

Topical Anaesthesia Versus Peribulbar Anaesthesia in Small Incision Cataract Surgery – A Comparative Study from Hyderabad Karnataka Region

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ABSTRACT

BACKGROUND

Anaesthesia is an integral part of any successful surgery. Advances in cataract surgery have led to changes in delivery of anaesthesia as well. Patient and surgeons' comfort during anaesthesia and surgery is the single most important factor. In developing countries, small incision cataract is preferred sometimes over phacoemulsification in high volume centers. This study was done to compare patient and surgeon satisfaction following topical anaesthesia (TA) versus peribulbar anaesthesia (PA) for small incision cataract surgery (SICS) with intraocular lens implantation (IOL).

METHODS

This comparative observational study was done at M.R. Medical College, Kalaburagi over a period of 15 months from November 2018 to April 2020. 400 patients undergoing manual small incision cataract surgery (MSICS) after obtaining consent were included in the study, out of which 200 patients were administered TA while 200 were given PA randomly. Patients were prospectively evaluated for pain during administration, during surgery and 4-hours post-operatively through a questionnaire.

RESULTS

In our study TA group complained no pain whereas 85 % had mild pain and 13 % had moderate pain in PA group during administration of anaesthesia ($P < 0.05$). During surgery, none of the patients in both the groups experienced severe pain. 17 % patients in TA group had mild pain at 4 hours while only 4 % patients in PA group had pain ($P < 0.05$). There was no statistically significant difference in surgeon's satisfaction between 2 groups.

CONCLUSIONS

Although the administration of PA is painful compared to TA, the patient satisfaction was more post-operatively in PA group. Topical anaesthesia has gained popularity due to minimal discomfort, speed of onset and lack of PA related complications. It is a safe and effective alternative to PA in MSICS with proper selection and education of patient.

KEYWORDS

Small Incision Cataract Surgery, Topical Anaesthesia, Peribulbar Anaesthesia

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BACKGROUND

In the present era, advances in cataract surgery have led to greater levels of refractive precision, faster visual rehabilitation, improved comfort, and safety. With refinements in cataract surgery techniques and with advent of foldable intra ocular lens, changes have occurred in the delivery of anaesthesia from retrobulbar, peribulbar, parabolbar or sub-tenon block to topical anaesthesia.¹ Peri bulbar anaesthesia provides excellent anaesthesia, akinesia and analgesia. But being a blind procedure, with the introduction of sharp needles into the orbit, it is associated with complications like globe perforation, orbital haemorrhage, central retinal artery occlusion, diplopia and brain stem anaesthesia.² Because of better perceived margins of safety, topical and sub-tenon's local anaesthesia techniques have rapidly gained popularity for cataract and other ophthalmic surgical procedures. In developing countries still sometimes small incision cataract surgery is preferred over phacoemulsification for high volume centres as it is cost effective with smaller and self-sealing incision. Although peribulbar anaesthesia is most commonly employed, topical anaesthesia is gaining popularity specially for day care cataract surgery due to

- Speed and ease of administration.
- Rapid vision recovery post-operatively.
- Lack of block related complications.³

However, topical anaesthesia has certain disadvantages as well. Most of the patients who underwent peribulbar block did remain totally calm throughout the procedure once the block was established as opposed to the topical group where most patients were anxious intra operatively.⁴ Some studies have found increased surgical difficulty with topical anaesthesia and a distinct learning curve was reported.⁵⁻⁶ It is debatable to assign the supremacy of one type of anaesthesia over the other. So, to clear this dilemma, this study is being conducted to investigate the merits of topical versus peribulbar anaesthesia in manual small incision cataract surgery.

Objectives

To compare the patients and surgeon satisfaction following topical versus peribulbar anaesthesia for small incision cataract surgery.

