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COMPARISON OF TOPICAL ANESTHESIA WITH PERIBULBAR ANESTHESIA SMALL INCISION CATARACT SURGERY

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ABSTRACT: AIM: To compare efficacy and safety in terms of pain, surgical complications and visual outcome of topical anesthesia with peribulbar anesthesia in manual small incision cataract surgery (MSICS) with posterior chamber intraocular lens (PCIOL) implantation. **DESIGN:** Prospective Clinical Study. **MATERIALS AND METHODS:** A total of 280 cataract patients underwent MSICS with PCIOL. 140 patients received peribulbar anesthesia and 140 patients received topical anesthesia. The two groups were compared regarding efficacy and safety in terms of pain, surgical complications and visual outcome. **RESULTS:** We observed that mean pain during administration of peribulbar anesthesia was 3.57 (SD $\pm$ 1.49) and with topical anesthesia was 2.32 (SD $\pm$ 1.19). The mean pain during surgery with peribulbar anesthesia was 1.87 (SD $\pm$ 1.40) and with topical anesthesia was 2.24 (SD $\pm$ 1.13). Chemosis and subconjunctival hemorrhage were not seen with topical anesthesia whereas akinesia is mainly a problem with topical anesthesia. **CONCLUSION:** The results of the present study showed that topical anesthesia is comparable to peribulbar anesthesia and is recommended as a safe and effective alternative to peribulbar anesthesia for manual small incision cataract surgery with posterior chamber intraocular lens implantation.

KEYWORDS: anesthesia, akinesia, visual activity, small incision, Cataract surgery.

INTRODUCTION: Cataract is a condition which is recognized by the opacification of the natural lens and is usually an age related phenomenon. Senile cataract is the most common type and causes gradual and progressive painless loss of vision and if untreated, can lead to many complications. No pharmacological preventive or therapeutic treatment for this disease is available. Therefore, surgical treatment for cataract remains the only recognized alternative.

An uneventful cataract surgery is the aim of every eye surgeon. A perfectly done surgery may bless a person with good sight and a complicated one may render him visually handicapped. So as to accomplish this successfully, in addition to other conditions being ideal for cataract surgery, a good anesthesia is must for such an event.^{1,2}

In an economically weaker nation like India, the method of choice needs to be cheap, effective and easy to perform at community level. In order to obtain the advantages of a self-healing suture less incision at a low cost, ophthalmologists in the developing world are performing manual small incision cataract surgery (MSICS) at a large scale.^{3,4,5}

Advances and sophistication in surgical techniques have been possible only because of advances in anesthesia. Modern anesthesia has made surgery painless.

The options for anesthesia for cataract surgery are:

1. General anesthesia.
2. Local anesthesia.

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Local anesthesia consists of topical anesthesia and infiltration anesthesia.

The risks associated with infiltration anesthesia are periorbital ecchymosis, globe perforation, ptosis, optic nerve damage, retinal vein occlusion, respiratory arrest and even brainstem anesthesia^{2,6,7,8}

Topical anesthesia is given in the form of drops or gel. The advantages of topical anesthesia are shorter duration of action, allowing the patient to rapidly regain sight after surgery and less pain during the administration of anesthesia. Topical anesthesia reduces surgical cost and increases patient satisfaction. Its major requirement is the need for good patient cooperation^{9,10,11}

The principle of peribulbar block is to inject the local anesthetic outside the muscle cone and avoid the proximity to the optic nerve. The most common mixture used is bupivacaine 0.5%, lignocaine 2% plus hyaluronidase 150 IU/ml. The lignocaine provides an early onset of action, bupivacaine prolonged efficacy and hyaluronidase permits diffusion of anesthetic mixture into the orbit more effectively.

