
Pain induced by phacoemulsification without sedation using topical or peribulbar anesthesia

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Purpose: To evaluate patient-reported pain induced by phacoemulsification without sedation using topical or peribulbar anesthesia.

Setting: Department of Ophthalmology, School of Medicine of Ribeirão Preto, São Paulo, Brazil.

Methods: This study assessed patient-perceived pain during phacoemulsification cataract surgery with peribulbar anesthesia (lidocaine 2%–bupivacaine 0.5% mixture) or with topical anesthesia (tetracaine drops); no patient received sedation. The same surgeon performed all surgeries using a clear corneal approach and in-the-bag intraocular lens implantation. Approximately 15 minutes after surgery, patients in the topical anesthesia group ($n = 20$) were asked to rate their pain during the procedure and patients in the peribulbar anesthesia group ($n = 21$), during infiltration of the anesthetic solution. Patients graded their pain using a 0- to 10-point visual analog scale (0 = no pain; 10 = unbearable pain). The results in the 2 groups were compared using the nonparametric Mann-Whitney U test.

Results: The median pain score in the topical anesthesia group was 2 (range 0 to 5) and in the peribulbar anesthesia group, 3 (range 0 to 7). The mean rank in the topical anesthesia group (15.78) was significantly lower than the mean rank in the peribulbar anesthesia group (25.98) ($P = .0057$, Mann-Whitney U test).

Conclusion: In patients having phacoemulsification without sedation, those receiving peribulbar anesthesia reported more pain than those receiving topical anesthesia during anesthetic solution infiltration and during the procedure, respectively.

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For many years, retrobulbar anesthesia was the only method used in ophthalmologic surgeries.¹ In 1986, surgeons began using peribulbar anesthesia after it was reported to be a safe, effective alternative to

retrobulbar injections.² However, the safety of peribulbar anesthesia came into question when serious complications such as ocular globe perforation, retrobulbar hemorrhage, optic nerve trauma, extraocular muscle dysfunction, and retinal venous occlusion were reported.³ Today, several types of anesthesia, including retrobulbar, peribulbar, subconjunctival, sub-Tenon's, and topical, are available for phacoemulsification cataract surgery. The choice of technique is based on the surgeon's experience, patient's emotional characteristics, and type of surgery.^{4–6}

The application of topical anesthesia in ocular surgery is not new. In 1884, Knapp⁷ reported the use of cocaine 5% for cataract extraction. A new era of topical anesthesia use began with phacoemulsification using the clear corneal approach. This technique involves

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minimal manipulation of the conjunctiva, episclera, and muscles, greatly reducing the need for bulbar akinesia and deep analgesia, and no anesthetic agent is introduced into the orbit. Thus, the eye remains normotensive throughout surgery, visual recovery is rapid, and postoperative side effects are minimal.⁸ In addition, topical anesthesia has a low rate of complications, avoids patients' fear of needle use, and reduces the risk for systemic toxicity.

An important criticism of the use of topical anesthesia for intraocular surgery is that its analgesic effect may be less than that of peribulbar or retrobulbar anesthesia. However, it is difficult to compare the pain induced by different surgical modalities because pain is a subjective sensation that is highly dependent on the patient's emotional state and cultural background. In the present study, we compared the pain between patients who had phacoemulsification with topical anesthesia and patients who had phacoemulsification with peribulbar anesthetic infiltration.

Patients and Methods

This study comprised 41 patients who had phacoemulsification, 20 under topical anesthesia and 21 under peribulbar anesthesia. Patients with total cataract, unstable fixation, intense photophobia, or poor mydriasis and those who had difficulty keeping their eyes open during tonometry were excluded from the study. Group formation was randomized to prevent selection criteria from influencing the pain experience. The patients were informed about the type of anesthesia they would receive. No patient received sedation.

The topical anesthesia consisted of 3 or 4 drops of proximetacaine hydrochloride 0.5% eyedrops at 5-minute intervals before surgery. The peribulbar anesthesia consisted of 6 mL of a mixture of equal parts of lidocaine 2% without adrenaline and bupivacaine 0.5%. The anesthetic solution was prepared 15 minutes before surgery and administered in the inferotemporal quadrant.

