesthesia, sub tenons anaesthesia and topical are the commonly used techniques for intraocular surgeries. Peribulbar and retrobulbar anaesthesia cause multiple complications [2]. Sharp needle techniques are associated with risks such as inadvertent globe perforation, retrobulbar haemorrhage or direct injection into the optic nerve. To avoid these complications, needle-free procedures such as sub-Tenon and topical as well as topical with intracameral anaesthesia were developed.

Various studies support sub tenons anaesthesia as a safe and efficient technique. Some of its merits include ease of administration, eliminates the risk involved in sharp needle usage, good postoperative analgesia, as well as minimal respiratory and cardiovascular systems complications [3-6].

Hence an attempt is made in this study to compare the efficacy of sub-Tenon's anaesthesia versus peribulbar anaesthesia for cataract surgery under various aspects.

**Methodology**

Study was conducted for a period of one year from January 2022 to December 2022 at Department of Ophthalmology, Govt. Medical College Palakkad. A total of 60 patients as per inclusion and exclusion criteria of the study and covered during the study period became part of the present study. They were randomly allocated into two groups of 30 each. One group received sub-tenon's anaesthesia and the other group received peribulbar anaesthesia. Institutional Ethics Committee Permission was obtained. Patients were explained regarding the

nature of the study and informed consent was taken.

**Inclusion criteria:** Patients aged between 40 and 80 years willing to undergo manual small incision cataract surgery having no serious ailments. **Exclusion criteria:** Sensitivity to lignocaine, previous intra ocular surgery, inability to give informed consent, age below 40 years and above 80 years.

Pain during administration, intra operative analgesia and eyelid, globe akinesia and complications during block were graded by a subjective grading. 30 patients were given peribulbar block and 30 patients were given sub-tenon's block. Manual small incision cataract surgery was performed in all patients. All surgeries and anaesthesia were done by same surgeon. Comprehensive ocular examination was done after taking detailed history as done for a routine cataract surgery including vision testing, slit lamp examination, fundoscopy and IOL Power calculation. Preoperative preparation was done with moxifloxacin 0.5% eye drop, tropicamide plus 0.5% eye drops and flurbiprofen 0.3% eye drops. Anaesthetic mixture was prepared using 1 vial of hyaluronidase containing 1500IU, 30 ml vial containing 2% lignocaine with 1:200000 adrenaline. Sensitivity to the anaesthetic mixture was tested. The eye to be operated was cleaned with 10% povidone iodine solution and after few minutes, the anaesthetic block was given.

**Procedure for Sub tenon's block:** After placing a drop of topical proparacaine drop, lid speculum is placed, the conjunctiva is cleaned with 5% povidone iodine solution. The fused conjunctiva and anterior tenon's space are picked up at an inferonasal point 7mm to 8mm from the limbus, midway between the insertions of the medial and inferior rectus muscles. After making a small cut, the sub tenon's space is accessed using the closed blunt Westcott scissor to create a thin channel just past the equator of the globe to the posterior sub tenon's space. A blunt tipped cannula is then inserted into the posterior sub tenon's space and approximately 2ml of local anaesthetic is introduced. Gentle constant digital pressure over the closed lids with two fingers, one of which is over the point where the conjunctival cut was made, is applied for 2 to 3 minutes. Ocular massage was avoided.

**Procedure for Peribulbar block:** A 26G 2.5cm long disposable needle is attached to the syringe containing local anaesthetic. The patient is placed in the supine position and asked to look steadily straight ahead. The needle is inserted transcutaneous at the junction of the medial two thirds and lateral one third of the lower lid adjacent and parallel to the orbit floor for about 2.5cm.

Gentle aspiration of the syringe is performed to rule out the possible entry of the needle into a blood vessel and then 6 ml of the mixture is injected into the lateral adipose tissue of the orbit. Intermittent and uniform pressure is then applied to the site for 3 to 5 minutes.

The time of onset of akinesia was noted and graded based on ocular movement. **Globe:** Grade 0: Complete movement remaining. Grade 1: Moderate movement. Grade 2: Slight movement. Grade 3: No movement. **Lid:** Grade 0: Normal movements. Grade 1: reduced movements. Grade 2: No movement. Any complications during administration of anaesthetic such as subconjunctival haemorrhage, globe perforation, and conjunctival chemosis was assessed before starting the surgery and documented. The patients were asked immediately after the end of surgery to assess the degree of discomfort experienced during the operation. Discomfort and pain were assessed by on scale of 0-4 where, score 0- No pain no sensation, score 1-sensation but no pain, score 2-slight pain, score 3-Moderate pain and score 4- Intense pain.

**Statistical analysis:** Data was recorded in the pre-designed semi-structured questionnaire. The data was expressed in percentages. Fisher's test and chi square tests were used as statistical tools and p value less than 0.05 taken as statistically significant.

