

Original Article

Pain perception in cataract surgery: topical versus peribulbar anaesthesia

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Abstract

Introduction: The requirement for very deep akinesia has decreased with the use of modern phacoemulsification technique for cataract surgery. The use of topical anaesthesia has increased as a way to reduce complications associated with anaesthesia with injection and to allow the most rapid visual recovery. The objective of this study was to assess the patient reported pain in phacoemulsification cataract surgery under topical anaesthesia versus peribulbar anaesthesia administered using an injection.

Materials and methods: The subjects for this study were the patients undergoing phacoemulsification cataract surgery at HEH. Subjects were divided into two groups, one having topical anaesthesia for phacoemulsification and the other having peribulbar anaesthesia with injection. The data for the study was collected in a ten point visual analogue graphic pain scale. After the surgery was over the patients reported on the felt pain wherein the scale zero was assigned for no pain at all, 1 to 3 for mild pain, 4-6 for moderate pain and 7-10 for severe pain.

Results: In total, 366 subjects received peribulbar anaesthesia and 336 subjects received topical anaesthetic drops. The mean pain score between the two groups was found to be higher in the peribulbar injection group ($p < 0.001$). The mean pain score for both males and females was found to be higher in the peribulbar injection group ($p < 0.001$ for both genders).

Conclusion: Topical anaesthesia for phacoemulsification cataract surgery tends to cause less pain and discomfort for patients.

Key words: Anaesthesia, Phacoemulsification, Peribulbar, Topical.

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Introduction

The leading cause of blindness globally in people aged 50 years and older is cataract (Flaxman et.al. 2017). Cataract is the major cause of avoidable blindness in Nepal (62.2%) (Sangh, N. N. J, 2012). Cataract is also the main cause of blindness in the Gandaki zone of Nepal (Sapkota et al, 2006). Cataract surgery is the most common surgical procedure worldwide with nearly 350,000 cataract surgeries performed every year in Nepal (Nepal Ophthalmic Society, 2015).

Cataract surgery is performed following various techniques of regional anaesthesia. The anaesthesia technique for routine cataract surgery varies significantly around the world (Eichel and Goldberg, 2002). From the early nineties variations of facial nerve, retrobulbar, peribulbar and sub-tenon's anaesthesia have been popular. Since the 1990s topical anaesthesia has been revived, especially for phacoemulsification surgery (Athanasiov and Henderson, 2010). The introduction of small incision phacoemulsification surgery has revolutionised how cataract surgery is performed. The small self-sealing incision made for modern phacoemulsification surgery has greatly improved the control of the wound and anterior chamber during cataract surgery. The requirement for very deep akinesia has decreased with the use of modern phacoemulsification technique for cataract surgery. So, the use of topical anaesthesia has been increasing. The use of topical anesthesia has also increased as a way to reduce complications associated with anaesthesia with injection and to allow the most rapid visual recovery (Novak and Koch, 1995, Kreshner, 1993).

Although the use of topical anesthesia during phacoemulsification surgery eliminates the risk of complications associated with other forms of local anesthesia, it has been reported that patients experience intraoperative and/or postoperative pain at a rate of 34 to 90%

(Bethke, 1996, Kollartis et al, 1998, Novak and Koch, 1995) In most studies the intraoperative and/or postoperative pain is reported as mild, but in some patients the pain is severe enough to require intervention and lasts for days (Novak and Koch, 1995, Bethke, 1996).

Phacoemulsification cataract surgeries have been performed at Himalaya Eye Hospital (HEH) for over a decade. Recently there has been an increase in the number of phacoemulsification surgeries performed under topical anaesthesia.

In this study we aim to compare the patients reported pain sensitivity between peribulbar and topical anaesthesia techniques for phacoemulsification surgeries.

Materials and methods

This was a prospective qualitative study in the HEH, Nepal. The aim was to study the patient reported pain sensitivity in phacoemulsification cataract surgery under two different types of anaesthesia techniques: peribulbar and topical.

Ethical considerations

Approval for the study was obtained from the Institutional Review Committee of Nepal Netra Jyoti Sangh (Ref no. 371/075/076). Informed written consent was obtained from all subjects. For subjects with communication difficulties and minors consent was obtained from the guardians.