The anesthetic agent is injected at the junction of middle & outer third of lower orbital margin with needle directed towards floor of orbit. A supplementary injection can be given at the supra orbital notch with needle directed towards orbital roof. The eye is closed and pressure is applied for a couple of minutes^{12,13,14,15}

Local anesthetic (lignocaine 2% gel) is placed in the superior and inferior fornices and on the corneal surface twice at 5 minutes interval. This may be supplemented intra operatively by the injection of local anesthetic (lignocaine 2% preservative free) in the anterior chamber of the eye with a cannula through the side port (Intracameral) if required^{9,16,17,18,19}

AIMS AND OBJECTIVES: To compare efficacy and safety in terms of pain, surgical complications and visual outcome of topical anesthesia with peribulbar anesthesia in manual small incision cataract surgery with posterior chamber intraocular lens implantation.

MATERIALS AND METHODS: The proposed study was conducted on patients undergoing cataract surgery in the upgraded Department of Ophthalmology Govt. Medical College, Jammu.

Total 280 cases were studied over a period of one year. Patients were divided into two groups of 140 each. 140 cases underwent MSICS with PCIO under peribulbar anesthesia while 140 cases underwent MSICS with PCIO under topical anesthesia.

Inclusion criteria were patients aged 31 yrs & above with uncomplicated unilateral or bilateral cataract, patients of either sex and those available for follow up.

Exclusion Criteria were deafness, language barrier, anxiety, uncooperative patients, inability to understand the visual analogue pain scale, reported allergy to topical anesthetic agent and nystagmus.

All patients underwent a comprehensive ophthalmic examination including review of medical history, visual acuity testing, slit lamp biomicroscopy, intraocular pressure (IOP) measurement and dilated fundus examination.

Pre-operative protocols were same for both groups. Preoperative antibiotic drops and oral antibiotics were given a day before surgery. Antibiotic drops were instilled two hourly a day before surgery. Mydriasis was achieved by using 1% tropicamide and phenylephrine 5%. Flurbiprofen 0.3% eye drops was instilled half hourly for two hours before surgery to maintain intraoperative mydriasis.

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The patients were given the respective anesthesia, the parameters were noted and the patients underwent manual small incision cataract surgery with posterior chamber intraocular lens implantation.

PERIBULBAR ANESTHESIA: Three ml of 2% lignocaine and 3 ml of 0.5% bupivacaine plus hyaluronidase 150 IU/ml was the most commonly used anesthetic mixture. A 24 gauge 2.5cm disposable needle was attached to the syringe. The needle was inserted transcutaneously at the junction of the middle two-thirds and lateral one-third of the lower orbital margin with needle directed towards the floor of the orbit for about 2.5cm. Gentle aspiration of the syringe was performed to alleviate possible entry of the needle into a blood vessel and then 4-5 ml of the anesthetic mixture was injected into the lateral adipose tissue of the orbit.

A supplementary injection of 3-4 ml was given at the supra-orbital notch with needle directed towards the roof of the orbit.

TOPICAL ANESTHESIA: The aim of topical anesthesia is to block the nerves that supply the superficial cornea and conjunctiva. Lignocaine 2% gel was instilled in the superior & inferior fornices and on the corneal surface twice at 5 minutes interval allowing the anesthetic to bathe the cornea. The eye was washed thoroughly by ringer lactate on the operating table before starting the surgery.

Manual small incision cataract surgery with posterior chamber intraocular lens implantation was performed in both the groups.

On completion of the operation, each patient was shown a visual analogue pain scale with numeric and descriptive ratings from 0 (no pain) to 10 (severe pain), as described by Steven. Patients were asked to use this 10-point scale to rate the level of pain felt during the operation, including the pain felt after delivery of topical or peribulbar anesthesia.

Outcome measures were compared using student t test. Bivariate analysis was performed using the χ^2 test. A p value of < 0.05 was considered as statistically significant. All p values reported were two tailed.

