

# A comparison of sub-tenon block with peribulbar block in small-incision cataract surgery

Reeja M Antony, Ajay R Kamath, Sangeetha Jeganathan, Gladys R Rodrigues

**Purpose:** To compare the efficacy and safety of sub-tenon block to peribulbar block with respect to analgesia, akinesia, and complications. **Methods:** It is an observational study conducted at a government hospital in Karnataka. Seventy patients who came to the ophthalmology OPD for small-incision cataract surgery (SICS) under local anesthesia were included in the study. The participants were divided into two groups of 35 as per the surgeon. The pain was evaluated at the time of administration of the block, during the surgery, and during the postoperative period of 4 h. Akinesia was noted in both the groups and the time of onset of akinesia was noted. Any complications associated with the block such as chemosis or subconjunctival hemorrhage were also noted. Statistical analysis was done using PSS version 25.0, where  $P < 0.05$  was considered significant. **Results:** The baseline pain score was higher in the peribulbar group (1.57). The onset of akinesia was faster in sub-tenons (90.34 s). Complete akinesia was achieved in 82.9% of patients after peribulbar block. There was no significant difference in complications in both groups. **Conclusion:** Sub-tenons block is an effective and safer technique of ocular anesthesia for SICS. It can be considered as an alternative to the conventional peribulbar block for SICS.

**Key words:** Akinesia, analgesia, peribulbar block, SICS, sub-tenons block

A cataract is a leading cause of preventable blindness in the world. This is because cataract extraction with intraocular lens (IOL) implantation is one of the most effective surgical procedures.<sup>[1]</sup> Local anesthesia is commonly used in ocular surgeries, which involves blocking the nerve by infiltration of the area around the nerve with a local anesthetic agent.<sup>[2]</sup> Local anesthesia is popular in ophthalmic surgery because of its wide range of safety, high success rate, and faster patient recovery. Patients with multiple comorbidities can be operated on under local anesthesia with better patient comfort and under optimum safe conditions for the procedure.<sup>[2]</sup> Peribulbar and retrobulbar anesthesia cause multiple complications.<sup>[3]</sup> A newer technique is sub-tenons anesthesia. Peribulbar anesthesia is the most commonly used anesthesia for intraocular procedures.<sup>[4]</sup> It has less incidence of optic nerve damage but akinesia produced is less as compared to the older retro bulbar technique. Although the peribulbar technique is considered safer as compared to retrobulbar block, cases of brainstem anesthesia after peribulbar block have been reported.<sup>[5]</sup> Globe perforation is one of the most serious complications associated with this technique.<sup>[3]</sup> It presents with intense ocular pain, sudden loss of vision, and hypo tonicity of the globe. This condition requires immediate surgical management.

Sub-tenon anesthesia is a technique of injecting the anesthetic agent into the sub-tenons space with prior use of topical anesthesia.<sup>[4]</sup> It decreases the incidence of patient anxiety and the painful experience associated with the use of needles

in the peribulbar block.<sup>[6]</sup> This technique avoids damage to the vasculature and optic nerve and it requires less volume of drug.

## Methods

The Ethical and Scientific committee clearance was obtained before the data collection. Patients who came to the outpatient department for cataract surgery were included in the study. A written, informed consent was taken from all patients before their participation in the study. Patients were randomized into two groups of 35 each by the surgeon. The pre-operative evaluation included visual acuity, a detailed anterior segment examination under slit-lamp including the lids and adnexa, and a fundus examination. Intraocular pressures, sac syringing, and routine examinations such as random blood sugars and blood pressures were evaluated before the surgery. Moxifloxacin 0.5% eyedrops QID were instilled in the eyes to be operated on 1 day before the surgery. One hour before the surgery, phenylephrine 5% with tropicamide 0.8% eyedrops were instilled in the eyes to be operated on as one drop/10 min until full dilation of the pupil. Povidone iodine 5% eye drops were instilled in the eyes before administration of the block. One 30 mL vial of 2% lidocaine with adrenaline 1:200,000 mixed with one vial of lyophilized hyaluronidase (1500 I.U.) was used as an anesthetic agent.

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**Cite this article as:** Antony RM, Kamath AR, Jeganathan S, Rodrigues GR. A comparison of sub-tenon block with peribulbar block in small-incision cataract surgery. Indian J Ophthalmol 2022;70:3840-3.

