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Patient's pain perception and surgeon satisfaction with topical anaesthsia in phacoemulsification surgery

Ziya Siddiqui[1], Sheerin Fatima[1], Adeeb Alam Khan[1], Humayoun Ashraf[1], Syed Wajahat Ali Rizvi[1,*]

[1] *Dept. of Ophthalmology, Jawaharlal Nehru Medical College, AMU, Aligarh, Uttar Pradesh, India*

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ABSTRACT

Background: As the cataract surgery has taken the quantum leaps, so does the advancements in various anaesthetic techniques, aiming to provide a safer, painless and comfortable surgery. Topical anaesthesia is a less invasive anaesthetic option which provides adequate analgesia with wide margin of safety. We aimed to evaluate the efficacy of topical anaesthesia as a routine in a standard phacoemulsification surgery.

Materials and Methods: A total of 200 patients scheduled for routine phacoemulsification were enrolled in a prospective, non-randomized comparative clinical study. Patients were then distributed to either topical anaesthesia group (TA) or peribulbar anaesthesia group (PA) to evaluate for patient and surgeon satisfaction, and intraoperative complications.

Observations: The study groups were comparable demographically. Pain scores were higher during late stages of surgery in TA ($p<0.01$), while higher scores were noticeable in PA ($p<0.01$) during administration and in the postoperative periods. Significantly higher rate of chemosis was seen in PA ($p<0.01$). The patients in the TA had an overall better surgical experience as compared to the PA ($p<0.01$).Though surgeon does note higher per-operative pain perception ($p=0.027$) and ocular motility ($p<0.01$) in the TA there was no significant difference as far as ease of surgery was concerned.

Conclusion: Despite higher per-operative pain perception most of the patients describe their surgical experience with topical anaesthesia as satisfactory. In view of its minimally invasive nature, topical anaesthesia is a safer alternative to peribulbar anaesthesia practically avoiding all block related complications especially in at risk eyes, and thus can be safely administered as a routine in phacoemulsification surgery.

1. Introduction

From couching to laser assisted phacoemulsification, cataract surgery has seen tremendous advancements over the decades. Newer techniques using small self-sealing incisions and shorter surgical duration have made it possible to move towards less invasive anaesthetic options. A relatively new local anaesthetic technique for small incision cataract surgery is topical anaesthesia, which is practically free of complications associated with retrobulbar and peribulbar approach.[1] In addition, the technique is also cost effective, avoids undesirable post-operative cosmetic effects, and allows faster visual rehabilitation. The technique is simple and essentially involves instillation of anaesthetic eye drops or ointment into the conjunctival sac. The analgesia induced; with or without supplemental intracameral lignocaine is sufficient to allow cataract surgery to be carried out painlessly in most of the cases.

The retrobulbar anaesthesia supplemented by facial nerve block (Atkinson, O'Brien, Van Lint etc.) was the

* *Corresponding author.*
E-mail address: wajahatrizamu@gmail.com (S. W. A. Rizvi).

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gold standard for decades, but had the disadvantage of being a "blind injection" with the potential for causing globe perforation, optic nerve damage, hematomas, and intrathecal/central nervous system spread. Peribulbar approach though relatively safe, is again a blind procedure and may be associated with complications.[2,3]

These complications and limitations can be avoided by the use of topical anaesthesia and presently the trend is to adopt this technique as a standard of care. In the year 2000, a survey of American Society of Cataract and Refractive Surgery (ASCRS) concluded that 49% of respondents reported that their primary method of anaesthesia was topical (from 0% in 1990, 8% in 1995, and 45% in 1999), 26% had retrobulbar anaesthesia (from 69% in 1990, 50% in 1995, and 29% in 1999), while 24% opted for peribulbar anaesthesia (from 30% in 1990, 38% in 1995, and 24% in 1999).[4]

We set out to evaluate the efficacy of topical anaesthesia as a routine alternative to peribulbar anaesthesia in patients undergoing phacoemulsification with intraocular lens implantation in terms of patient and surgeon satisfaction, and rate of intraoperative complications.

