International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Sub Tenons Block vs Peribulbar Block: A Comparative Study of Pain, Efficacy and Safety in Small Incision Cataract Surgery

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Abstract: ***Background**: This study compared sub-Tenon's block and peribulbar block in patients undergoing bilateral small incision cataract surgery, focusing on pain, efficacy, safety, and surgeon comfort. **Methods**: A prospective randomised interventional study included 57 patients with bilateral immature cataracts undergoing sequential bilateral small incision cataract surgery. Each patient received sub-Tenon's block in one eye and peribulbar block in the other, in randomized order. Pain, block onset, efficacy, complications, and surgeon comfort were assessed. **Results**: Sub-Tenon's block caused significantly less pain during administration compared with peribulbar block (p less than 0.001). Intraoperative pain was comparable between groups. Sub-Tenon's block had significantly faster onset (72.89 vs 168.37 seconds, p less than 0.001). Block efficacy and surgeon comfort were comparable. Retrobulbar haemorrhage occurred only in the peribulbar group (10.5%). **Conclusion**: Sub-Tenon's block appears to be a safer and more comfortable alternative to peribulbar block, with faster onset and comparable surgical efficacy in small incision cataract surgery*

Keywords: Small Incision Cataract Surgery (SICS), Peribulbar block, Sub-Tenon's block, Local anaesthesia, Pain assessment

1. Introduction

Cataract is when the clear lens of the eye turns opaque. Cataract extraction followed by placing an IOL is the treatment of choice for cataract. For performing the surgery, local anaesthesia is given by infiltrating the local anaesthetic to the nerve supplying the eye (1). Age-old method was to sedate the patient or give general anesthesia. Local anaesthesia became popular as cataract surgeries had short duration. It started with retrobulbar block given with a long needle to the retrobulbar space. It had serious complications such as globe perforation, optic nerve injury, retinal vascular occlusion and CNS toxicity. Then came peribulbar block which decreased the extent of complications, but globe perforation and retrobulbar hemorrhage still remained serious. The advent of Sub-tenon's anaesthesia was a boon for Small Incision Cataract Surgery (SICS) as it did not have serious complications (2). Even though sub tenon's block is much safer than other routes (3,4), the adoption of this route has not been on the top. Various reasons could be that any new method takes time to get implemented or it could be that it needs a little skill to administer the block.

This study compares peribulbar and sub tenon's block with respect to safety, efficacy, complications, patient compliance and surgeon's comfort. The novelty of the study is that, same patients were chosen for both blocks, each eye was given different block at different sittings for SICS. This helped us in overcoming the pain sensitivity bias as pain perception is subjective in each patient.

2. Methods

After obtaining ethical clearance from institutional ethics committee, patients who had cataract in both eyes were considered. Patients who were willing to undergo SICS for both eyes in a span of a month in our hospital were considered. A total of 57 patients were taken and informed consent for the blocks and the surgical procedure were taken.

Pre operative assessment was done using snellen's visual acuity chart for visual acuity. Slit lamp examination was done, the cataract was graded, AC depth was noted and fundus examination was done.

All 57 patients had clear cut immature cataracts with no other ocular associations in both eyes.

Each subject was given peribulbar or sub tenons randomly with no specific order of which was given in the first setting. Only one person gave both the blocks to all 57 patients. To negate the bias, a small conjunctival nick was also made after the peribulbar was given, so as to remove the bias of the only surgeon who operated all the cases.

Ofloxacin and nepafenac eye drops were instilled on the previous day. On the day of surgery, patients were not informed kept track about the type of block that they were going to be administered.

2% lignocaine without adrenaline was taken as a standard anaesthetic agent. 1 vial of Lyophilized hyaluronidase was added to 1 vial of the anaesthetic agent.

For peribulbar block
The eye was painted, 5% proparacaine eye drops instilled into the operating eye. The local anaesthetic was drawn in a 5 ml syringe. Using a 23G needle, 3 ml was given in the inferior fornix at the junction of lateral 1/3rd and medial 2/3rd and the remaining 2 ml was given in the superior fornix at the junction of lateral 2/3rd and medial 1/3rd . A digital massage was performed post injection.

For Sub tenon's block
The eye was painted and draped. 5% Proparacaine eye drops were instilled into the operating eye. The local anaesthetic was drawn in a 5 ml syringe. Inferonasal quadrant of the conjunctiva around 4-5 mm away from the limbus is held using a colibri forceps. A small nick using westcott's scissor is given at that point to cut both conjunctiva and tenon's capsule. A 23G blunt cannula is used to deliver the

anaesthesia through the opening made. The cannula is inserted completely into the opening to reach the posterior space and then 3 ml of the block is delivered. A cotton swab is used to put pressure on the opening to prevent leakage.