### Access this article online

#### Website:

www.ijo.in

#### DOI:

10.4103/ijo.IJO\_1553\_22

### Quick Response Code:



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Received: 01-Jul-2022

Revision: 09-Aug-2022

Accepted: 12-Sep-2022

Published: 25-Oct-2022

For the peribulbar block, 5% proparacaine eyedrops were instilled. Using a 26 G 13 mm needle, 2 mL of the anesthetic agent was injected each into the inferior and superior peribulbar space using a 10 mL syringe. A 5 mL syringe could have also been used. The inferior site of injection was along the infraorbital margin just above the notch and superiorly at the supraorbital notch. Immediate digital massage was given after the block to control the rise in IOP. A total of 4 mL of the anesthetic agent is used.

For the sub-tenons block, the site was painted and draped on the operation table under all aseptic conditions. After instilling 5% proparacaine eyedrops, under microscopic visualization, a nick was made in the conjunctiva using a Westcott's scissor inferonasally 4 mm from the limbus. The Tenon's tissue was then separated and the sub-tenons space was exposed. Using a 2 mL syringe loaded with 2 mL of the anesthetic agent, the drug was injected into the posterior sub-tenons space using a 23 G bent cannula, which was then introduced into the exposed sub-tenons space. Any chemosis noted at the site of injection was managed by a digital massage with closed eyelids to spread the drug to all the quadrants.

The pain was scored at the time of administration of block, during surgery and 4 h after the surgery using the Wong–Baker Facial Grimace Scale [Fig. 1]. The level of akinesia was assessed on a grade of 0–8 where each of the recti muscles akinesia was given a score of 0, 1, or 2. Where 0 is no akinesia/full movement, 1 is partial akinesia/reduced movement, and 2 is absolute akinesia/no movement. A total score of <2 was considered as unsuccessful akinesia.<sup>[7]</sup>

The time of onset of akinesia was noted in seconds just at the time of infiltration of the block.

The presence or absence of the chemosis or subconjunctival hemorrhage was noted at the time of administration of the block. 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.  $P < 0.05$  was considered significant.

**Table 1: Comparison of pain in the groups**

Variable	Group	n	Mean	Std. Deviation	T statistic (P)
Baseline pain	Peribulbar	35	1.57	0.850	9.792
	Subtenon	35	0.06	0.338	(<.001)
Perioperative pain	Peribulbar	35	0.03	0.169	-0.447
	Subtenon	35	0.06	0.338	(.65)
Postoperative pain	Peribulbar	35	1.63	0.731	2.385
	Subtenon	35	1.26	0.561	(.02)

**Table 2: Comparison of time of onset of akinesia in both groups**

Variable	Group	n	Mean (sec)	Std. Deviation	T statistic (P)
Akinesia onset	Peribulbar	35	194.40	66.914	8.696
	Subtenon	35	90.34	23.101	(<.001)

## Results

We observed that the proportion of patients with mild pain was significantly greater in the peribulbar group  $P < 0.001$ , whereas, a greater proportion of patients in the sub-tenons group had no pain during administration of the block [Fig. 2]. Perioperative pain grade showed no significant difference in both the groups with a  $P$  value of 1.00 [Fig. 3]. The baseline and postoperative pain scores were significantly greater in the peribulbar group  $P < 0.001$  [Table 1]. However, the pain experienced by the patient during the postoperative period was similar in both groups [Fig. 4]. The time of onset of akinesia in both the groups showed a significant difference, with a mean time of 194.40 s in peribulbar and 90.34 s in the sub-tenons group  $P < 0.001$  [Table 2]. However, the proportion of patients with complete akinesia (grade 8) was significantly greater in the peribulbar group with 82.9% than in the sub-tenons group where 74.3% of the patient attained only partial akinesia (grade 4)  $P < 0.001$  [Fig. 5]. The presence of chemosis and subconjunctival hemorrhage showed no statistically significant difference in both groups. We noted that only 5.7% in the peribulbar group and 20.0% in the sub-tenons group had chemosis [Fig. 6]. None of the patients in the peribulbar group had a subconjunctival hemorrhage, whereas 8.6% in the sub-tenons group had subconjunctival hemorrhage [Fig. 7].

