

# Comparison of sedation requirements for cataract surgery under topical anesthesia or retrobulbar block

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**PURPOSE.** *Topical anesthesia is increasingly being used for cataract surgery. However, it is believed that topical anesthesia causes an increased risk of intraoperative complications from unrestricted eye movement and insufficient pain control and more need for sedation. It is difficult to compare pain and anxiety experienced by individual patients; therefore, the authors used the method of patient-controlled sedation to determine whether there is a difference in sedation requirements under topical or retrobulbar anesthesia.*

**METHODS.** *In this prospective study, patients received either topical anesthesia (n=87) or retrobulbar block (n=104) and self-administered a mixture of midazolam (0.5 mg) and fentanyl (25 µg) in increments using a patient controlled analgesia infuser to achieve sedation. At the end of surgery, patients rated their pain on a 10-point numerical rating scale and their comfort on a 5-point scale. The number of demands and deliveries were noted from the patient controlled analgesia infuser display.*

**RESULTS.** *Pain scores were between 0 and 2 in 95.4% in the topical and in 94.2% in the retrobulbar group (p>0.05). Patient comfort was equal in both groups with 2.94 ± 0.92 in the topical group and 2.92 ± 0.99 in the retrobulbar group (p>0.05). Mean sedation requirements were similar in both groups: 26.4% of patients in the topical group and 19.2% in the retrobulbar group did not request any sedation (not significant, p>0.05).*

**CONCLUSIONS.** *Sedation requirements were similar for cataract surgery under topical and retrobulbar anesthesia. (Eur J Ophthalmol 2004; 14: 473-7)*

**KEY WORDS.** *Anesthesia, Topical, Retrobulbar, Cataract extraction, Sedation*

*Accepted: June 20, 2004*

## INTRODUCTION

Most patients preparing for intraocular surgery are anxious about their treatment, which may lead to poor cooperation during surgery. This is even more important for cataract surgery under topical anesthesia, which has become more popular in recent years (1). How-

ever, reports suggest that careful patient selection is important. Anxious and uncooperative patients should be excluded (2). Surgical ocular procedures carried out under local anesthesia are associated with varying degrees of patient discomfort and apprehension and sedation requirements. The level of pain control and akinesia produced by different regional ap-

proaches may also affect sedation requirements (3).

Sedation presents special challenges in these patients: they must remain fully cooperative; sedation must be safe, since many of these patients are elderly with comorbidities such as cardiac or respiratory diseases. Patient-controlled sedation (PCS) may be an alternative to anesthetist-administered sedation. The patient is the only competent assessor of his or her general experience during the surgical procedure and PCS allows patients to dose sedation to his or her own requirements, reducing the risk of over- or underdosage, a potential disadvantage of anesthetist-administered sedation (4).

The aim of this study was to evaluate if patients' sedation requirements are different during cataract surgery under topical or retrobulbar anesthesia. PCS with equal programs was used to determine patients' own requirements and to reveal any difference.

## METHODS

After obtaining approval from the local ethics committee and informed patient consent, ASA I-III, unpremedicated outpatients undergoing elective uncomplicated cataract surgery with phacoemulsification technique under local anesthesia were included in the study during a 3-month period. Patients with severe cardiovascular or respiratory disease and patients without adequate communication skills were excluded. An experienced surgeon selected the anesthesia method based on the eye examination and no special assessment of patients' anxiety level was made.

The anesthesiologist gave instruction on the use of a commercially available patient-controlled analgesia machine (PCA) (Abbott Pain Management Provider, Abbott Laboratories Nord, Chicago, IL) on the day of surgery. The pump, charged with midazolam  $0.2 \text{ mgml}^{-1}$  and fentanyl  $10 \text{ } \mu\text{gml}^{-1}$ , was programmed to deliver on demand a bolus dose of 2.5 ml (0.5 mg midazolam and 25  $\mu\text{g}$  fentanyl) with a lockout period of 5 min after each delivered dose (4). Immediately after pump connection to a 22-gauge peripheral intravenous cannula, and before administration of the local anesthetic to the eye, the patient was encouraged to make the first demand by pressing the hand-held triggering device and to make a demand in the event of any discomfort, pain, or anxiety during the whole procedure.

Topical anesthesia or retrobulbar block was administered in a standard fashion by the ophthalmologist. In the topical anesthesia group (T) sponges soaked with a mixture of equal volumes of 2% prilocaine and 0.5% bupivacaine were placed into the conjunctival fornices for about 5 minutes. Patients in the retrobulbar block group (RBB) received an injection of a 3-4 ml mixture of 2% prilocaine and 0.5% bupivacaine in a total volume of 3-4 ml with a 25 gauge, 38 mm long disposable standard needle (Retro Atkinson, Beaver-Visitec, FL) and ocular compression for 10 minutes was achieved using a modified Honan balloon.

The electrocardiogram, noninvasive arterial pressure, respiratory rate, and oxygen saturation were monitored and an anesthesiologist was present throughout the surgery. All patients breathed oxygen-enriched air ( $10 \text{ L min}^{-1}$  via a cannula near the mouth).