2. Materials and Methods

This was a prospective, nonrandomized, comparative clinical study conducted at a tertiary care hospital after ethical clearance from Institutional Research and Ethics Committee.

A total of 200 patients were consecutively enrolled in the study from the adult patients diagnosed as having senile cataracts over a period of 2 years. The sample size was calculated for a non-inferiority non-randomized study design. The power was being set at 80% and level of significance 0.05. Patients were excluded if they were potentially one eyed, had previous allergic response to proparacaine or lignocaine, history of convulsions, impaired hearing, ocular co-morbidities, fixation instability due to nystagmus, excessive anxiety, small pupil. All patients underwent thorough ophthalmic examination which included slit lamp biomicroscopy, indirect ophthalmoscopy, IOP measurement, routine blood investigations and lignocaine sensitivity. The patients were then assigned to either topical anaesthesia (TA) or peribulbar anaesthesia (PA) group and were operated by two experienced surgeons. Patients in TA group were given 3 instillations of 0.5% proparacaine hydrochloride solution 15 minutes prior to surgery. PA group received a transcutaneous 5 ml injectable cocktail of Lignocaine hydrochloride 2% with/without adrenaline (1:200000) + Bupivacaine hydrochloride 0.5% + Hyaluronidase 5% (IU) at the junction of medial two third and lateral one third of lower orbital margin in peribulbar space. Supplemental topical or injectable anaesthetics were used for any breakthrough pain during the surgery. The surgeons followed the standard phacoemulsification technique in both the groups, and any change in the surgical technique and per-operative complications were documented and managed accordingly.

Immediately after completion of the surgery, each patient was shown a visual analogue scale (VAS) consisting of 10cm line with 0 on one end representing "no pain" and 10 on the other representing the "worst pain". Pain scores on VAS were assessed at the delivery of anaesthesia, during the surgery, 2 hours and 24 hours after the surgery (Hjermstad et al, 2011).[5] Surgeon's satisfaction was also graded for any difficulties encountered during surgery, immediately after the operation, using a 4-point scale, where 1=no difficulty and 4=extremely difficult.

For qualitative data, statistical analysis was done using Chi-square test and Fisher Exact test was used when minimum expected value was less than 5. For pain score on VAS, Kruskal-Wallis test was used. Quantitative was assessed Independent Samples T-test and mean values, standard deviation. Mean difference, 95% confidence interval and P-values were derived. A 2-tailed p-value of less 0.05 was considered statistically significant.

3. Results

The two groups did not vary significantly ($p > 0.05$) in terms of patient age, gender, preoperative data of visual acuity, cataract grade, IOP, keratometric readings, axial length, and IOL power. The mean age was 58.69 ± 8.36 years in the topical anaesthesia group and 60.10 ± 10.03 years in the peribulbar group (p-value = 0.282) (Table 1). During anaesthesia, pain scores were significantly higher in peribulbar as compared to topical group ($p<0.01$), while significantly higher pain scores were seen in topical group during middle and late stages of surgery ($p<0.01$). In postoperative period, patients in peribulbar group perceived higher pain as compared to topical group ($p<0.01$) (Table 2). Shorter surgical durations were noted in topical group as compared to peribulbar ($p<0.01$). As far as anaesthesia related complications are concerned, a significant number of patients had chemosis following peribulbar injections ($p<0.01$) (Table 3). Both the groups were comparable in terms of intraoperative complications viz. corneal edema, posterior capsular rent, Descemet detachment, nucleus drop etc. There was a statistically significant difference in patient's satisfaction with their overall surgical experience, where more patients were reported to be very happy with their surgical experience when topical anaesthesia was used as compared to the Peribulbar Anaesthesia ($p<0.01$) (Table 4). The operating surgeon noted higher pain perception ($p=0.027$) and unwanted ocular mobility ($p<0.01$) in topical group, however poor chamber stability was encountered in peribulbar group ($p=0.038$) and there was no significant difference in ease of surgery between the two groups ($p=0.094$) (Table 5). The two groups

were comparable in their postoperative BCVA at Day 1 (p=0.59) and 4-week (p=0.37), no patient in the study had postoperative week four BCVA >1 Log MAR.