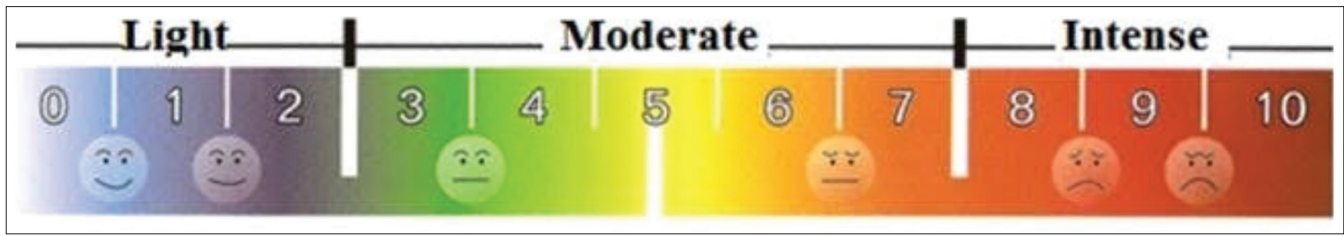
## Discussion

We 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. The mean baseline pain score in the peribulbar group was more (1.57) when compared to the sub-tenons group (0.06). This was similar to the observation in a study by Ashok *et al.*<sup>[11]</sup> However, Al-Yousuf observed that the pain perception was similar in both techniques.<sup>[8]</sup>

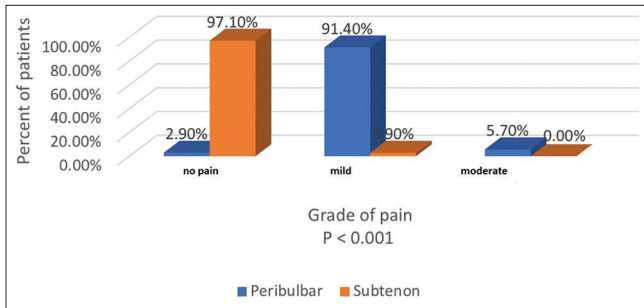
The mean perioperative pain score was 0.03 in peribulbar and 0.06 in sub-tenons. It was noted that patients who experienced perioperative pain in the sub-tenons group during the SRBS step of the surgery. Postoperative pain score was significantly higher in the peribulbar group  $P$  (0.02) in our study, whereas in a study by Adekola *et al.*<sup>[12]</sup> there was no significant difference in the postoperative pain in both groups. Parkar *et al.*<sup>[14]</sup> also observed no significant difference in both the groups during the perioperative and postoperative periods.

The time of onset of akinesia was significantly longer in the peribulbar group. The proportion of patients with greater akinesia grade was significantly greater in the peribulbar group ( $P < 0.001$ ). However, a study by Al-Yousuf showed better akinesia in the sub-tenons group.<sup>[8]</sup>

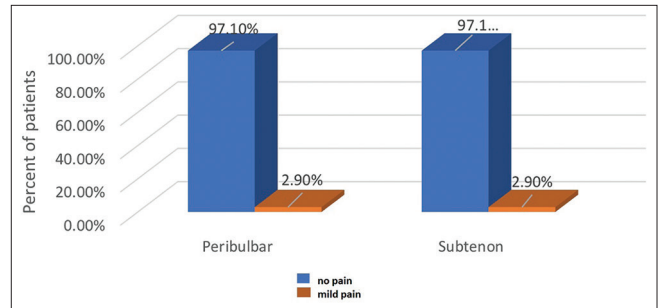
The presence of chemosis showed no significant difference in both groups  $P$  (0.15). Previous studies showed a significantly higher number of patients with chemosis in the sub-tenons group.<sup>[2,9]</sup> There was no statistically significant difference in the presence of subconjunctival hemorrhage after administering the block  $P$  (0.07). However, a previous study by Iganga *et al.*<sup>[9]</sup> showed a significant difference in both groups with respect to a subconjunctival hemorrhage. No globe perforation was noted in any of the cases.



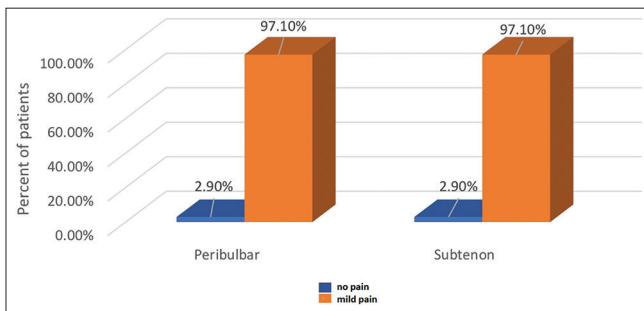
**Figure 1:** Wong-Baker Facial Grimace visual analogue Scale