Specific complications such as hypoventilation (respiratory rate  $<8 \text{ bpm}$ ), desaturation (oxygen saturation  $<90\%$ ), hypotension (systolic pressure  $<100 \text{ mmHg}$ ), nausea or vomiting, restlessness or excitement, and oversedation were recorded, and PCS was stopped in these patients.

The anesthesiologist stopped the PCS at the end of surgery. The number of total attempts of self-administration (demand) and the number of successful attempts (delivery) were noted from the PCS display. Timing of attempts was not recorded. Before discharge from the surgery unit, patients had to rate the pain they felt during surgery on a 10-point numerical rating scale (0: no pain, 10: worst pain), and their opinion of the whole surgery procedure including method of sedation on a 5-point scale (0: bad, 1: moderate, 2: good, 3: very good, 4: excellent).

Statistical analysis was carried out using SPSS for Windows version 8.0. Chi-square testing or Fisher exact test was used for analysis of PCS use, patient comfort, and pain scores and Student t-test for the other results;  $p < 0.05$  was considered significant.

## RESULTS

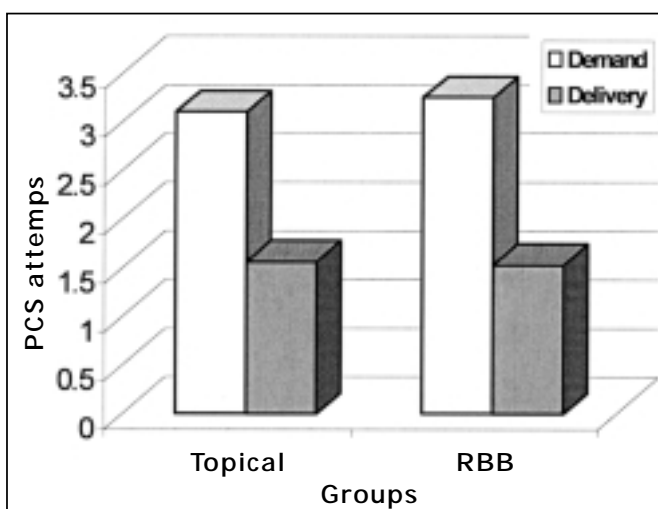
At the end of the study, 87 patients had received topical anesthesia and 104 patients had received retrobulbar block. Patient details are summarized in Table I.

**TABLE I - PATIENT CHARACTERISTICS**

Characteristics	Topical group n=87	Retrobulbar group n=104
Age, yr	67.36 (10.36)	66.05 (11.41)
Weight, kg	71.20 (10.03)	70.89 (11.69)
Men/women	59/28	58/46
ASA, I/II/III	22/59/6	39/58/7

Values are mean (SD)

No patient in any group had oversedation or any other adverse effect. Total duration of PCS use was 32.29 (11.38) minutes in the T group and 41.53 (14.49) minutes (SD) in the RBB group ( $p < 0.05$ ). Pain scores were between 0 and 2 in 95.4% in the T group and in 94.2% in the RBB group ( $p > 0.05$ ). Mean and median (range) for pain scores were 0.35 and 0 (0 to 7) for the T group and 0.39 and 0 (0 to 5) for the RBB group. Mean sedation requirements were similar in both groups: 26.4% of patients in the T group and 19.2% of patients in the RBB group did not request any sedation (did not use the button); the difference was not significant ( $p > 0.05$ ). For patients who used the PCS, mean demands were 3.10 with a median (interquartile range) of 1 (0 to 4) in the T group and 3.25 and 1.50 (1 to 3) in the RBB group (Fig. 1). Maximum delivery



**Fig. 1 - Details of patient-controlled sedation (PCS) use, evaluating demand of the patient and delivery from the PCS device. Highest and lowest demand rates were similar in both groups with a range of 0 to 21 and a mean of 3.10 for the topical anesthesia group and 3.25 for the retrobulbar block group ( $p > 0.05$ ).**

was six times in the T group and seven times in the R group. There was a significant but weak correlation between PCS duration and the delivery frequency with  $p < 0.01$  and  $r = 0.22$ . Patient comfort on the five-point scale was equal in both groups with  $2.94 \pm 0.92$  in the T group and  $2.92 \pm 0.99$  in the RBB group ( $p > 0.05$ ). Median value (interquartile range) for patient comfort was 3.0 (2 to 4) for both groups.

## DISCUSSION

This study shows that patients administered PCS had no difference in sedation or analgesic requirements between topical and retrobulbar anesthesia in regard of the whole surgery procedure including local anesthesia administration.