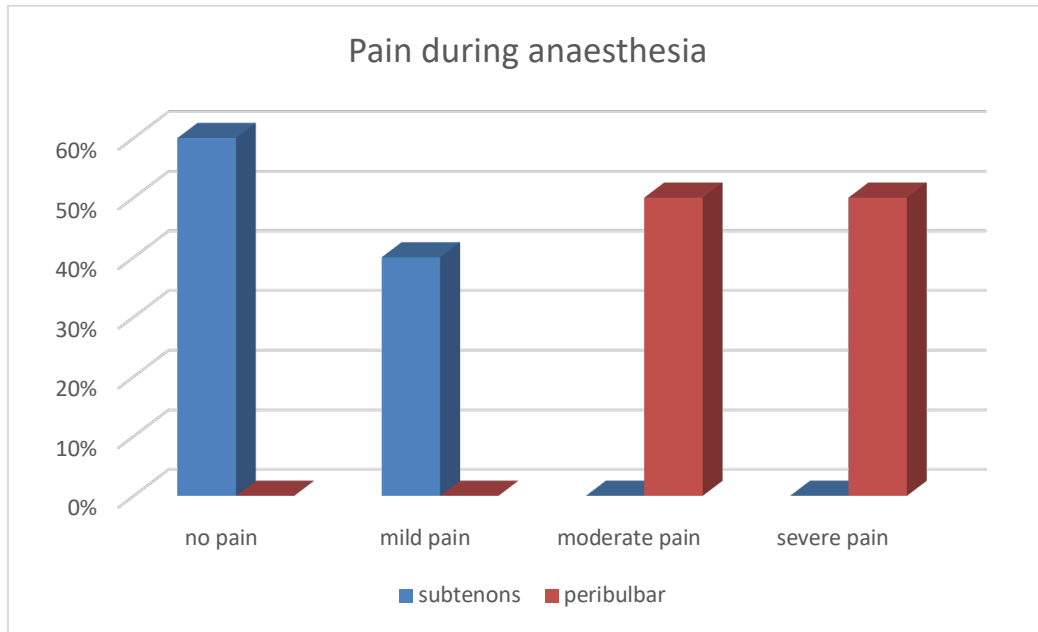
## Results

A total of 60 patients were included in the study, with 30 patients in the peribulbar anaesthesia group and 30 patients in the sub-Tenon's anaesthesia group. All the surgeries and anaesthesia were done by same surgeon.

The mean age of the patients was  $67.2 \pm 8.5$  years. There were 14 males (46.7%) and 16 females (53.3%) in the peribulbar group, and 13 males (43.3%) and 17 females (56.7%) in the sub-Tenon's group. The distribution of age and gender was similar in both groups.

## Pain Perception during Anaesthesia

**Administration:** In the sub-Tenon's group, 18 patients (60%) reported no pain during anaesthesia administration, while 12 patients (40%) experienced mild discomfort. In contrast, all patients in the peribulbar group reported varying degrees of pain during anaesthesia administration. Specifically, 15 patients (50%) experienced moderate pain, and 15 patients (50%) reported severe pain. Upon statistical analysis using Chi square test, the difference in pain perception during anaesthesia administration between the two groups was highly statistically significant ( $p < 0.001$ ). The data is represented graphically in Figure 1.



**Figure 1: Pain at the time of administering the block was significantly greater in the peribulbar group**

**Intra-operative Analgesia:** During the surgical procedure, the majority of patients in both groups did not feel pain. In the sub-Tenon’s group, 28 patients (93.3%) did not experience pain, while 2 patients (6.7%) reported mild discomfort. In the peribulbar group, 25 patients (83.3%) were comfortable with no pain, while 5 patients (16.7%)

had mild discomfort. No patients in either group reported moderate or severe pain during the surgery.

Chi-square test analysis revealed a statistically significant difference in intra-operative analgesia between the two anaesthesia techniques. The data is tabulated in Table 1.

**Table 1: Intraoperative pain comparison**

Pain level	Sub -Tenons	Peribulbar
No pain	28 (93.3%)	25(83.3%)
Mild pain	2(6.7%)	5(16.7%)
Moderate pain	0	0
Severe Pain	0	0

**Akinesia of Eyelid and Globe:** In the sub-Tenon’s group, 21 patients (70%) achieved grade 2 akinesia of the eyelid; nine patients (30%) had grade 1 akinesia, suggesting minimal movement. Regarding globe akinesia, 4 patients (13.3%) had grade 3 akinesia, 23 patients (76.6%) had grade 2 akinesia and 3 (10%) had grade 1 akinesia. In the peribulbar group, 27 patients (90%) had grade 2 akinesia of the eyelid, while 3 patients (10%) had grade 1 akinesia. Regarding globe akinesia, 22 patients (73.3%) achieved grade 3 akinesia, while 6 patients

(20%) had grade 2 akinesia and 2 (6.6%) had grade 1 akinesia.

