



# Pain Perception in Phacoemulsification with Topical Anesthesia and Evaluation of Factors Related with Pain

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## Summary

**Objectives:** Evaluation of pain during and after phacoemulsification with topical anesthesia in patients with senile cataract and investigation of factors related with pain.

**Materials and Methods:** Ninety-two adult patients scheduled for routine clear corneal phacoemulsification with topical anesthesia who had no previous cataract surgery in their fellow eyes were included in the study. Verbal pain scale and visual analog scale were used to measure pain intensity. Demographic characteristics, concomitant systemic diseases, drug consumption, need of additional anesthesia during surgery, surgical complications, duration of surgery and surgeon comfort were also evaluated for each patient.

**Results:** Seventy-two patients (78.3%) reported pain during surgery and 68 patients (73.9%) reported pain in the period after the surgery. When the intensity of pain during the surgery was evaluated, the percentage of patients reporting mild, moderate and intense pain was 35.9%, 25.0% and 17.4%, respectively. The average verbal pain score during the surgery was  $1.4 \pm 1.0$  (0-3). Reported pain level was not associated with age or gender ( $p > 0.05$ ). Diabetic patients and patients who consumed nonsteroidal anti-inflammatory drugs in the morning before operation reported less pain during and after the surgery ( $p < 0.05$ ). There were no complications except posterior capsule rupture in one patient. Duration of surgery was longer in patients who reported pain during surgery ( $p < 0.05$ ). There was no significant difference between pain reported during surgery and surgeon comfort ( $p > 0.05$ ).

**Conclusion:** Patients frequently experience pain during phacoemulsification with topical anesthesia. Although pain perception does not affect surgical success, preoperative administration of analgesics in suitable patients or giving additional anesthesia to patients reporting severe pain during surgery may increase patient comfort.

**Keywords:** Pain, phacoemulsification, topical anesthesia, verbal pain scale, visual analog scale

## Introduction

Phacoemulsification under local anesthesia is the surgical method currently used to treat most cases of senile cataract.<sup>1</sup> Retrobulbar or peribulbar anesthesia plus topical anesthesia (alone or with intracameral anesthesia) are commonly used for local anesthesia. Various potentially sight-threatening complications have been reported related to agents used in retrobulbar or peribulbar anesthesia or arising from the technique itself.<sup>2</sup> Among these complications are chemosis, ecchymosis, retrobulbar hemorrhage, globe penetration or perforation, extraocular muscle damage, ptosis, amaurosis, penetration of the optic nerve sheath and optic atrophy.<sup>3</sup> The use of topical anesthesia may help avoid possible complications of retrobulbar or peribulbar anesthesia, but the possibility of eye closing and movement due to pain sensation may present a significant handicap.

Topical anesthesia is growing in popularity with the clear corneal incision phacoemulsification procedure.<sup>4</sup> Although the use of topical anesthesia during phacoemulsification surgery is a faster method and eliminates the risk of complications associated with local anesthesia, it has been reported that patients experience intraoperative and/or postoperative pain at a rate of 34 to 90%.<sup>5,6,7</sup> 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.<sup>5,6</sup>

There are many reports in the literature about the effect of different anesthetic agents,<sup>8</sup> additional sedation<sup>9</sup> and preoperative analgesic medication<sup>10</sup> on intraoperative and postoperative pain during cataract surgery under topical anesthesia. However, there are very few studies evaluating pain levels and the factors generally associated with pain. Awareness of the various factors that may affect pain could help identify patients with a greater



postoperative pain as unbearable. Seventy-two patients (78.3%) reported feeling no pain after the second postoperative hour. The patients' intraoperative and postoperative pain levels evaluated by VPS and VAS are shown in Table 1.

No statistically significant association was found between reported intraoperative and postoperative pain levels and age or gender ( $p>0.05$ ) (Table 2). Concomitant systemic diseases were present in 62% of the patients in the study. Diabetic patients ( $n=28$ ) reported significantly less pain both intra- and postoperatively ( $p=0.03$  and  $p=0.01$ , respectively). No significant associations emerged between other systemic diseases and pain scores ( $p>0.05$ ). Patients who took an NSAID drug on the morning of the surgery (42 patients, 45.6%) reported significantly less intraoperative pain ( $p<0.001$ ). However, after the second postoperative hour, there was no difference in pain level between patients who took an NSAID drug and those who did not (Table 3).

