



Effectiveness of Peribulbar vs Sub-tenon's Anaesthesia Among Patients Undergoing Cataract Surgery - A Randomised Controlled Trial

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Abstract

Evidence on effective local anesthesia for cataract surgery was lacking. The study aimed to compare the effectiveness of two common anesthetic technique used for cataract surgeries, Peribulbar Anesthesia (PBA) vs Subtenon Anesthesia (STA). Prospectively 100 subjects from a tertiary care hospital were recruited and randomly assigned to either PBA or STA group. The outcome assessed were pain during administration of anaesthesia, at the end of surgery, 4 hours after surgery, Orbital akinesia, complications and surgeons discomfort between the two groups. The results revealed a significant lesser level of pain among STA group during administration, immediately after administration and 4 hours after administration of anaesthesia than PBA group. There was no significant difference observed in the overall ocular akinesia, complication and surgeons discomfort between two groups. STA may be considered an safe and effective local anaesthesia for cataract surgery then PBA.

Keywords: Cataract; Surgery; Anesthesia; Sub-tenon; Peribulbar

Abbreviations

PIMS: Pondicherry Institute of Medical Sciences; PBA: Peribulbar Anesthesia; STA: Sub Tenon Anesthesia

Introduction

Cataract surgery is one of the oldest surgical procedures known, first documented in the fifth century BC [1]. In the past decade there has been a significant evolution in surgical techniques of cataract extraction. The technological advances in phaco machines, phacotips, and availability of ophthalmic viscoelastic devices and premium intraocular lenses have played a great role in evolution of cataract surgery. Anaesthesia for cataract surgery has undergone progressive changes due to advances and availability of better drugs, surgical instruments and modification of surgical

technique [2]. Infiltration from of local anaesthesia is given as retrobulbar or peribulbar or sub-Tenon's block.

Retrobulbar block was the mainstay of local anaesthesia for cataract surgery. It had fast onset of action with a small volume of anaesthetic agent. However, it is associated with vision and life-threatening complications. Some of these complications include retrobulbar haemorrhage, globe perforation and brainstem anaesthesia [3,4]. Peribulbar anaesthesia (PBA) was developed as a potentially safer option. However, it has a slower onset of akinesia, requires larger volume of anaesthetic agent and higher rate of supplementation [5-9]. Serious complications such as retrobulbar haemorrhage, globe perforation, and brainstem injection have also been reported following peribulbar injections [10]. To avoid these complications, needle-free procedure Sub-Tenon anaesthesia (STA)

was developed. Although it was reported to be safe compared to needle blocks, complications such as orbital and retrobulbar haemorrhage, globe perforation, the central spread of local anaesthetic, orbital cellulitis, etc., have been reported in the literature [11,12]. The other minor complications known to occur are chemosis and conjunctival haemorrhage [13].

The million dollar question is: which anaesthesia to choose for cataract surgery?. Studies have showed different trends of local anaesthesia usage in different countries. A national postal survey was conducted in 2008 in the United Kingdom for choice of local anaesthetic techniques. STA was the local anaesthetic technique of choice (47% compared to topical 33%, PBA 16%, retrobulbar 2%, and others 2%). Of STA, 28% were given by surgeons and 47% by the anaesthetist [14]. A similar survey done in Singapore in 2004 showed 92% cataract extraction were done by phacoemulsification technique. For phacoemulsification technique, the anaesthetic technique of choice was PBA (43%) [15]. There is substantial variation in the conduct of anaesthesia for ophthalmic surgical procedures across the globe. It is debatable to assign the supremacy of one type of anaesthesia over the other [16,17]. Hence the present study aimed to compare the effectiveness of PBA and STA among patients undergoing cataract surgery in terms of perioperative analgesia, ocular akinesia, complications and surgeons discomfort.

Materials and Methods

This study was conducted prospectively at Department of Ophthalmology, PIMS between September 2016 to April 2018. A total of 100 eligible subjects with cataract within the age group of 30- 90 years were recruited for the study and randomly assigned into either PBA group or STA group with 50 subjects in each group. Subjects with history of orbital trauma, Previous intraocular injury/ inflammation/surgery and pupil with < 5 mm diameter were excluded. Cataract surgery was performed by three surgeons, who are proficient in Phacoemulsification and Manual small incision cataract surgery in PIMS. The consent form and participation information sheet were given to the patient and informed consent was obtained from all the participants involved in this study. Randomization of patients was done by lottery method into two group and both surgeons and patients were masked regarding patient groups and type of anaesthesia respectively.

The main outcome assessed were pain during administration of anaesthesia, at the end of surgery, 4 hours after surgery, Orbital

akinesia, complications and surgeons' discomfort between the two groups. Patient was assessed for pain score by Wong-Becker faces pain rating scale during administration anaesthesia, after the surgery is completed and four hours after the surgery. The scale consists of score range from 0 to 10 with a higher score indicating more severe pain (0="no pain" to 10="severe pain", Grade 1-3 - Mild, Grade 4-6 -Moderate, Grade 7-9- Severe, Grade 10- worst pain). Orbital akinesia was assessed five minutes after the administration of anaesthetic agent. Akinesia was graded on a scale designed to measure ocular movements in each quadrant (no movement = 0, mild = 1, moderate = 2, severe = 3, in each quadrant, with minimum score = 0 and maximum = 3x4=12).Complication developed by patient following surgery was observed and documented. In addition, Surgeons are also asked to grade overall "discomfort" during the surgery through a rating scale (grade 0 = no discomfort, grade 1 = mild discomfort, grade 2 = moderate, grade 3 = severe, grade 4 = surgery not possible).

Formal ethical clearance was obtained from Institute ethics Committee before implementing the study. Data collected were analysed using appropriate descriptive and inferential statistics using SPSS for windows version 21.