Subjects

The subjects for the study were the patients who underwent routine phacoemulsification cataract surgery at HEH. The patients undergoing phacoemulsification cataract surgery from May 2019 to October 2019 were taken for the study. A consecutive sampling technique was used to select the participants for both anaesthesia types. In order to confirm the participants and the anaesthesia types, the examining ophthalmologist discussed the

possible benefits and risks of both topical and peribulbar anaesthesia types with the patients. As per the norm of the hospital, every patient undergoing cataract surgery is counselled on the types of cataract surgery, their benefits and risks through a counsellor. The participants for this study were provided more information on the anaesthesia types and their preference of anaesthesia were discussed with the counsellor. This meant the selection of anaesthesia was according to the surgeon's and patient's preference.

Based on the comparison of means between two groups we calculated the sample size needed for each group. From the known standard deviation of pain scale from studies in the past (Boezaart et al, 2000), the type 1 error of 5%, power of 80% and the difference of 1 between the mean values the sample size needed for each group was 99. Based on the number of phacoemulsification surgeries performed at HEH in the past and the likelihood of patients consenting for the study we aimed to collect the required number of sample sizes within 6 months.

Considering the likelihood of some common similarities between the consecutive samples and the likely temporal trend of patients presenting at the hospital we decided to collect data over a period of 6 months. This provided us with the sufficient number of samples with good age and gender distribution for comparison. These aspects together with the prescribed inclusion and exclusion criteria for the selection of subjects helped in minimizing the possibility of selection bias.

Inclusion and exclusion criteria

The study included all patients who were 18 years and older and had non-complicated cataract selected for phacoemulsification cataract surgery from May to October 2019. The study excluded monocular patients, patients less than 18 years of age, patients

with complicated cataract and patients with communication difficulties.

Anaesthesia administration

Three milliliters of a mixture of 2% Lignocaine in a 30ml bottle and one ampoule of 1500 IU hyaluronidase was combined with 1ml 0.5% bupivacaine as the drug for peribulbar injection. The peribulbar anaesthesia with the combination of these drugs was administered by the ophthalmic assistant in the operating theatre.

The drug used for topical anaesthesia was Lignocaine 4% instilled one drop at a time in the interval of 1 minute, 2 minutes, 3 minutes, 5 minutes and 10 minutes. In cases where the topical anaesthesia seemed to have low effect, additional drops of Lignocaine 2% were instilled intraoperatively as needed.

Surgical technique

The surgical technique for all subjects in this study was the conventional Phacoemulsification technique and intraocular lens (IOL) implantation for cataract surgery. To perform the phacoemulsification surgery a clear corneal incision of size 2.8mm was performed with insertion of a foldable silicone IOL. In order to reduce the possible bias among patients operated by different surgeons we only took the patients operated by the same surgeon. The patients in the topical group were informed that they will be able to move their eyeballs and will also be aware of the sensation of touch.

Data collection

As the surgery was performed the patients were taken to the recovery room for usual evaluation. The ophthalmic assistant working in the recovery area collected the patients' responses for the pain sensitivity. The patients' responses were collected in a standardized form. The form had a ten point visual analogue graphic pain scale previously used by Patel et. al in 1996. In the scale zero was assigned

for no pain at all, 1 to 3 for mild pain, 4-6 for moderate pain and 7-10 for severe pain. The patients were asked to report the grade and the level of pain during the time of administration of anaesthesia and during the surgery. For the patients who were unable to see or read the pain scale, it was described by the ophthalmic assistant and a verbal response for score was obtained. Furthermore, each of the participating patients reported on the degree to which they were bothered by the ability to move their eyes, the sensation of touch, and the light from the operating microscope. The degree to which each of these bothered the patients were graded as none, a little or a lot. The patients were kept in the recovery room for 30 minutes, unless there were other signs to prolong the stay.

The surgeon also completed the form for the surgical notes, especially to record any surgical complications and need for supplemental anaesthesia. For the purpose of this study, only surgeries with no intraoperative complications for both types of anaesthesia techniques were taken. In addition, any verbal expression of the pain that the patients made during the surgery were also noted.