METHODS

The present prospective longitudinal study was conducted in the Department of Ophthalmology at Basaveshwara Teaching and General Hospital, Kalaburagi from November 2018 to April 2020. Institutional ethical committee (IEC NO.201134) clearance was obtained for the conduct of the study and informed consent was taken from all the patients.

A total of 200 patients were divided by simple random number table into topical anaesthesia (TA) group (Group 1) or peribulbar anaesthesia (PA) group (Group 2).

Sample Size Calculation

Sample size

$$(n) = \frac{4pq}{L^2}$$

Where,

P = prevalence rate = 53

Q = 100-p = 100-53 = 47

L = permissible error that is 15 % of p = 7.5

$$n = \frac{4 \times 53 \times 47}{(7.5)^2}$$

= 159.65

= 200 cases

Inclusion Criteria

1. Age > 40 years
2. Senile cortical cataract
3. Posterior sub-capsular cataract
4. Grade I – II nuclear cataract

Exclusion Criteria

1. History of previous ocular co-morbidities, injury or surgery.
2. Allergy to lignocaine, bupivacaine, proparacaine.
3. Anxiety, dementia, deafness and ocular movement disorders.
4. Patient who are unable to understand pain scale.
5. Hard cataracts-grade III & IV nuclear cataracts

Study Procedure

After assignment to either group, the socio-demographic data and clinical data were collected using a semi-structured questionnaire. A detailed examination of the involved eye was done as mentioned below:

Preliminary Examination

- Visual acuity testing by Snellen's chart.
- Slit lamp examination.
- Schiötz tonometry.
- Lacrimal sac syringing.
- Direct and indirect ophthalmoscopy.
- BIOMETRY: Keratometry, Axial length (A-scan) and IOL Power calculation

Systemic Examination

All the patients were examined by a physician to rule out any systemic disorders.

Laboratory Details

- Routine haematological investigations like complete blood count (CBC)
- Urine routine and microscopy
- Random blood sugar level
- Electrocardiogram in indicated cases
- Chest X-ray PA view in indicated cases

- Blood urea and serum creatinine levels in indicated cases

Pre-operative preparation by instillation of topical ofloxacin (antibiotic), followed by tropicamide and flurbiprofen eye drops for dilatation of pupil for both the groups was done.

Technique of Topical Block

Patients in topical anesthesia (TA) group received 1 drop of proparacaine hydrochloride 0.5 % which was instilled 4 times at an interval of 5 minutes before the start of surgery. Topically applied 0.5 % proparacaine hydrochloride eye drops predominantly act on the corneal epithelium and stroma and some amount of drug penetrating into anterior chamber suppresses pain arising from iris and ciliary body. It typically acts for a period of 15 - 20 minutes.

Technique of Peribulbar Block

- Anaesthetic solution was prepared using solution of hyaluronidase 1500 IU dissolved in 30 ml of 2 % lignocaine with adrenaline (1 : 200000) resulting in 50 IU/ml of anaesthetic mixture, 3 ml of this solution is mixed with 2 ml of 0.5 % of bupivacaine.
- Patient was asked to keep their eyes still in primary gaze. A 5 ml syringe with 24-gauge needle was used. The first injection was injected inferior-temporally at the lower orbital margin such that it is midway between lateral canthus and lateral limbus.
- The second injection was injected at supero-nasal quadrant.

Surgical Procedure of Small Incision Cataract Surgery

The eye to be operated is painted and draped under aseptic conditions. Universal wire speculum was placed. A small fornix based conjunctival flap is made and sclera is exposed. Haemostasis is achieved by gentle thermal ball cautery. 6mm horizontal straight incision is made around 1.5 mm away from the limbus, superiorly. Sclerocorneal tunnel is made. Side port entry is made with 1.5 mm corneal valvular incision at 9 o'clock position. Anterior capsule is stained with trypan blue dye. Anterior capsulotomy is done by can opener method or continuous curvilinear capsulorhexis. Anterior chamber is entered through the main port and the wound is extended. Hydro dissection is done. Nucleus is dialled into the anterior chamber and delivered out either by sandwich method or visco-expression. Thorough irrigation and aspiration is done to remove cortical matter. Posterior chamber IOL is placed in the capsular bag. Anterior chamber IOL is placed if posterior chamber intraocular lens cannot be placed. Subconjunctival injection of 0.5 cc of 0.3 ml (4 mg/ml) dexamethasone and 0.2 ml (40 mg/ml) gentamycin was given, and pressure patch was applied. Post-operatively, all patients received a course of topical antibiotic and steroid eye drops hourly. Systemic antibiotic and analgesics were prescribed for three days.