Once the block was delivered, SICS was done taking approximately 10-15 minutes. All blocks were given and cases were done by one surgeon only. The time of onset of the block was also noted in each case.

After the procedure, the patients and the surgeon were given questionnaires.

The patient was asked about the pain he/she suffered during the administration of the block, during the surgery and during the first 4 hours of the post op period. They were also asked about the anxiety level while the block was being administered. The pain was assessed using a subjective ordinal scoring system, which may limit objective comparability. As most of the subjects were uneducated, a structured pain scoring system was not used as it would lead to inappropriate results.

The person who administered the block kept track of the efficacy of the block which was measured out of 8. The action of the four recti were assessed after the administration of the block. For each muscle and the extra ocular movement: 0 being full movement, 1 being partial movement and 2 being complete restriction of the movement. A score of 4-7 were considered partial blocks and a score of 8 was considered a complete block. The surgeon was also asked about the complications, if any related to the block, and about his comfort while operating the case based on co operation from the patient.

Data was analysed using SPSS software. Student's t test and mann whitney test were used to tabulate the results of the study.

3. Results

The results were tabulated after all 57 patients underwent bilateral SICS with different blocks given to each eye.

During the administration of the block, no patient in the sub tenon's group suffered any pain, whereas 18, 30 and 9 patients in the peribulbar group suffered marked, moderate and no pain respectively. While statistical significance was observed, the clinical relevance of differences, particularly in postoperative pain, may be limited, as both groups had predominantly mild pain. During the surgery 3 and 6 patients had mild pain in the peribulbar and sub tenon's group but was not statistically significant. In the post operative period of 4 hours , 48 patients in the peribulbar group and 45 patients in the sub tenon's group had mild pain. 9 patients in the peribulbar group and 12 patients in the sub tenon's group had no pain which was statistically significant.

The mean of time of onset of peribulbar block was 168.37 seconds and of sub tenon's block was 72.89 seconds. This was the time taken to achieve maximum efficacy of the block. Peribulbar block took more time when compared to sub tenon's to act on the extraocular muscles. This was statistically significant. The faster onset of sub-Tenon's block may be attributed to direct diffusion of anesthetic into the episcleral space, which allows rapid spread of the agent to motor nerves, whereas peribulbar block relies on diffusion through orbital tissues.

Table 1: Distribution of subjects according to pain over groups

Variable	Subcategory	Group	
		Peribulbar	Subtenon
During block	Marked pain	18 (31.6%)	0
	Mild pain	30 (52.6%)	0
	No pain	9 (15.8%)	57 (100%)
During surgery	Mild pain	3 (5.3%)	6 (10.5%)
	No pain	54 (94.7%)	51 (89.5%)
Post OP for 4 hrs	Mild pain	48 (84.2%)	45 (78.9%)
	No pain	9 (15.8%)	12 (21.1%)