Additional anesthesia (intravenous fentanyl) was administered to 3 patients who tensed or moved their eyes because of intraoperative pain. Posterior capsule rupture occurred in one of the patients included in the study. This patient reported moderate to severe pain. None of the patients developed serious postoperative complications.

The mean surgery duration was  $22.2\pm 4.6$  minutes. Surgery duration was significantly longer in patients who reported having intraoperative and postoperative pain ( $p=0.003$  and  $0.01$ , respectively). Among patients with no intraoperative pain, the surgeon's comfort was rated as good in 80%, while the rate of good surgeon comfort was 62.5% among patients with intraoperative pain. However, the difference was not statistically significant ( $p=0.14$ ).

## Discussion

Many studies have demonstrated the efficacy and safety of cataract surgery through clear corneal incision under topical

anesthesia, and it is one of the most common surgical procedures performed today.<sup>13,14,15</sup> Topical anesthesia is preferred over local anesthesia by patients because it does not require an injection like in the retrobulbar or peribulbar application of local anesthesia, and also by physicians because it avoids injection-related complications.

In the current study evaluating pain levels experienced by patients undergoing phacoemulsification under topical anesthesia, 72 of 92 patients (78.3%) reported feeling pain intraoperatively. In a recent study investigating the analgesic efficacy of topical anesthesia for phacoemulsification surgery, pain was reported by 89.5% of the patients.<sup>6</sup> In another study including 124 eyes of 96 patients, pain was reported at a rate of 71.8% among patients undergoing cataract surgery under topical anesthesia. However, in this study, deep topical anesthesia was achieved using topical anesthetic drops as well as sponges soaked in an anesthetic substance applied to the inferior and superior fornices.<sup>13</sup>

In the current study, a total of 68 patients (73.9%) reported postoperative pain, mostly within the first hour after surgery. Porela-Tiihonen et al.<sup>5</sup> evaluated patients' postoperative pain levels after phacoemulsification with topical anesthesia and reported that 34% of their patients felt pain postoperatively, with 10% of patients describing their pain as severe the day after surgery. The authors stated that patients were asked to rate their pain within the first 4 hours after the procedure. The lack of a specific time when patients' pain levels were assessed may prevent the proper evaluation of these data. In our study, 60.9% of patients reported having pain at 30 minutes after the surgery, whereas 21.7% reported pain at postoperative 2 hours.

Many studies have utilized the VPS and/or VAS to evaluate pain levels during phacoemulsification surgery under topical anesthesia. Apil et al.<sup>6</sup> used the VPS with patients who received topical anesthesia and found a mean pain level of  $1.01\pm 0.41$ .

**Table 1. Patients' mean pain levels assessed using the verbal pain scale and visual analog scale**

	Intraoperative	Postoperative					
		0 minutes	30 minutes	1 hour	2 hours	4 hours	1 day
<b>Verbal pain scale</b>							
%	78.3	73.9	60.9	39.1	21.7	9.8	4.3
Mean score	$1.4\pm 1.0$	$1.3\pm 1.1$	$0.9\pm 0.9$	$0.6\pm 0.8$	$0.3\pm 0.6$	$0.1\pm 0.4$	$0.1\pm 0.3$
<b>Visual analog scale</b>							
cm	-	$2.5\pm 2.2$	$1.6\pm 1.8$	$1.1\pm 1.5$	$0.5\pm 1.1$	$0.2\pm 0.6$	$0.1\pm 0.1$

**Table 2. Comparison of the demographic characteristics of patients with and without intraoperative and postoperative pain**

	Intraoperative pain (+)	Intraoperative pain (-)	p value	Postoperative pain (+)	Postoperative pain (-)	p value
Age (years)	$67.2\pm 10.6$	$66.0\pm 10.9$	0.67	$66.6\pm 10.5$	$67.8\pm 11.1$	0.64
Gender						
Male (n=47)	34	13	0.16	35	12	0.90
Female (n=45)	38	7		33	12	

**Table 3. Comparison of mean pain levels assessed by verbal pain scale and visual analog scale (cm) according to nonsteroid anti-inflammatory use**

	Verbal pain scale			Visual analog scale		
	NSAI (+)	NSAI (-)	p value	NSAI (+)	NSAI (-)	p value
Intraoperative	0.8±0.8	1.9±0.9	<0.001	-	-	-
Postoperative 0 minutes	0.7±0.8	1.9±1.0	<0.001	1.4±1.7	3.3±2.2	<0.001
Postoperative 30 minutes	0.5±0.7	1.3±0.9	<0.001	0.9±1.6	2.2±1.8	<0.001
Postoperative 1 hour	0.3±0.6	0.8±0.9	0.01	0.6±1.3	1.3±1.6	0.03
Postoperative 2 hours	0.2±0.5	0.4±0.7	0.20	0.4±1.1	0.5±1.1	0.49
Postoperative 4 hours	0.1±0.4	0.2±0.5	0.47	0.1±0.5	0.2±0.7	0.54
Postoperative 1 day	0.1±0.4	0.02±0.1	0.22	0.1±0.5	0.04±0.2	0.34