4. Discussion

Retrobulbar and peribulbar anaesthesia has been successfully used for decades in cataract surgery, despite the advantage of painless surgery throughout; it carries the risks of injury to the orbital structures. These complications necessitate looking for better alternatives, and topical anaesthesia is one such method. The advantages of topical anaesthesia include its ease of application, minimal to absent discomfort on administration, rapid onset of anaesthesia, rapid visual recovery and most important is the reduction of risks associated with retrobulbar or peribulbar injections.

In our study, pain during application of the peribulbar anaesthesia has been perceived to be higher as compared to the topical anaesthesia and was the main reason for negative feedback from patients. Dole et al. 2014, Ahmad et al. 2012, and Pablo et al. 2009 also reported higher pain scores in topical group [p=0.003, (95% CI: 0.002–0.004)], (p=0.022), and (<0.001).[6–8] The pain scores reported by patients towards the end of surgery were higher in topical group, while pain perception at 2 hours and 24 hours postoperatively was significantly higher in peribulbar group. Despite higher pain perception during intraoperative course not even a single patient required supplemental anaesthesia for breakthrough pain in the form of intracameral anaesthesia or was converted from topical anaesthesia to regional anaesthesia. Similar to our study, Ahmad et al. 2012 observed that intraoperative pain score (p=0.022), discomfort (p<0.001), and pressure (p<0.001) were significantly higher in the topical anaesthesia group compared to the peribulbar anaesthesia group.[7] Contrary to our observations, Pablo et al. 2009 reported no significant difference in pain during the surgery (p=0.355) and postoperatively (p=0.07) between the two groups, similar observations were made by Sauder et al. 2003 (p=0.54).[8,9] Zhao et al. 2012 observed that the postoperative pain perception was significantly higher in the topical anaesthesia group (p<0.05).[10] The delayed pain perception seen with peribulbar block can be attributed to the rebound pain response often seen with regional blocks.[11]

We also evaluated the surgical duration in the two groups. The mean duration of surgery in the topical anaesthesia group was 18.53 (± 4.019) minutes (Range: 12 to 38 minutes) as compared to 26.97 (± 11.558) minutes (Range: 10 to 62 minutes) in the peribulbar anaesthesia group. A statistically significantly shorter surgical duration was reported in the topical anaesthesia group (p<0.01), this may be attributed to the fact that while operating under topical anaesthesia, surgeon is relatively more mindful of the time and consciously aims for a faster and precise surgery. Hence, skills and abilities of the surgeon to perform cataract surgery over a short period of time is one of the factors relevant for the feasibility and applicability of the topical anaesthetic procedures.[10] Shorter surgical duration is particularly advantageous in hospital settings conducting high volume surgeries.

Anaesthesia related complications like retrobulbar and subconjunctival haemorrhage, and chemosis were encountered only in peribulbar group; however, significant difference was noted only in chemosis (p<0.001). Similar to our study, Jacobi et al. 2000 in a randomised controlled trial reported higher incidence of anaesthesia related complications in retrobulbar group.[12]