VISUAL ANALOGUE PAIN SCALE: The patient was asked to grade the pain felt at the time of application of the anesthesia and intraoperatively on a linear scale from 0 (no pain) to 10 (severe pain) in the recovery room after the completion of the surgery²⁰

Table I

Pain Level	Description
0	No pain
2	Mild discomfort
4	Moderate discomfort /mild pain
6	Moderate pain
8	Severe pain
10	Unbearable pain

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Table II

Grade	Pain Level
Grade 0	0-2
Grade 1	3-4
Grade 2	5-6
Grade 3	7-8
Grade 4	9-10

Table III**Chemosis was graded as:**

Grade 0	=	No chemosis.
Grade 1	=	Chemosis involving one quadrant.
Grade 2	=	Chemosis involving two quadrants.
Grade 3	=	Chemosis involving three quadrants.
Grade 4	=	Chemosis involving all four quadrant.

Table IV**Sub conjunctival haemorrhage was graded as:(19)**

Grade 0	=	No haemorrhage.
Grade 1	=	Haemorrhage involving one quadrant.
Grade 2	=	Haemorrhage involving two quadrants.
Grade 3	=	Haemorrhage involving three quadrants.
Grade 4	=	Haemorrhage involving all four quadrants.

Table V**Akinesia was graded on a scale designed to measure ocular movement in each quadrant.**

Grade 0	=	No movement
Grade 1	=	Mild movement
Grade 2	=	Moderate movement
Grade 3	=	Severe movement

This was multiplied by the number of quadrants in which movements were persisting. So minimum possible score was zero & maximum possible score was 12(4x3).

OBSERVATIONS:

Age (in years)	Males		Females		Total no. of cases	
	No. of cases	%age	No. of cases	%age	No. of cases	%age
31-40	10	3.57	4	1.43	14	5.00
41-50	17	6.07	9	3.21	26	9.28
51-60	42	15.00	50	17.86	92	32.86
61-70	46	16.44	36	12.85	82	29.29

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71-80	30	10.71	25	8.93	55	19.64
81 & above	6	2.14	5	1.79	11	3.93
Total	151	53.93	129	46.07	280	100

Table 1: Age and Sex Distribution of the Cases

The mean age of the patients in Group I was 62.12 ± 6.4 years and 61.82 ± 6.2 years in Group II patients.

P value = 0.72 (Not significant).

SEX	GROUP I	GROUP II	TOTAL
MALES	71	80	151
FEMALES	69	60	129
Total	140	140	280

TABLE 2: Sex-wise Distribution of the Cases

In Group I, 71 (51%) patients were males and 69 (49%) patients were females. In Group II, 80 (57%) patients were males and 60 (43%) patients were females.

P value = 0.28 (Not significant).

Grade of Pain	Group I		Group II		Total	
	No. of Cases	% age	No. of Cases	% age	No. of Cases	% age
Grade-0 (0-2) (no pain)	50	35.72	110	78.57	160	57.14
Grade-1 (3-4) (Mild pain)	76	54.28	26	18.58	102	36.43
Grade-2 (5-6) (Moderate Pain)	9	6.44	4	2.85	13	4.64
Grade-3 (7-8) (Severe Pain)	4	2.85	0	0	4	1.44
Grade-4 (9-10) (Unbearable Pain)	1	0.71	0	0	1	0.35
Total	140	100	140	100	280	100

Table 3: Visual Analogue Pain Scale during Anesthesia

The mean pain during anesthesia in Group I was 3.57 (SD ± 1.49) and in Group II was 2.32 (SD ± 1.19).

Applying χ^2 test there is statistically significant difference between the two groups regarding pain during anesthesia (P < 0.005).