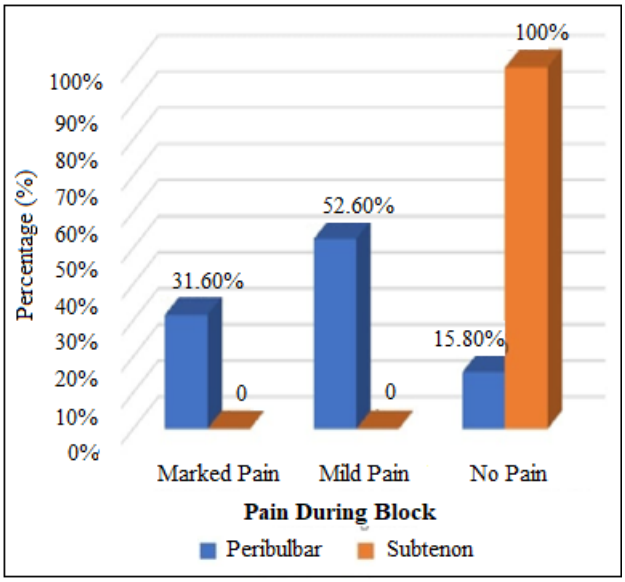

Figure 1: Distribution of subjects based on Pain during block over groups

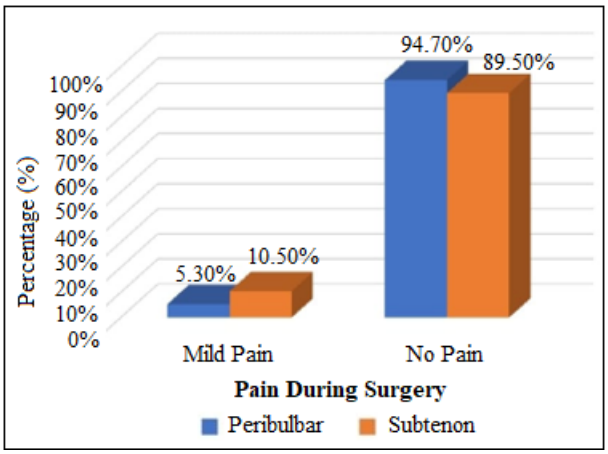

Figure 2: Distribution of subjects based on Pain during surgery over groups

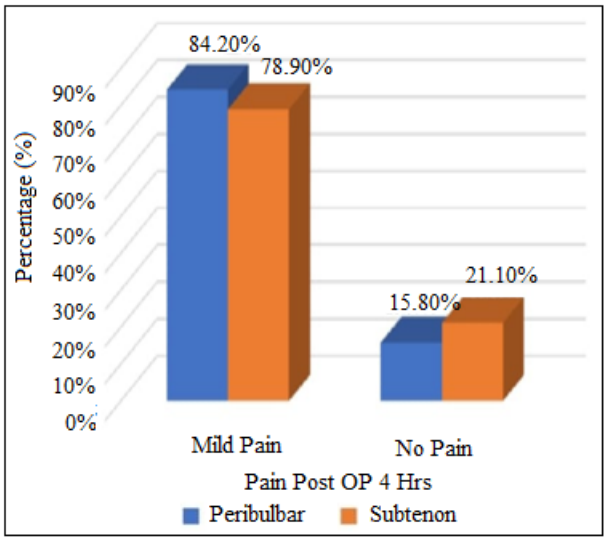

Figure 3: Distribution of subjects based on Pain - post op 4 hours over groups

Table 2: Mean difference of Pain scores over groups

Variable	Subcategory	Group		p-value
		Peribulbar	Subtenon	
During block	Mean ± SD Median (Q1, Q3)	5.37 ± 2.54 5 (3, 8)	0.63 ± 0.672 1 (0, 1)	<0.001
During surgery	Mean ± SD Median (Q1, Q3)	1.37 ± 0.938 1 (1, 2)	1.53 ± 1.61 1 (0, 2)	0.830
Post OP for 4 hrs	Mean ± SD Median (Q1, Q3)	4 ± 1.66 4 (3, 5)	3.37 ± 1.61 3 (3, 4)	0.013

Table 3: Distribution of subjects according to time of onset (secs) over groups

Variable	Subcategory	Groups		p-value
		Peribulbar	Subtenon	
Time of onset (secs)	Mean ± SD Median (Q1, Q3)	168.37 ± 16.62 166 (156, 185)	72.89 ± 10.88 69 (66, 81)	<0.001*[MW]

*Abbreviation- MW: Mann Whitney U test, *- indicates statistical significance*

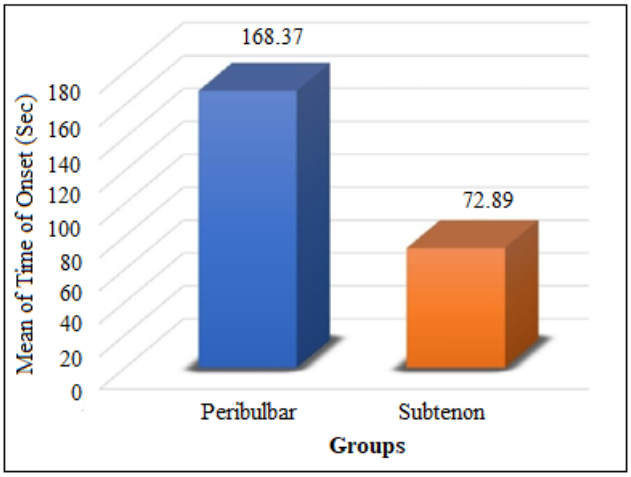

Figure 4: Mean plot of time of onset (sec) over groups

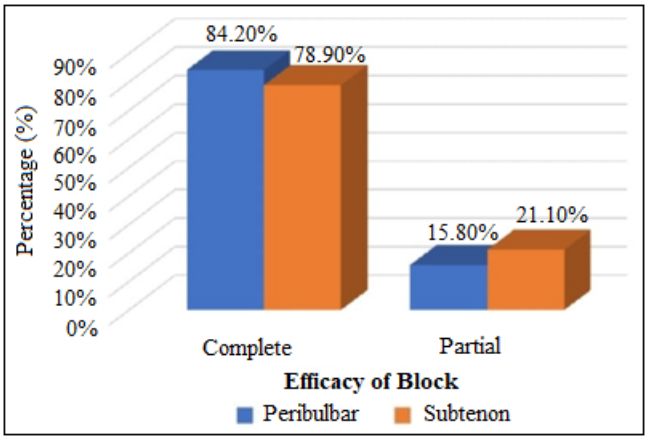

Figure 5: Distribution of subjects based on efficacy of blockage over groups

Table 4: Distribution of subjects according to efficacy of block, surgeons comfort and complications over groups