In our study, patients were reportedly 'very happy' with their surgical experience when topical anaesthesia was used as compared to peribulbar anaesthesia. It is also imperative to note that significantly higher number of patients in the peribulbar anaesthesia group wanted to switch to topical anaesthesia (33%) as compared to topical anaesthesia group where only 3% prefers peribulbar anaesthesia. A significant number of patients who never had any surgical or anaesthetic experience were willing to have surgery done under topical anaesthesia in the future. There was no statistically significant difference noted between the groups in terms of difficulty felt by the patients in understanding surgeon's instructions. Said et al. 2002 reported that patient's satisfaction was 90% for topical anaesthesia and 72% for peribulbar anaesthesia.[13] However, Ahmad et al. 2012 reported that the patient's satisfaction measured with ISAS (Iowa satisfaction with anaesthesia scale) shows that the patients were highly and statistically more satisfied with the peribulbar anaesthesia (p=0.0001) as compared to the topical anaesthesia.[7]

Surgeons reported better intraoperative patient's co-operability (p=0.027), lesser unwanted ocular mobility and better analgesia (p<0.001) but higher grades of chemosis with the peribulbar anaesthesia as compared to the topical anaesthesia. Though poor chamber stability was noted in peribulbar group (p=0.038), there was no significant difference observed in terms of surgeon's overall ease of surgery (p=0.094). The possible explanation for this observation could be the use of large volume of anaesthetic in the peribulbar space which may leads to increase in intraorbital pressure and consequent anterior chamber instability. Similar to our observations, Zhao et al. 2012 and Johnston et al. 1998 reported that there was no statistically significant difference between the two groups in intraoperative difficulties, as assessed by the surgeons (p>0.05).[10,14] Jacobi et al. 2000 reported that in most of the patients in both groups, the surgeon reported no difficulty to slight difficulty.[12] However, Ahmad et al. 2012 reported that the surgery was statistically significantly less difficult in patients belonging to the peribulbar anaesthesia group (p=0.046).[7] Addition of intracameral lidocaine to the

Table 1: Pre-operative parameters and group demographics

		Topical Anaesthesia (n=100)	Peribulbar Anaesthesia (n=100)	Mean difference (95% CI)	P-value
Age (years)		58.69 ± 8.36	60.10 ± 10.03	-1.41 (-3.99 to 1.17)	0.282
Gender (M/F)		50/50 (50%)	50/50 (50%)	OR=1 (0.57 to 1.74)	0.571
BCVA: LogMAR	<0.3	17 (17%)	9 (9%)	χ2= 7.2 df= 3	0.065
	0.3 to 1	56 (56%)	58 (58%)		
	1 to 1.3	8 (8%)	3 (3%)		
	>1.3	19 (19%)	30 (30%)		
Cataract (all grades)	NS1+ Cortical	14	10	χ2= 2.726 df= 6	0.842
	NS1+PSC	9	6		
	NS2	14	17		
	NS2+ Cortical	25	29		
	NS2+PSC	8	7		
	NS3	15	19		
	NS3+ Cortical	15	12		
IOP (mmHg)		14.62 ± 2.76	15.15 ± 3.14	-0.530 (-1.353 to 0.293)	0.206
K1 (D)		43.02 ± 1.61	43.47 ± 1.94	-0.454 (-0.952 to 0.042)	0.073
K2 (D)		43.10 ± 1.62	43.55 ± 2.06	-0.454 (-0.972 to 0.063)	0.085
Axial length (mm)		23.08 ± 0.78	22.94 ± 0.89	-0.376 (-1.044 to 0.292)	0.268

Table 2: Pain scores during various stages of surgery and postoperative period

	Topical Anaesthesia		Peribulbar Anaesthesia		p -value
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)	
Pain at delivery of anaesthesia	0(0)	0(0)	5(0-10)	4.53(±2.746)	<0.01^k
Early Phase	0 (0 to 5)	0.49(±1.068)	0 (0 to 5)	0.48(±1.039)	0.825^k
Middle Phase	1 (0 to 10)	1.48(±1.951)	0 (0 to 6)	0.44(±1.122)	<0.01^k
Late Phase	0 (0 to 7)	0.75(±1.395)	0 (0 to 5)	0.24(±0.767)	<0.01^k
2 hours postoperatively	0 (0 to 2)	0.07(±0.326)	0 (0-6)	0.56(±1.225)	<0.01^k
24 hours postoperatively	0 (0)	0 (0)	0 (0 to 3)	0.15(± 0.50)	<0.01^k