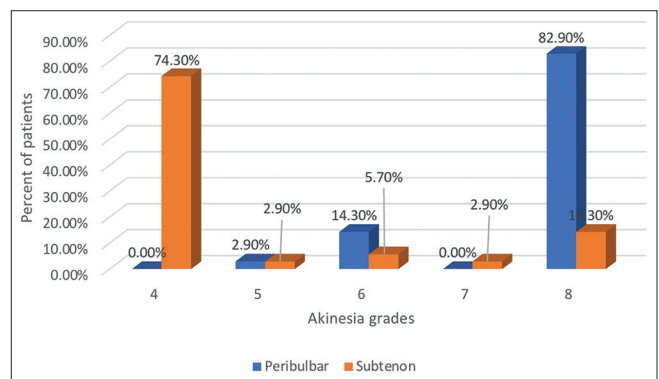
**Figure 2:** Pain at the time of administering the block was significantly greater in the peribulbar group  $P < 0.001$



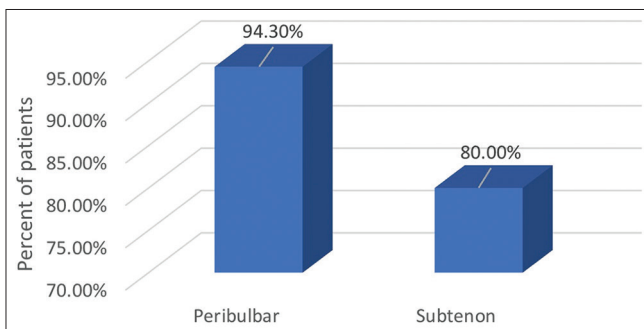
**Figure 3:** Peri-operative pain showed no significant difference in both the groups  $P = 1.0$



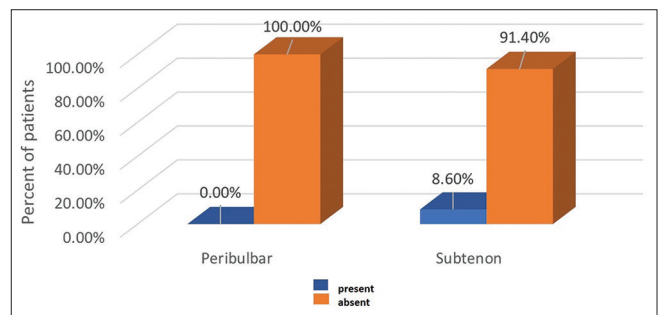
**Figure 4:** The number of patients who experienced mild grade of pain during the postoperative period was similar in both the groups



**Figure 5:** The number of patients who attained complete akinesia (grade 8) was greater in the peribulbar group (82.9%), whereas 74.3% of patients in the sub-tenons group attained only partial akinesia (grade 4)



**Figure 6:** 94.3% of patients in the peribulbar group and 80% in the sub-tenons group had chemosis following the administration of the block



**Figure 7:** The presence of subconjunctival hemorrhage following the block administration was seen only in the sub-tenons group (8.6%). No patients in the peribulbar group had a subconjunctival hemorrhage

In our study, all blocks were administered by the same surgeon in the group to avoid any variation in the technique. The cataract surgery was also performed by the same surgeon and lasted between 10–15 min. Hence, there was no relation between the pain experienced by the patient during the surgery and the duration of the surgery. The peribulbar block was also administered by the same individual. The

anesthetic agent and hyaluronidase used were the same for all patients and the volume of anesthetic used was the same for all patients in the sub-tenons and peribulbar group. No

other supplement was used to reduce intraoperative pain in any of the cases.

It was noted that the volume of anesthetic agent used in sub-tenons (2 mL) was much less as compared to peribulbar (4 mL). Although the akinesia grade was lower in the sub-tenons group it was acceptable by the surgeon for small-incision cataract surgery (SICS). Sub-tenons provide good analgesia during the perioperative and postoperative periods, which was comparable to the peribulbar block. The use of blunt cannula in sub-tenons avoids the risk of globe perforation associated with the use of needles in the peribulbar technique.

We observed that patients were more comfortable during the administration of sub-tenons block and experienced almost no pain when compared to peribulbar block. The onset of akinesia was faster as compared to the peribulbar technique. Mild chemosis that was observed after the administration of sub-tenons block was managed by local digital massaging.

The limitations of our study were that the volumes of the anesthetic agent used in both groups were different. This may have influenced the grade of akinesia and analgesia in both groups. Intraocular pressures were not monitored after the administration of the block in both groups, which may have been a comparable variable. The time of onset of pain in the postoperative period was not compared in this study.

Although the akinesia was lesser in sub-tenons, which reduces the efficacy, serious risks and complications associated with ocular anesthesia were almost nil. Hence, the safety quotient outweighs the reduced efficacy of the sub-tenons technique.

## Conclusion

The sub-tenons block is an effective and safe technique of ocular anesthesia for SICS. It can be considered as an alternative to the conventional peribulbar block for SICS.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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