Outcome measures

The outcome measures for the study were obtained from the number and degree of complications and adverse effects arising during the surgery. This also included the patient reported pain score and intraoperative complications judged by the surgeon. While counselling and obtaining the consent for the study the patients, taken as subjects for this study were pre informed to gauge the pain and intraoperative discomfort. After the phacoemulsification surgery was completed and the patient was taken to the recovery area they were asked to report the pain sensitivity on the ten point visual analogue graphic pain scale. Besides these, after the completion of the surgery each patient was asked whether the anaesthesia technique used would be

their preferred choice of anaesthesia for phacoemulsification surgery they may require in the fellow eye in future.

Statistical Analysis

This was a descriptive study. The data collected from the subjects were first entered in the standard forms prepared for data collection. This data was entered in the Microsoft Excel version 2016 and analysed in Statistical Package for the Social Sciences (SPSS) version 22. The data are presented in tables and the quantitative data are reported as means and standard deviations. The p value was considered significant at level <0.05 .

Results

This prospective study was carried out over a six-month period. The surgeries performed by a single ophthalmologist were taken for the study. There were a total of seven hundred and two eyes of seven hundred and two patients included in the study. The subjects were divided into two groups, one who had the peribulbar injection for anaesthesia and the second who had the topical anaesthetic drop for the surgery. In total, 366 subjects received peribulbar anaesthesia through an injection and 336 subjects received topical anaesthetic drops. In the peribulbar injection group were 164 males and 202 females and in the topical anaesthesia group were 161 males and 175 females. The mean age of the participants was 66 ± 14.18 and 65 ± 13.13 years of age in the peribulbar and topical anaesthesia group respectively.

Table 1 shows the detailed characteristics of subjects according to the age, gender and pain score for the cataract surgeries performed. The mean pain score between the two groups was found to have a significant difference ($p < 0.001$) with higher pain score in the peribulbar injection group. The t-statistic for the mean pain score between males and females in the peribulbar injection group was calculated and p value enumerated. The mean pain score

between the genders for peribulbar injection group was significant at p value 0.005 with higher pain perception in the females. Likewise, the t-statistic for the mean pain score between males and females in the topical anaesthesia group was calculated and p value enumerated. There was no significant difference (p=0.067) in the mean pain score between the genders for the topical anaesthesia. The mean pain score for all participants between the peribulbar and topical anaesthesia groups was highly significant (p<0.001). For both the genders the mean pain score in peribulbar anaesthesia

was found on the higher scale. Figure 1 shows the comparison of grade of pain in all study participants between both groups.

The detailed comparison of the number of participants in different gender and age groups reporting different scores for pain in both anaesthesia groups are mentioned in the table 2 and 3. Table 2 shows the higher percentage of participants in the peribulbar injection anaesthesia group reported of moderate pain (68.58%). Table 3 shows the higher percentage of participants in the topical anaesthesia group reported mild pain (57.14%)