In all cases, mydriasis was obtained with 3 drops phenylephrine and tropicamide before surgery. Barophthalmos to reduce intraocular pressure was done only in the peribulbar anesthesia group. Patients were monitored with a cardioscope and venous access maintained with Ringer's lactate solution in both groups.

All surgeries were performed by the same surgeon (R.P.C.) using an identical procedure. Briefly, a superior temporal 2.75 mm clear corneal incision and a paracentesis were made with a 15-degree knife. After a continuous curvilinear capsulorhexis was created, the cataract was extracted

with an Alcon Legacy 20000 phacoemulsifier using the stop-and-chop technique. This was followed by irrigation/aspiration of the cortical remnants. The incision was widened to 3.2 mm for in-the-bag implantation of a foldable acrylic intraocular lens (IOL). No sutures were used.

Approximately 15 minutes after surgery, patients in the topical anesthesia group were asked to estimate the sensation of pain during the phacoemulsification procedure and patients in the peribulbar anesthesia group, the pain during infiltration of the anesthetic solution. Both groups scored their pain using a 10-point visual analog scale on which 0 was the absence of pain and 10, unbearable pain.⁹ Patients unable to see the scale verbally rated their pain sensation.

The pain scores in the 2 groups were compared using the nonparametric Mann-Whitney *U* test for the medians of independent samples.

Results

The mean age was 62.95 years in the topical anesthesia group (range 47 to 79 years) and 68.04 years (range 29 to 84 years) in the peribulbar anesthesia group. There was no significant difference between the groups in age or in the male:female ratio.

The mean surgical time was 23.1 minutes \pm 3.2 (SD) in the topical anesthesia group and 20.0 \pm 3.0 minutes in the peribulbar anesthesia group. Five patients in the topical anesthesia group required additional eyedrops during surgery for discomfort. No patient in the topical anesthesia group required conversion to peribulbar anesthesia.

Figures 1 and 2 show the distribution of the pain scores in the 2 groups. Patients in the peribulbar

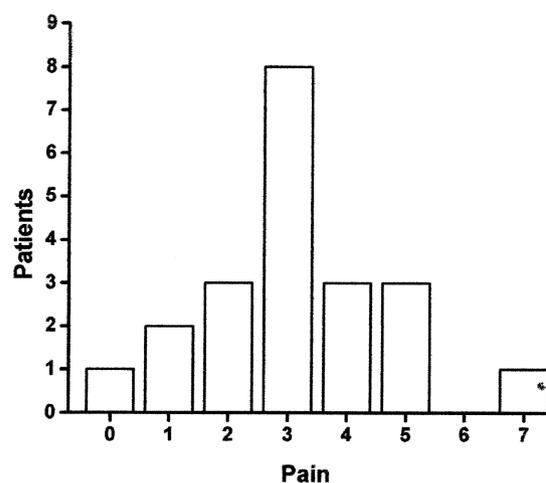


Figure 1. Distribution of the pain scores (10-point scale) in the peribulbar anesthesia group.

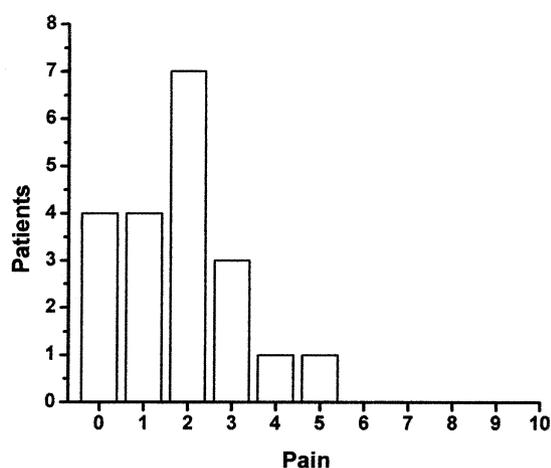


Figure 2. Distribution of the pain scores (10-point scale) scale in the topical anesthesia group.

anesthesia group reported significantly greater pain than patients in the topical anesthesia group ($P = .0056$, Mann-Whitney).