Outcomes

The outcomes measured were patients and surgeon satisfaction following topical versus peribulbar anaesthesia in small incision cataract surgery, which was done by using pain scale

Patient's Satisfaction

Following surgery, patients were asked to grade the pain during administration of anaesthetic, during surgery and 4 hours post operatively. For this purpose, a 10-point visual analogue scale (VAS) was used, where 0 being no pain and 10 being severe pain. Patients who complained of moderate to severe pain postoperatively were given oral analgesics.

Visual Analogue Pain Scale	
Pain score during administration of anaesthetic agent	
Pain level	Score
No pain (Grade 0)	0 – 1
Mild pain (Grade 1)	2 – 4
Moderate pain (Grade 2)	5 – 7
Severe pain (Grade 3)	8 – 10
Pain score during intra-operative period	
Pain level	Score
No pain (Grade 0)	0 – 1
Mild pain (Grade 1)	2 – 4
Moderate pain (Grade 2)	5 – 7
Severe pain (Grade 3)	8 – 10
Pain score 4 hours post operatively	
Pain level	Score
No pain (Grade 0)	0 – 1
Mild pain (Grade 1)	2 – 4
Moderate pain (Grade 2)	5 – 7
Severe pain (Grade 3)	8 – 10
Patient Co-operation	
Excellent	1
Good	2
Poor	3
Difficulty due to ocular movements	
No difficulty	1
Some difficulty	2
Great difficulty	3
Surgeon Questionnaire	

Surgeons' Satisfaction

Difficulties encountered during surgery were graded by surgeon based on

- Patient co-operation during surgery (excellent, good, poor),
- Difficulty due to ocular movements (no difficulty, some difficulty, and great difficulty)

Statistical Analysis

Statistical data will be analysed by using IBM Statistical Package for Social Sciences (SPSS) 20.0 version software. For qualitative data analysis, Chi-square and Fisher's exact test, t test or Mann Whitney U test was applied. If P-value was < 0.05, it was considered as significant.

RESULTS

A total of 200 patients were selected for current study, of which 100 patients underwent small incision cataract

surgery under topical anaesthesia and 100 under peribulbar anaesthesia satisfying all inclusion and exclusion criteria. Our study showed that in group 1 (Topical Anaesthesia), 100 % patients were pain free during administration of anaesthesia whereas in group 2 (Peribulbar Anaesthesia), 85 % had mild pain, 13 % had moderate pain and 2 % had severe pain during administration of anaesthesia as shown in Table no. 3.

Study reveals that, there was statistically significant difference of mean VAS score while giving anaesthesia between group 1 (Topical anaesthesia) and group 2 (Peribulbar anaesthesia). In group 2 (Peribulbar anaesthesia), mean VAS score was significantly higher when compared to group 1 (Topical anaesthesia) as shown in Table no. 6. Our study showed that in group 1 (Topical anaesthesia), 77 % patients had no pain, 17 % had mild pain and 6 % had moderate pain during surgery. However, in group 2 (Peribulbar anaesthesia) 82 % had no pain, 14 % had mild pain and 4 % had moderate pain during administration of anaesthesia as shown in Table no. 3. None of the study patients had severe pain.