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Grade of Pain	Group I		Group II		Total	
	No. of Cases	% age	No. of Cases	% age	No. of Cases	% age
Grade-0 (0-2)	118	84.28	120	85.72	238	85.00
Grade-1 (3-4)	18	12.85	14	10.00	32	11.43
Grade-2 (5-6)	4	2.87	6	4.28	10	3.57
Grade-3 (7-8)	0	0	0	0	0	0
Grade-4 (9-10)	0	0	0	0	0	0
Total	140	100	140	100	280	100

Table 4: Visual Analogue Pain Scale during Surgery

The mean pain during surgery in Group I is 1.87 (SD $\pm$ 1.40) and in Group II is 2.24 (SD $\pm$ 1.13). P = 0.026 (Not significant)

Grade	Group I	
	No. of Cases	% age
Grade-0	32	22.85
Grade-1	28	20.00
Grade-2	31	22.15
Grade-3	34	24.28
Grade-4	15	10.72
Total	140	100

Table 5: Chemosis after Peribulbar Anesthesia

In Group II, chemosis was not seen in any patient.

Applying χ^2 test, $\chi^2 = 16.06$ P < 0.0001 which shows that difference in chemosis between the two groups is highly significant.

Subconjunctival Hemorrhage Grade	Group I	
	No. of Cases	% age
Grade-0	62	44.28
Grade-1	42	30.00
Grade-2	26	18.57
Grade-3	7	5.00
Grade-4	3	2.15
Total	140	100

Table 6: Subconjunctival Haemorrhage after Peribulbar Anesthesia

In Group II, subconjunctival haemorrhage was not seen in any patient after anesthesia.

Applying χ^2 test, $\chi^2 = 10.53$ P < 0.0001 which shows that difference in subconjunctival haemorrhage between the two groups is highly significant.

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Akinesia Grade	Group I		Group II		Total	
	No. of Cases	%age	No. of Cases	%age	No. of Cases	%age
Grade-0	124	88.57	0	0	124	44.28
Grade-1	10	7.14	15	10.71	25	8.93
Grade-2	6	4.29	65	46.43	71	25.36
Grade-3	0	0	60	42.86	60	21.43
Total	140	100	140	100	280	100

Table 7: Akinesia (Ocular Movements) during Surgery

Applying χ^2 test there is significant difference between the two groups regarding akinesia during surgery ($\chi^2 = 19.23$ P = 0.0004).

ANESTHETIC-RELATED DIFFICULTY	Group I		Group II	
	No. of Cases	% age	No. of Cases	% age
1. None to slightly difficult	129	92.14	120	85.71
2. Moderately difficult	7	5.00	12	8.57
3. Extremely difficult	4	2.86	8	5.72
Total	140	100	140	100

Table 8: Anesthetic-Related Intraoperative Difficulties as Judged by the Surgeon

P = 0.08 (Not significant)

VISUAL ACUITY	Group I		Group II	
	No. of Cases	%age	No. of Cases	%age
PL & PR +VE	44	31.43	48	34.29
CF Close to face – 5/60	70	50.00	76	54.29
6/60 – 6/36	26	18.57	16	11.42
Total	140	100	140	100

Table 9: Preoperative Visual Acuity

Applying χ^2 test there is no significant difference between the two groups in terms of preoperative visual acuity ($\chi^2 = 2.80$ P = 0.24).

UCVA	Group I		Group II	
	No. of Cases	% age	No. of Cases	% age
6/60 or <	31	22.44	22	15.71
6/36 – 6/18	64	45.72	41	29.29
6/12 – 6/6	45	32.14	77	55.00
Total	140	100	140	100

Table 10: Postoperative Uncorrected Visual Acuity (UCVA) On Day 1

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Applying χ^2 test, $\chi^2 = 14.96$ $P = 0.0005$) which shows that difference in UCVA on postoperative day 1 between the two groups is significant.

UCVA	Group I		Group II	
	No. of Cases	%age	No. of Cases	%age
6/60 or <	17	12.15	10	7.14
6/36 – 6/18	31	22.14	27	19.29
6/12 – 6/6	92	65.71	103	73.57
Total	140	100	140	100

Table 11: Postoperative Uncorrected Visual Acuity (UCVA) At 1st Week

Applying χ^2 test there is no significant difference between the two groups in terms of UCVA at 1st week ($\chi^2 = 1.45$ $P = 0.68$).