Table 3: Comparison of anaesthesia related complications

		Topical Anaesthesia (n=100)	Peribulbar Anaesthesia (n=100)	p -value
Retrobulbar Haemmorhage	Yes (%)	0(0%)	1(1%)	1.000
	No (%)	100(100%)	99(99%)	
Subconjunctival Haemmorhage	Yes (%)	0(0%)	4(4%)	0.121
	No (%)	100(100%)	96(96%)	
Chemosis	Yes (%)	0(0%)	71(71%)	<0.01
	No (%)	100(100%)	29(29%)	

Table 4: Comparison of patient satisfaction

Satisfaction Grades		Topical Anaesthesia (%) (n=100)	Peribulbar Anaesthesia (%) (n=100)	p - value
Patient's satisfaction grade	- Very Happy	43(43%)	20(20%)	<0.01
	- Happy	54(54%)	77(77%)	
	- Dissatisfied	3(3%)	3(3%)	
Preferable anaesthesia in future	- Topical	97(97%)	33(33%)	<0.01
	- Peribulbar	3(3%)	67(67%)	

Table 5: Comparison of surgeon satisfaction

Satisfaction grades		Topical Anaesthesia (%) (n=100)	Peribulbar Anaesthesia (%) (n=100)	p -value
Patient's cooperation from surgeon's perspective	- No pain	89(89%)	97(97%)	0.027
	- Mild pain	11(11%)	3(3%)	
	- Moderate pain	0(0%)	0(0%)	
	- Severe pain	0(0%)	0(0%)	
Unwanted ocular mobility	- Nil	70(70%)	93(93%)	<0.01[f]
	- Some	24(24%)	7(7%)	
	- A lot	6(6%)	0(0%)	
Anterior chamber stability	- Excellent	68(68%)	71(71%)	0.038[f]
	- Good	30(30%)	20(20%)	
	- Poor	2(2%)	9(9%)	
Ease of surgery	- No difficulty	85(85%)	82(82%)	0.094[f]
	- Slight difficulty	14(14%)	10(10%)	
	- Some difficulty	1(1%)	5(5%)	
	- A lot of difficulty	0(0%)	3(3%)	

topical anaesthetic has been reported by Pablo et al. 2009 to improve patient's and surgeon's comfort.[8]

At the end of four weeks postoperatively, 193 out of 198 patients (97.5%) reported BCVA of <0.3 Log MAR group (Better than 6/12) with 96 patients in the topical anaesthesia group as compared to 97 patients in the peribulbar anaesthesia group. The two groups were comparable in their postoperative week four BCVA (P=0.37). No patient in the study had postoperative week four BCVA >1 Log MAR (worse than 6/60). Similarly, Dole et al. 2014 reported that four to six weeks' postoperative visual acuity between the topical anaesthesia and peribulbar anaesthesia groups had no statistically significant differences (χ2=2.13, df=4, p=0.14).[6]

5. Conclusion

We thus conclude that the topical anaesthesia is equally efficacious, if not better, than the peribulbar anaesthesia both in terms of patient pain score and cooperation, and surgeon satisfaction. This study reflects that in the hands of an experienced cataract surgeon, topical anaesthesia is a relatively safer tool as far as block related complications are concerned. Moreover, in patients with staphylomatous globes, in high myopia, scleritis and systemic or drug-associated bleeding tendencies there is absolutely no risk of damage to the globe or orbital contents with topical anaesthesia.

6. Source of Funding

None.

7. Conflicts of Interest

None.

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Author biography

Ziya Siddiqui, Associate Professor

Sheerin Fatima, Resident

Adeeb Alam Khan, Professor

Humayoun Ashraf, Professor

Syed Wajahat Ali Rizvi, Assistant Professor https://orcid.org/0000-0001-9265-4332

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