Discussion

The main advantages of cataract surgery without retrobulbar or peribulbar anesthesia are the rapid recovery of vision and the elimination of complications associated with the introduction of a needle into the orbit, such as retrobulbar hemorrhage, palpebral hematoma, optic nerve lesions, ocular perforation, diplopia, and respiratory arrest.^{2,3} However, phacoemulsification with topical anesthesia also has disadvantages including the need for greater patient cooperation and limitation of ocular and palpebral mobility during surgery. Poor cooperation can be reduced by careful patient selection. Inadvertent ocular movement and pressure for palpebral closure can be assessed during the tonometry and biometry examinations.^{10,11} Communication with the patient is crucial to the success of topical anesthesia. Patients should be informed they will not be able to move their eyes during surgery and that they might feel some sensation. Although most patients under topical anesthesia tolerate the surgical procedure well, the light of the microscope and some surgical steps (eg, iris manipulation, globe expansion with irrigation, and IOL implantation) are associated with discomfort.^{10,11}

Pain is more than the final product of a system of linear sensory transmission resulting from real or potential tissue damage. It is a dynamic process involving continuous interactions between complex neuronal sys-

tems. The patient's past cognitive experiences, cultural background, and degree of anxiety affect this process.¹⁰ Thus, pain differs from person to person and a stimulus that produces intolerable pain in 1 individual is easily tolerated by another individual.

Patients describe the discomfort caused by infiltration of the anesthetic agent during peribulbar anesthesia as "intense heat" or "burning." This sensation is caused by several factors such as the temperature of the anesthetic agent, velocity of injection, removal of the needle during injection, and the presence or absence of a vasoconstrictor in the solution. In the latter, the presence of a preservative reduces the pH of the anesthetic agent.

Although the pain induced by phacoemulsification with topical anesthesia is more difficult to characterize qualitatively, patients who had topical anesthesia reported significantly less pain during surgery than patients in the peribulbar anesthesia group reported during the peribulbar injection. Thus, with proper patient selection and good cooperation, phacoemulsification with topical anesthesia and no sedation involves fewer risks and a higher level of comfort than surgery with peribulbar anesthesia.

References

1. Atkinson WS. Retrobulbar injection of anesthetic within the muscular cone (cone injection). *Arch Ophthalmol* 1936; 16:494-503
2. Davis DB II, Mandel MR. Posterior peribulbar anesthesia: an alternative to retrobulbar anesthesia. *J Cataract Refract Surg* 1986; 12:182-184
3. Morgan CM, Schatz H, Vine AK, et al. Ocular complications associated with retrobulbar injections. *Ophthalmology* 1988; 95:660-665
4. Duguid IGM, Claoué CPM, Thamby-Rajah Y, et al. Topical anaesthesia for phacoemulsification surgery. *Eye* 1995; 9:456-459
5. Grabow HB. Topical anaesthesia for cataract surgery. *Eur J Implant Refract Surg* 1993; 5:20-24
6. Stevens JD. A new local anaesthesia technique for cataract extraction by one quadrant sub-Tenon's infiltration. *Br J Ophthalmol* 1992; 76:670-674
7. Knapp H. On cocaine and its use in ophthalmic and general surgery. *Arch Ophthalmol (old series)* 1884; 13: 402-448
8. Kershner RM. Topical anesthesia for small incision self-sealing cataract surgery; a prospective evaluation of the first 100 patients. *J Cataract Refract Surg* 1993; 19: 290-292

9. Revill SI, Robinson JO, Rosen M, Hogg MIJ. The reliability of a linear analogue scale for evaluating pain. *Anesthesia* 1976; 31:1191–1198
10. Melzack R. Psychological aspects of pain: implications for neural blockade. In: Cousins MJ, Bridenbaugh PO, eds, *Clinical Anesthesia and Management of Pain*, 3rd ed. Philadelphia, PA, Lippincott, 1998; 781–792
11. Fraser SG, Siriwardena D, Jamieson H, et al. Indicators of patient suitability for topical anesthesia. *J Cataract Refract Surg* 1997; 23:781–783