UCVA	Group I		Group II	
	No. of Cases	% age	No. of Cases	% age
6/60 or <	8	5.71	6	4.29
6/36 – 6/18	14	10.00	14	10.00
6/12 – 6/6	118	84.29	120	85.71
Total	140	100	140	100

Table 12: Postoperative Uncorrected Visual Acuity (UCVA) At 6th Week

Applying χ^2 test there is no significant difference between the two groups in terms of UCVA at 6th week ($\chi^2 = 0.30$ $P = 0.85$).

DISCUSSION: In the present study, the two groups were compared regarding efficacy and safety in terms of pain, surgical complications and visual outcome in MSICS with PCIOL implantation.

The results obtained were observed and analysed.

In our study pain during administration of anesthesia in Group I patients was Grade- 0 in 50(35.72%) patients and Grade- 1 in 76(54.28%) patients. In Group II 110(78.57%) patients had Grade-0 pain and 26(18.58%) patients had Grade-1 pain (Table 3) ($P < 0.005$).

In Group I pain during surgery was Grade-0 in 118(84.28%) patients and Grade-1 in 18 (12.85%) patients. In Group II pain during surgery was Grade-0 in 120 (85.72%) patients and Grade-1 in 14(10%) patients (Table 4) ($P = 0.026$).

There was statistical significance between chemosis and subconjunctival haemorrhage in the two groups ($P < 0.0001$).

There was significant difference between the two groups regarding akinesia during surgery ($P = 0.0004$).

Postoperatively on Day 1, about 32% patients had uncorrected visual acuity (UCVA) $> 6/18$ in Group I as compared to 55% patients in Group II. About 46% patients in Group I had visual acuity between 6/36-6/18 as compared to about 29 % patients in Group II. About 22% patients had UCVA of 6/60 or $<$ in Group I while about 16% patients had UCVA of 6/60 or $<$ in Group II (Table 10). (Statistically significant $P = 0.0005$).

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At 6th postoperative week, about 84% of the patients had UCVA > 6/18 in Group I as compared to about 86% in Group II. 10% of the patients had UCVA between 6/36-6/18 in both Group I & Group II. About 6% of the patients in Group I had UCVA of 6/60 or < as compared to about 4% in Group II (Table 12). (P = 0.85).

Jacobi PC et al (2000) in their study of 476 patients found approximately 17% in the infiltration group expressed pain score ≥ 4 while only 2% in the topical group reported pain score ≥ 2 during the administration of anesthesia (statistically significant). They also found that 85% patients had minimal discomfort (pain score ≤ 2) or no pain at all (Pain score 0) and 92% patients under peribulbar anesthesia had minimal discomfort (pain score ≤ 2) or no pain at all (pain score 0) during surgery (Statistically insignificant). The mean $\pm$ SD pain score in the topical anesthesia group was 0.84 ± 1.30 , while in the peribulbar group it was 0.73 ± 1.50 . Anesthesia-related chemosis, periorbital hematoma and subconjunctival haemorrhage occurred only in the infiltration anesthesia group and none of the cases were reported in the topical anesthesia group which was statistically significant (P=0.003). The lack of akinesia was not clinically significant since supplemental anesthesia was not required in any patient to continue surgery.⁸

Sauder G et al (2003) in their study of 140 patients reported that about 10% of patients in the peribulbar anesthesia group had mean pain score ≥ 4 while 3% of patients in the topical anesthesia group had mean pain score ≥ 4 during administration of anesthesia (P = 0.03). The mean pain score during surgery was 1.40 ± 1.17 in the topical anesthesia group and 1.36 ± 1.26 in the peribulbar anesthesia group (P = 0.54). They also concluded that as topical anesthesia is less invasive than peribulbar anesthesia, patients may require less intraoperative and postoperative monitoring with topical anesthesia than with peribulbar anesthesia.²¹

There was no difference in visual acuity in the two groups after six weeks. They reported that visual rehabilitation in the postoperative period is faster with topical anesthesia, as it allows patients to see just after surgery, whereas the optic nerve and extraocular muscles may still be partially blocked by local anesthetics in patients who have undergone cataract surgery with peribulbar anesthesia.