Study reveals that, there was statistically significant difference of mean VAS score during surgery between group 1 (Topical anaesthesia) and group 2 (Peribulbar anaesthesia). In group 2 (Peribulbar anaesthesia), mean VAS score was significantly less when compared to group 1 (Topical anaesthesia) as shown in Table no 7.

Study reveals that there was statistically significant difference of mean VAS score at 4th hour post-operative between group 1 (Topical anaesthesia) and group 2 (Peribulbar anaesthesia). In group 2 (Peribulbar anaesthesia), mean VAS score was significantly less as compare to group 1 (Topical anaesthesia) at 4th hour post-operative. Study reveals that there was no statistically significant difference of patient's co-operation grades between group 1 (Topical anaesthesia) and group 2 (Peribulbar anaesthesia) as shown in Table no.5. Study reveals that there was statistically significant difference of unwanted ocular movement between group 1 (Topical anaesthesia) and group 2 (Peribulbar anaesthesia). Group 2 was better when compared to group 1 as shown in Table no 8.

Age in Years	Group 1 (Topical Anaesthesia)		Group 2 (Peribulbar Anaesthesia)		Total	
	No.	%	No.	%	No.	%
40 – 50	7	7.0	8	8.0	15	7.5
51 – 60	34	34.0	29	29.0	63	31.5
61 - 70	50	50.0	51	51.0	101	50.5
71 - 80	9	9.0	12	12.0	21	10.5
Total	100	100.0	100	100.0	200	100.0
Mean ± SD	62.66 ± 6.87		62.39 ± 7.38		62.97 ± 7.10	
t-test, P-value	t = 0.625 P = 0.533 NS					
Significance						

Table 1. Age Wise Distribution of Patients among the Two Groups

NS= not significant, S=significant, HS=highly significant, VHS=very highly significant

Study observed that maximum number of patients 101 (50.5 %) belonged to the age group of 61 - 70 years, followed by 63 (31.5 %) number of patients who belonged to the age group of 51 - 60 years, 21 (10.5 %) patients belonged to the age group of 71 - 80 years and 15 (7.5 %)

patients belonged to the age group of $\leq$ 50 years The mean and SD age of group 1 (Topical anaesthesia) was 62.66 $\pm$ 6.87 and the mean and SD age of group 2 (Peribulbar anaesthesia) was 62.39 $\pm$ 7.38. There was no statistically significant difference of mean age of patients between group 1 and group 2 (P > 0.05). Study observed that female patients were dominant 121 (60.5 %) in both groups; Group 1 and group 2, male patients were 79 (39.5 %). But there was no statistically significant difference of gender between group-1 and group-2 (P > 0.05)

Gender	Group 1		Group 2		Total	
	No.	%	No.	%	No.	%
Males	36	36.0	43	43.0	79	39.5
Females	64	64.0	57	57.0	121	60.5
Total	100	100.0	100	100.0	200	100.0
X ² -test value	X ² = 1.025 P = 0.762 NS					
P-value						

Table 2. Gender Wise Distribution of Study Population

NS= not significant, S=significant, HS=highly significant, VHS=very highly significant

Grade of Pain	Group-1 N (%)	Group-2 N (%)	Total N (%)
Grade 0 (No Pain)	100 (100.0 %)	0 (0.0 %)	100 (50.0 %)
Grade 1 (Mild)	0 (0.0 %)	85 (85.0 %)	85 (42.5 %)
Grade 2 (Moderate)	0 (0.0 %)	13 (13.0 %)	13 (6.5 %)
Grade 3 (Severe)	0 (0.0 %)	2 (2.0 %)	2 (1.0 %)
Total	100 (100.0 %)	100 (100.0 %)	200 (100.0 %)