There currently is no consensus for the optimal approach to regional anesthesia and sedation for cataract surgery. Choice of local anesthesia technique depends largely on the preferences of anesthesiologists and surgeons, but increasing attention is being given to patient preferences and their perceptions of intraoperative pain (5, 6). Approaches to anesthesia in uncomplicated cataract surgery vary from topical anesthesia to retrobulbar and peribulbar anesthesia with or without oral or intravenous sedation in various combinations. As a result of improvements in surgical and anesthetic techniques, topical anesthesia has become more popular in recent years (1). It is believed that topical anesthesia causes an increased risk of intraoperative complications from unrestricted eye movement and insufficient pain control (7). Careful patient selection is therefore required for topical anesthesia, especially early in the surgeon's conversion. Anxious or uncooperative patients are poor candidates and probably need more sedation (2). The level of pain control and akinesia produced by different regional approaches may also affect sedation requirements (3). In some studies performing topical anesthesia for cataract surgery no sedation was used at all (8, 9). Painless cataract surgery using only topical anesthesia is possible and desirable and topical anesthesia without sedation has been shown to be well tolerated (1, 10). Patient preference for topical anesthesia appears to be significantly higher than for retrobulbar anesthesia and topical anesthesia is justified as a means of improving safety without causing discomfort to the

patient even in complicated cases of cataract surgery (11). Patients who had different types of anesthesia in each eye said they preferred the topical technique (2). Others have found that patient preference for retrobulbar anesthesia was higher than for topical anesthesia (5, 6). There is also good evidence that retrobulbar block provides better pain control during surgery than topical anesthesia (3).

Sedation for cataract surgery under topical anesthesia changes between routine use of sedation and no sedation. Different methods of sedation were compared in most of the studies. It is difficult to compare pain and anxiety experienced by individual patients, and with different sedative treatments. Therefore we used the method of PCS with the same drug combination in both groups. With this method patients can relieve their pain and anxiety by themselves and the real requirements of the patients can be evaluated.

PCS has been used successfully during different surgeries including cataract surgery, where early recovery and lack of side effects are essential. Patients using this method remarked that knowing they could have used more sedation if they wanted it gave them confidence, and therefore they did not (12). PCS is gaining popularity in ocular surgery. Morley et al (4) have used this method for vitreoretinal surgery. They compared PCS propofol with anesthetist-administered midazolam and found both approaches safe. It has been shown that elderly patients can use PCS during cataract surgery to induce and maintain anxiolysis and conscious sedation with minimal drowsiness (13). Kallio et al (14) used propofol sedation with topical anesthesia for cataract extraction and even though they were satisfied with that method they stated that keeping the patient cooperative under intravenous propofol sedation is a challenge and the risk of respiratory depression necessitates the presence of experienced anesthesia personnel. Increasing age was significantly correlated with a deeper maximum level of sedation when fixed propofol doses were used (15,16). We used midazolam and fentanyl for PCS because these are the routinely administered drugs for sedation in eye surgery by the anesthesiologist in our hospital and in other countries as well (2, 4). We also have evaluated the efficacy and safety of using this drug combination and the selected PCS program in elderly patients undergoing cataract surgery in a previous study (17).

Sedation is not required in all patients undergoing cataract surgery with local anesthesia. Thus as the need for sedation is unpredictable and clearly there is no requirement for routine use, a case may be made for demand sedation in all patients. In these situations security and confidence are provided by the patient's knowledge of the immediate availability of sedation should they become acutely anxious (13). In patients undergoing cataract surgery using peribulbar block and PCS it has been shown that 13% of 75 patients did not require any sedation and for several other patients, drug consumption was minimal with the PCS technique (13). Similarly, 19.2% of the patients in the retrobulbar block group in our study did not use PCS. In the topical anesthesia group this was 26.4%. The difference was not significant but the reason why the patients in the retrobulbar group used the PCS more than the topical group could be fear of injection.

The duration of PCS use was shorter in the topical group. Surgery started earlier in this group because the waiting period for the effect of local anesthesia was shorter. The same surgeon operated the patients; the residents who assisted him changed from time to time. This may have led to some delays in patient preparation, which may be another reason for the difference in the duration of PCS use between the groups. This and patient selection according to the surgeon's decision without randomization is a limitation of the present study. There was no strong correlation between patients' sedation demands and the duration of PCS, however. Because there was also no difference in PCS use, the shorter PCS period in the topical group has not changed the general results of the study. The level of anxiety could be evaluated before surgery but in our previous study this was evaluated and no correlation could be found between frequency of PCS use and preoperative anxiety level in a population similar to that in this study (17).

Pain experienced during cataract surgery varies according to the local anesthetic technique. There is evidence that retrobulbar and peribulbar blocks provide equal pain control and that retrobulbar block provides better pain control than topical anesthesia (3). Jacobi et al (11) showed that even in complicated cataract surgery 85% of patients in the topical group and 92% of patients in the retrobulbar group had pain scores between 0 and 2. These results are similar to the re-

sults in our study. There was no significant difference in pain scores. This may have affected the PCS use and the similar highest and lowest demand and delivery rates in both groups. The use of PCS is not routine in our hospital, but it seems to be a good method for evaluation of sedation requirements on an individual basis. The use of PCS is consistent with a trend toward more active patient participation in treatment, which is also an important issue for ocular surgery under topical anesthesia.

Sedation requirements with PCS were similar for elective cataract surgery with phacoemulsification

technique under topical and retrobulbar anesthesia. The general opinion that patients need more sedation and feel more pain under topical anesthesia should be questioned.

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