Results and Discussion

Results

Of the total 100 patient included in the study, the mean age 60.2 in PBA group and 62 in STA group. Male to female distribution was in PBA and STA group was 28% vs.32% and 72%vs.68 respectively. The distribution of the Phacoemulsification and Manual small incision cataract surgery between PBA and STA group was 34% vs. 56% and 66% vs. 44% respectively. The baseline characteristics of the subjects with respect to age, sex and type of surgery were comparable between the two groups as there was no statistically significant difference existed.

Comparison of level of Pain between PBA and STA groups

During administration of Anaesthesia, Severe to worst pain was more likely to be reported among PBA than STA group 82%vs. 58%. Likewise mild to moderate pain was reported more likely in STA than PBA group 42% vs.18% (p value 0.0088) (Table 1). Immediately after surgery, severe pain was more likely to be reported only by PBA than STA group 100%vs. 0%. (p value 0.001) (Table 2). Comparison of pain level 4 hours after surgery revealed moderate

to severe pain was more likely to be reported among PBA than STA group 42% vs. 22%. (p value 0.0321) (Table 3).

Level of Pain score	Group		Chi square test p value
	PBA n = 50	STA n = 50	
Mild to Moderate Pain	9(18%)	21(42%)	0.0088
Severe to Worst pain	41(82%)	29(58%)	

Table 1: Comparison of Pain Score during Administration of Anaesthesia between PBA and STA Group.

Level of Pain score	Group		Chi square test p value
	PBA n = 50	STA n = 50	
No Pain to Mild Pain	0(0%)	17(34%)	0.001
Moderate Pain to Severe pain	50(100%)	33(66%)	

Table 2: Comparison of Pain Score at the End of Surgery between PBA and STA Group.

Level of Pain score	Group		Chi square test p value
	PBA n = 50	STA n = 50	
No Pain to Mild Pain	29(58%)	39(78%)	0.0321
Moderate Pain to Severe pain	21(42%)	11(22%)	

Table 3: Comparison of Pain Score 4 Hours after Surgery PBA and STA Group.

Comparison of ocular akinesia, complication and surgeons' discomfort between PBA and STA groups

In the current study although the rate of complete akinesia was found to be higher among STA group than PBA 84%vs. 78%, it was not statistically significant. Overall, when comparing the incidence of complication between the two groups no statistical difference was found, but with respect to specific complication like chemosis and subconjunctival hemorrhage difference was found. Chemosis was observed to be higher among STA than PBA 20%vs. 18%. Sub-

conjunctival hemorrhage was observed among 14% of the subjects in STA group, but none in PBA group developed subconjunctival hemorrhage (Table 4). In addition no statistical difference was found between surgeon discomfort during the surgery between PBA and STA group.

Complication	Group		Chi square test p value
	PBA n = 50	STA n = 50	
Chemosis	9(18%)	10(20%)	0.049
Subconjunctival haemorrhage	0(0%)	7(14%)	
None	41(82%)	33(66%)	

Table 4: Comparison of Complication between Peribulbar Anaesthesia and Sub- Tenon's Anaesthesia Group.

Discussion

The postoperative pain following cataract surgery are likely to be mild and may be of very short duration, but more severe or consistent pain with duration of several days has also been reported in past [18]. We found that the pain during administration of anaesthesia was significantly less in STA than PBA group. A similar finding was reported by 6 studies in past [19-24]. A systematic review by Porela-Tiihonen S (2013) reported post operative pain assessment after cataract surgery is rarely reported in literature [25]. The present study fulfilled the gap by assessing the post operative pain immediately at the end of surgery and 4 hours after surgery. Immediate post operative pain level between STA group was found to be significantly less when compared to the PBA group, which is congruent with the finding of M. R. Pujari, *et al.* (2015) [26] and Khan SA, *et al.* (2014) [21] who reported PBA to be significantly painful than STA at the end of surgery.

Pain after 4 hours of surgery was found to be significantly less in STA group than PBA group. Similar to the current study finding, Oyebola Olubodun Adekola, *et al.* (2018) [27] in their study reported post operative pain after 30 minutes and 1 hour after surgery was significantly more in PBA than STA. In our study no difference was observed in ocular akinesia between PBA and STA groups. In line with the present finding a study by Abhinay Ashok, *et al.* (2018) [28] and Gajanan. D.C., *et al.* (2014) [20] reported no statistical difference between akinesia among PBA and STA among

their subjects. The surgeon rated discomfort was also found to have no difference between the two group in the present study, which is congruent with the finding of Irrazábal V, *et al.* (2006) [29].

Complications arising from orbital regional anaesthesia may be local, or may manifest systemically and may arise immediately or may be delayed. Complications are related to the method of administration or local anaesthetic agent and adjuvant used [30,31]. In our study when comparing overall the incidence of complication between the two groups no significant difference could be observed ($p = 0.068$). A similar study done by Gajanan. D.C., *et al.* (2014) [20] reported no difference in the complication rate between PBA and STA. Limitations of our study is subjective nature of the Wong-Baker Faces Pain Rating Scale and the posterior segment was not assessed in our patients after administration of anaesthesia, however all patients had a visual acuity of $> 6/12$.

Conclusion

Sub-Tenon Block offered better analgesia during administration, at the end of surgery and 4 hours post-surgery when compared to Peribulbar block. The incidence of subconjunctival haemorrhage was seen significantly higher following Sub Tenon anaesthesia (14%) over Peribulbar anaesthesia (0%), a minor complication. However, none of our patients developed major complication such as Retrobulbar haemorrhage, globe rupture, brain stem anaesthesia etc. Sub Tenon anaesthesia may be considered as a safe and effective alternative to Peribulbar Anaesthesia for cataract surgery.

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Conflict of Interest

None.

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