The number of patients who attained complete akinesia (grade 3) was greater in the peribulbar group (73.3%), whereas 76.6% of patients in the sub-tenons group attained only partial akinesia (grade 2). The proportion of patients with greater akinesia grade was significantly greater in the peribulbar group (P < 0.001). The data is represented in a line diagram.

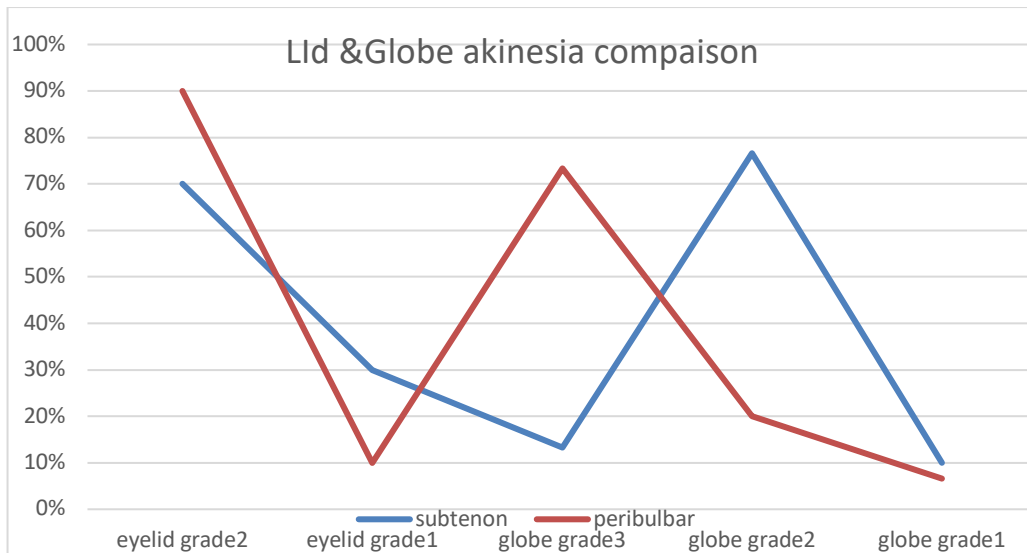


Figure 2: Lid &Globe akinesia compaison

**Volume of Anaesthetic Agent and Surgeon’s Comfort:**

In the peribulbar group, the mean volume of anaesthetic agent used was 5. ml (SD 0.4), with an additional volume of 0.3 ml, whereas in the sub-Tenon’s group, it was 2.5ml (SD 0.5) with negligible additional volume. Chi-square test analysis showed a statistically significant difference ( $p < 0.001$ ) in the volume of anaesthetic agent used between the two groups.

The surgeon’s comfort scores were comparable between the sub-Tenon’s and peribulbar groups, with 90% of surgeons being comfortable and 10% experiencing mild discomfort in both groups.

**Complications of Anaesthesia**

Chemosis was observed in 20 patients (66.67%) in the sub-Tenon’s group and 10 patients (33.3%) in the peribulbar group. Subconjunctival haemorrhage occurred in 18 patients (60%) in the sub-Tenon’s group and 5 patients (16.7%) in the peribulbar group.

In sub tenon group even though chemosis and subconjunctival haemorrhage was more, majority of patients it occurred in one quadrant i.e., injection site. Subcutaneous haemorrhage was noted in 2 patients (6.7%) in the peribulbar group and was absent in the sub-Tenon’s group. Data is represented in Table 2.

Table 2: Complications of Anaesthesia

Complication	Sub tenons group	Peribulbar group
Chemosis	20(66.67%)	10 (33.3%)
Subconjunctival haemorrhage	18 (60%)	5(16.7%)
Subcutaneous haemorrhage	0	2(6.7%)

**Discussion**

The present study aimed to compare the outcomes of sub-Tenon’s anaesthesia and peribulbar anaesthesia in 60 patients undergoing small incision cataract surgery procedure. The study focused on various parameters, including pain perception during anaesthesia administration, intra-operative analgesia, akinesia of eyelid and globe, volume of the anaesthetic agent, and complications associated with each technique.