Coelho RP et al (2005) in their study of 41 patients reported that during the application of peribulbar anesthesia, patients described the discomfort caused by infiltration of the anesthetic agent as 'intense heat' or 'burning'. Approximately 25% of patients had pain score ≥ 2 in the peribulbar anesthesia group and 3% of patients in the topical group had pain score ≥ 2 which statistically significant (P < 0.005). The median pain score in the topical anesthesia group was 2 (Grade-0) and the median pain score was 3 (Grade-1) in the peribulbar group (P=0.0057).

They reported that significant number of patients in the peribulbar anesthesia group had anesthesia-related complications like chemosis and subconjunctival haemorrhage. The difference in attaining the akinesia in the two groups was statistically significant. They reported that visual recovery is faster in the topical anesthesia group ($90\% \geq 6/36$) than in the peribulbar anesthesia group ($62\% \geq 6/36$) on postoperative day 1 which is statistically significant (P = 0.004).²²

Shammas HJ et al (1997) in their study found statistically significant complications like chemosis & lid bruising in infiltration anesthesia group while no such complication was seen in the topical anesthesia group. They found that the lack of akinesia in the topical anesthesia group is statistically significant as compared to the akinesia attained by the infiltration anesthesia. They recommended that topical anesthesia should not be used in young and anxious patients who might

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move during surgery. They reported that there was no statistical significance of the preoperative vision of the patients between the two groups. The difference between the two groups was statistically significant ($P < 0.01$) on the first postoperative day only.²³

Gupta SK et al (2009) conducted a study on pain evaluation in manual small incision cataract surgery under topical anesthesia in 96 patients and reported that patient cooperation as evaluated by the surgeon was good in majority of the cases (87.5%). The surgeon's evaluation of the technique in terms of surgical ease and complications were favourable. On a cumulative scale ranging from 3 to 9 (lower value indicating favourable result), the average score was 3.4 ($SD \pm 0.85$).⁴

Above discussion shows that topical anesthesia is as safe and effective as peribulbar anesthesia for routine cataract surgery. Topical anesthesia was more comfortable to the patient at the time of administration. But there was no statistically significant difference in the pain scores between the topical anesthesia group and the peribulbar group during the surgery. Patients may require less intraoperative and postoperative monitoring with topical anesthesia. However, topical anesthesia has the disadvantage of the need for greater patient cooperation and limitation of ocular and palpebral mobility during surgery as akinesia is not achieved by topical anesthesia.

Visual rehabilitation was faster in the postoperative period with topical anesthesia, as it allows patients to see just after surgery.

CONCLUSION: In our present study we conclude that topical anesthesia was more comfortable to the patient at the time of administration. Anesthesia-related complications were seen exclusively in the peribulbar-injected group. Although the results of pain assessment during anesthesia delivery favoured the topical anesthesia group, patient assessments of pain during surgery were not statistically significant in the topical and peribulbar groups. The surgeon had to operate with incomplete akinesia in the topical group which was statistically significant but the lack of akinesia was not clinically significant since supplemental anesthesia was not required in any patient to continue surgery. Photophobia, the cause of eye movement in some patients, could be overcome by simply reducing the brightness of the operating microscope.

In conclusion, patients undergoing manual small incision cataract surgery with posterior chamber intraocular lens implantation with topical anesthesia and with peribulbar anesthesia did not vary in terms of subjective pain score and other parameters measuring intraoperative pain, efficacy of anesthesia and feasibility of surgery. Thus topical anesthesia is comparable to peribulbar anesthesia and is recommended as a safe and effective alternative to peribulbar anesthesia for manual small incision cataract surgery with posterior chamber intraocular lens implantation.

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