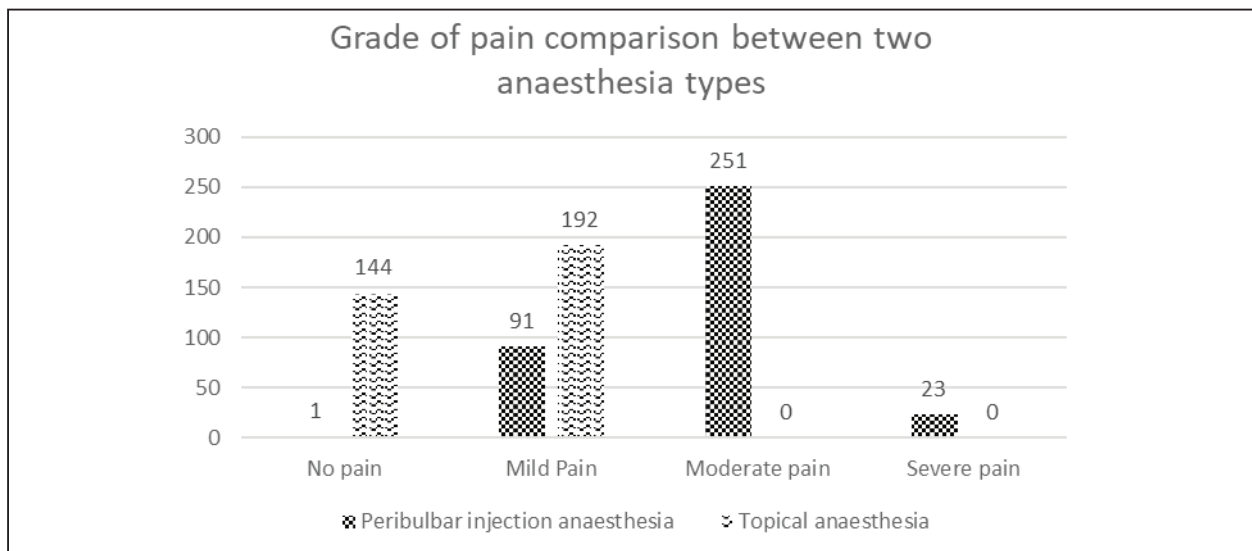


Figure 1: Grade of pain comparison between peribulbar injection and topical anaesthesia

Table 1: Detailed characteristics of subjects for both anaesthesia types

	Injection	Topical	p value
Eyes, n	366	336	
Age (years) Mean ± SD	66 ± 14.18	65 ± 13.13	0.33
Mean pain score ± SD	3.60 ± 1.73	0.57 ± 0.50	<0.001*
Median pain score	4	1	
Gender			
Male Mean pain score ± SD	3.32 ± 1.79	0.52 ± 0.51	<0.001*
Female Mean pain score ± SD	3.82 ± 1.64	0.62 ± 0.49	
Male, n (%)	164 (44.8)	161 (47.91)	0.005* (male vs female, injection)
Female, n (%)	202 (55.2)	175 (52.09)	0.067 (male vs female, topical)

Abbreviation: SD, Standard deviation, * p value significant at level <0.05

Table 2: Self-reported grading of pain among subjects with peribulbar anaesthesia injection

Category	No pain, n (%)	Mild Pain, n (%)	Moderate Pain, n (%)	Severe Pain, n (%)	Total, n
Gender					
Male	0 (0)	53 (32.32)	101 (61.59)	10 (6.09)	164
Female	1(0.5)	38 (18.81)	150 (74.26)	13 (6.43)	202
Total	1 (0.28)	91 (24.86)	251 (68.58)	23 (6.28)	366
Age groups					
<40	0 (0)	4 (18.18)	14 (63.64)	4 (18.18)	22
40-49	0 (0)	3 (23.08)	9 (69.23)	1 (7.69)	13
50-59	0 (0)	11 (22)	37 (74)	2 (4)	50
60-69	1 (0.91)	33 (30.28)	72 (66.06)	3 (2.75)	109
70 and above	0 (0)	40 (23.26)	119 (69.19)	13 (7.55)	172
Total	1 (0.27)	91 (24.86)	251 (68.58)	23 (6.28)	366

Table 3: Self-reported grading of pain among subjects with topical anaesthesia

Category	No pain, n (%)	Mild Pain, n (%)	Moderate Pain, n (%)	Severe Pain, n (%)	Total, n
Gender					
Male	78 (48.45)	83 (51.55)	0 (0)	0 (0)	161
Female	66 (37.71)	109 (62.29)	0 (0)	0 (0)	175
Total	144 (42.86)	192 (57.14)	0 (0)	0 (0)	336
Age groups					
<40	5 (35.71)	9 (64.29)	0 (0)	0 (0)	14
40-49	10 (41.66)	14 (58.34)	0 (0)	0 (0)	24
50-59	24 (43.64)	31 (56.36)	0 (0)	0 (0)	55
60-69	42 (39.62)	64 (60.38)	0 (0)	0 (0)	106
70 and above	63 (45.99)	74 (54.01)	0 (0)	0 (0)	137
Total	144 (42.86)	192 (57.14)	0 (0)	0 (0)	336

Discussion

This study provides the comparison of patient reported intraoperative pain in phacoemulsification cataract surgery with topical anaesthesia versus the anaesthesia given through peribulbar injection. This study is also one of the first of its kind done in Nepal. The respondents in our study were asked to provide the level of pain they had during the surgery on a scale of 0 to 10. The maximum level of pain patients had during the cataract surgery was 3 (mild pain) for topical anaesthesia while

there were a considerable number of patients reporting moderate or severe pain using the peribulbar injection for local anaesthesia.