NSAI: Nonsteroid anti-inflammatory

In the current study, the intraoperative pain level was evaluated as  $1.4 \pm 1.0$  using the VPS. In their studies comparing topical anesthesia to sub-Tenon's anesthesia, Srinivasan et al.<sup>16</sup> reported VPS pain levels of  $3.44 \pm 2.3$  and  $2.25 \pm 2.2$  and Zafirakis et al.<sup>17</sup> of  $1.13 \pm 1.57$  and  $0.80 \pm 0.93$  in the topical anesthesia group during or immediately after the surgery and at postoperative 30 minutes, respectively. The mean pain level as assessed by VPS in the current study was  $2.5 \pm 2.2$  immediately after surgery and  $1.6 \pm 1.8$  at postoperative 30 minutes.

We detected no association between intra- or postoperative pain levels and patient age or gender. Similarly, Apil et al.<sup>6</sup> reported that intraoperative pain was not associated with age or gender in their study. However, in a study including 506 patients, Tan et al.<sup>18</sup> found that female patients experienced more pain during cataract surgery, while Gombos et al.<sup>19</sup> reported that young patients were more sensitive to pain during cataract surgery.

Most patients scheduled for senile cataract have one or more concomitant systemic diseases. To the best of our knowledge, there are no studies in the literature investigating the relationship between concomitant diseases and pain sensation during cataract surgery. We found that diabetic patients reported feeling less pain during and after cataract surgery. This may be attributable to diabetic neuropathy. Mocan et al.<sup>20</sup> observed by confocal scanning laser microscopy that the corneal nerve plexus was less dense and showed more morphologic abnormalities in diabetic patients.

We found that surgery duration was significantly longer in patients who reported having intraoperative and postoperative pain. Rothschild et al.<sup>7</sup> also reported that surgery duration was significantly longer in the patient group with high pain scores. No relation emerged in our study between intraoperative pain and surgeon comfort. It has been reported in the literature that the use of sedation in addition to topical anesthesia resulted in less pain and better surgeon comfort.<sup>9</sup>

Although topical anesthesia does not provide analgesia as effectively as retrobulbar or peribulbar anesthesia, there is evidence that these methods do not differ in terms of surgical outcome and reliability.<sup>4</sup> However, as topical anesthesia does not affect the intraocular tissues, patients may feel pain in certain

situations, such as when the surgical instrument touches the iris, and blood pressure, heart rate and serum adrenaline levels may rise as a result.<sup>19</sup> Various techniques such as intracameral anesthesia,<sup>15</sup> supplemental sedation<sup>9</sup> and taking an analgesic preoperatively<sup>10</sup> have been shown to be effective in addition to topical anesthesia for improving surgical safety and comfort. We also found that patients who used an NSAI drug on the morning of the surgery had significantly lower pain levels.

In the current study, most of the patients undergoing phacoemulsification surgery under topical anesthesia experienced pain. However, most patients' pain was mild to moderate, and pain perception was not associated with surgical outcome or surgeon comfort.

## Conclusion

Most patients experience pain during phacoemulsification surgery under topical anesthesia. Although pain perception does not affect surgical success, giving selected patients an analgesic prior to surgery or administering additional anesthesia to patients with severe pain can improve patient comfort.

## Ethics

Ethics Committee Approval: Mevlana University Ethic Committee Approval Number 2013/004, Informed Consent: Obtained.

Peer-review: Externally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: Zeynep Dadacı, Mehmet Borazan, Nurşen Öncel Acır, Concept: Zeynep Dadacı, Mehmet Borazan, Nurşen Öncel Acır, Design: Zeynep Dadacı, Mehmet Borazan, Nurşen Öncel Acır, Data Collection or Processing: Zeynep Dadacı, Mehmet Borazan, Nurşen Öncel Acır, Analysis or Interpretation: Zeynep Dadacı, Mehmet Borazan, Nurşen Öncel Acır, Literature Search: Zeynep Dadacı, Mehmet Borazan, Writing: Zeynep Dadacı.

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