Variable	Subcategory	Groups		p-value
		Peribulbar	Subtenon	
Efficacy of block	Complete	48 (84.2%)	45 (78.9%)	0.469[C]
	Partial	9 (15.8%)	12 (21.1%)	
Surgeons comfort	Comfortable	54 (94.7%)	54 (94.7%)	1[C]
	Mild discomfort	3 (5.3%)	3 (5.3%)	
Complications	Nil	51 (89.5%)	57 (100%)	0.012*[C]
	RBH	6 (10.5%)	0	

*Abbreviation- C: Chi square test, *- indicates statistical significance*

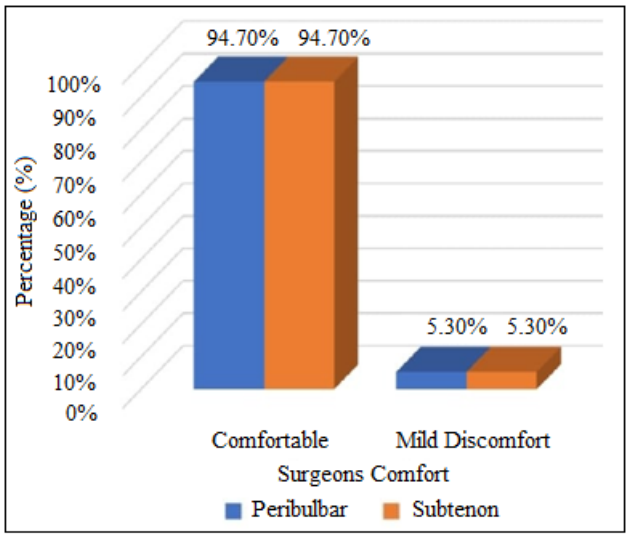

Figure 6: Distribution of subjects based on surgeons comfort over groups

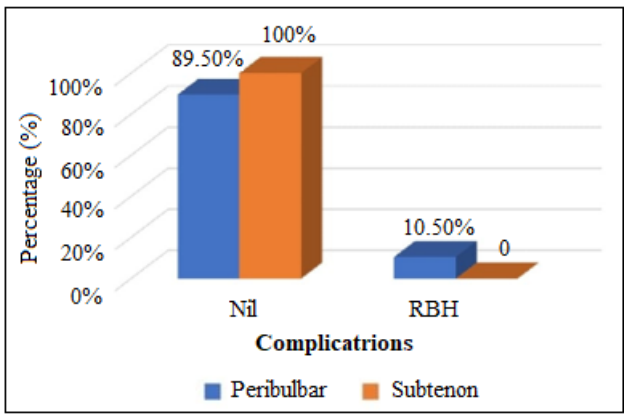

Figure 7: Distribution of subjects based on complications over groups

4. Discussion

In the present study, we compared the patient discomfort, time of onset of action, surgeon's comfort and complications between sub-Tenon block and peribulbar block for cataract surgery. Though both the techniques are well-established methods of regional anesthesia for cataract surgery, they differ in administration technique, time of onset of action, patient comfort and associated complications.

Statistically significant difference was found between the two modalities of blocks in our patients with greater pain experienced during peribulbar block administration and 4 hour post operative period. However the pain scores did not vary significantly during the surgery between the two blocks.

These results are similar to studies which have shown lesser pain with sub tenons block compared to peritubular block (1,5, 6).

Our results are in contrast with the results obtained in studies who found no difference between the two groups in the pain experienced during block administration (5,7,8).

Our study demonstrate that sub tenons block provided analgesic effect faster than the peribulbar block. This finding is in contrast with the studies which have shown equal analgesic effect in both the groups (5,7,8) and similar to studies which have shown faster effect in sub tenons block (9,10,11).

Our study found no difference in the efficacy between the two blocks. Similarly there was no statistically significant difference in the surgeons comfort between the two blocks. However, 10.5 % of the patients experienced mild retrobulbar haemorrhage with peribulbar block but none of them had any serious complications with sub tenons block. In our study even a mild blackening or discoloration was considered as retrobulbar haemorrhage. The surgery was continued in all these cases after decreasing the IOP and taking necessary measures to avoid further complications.

This observation is in contrast with the studies which have shown more complications with sub tenons block when compared with peribulbar block (7,12, 13)

5. Conclusion

Sub-Tenon's block demonstrated significantly better patient comfort during administration, faster onset of action, and fewer complications compared with peribulbar block in small incision cataract surgery. Both techniques showed comparable intraoperative efficacy and surgeon comfort. Sub-Tenon's block may be considered a safe and effective alternative to peribulbar anesthesia, though larger studies with validated outcome measures would strengthen these findings.

Financial disclosure: None

Data availability statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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