Table 3. Pain Scale Grading during Administration of Anaesthesia

Grade of Pain	Group 1 N (%)	Group 2 N (%)	Total N (%)
Grade 0 (No Pain)	77 (77.0 %)	82 (82.0 %)	159 (79.5 %)
Grade 1 (Mild)	17 (17.0 %)	14 (14.0 %)	31 (15.5 %)
Grade 2 (Moderate)	6 (6.0 %)	4 (4.0 %)	10 (5.0 %)
Grade 3 (Severe)	0 (0.0 %)	0 (0.0 %)	0 (0.0 %)
Total	100 (100 %)	100 (100.0 %)	200 (100.0 %)

Table 4. Pain Scale Grading during Surgery

Patient Co-Operation Grades	Group 1		Group 2	
	No.	%	No.	%
Good & Excellent	99	99.0	99	99.0
Poor	1	1.0	1	1.0
Total	100	100.0	100	100.0
Fisher's exact test, P-value	P = 0.99, NS			

Table 5. Comparison of Patient's Co-Operation Between the Groups

VAS Score while Administration of Anaesthesia	Group 1 (Topical Anaesthesia) Median (IQR)	Group 2 (Peribulbar Anaesthesia) Median (IQR)
VAS score	1.01 (0.32)	3.32 (1.23)
P-value	P = 0.000*** [*** indicates statistically very highly significant at P<0.001]	

Table 6. Comparison of VAS Score (Pain Score) while Administration of Anaesthesia between the Groups

VAS Score During Surgery	Group 1 (Topical Anaesthesia) Median (IQR)	Group 2 (Peribulbar Anaesthesia) Median (IQR)
VAS score	1.72 (0.78)	1.36 (0.41)
P-value	P = 0.038* *indicates statistical significance at P < 0.05	

Table 7. Comparison of VAS Score during Surgery between the Groups

Unwanted Ocular Movement	Group 1 No.	Group 1 %	Group 2 No.	Group 2 %
No difficulty	85	85.0	96	96.0
Some difficulty	15	15.0	4	4.0
Total	100	100.0	100	100.0
Fisher's exact test	P = 0.0375* *indicates statistical significance at P < 0.05			

Table 8. Comparison of Unwanted Ocular Movement between Groups

DISCUSSION

In small multi-planar, self-sealing incision cataract surgeries, very little manipulation is needed which resulted in the widespread acceptance of topical anaesthesia⁷⁻⁸ and has several other benefits like:

- The return of vision is more rapid,
- It is less costly,
- Patients can have surgery without discontinuation of systemic anticoagulants or aspirin,
- There is more patient satisfaction.⁵

This study compares the role of topical and peribulbar techniques in small incision cataract surgery (SICS) where the painful step of passing the superior rectus suture has been eliminated. The dilatation of the pupil using tropicamide (0.8 %) with phenylephrine (5 %) prior to the surgery is also a very important procedure to decrease pain in both methods. The fact that the time taken for surgery is less than 10 minutes is also contributory to the success of surgery under topical anaesthesia.

In our present study, total 200 patients underwent SICS. In topical group, there were total of 36 male patients and 64 female patients. In peribulbar group, 43 were male patients and 57 were female patients. Most of the patients were educated up to 7th standard.

In the topical group, the total number of right eyes operated were 55 and left eyes were 45. In the peribulbar group, the total numbers of right eyes operated were 63 and the left eyes being 37.

In our study, during administration of anaesthesia, all the patients in group 1 had no pain whereas in group 2, 85 patients had mild pain, 13 had moderate pain and 2 of them had severe pain. The median pain score during administration of anaesthesia in group 1 was 1.01 (IQR = 0.32) and in PA group was 3.32 (IQR = 1.32). $P = 0.000$ (statistically very highly significant).

During surgery in group 1, 77 patients had no pain while 17 had mild pain and 6 had moderate pain. In group 2, 82 patients had no pain while 14 had mild pain and 4 had moderate pain. None of the patients in both the groups experienced severe pain.

The median VAS pain score during surgery in group 1 was 1.72 (IQR = 0.78) and in group 2 was 1.36 (IQR = 0.41) which suggests that VAS pain score was more in group 1 than group 2 during surgery. $P = 0.038$ (statistically significant).