In the present study, patients in the sub-Tenon’s group had significantly lower pain perception during anaesthesia (60% reported no pain, 40% mild discomfort). In contrast, all patients in the peribulbar group reported varying degrees of pain during anaesthesia administration. 50% experienced moderate pain, and 50% reported

severe pain. During the surgical procedure, the majority of patients in both groups did not feel pain. In the sub-Tenon’s group, 93.3% did not experience pain, while in the peribulbar group, 83.3% were comfortable with no pain. Janakpur S et al [7] reported 72% had slight pain after administration of anaesthesia in the sub-tenon’s group and remaining 28% had mild discomfort. In the peribulbar group, 48% had mild discomfort and 50% had moderate pain. Antony et al8 noted that pain experienced by the patients at the time of administering the block was significantly more in the peribulbar group ( $P < 0.001$ ). Further, 91.4% of the patients in the peribulbar group experienced pain of grade 1, whereas a great proportion of patients in the sub-tenons group had pain of grade 0. Briggs MC et al [9] in their study reported the effectiveness of sub-tenon’s anaesthesia over

peribulbar anaesthesia in terms of pain experienced. The patients in the sub-tenon's group experienced lesser pain compared to patients in the peribulbar group. Parkar T et al [10] noted that 77.5% in the sub tenon's group experienced no pain compared to only 35.2% in the peribulbar group. Thus, they stated that in terms of pain, sub-tenon's anaesthesia was more effective than peribulbar anaesthesia. Azmon et al [11] in their study observed that, there was no statistically significant difference between peribulbar and sub-tenon's groups in intraoperative analgesia and approximately the same intra-operative pain levels as that of peribulbar anaesthesia. 43% of patients in the sub-Tenon's group and 47% in peribulbar group reported no pain intraoperatively. 31% in sub-Tenon's group and 28% in the peribulbar group reported mild discomfort during surgery. Stevens JD [12] observed in their study that during administration of sub-tenon's block, 46% had sensation and 36% had no pain.

We also observed complete Akinesia in (73.3%) of patients in Peribulbar group as compared to (13.3%) of Sub-Tenon group. Even though complete akinesia is ideal, excellent pain relief can compensate for moderate akinesia by ensuring patient cooperation. However, a study by Al-Yousuf [13] showed better akinesia in the sub-tenons group. Jayashree. M.P et al. study [14] found that 60% patients of peribulbar group had complete akinesia of globe, compared to 6% patients of sub-Tenon's having complete akinesia of globe evaluated just after administration of block. After few minutes the globe akinesia in both groups was comparable. 36% patients in either group had mild-moderate globe movements. Jayashree B and Sadanand et al [15] study found that the onset of akinesia with sub tenon's block was (3min+/- 1.5min) compared to peribulbar block (7min+/-2min). In ST group, only 2 patients had total akinesia and 48 patients had >200 movement in any direction while 55(78.1%) patients in PB group had total akinesia. This is in agreement with Tsuneoka et al [16] who also reported poor akinesia with sub tenon's anaesthesia.

In the present study peribulbar group, the mean volume of anaesthetic agent used was 5 ml with an additional volume of 0.3 ml, whereas in the sub-Tenon's group, it was 2.5 ml with negligible additional volume. In Jayashree MP et al [14] study mean volume of anaesthetic agent required in peribulbar group was 5.88 ml and in sub-Tenon's group it was 2.67 ml. Antony RM et al [8] noted that the volume of aesthetic agent used in sub-tenons (2 mL) was much less as compared to peribulbar (4 mL). In our study chemosis was observed in 66.6% in the sub-Tenon's group and 33.3% in the peribulbar group. In Janakpur S et al [7] study, found that the incidence of chemosis was 100% as

compared to only 68% of patients in the peribulbar group. Antony, et al [8] in her study noted that 94.3% of patients in the peribulbar group and 80% in the sub-tenons group had chemosis following the administration of the block. Subconjunctival haemorrhage occurred in 60% in the sub-Tenon's group and 16.7% in the peribulbar group. But it was limited to the site of injection in most cases. In Antony, et al [8]. Study sub conjunctival haemorrhage following the block administration was seen only in the sub-tenons group (8.6%). No patients in the peribulbar group had a subconjunctival haemorrhage, Jayasree MP et al [14] study subconjunctival haemorrhage was seen in 56% cases of sub-Tenon's group. Subcutaneous haemorrhage was noted in 2 patients (6.7%) in the peribulbar group and was absent in the sub-Tenon's group. Subcutaneous haemorrhage was seen only in peribulbar group accounting to 6% of cases in In Jayashree MP et al [13] study.

In conclusion, the study demonstrates that sub-Tenon's anaesthesia is associated with reduced pain during administration, comparable intra-operative analgesia, and effective akinesia in the context of cataract surgery. The lower volume of the anaesthetic agent in the sub-Tenon's group suggests potential cost savings and decreased risk of adverse events associated with higher volumes. However, the choice between the two techniques should consider individual patient characteristics and surgeon preference.

Further research with larger sample sizes and long-term follow-ups is warranted to validate these findings. We did not observe any serious complications with peribulbar as we used small needle however, potential risk of globe injury does exist. This study indicates that sub-Tenon's anaesthesia demonstrates comparable effectiveness, comfort, relative safety, and a more manageable learning curve. Consequently, it emerges as a favourable alternative to peribulbar anaesthesia for cataract surgery.

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