Hennig in 2010 reported the evolution of cataract surgical technique in Nepal (Hennig, 2010). Until early 1980 Intracapsular Cataract Extraction (ICCE) with aphakic correction were performed. In 1989 ICCE and insertion of iris claw lenses were performed. In 1990, while ICCE and insertion of anterior chamber intraocular lens (ACIOL) were performed ophthalmologists also performed extracapsular



cataract extraction (ECCE) and insertion of posterior chamber intraocular lens (PCIOL). From late 1990 small incision cataract surgery (SICS) and modern-day phacoemulsification cataract surgery were performed (Hennig, 2010).

For many years the cataract surgery was performed under retrobulbar anaesthesia. For cataract surgeries in Nepal, the Nepal Ophthalmic Society (NOS) has recommended two different techniques of anaesthesia namely, topical anaesthesia alone or in conjunction with preservative free intracameral local anaesthetic or peribulbar anaesthesia (NOS, 2015). Following these guidelines many cataract surgeons in Nepal have recently opted to use topical anaesthesia for cataract surgery in select cases. These days, globally many surgeons perform cataract surgery under peribulbar and a significant number prefer topical anaesthesia for routine cataract surgery (Athanasiov et. al. 2010, Jiang et. al. 2015). Topical anaesthesia essentially eliminates the risk of globe perforation, retrobulbar hemorrhage, damage to the optic nerve and prolonged postoperative akinesia of the operated eye (Kreshner, 1993). Eke and Thompson in 2007 have reported potentially sight threatening and some potentially life-threatening complications associated with regional anaesthesia, including peribulbar anaesthesia techniques for cataract surgery.

In developed countries like Singapore the phacoemulsification surgery under topical anaesthesia with sedation and monitored anaesthesia care provided by anaesthetists is the technique of choice for regular cataract surgery. There are however equal preferences for peribulbar anaesthesia for phacoemulsification or extracapsular cataract excision in mature cataracts (Tam et. al, 2018). Topical anaesthesia is easy to administer and the rapid visual recovery of patients makes it a suitable choice for routine cataract surgery (Maclean et. al.

1997, Tam et. al. 2018). In Nepal, with the rise in the number of phacoemulsification cataract surgery there has also been an increase in the number of ophthalmologists preferring to operate on topical anaesthesia.

Several studies have discussed the patients' satisfaction level with topical and peribulbar anaesthesia. Both the administration of anaesthesia and intraoperative score, especially for pain, discomfort and pressure have been discussed. Ahmad et al in 2012 have reported that the pain, pressure and discomfort were all lower during administration while during intraoperative procedures the scores for these aspects were higher for the same patient experiencing both topical and peribulbar anaesthesia techniques for cataract surgery. Topical anaesthesia with sedatives and opioids compared with topical anaesthesia alone showed reduced reporting of pain and compared favourably over anaesthesia with injection in terms of pain and side effects. (Katz et al. 2000). Roman and coworkers have reported of no difference in subjective pain sensitivity between patients who had cataract surgery under topical and peribulbar anaesthesia and concluded that the cataract surgery under topical anaesthesia as safe and effective alternative to peribulbar anaesthesia and the majority of the patients' preference to topical anaesthesia for the lack of periocular injection (Roman et al 1996).

For the success of surgery under topical anaesthesia patients' counselling before surgery and communication with the patients during the surgery are vital (Patel et al, 1996). In our study too, the surgeon frequently communicated with the patients informing they were able to move their eyes during surgery and would also have some sensation in the eye during surgery. This would not be the case in surgeries performed under peribulbar anaesthesia as akinesia would be present.

One of the main limitations of this study is that the patients' responses collected regarding pain during surgery did not specify the specific time during the surgery. Thus, we cannot tell whether certain aspects of surgery produce more pain than others. We also did not specifically note the patients' response for pain in the postoperative period. It is very likely that the patients interpreted "during surgery" differently. Some may have considered surgery alone while others may have considered anaesthesia administration, immediate postoperative pain or both.

Conclusion

From our study topical anaesthesia for phacoemulsification surgery for cataract tends to cause less pain and discomfort for patients. This finding, together with the inherent problems of quantifying surgical difficulty; patients' perspectives on post-operative pain; and performing phacoemulsification cataract surgery under topical anaesthesia in patients who had undergone phacoemulsification surgery in the fellow eye under peribulbar anaesthesia and vice versa must be considered before concluding to use topical anaesthesia for routine phacoemulsification cataract surgery in Nepalese population.

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