4 hours post operatively in group 1; 75 patients had no pain while 17 had mild pain, 7 had moderate pain and 1 patient had severe pain. In group 2, 90 patients had no pain while 4 had mild pain and 6 had moderate pain. None of the patients in PA group experienced severe pain. The mean VAS pain score 4 hours post operatively in group 1 was 1.71 (SD ± 1.45) and in group 2 was 1.31 (SD ± 0.78) which suggests that VAS pain score was more in group 1 than group 2, 4 hours post-operatively. $P = 0.017$ (statistically significant). This is self-explanatory as peribulbar anaesthesia has a longer duration of action. The pain was easily controlled with systemic NSAID in group 1.

In a study done by Bhat et al. total of 140 patients underwent SICS in each group and it was noticed that mean pain during anaesthesia in peribulbar group was 3.57 and in topical was 2.32 which was statistically significant ($P < 0.005$). The mean pain during surgery in peribulbar group is 1.87 (SD ± 1.40) and in topical group is 2.24 (SD ± 1.13). $P = 0.026$ (Not significant) which was similar to our present study.

A study done in 2016 by Joseph B et al. showed during anaesthesia, none of the patients in topical group complained of pain whereas 88 % had mild pain during needle insertion in peribulbar group.

There was statistically significant difference between two groups with P value < 0.05 . Intra operatively, 53.57 % experienced mild pain in topical group compared to 61.76 % in peribulbar group (not statistically significant). 4 hours post-operatively, 17.9 % in topical group had mild pain compared to 2.9 % in peribulbar group ($P < 0.05$) which was statistically significant.

Geeta P et al. study in 2019 also showed that patient satisfaction level was more in topical group 88.5 % when compared to peribulbar group 45.7 % during anaesthesia and SICS.⁹

Sauder G et al.¹⁰ (2003) in their study of 140 patients reported that there was faster visual rehabilitation in the post-operative period with topical anaesthesia, whereas with peribulbar anaesthesia, the optic nerve and extraocular muscles may still be partially blocked by local anaesthetics.

In our study, surgeon's satisfaction scoring was done immediately after the surgery, 96 % of the patient had excellent patient co-operation in group 1 and 95 % of the patients had excellent patient co-operation in group 2, ($P = 0.984$) not statistically significant.

96 % of the patients had no unwanted ocular movement in group 2 whereas 85 % of the patients had no unwanted ocular movement in group 1, ($P = 0.0046$) statistically significant.

Bhat et al.¹¹ study showed that akinesia during surgery in peribulbar group was seen in 88.5 % whereas in topical group none of the patient had grade 0 akinesia. ($P = 0.0004$) which was statistically significant. The lack of akinesia is another drawback of the topical anaesthesia. Some surgeons find it difficult to work without akinesia; however, as reported by many authors, lack of akinesia does not cause intra-operative difficulties to experienced surgeons.¹²

A study done by Suresh H.H. et al. showed that MSICS under topical anaesthesia with proparacaine is safe and effective for high risk patients with coexisting cardiac disease without any compromise in visual outcome.¹³

CONCLUSIONS

Topical anaesthesia is a safe, effective and patient friendly alternative to peribulbar anaesthesia in cataract surgery. However, use of topical anaesthesia requires proper selection of cases, adequate pre-op preparation, proper patient education and good surgical experience.

Even though complete akinesia is better obtained with peribulbar anaesthesia, experienced surgeons do not have intraoperative difficulties. And post-operative pain, though significantly higher in topical group, because of its short duration of action, can be easily managed with NSAIDs

The risk of globe perforation, optic nerve injury, pain and fear of the needle are all eliminated with topical anaesthesia and it can be safely used even in cardiac patients.

With day care surgeries becoming more popular, topical anaesthesia is more so relevant as the risk of serious complications are minimal and it is very patient friendly as well.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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