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Intraocular pressure, quality of block, and degree of pain associated with ropivacaine in peribulbar block: a comparative randomized study with bupivacaine-lidocaine mixture

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PURPOSE. *To compare the effects of ropivacaine and bupivacaine-lidocaine combination on intraocular pressure, quality of block, and degree of postoperative pain in peribulbar block.*
METHODS. *The study group involved 32 patients undergoing elective cataract surgery under peribulbar block. Patients were divided into two groups according to the local anesthetic used: Group 1 (n=16), ropivacaine 0.75%; and Group 2 (n=16), bupivacaine 0.5%–lidocaine 2% mixture. Intraocular pressure was measured at four time points: before block (control), 1 min after block, 5 min after block, and 15 min after block with Tonopen. Quality of block was evaluated using a three-point scoring system based on the reduction of globe motility. Patients were asked their degree of intraoperative pain by using a five-point verbal rating score after the surgery.*
RESULTS. *Mean values of intraocular pressure after block were significantly lower in Group 1 in comparison to Group 2 ($p<0.05$, Mann Whitney test). The quality of block was better in Group 2, and the degree of postoperative pain was lower in Group 1 ($p<0.05$, Mann-Whitney test).*
CONCLUSIONS. *Ropivacaine used in peribulbar block is better than bupivacaine-lidocaine mixture under the same standard conditions in terms of reducing intraocular pressure and postoperative pain in intraocular surgery. (Eur J Ophthalmol 2003; 13: 794-7)*

KEY WORDS. *Ropivacaine, Bupivacaine, Peribulbar anesthesia, Intraocular pressure, Pain*

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INTRODUCTION

Current approaches to anesthesia in an uncomplicated cataract surgery vary from topical anesthesia to retrobulbar and peribulbar anesthesia with various anesthetics in different combinations. Retrobulbar anesthesia became more widely used in the 1940s, and in order to reduce some of the complications, peribulbar anesthesia was introduced in the 1960s (1). Peribulbar injection of a local anesthetic agent is an effective technique for cataract surgery and the most frequently used local anesthetic agents for this procedure are lidocaine, bupivacaine, or a combination (2). New agents like ropivacaine and carticaine with low systemic side effects have been introduced and found to be safe and effective for peribulbar anesthesia in cataract surgery.

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The selection of anesthetics depends largely on the preference of the surgeon, but increasing attention is being given to patient preferences and their perceptions of intraoperative pain and side effects of anesthesia. The aim of this study was to compare ropivacaine with bupivacaine-lidocaine mixture in peribulbar block regarding their effect on intraocular pressure (IOP), quality of block, and degree of intraoperative pain.

METHODS

The protocol was approved by the hospital ethical committee and written, informed consent was obtained from each patient. Thirty-two ASA physical status I-II-III patients scheduled for elective cataract surgery were included in the study and were randomly assigned to one of two groups of 16. Patients did not receive premedication, and hemodynamic parameters were recorded.

Group 1 patients (n=16) received ropivacaine 0.75% and Group 2 patients (n=16) received bupivacaine 0.50%–lidocaine 2% mixture. In all cases peribulbar block was achieved by one experienced doctor (A.B.) in a double-blind manner. A total volume of 4.0 ml was injected in the junction of the lateral third with the two medial thirds of the inferior orbital edge, with a standard needle (25 mm length, 0.7 mm gauge), through the eyelid. Orbital mechanical compression was applied to the closed eye for 5 minutes using a Honan balloon. Measurement of IOP was performed at four time points with Tonopen. Quality of block was evaluated in terms of reduced ocular globe motility 15 minutes after injection, using a three-point scoring system proposed by Nicoll and coworkers (3):0 = akinesia (ocular movement <1 mm), 1 = reduced movement (ocular movement >1 mm but <4 mm), 2 = normal movement (ocular movement >4 mm) giving a maximal aggregate score of 8 for the four muscles. Degree of postoperative pain was recorded by using a five-point verbal rating score at the first hour after the surgery: 0 = no pain, 1 = mild pain, 2 = moderate pain, 3 = severe pain, 4 = unbearable pain.

Mann-Whitney U and Wilcoxon signed ranks tests were used for the comparison of parameters. The probability of 0.05 was accepted as the critical level of significance.

RESULTS

All patients were essentially healthy individuals who had successful cataract surgery with no postoperative complications. There was no need for a supplemental block during surgery in any patient. Both groups had similar demographics with regard to age, sex, and type and duration of operation. Hemodynamic signs of the groups did not show statistically significant differences ($p>0.05$) (Tab. I).

Mean values of IOP before block were similar between the two groups ($p>0.05$, Mann-Whitney test). Mean values of IOP after block were significantly lower in Group 1 in comparison to Group 2 ($p<0.05$, Mann-Whitney test). In Group 1, the mean values obtained at the three time points after block were significantly lower than the control ($p<0.05$, Wilcoxon signed rank test); in Group 2, the mean value of IOP rose significantly 1 and 5 min after block and was similar only at time point 3 (Tab. II).

Quality of block by means of three-point scoring system of Nicoll and the incidence of intraoperative

TABLE I - DEMOGRAPHIC DATA

	Group 1	Group 2
Sex (male/female)	9/7	10/6
Age (yr)	59.9±6.3	59.7±6.8
Weight (kg)	64±12.3	66±11.4
Systolic arterial pressure (mm Hg)	141.1±8.6	144.6±6.6
Heart rate (bpm)	74±7.2	78±6.4
Operation time (min)	27±6.2	28±5.1

Values are mean±SD unless otherwise indicated

TABLE II - MEAN INTRAOCULAR PRESSURE (mmHg) OF BOTH GROUPS BEFORE AND AFTER PERIBULBAR BLOCK

	Before block	1st min	5th min	15th min
Group 1	15.8±2.3	14.4±2.2	13.5±2.3	12.6±2.3
Group 2	15.1±2.5	19.7±3.3	17.8±2.5	15.6±2.2
p	>0.05	<0.05	<0.05	<0.05

Values are mean±SD

pain were evaluated. A successful block with no movements in any direction was achieved in three patients in Group 1 and in nine patients in Group 2. The difference between groups was significant ($p<0.05$, Mann-Whitney test). The incidence of postoperative pain was significantly different between groups ($p<0.05$, Mann Whitney test). There was no pain in 11 patients in Group 1 and in 5 patients in Group 2.

DISCUSSION

Peribulbar anesthesia is considered a safe and effective technique for most ophthalmic surgeries, and increasing attention is being given to patient perceptions of intraocular pain and side effects of anesthesia (4, 5). Lidocaine 2% and bupivacaine 0.5% combination is a well-known and frequently used local anesthetic agent in cataract surgery. In addition to this, ropivacaine 0.75% has less central nervous system and cardiac toxicity than bupivacaine (6). The use of ropivacaine in ophthalmic surgery has gained more popularity in recent years.

Analgesia, sufficient control of eye motility, and IOP levels are mandatory to allow an uncomplicated cataract surgery. The potential advantage of peribulbar anesthesia is the associated akinesia. In previous studies, Nociti et al found that ropivacaine has a quicker effect on ocular globe immobility compared to bupivacaine (7, 8). Gioia et al found similar complete akinesia scores between 2% lidocaine–0.5% bupivacaine (1:1, 8 ml) and 0.75% ropivacaine (8 ml) groups by using Bloomberg's modification of the Davis and Mendel peribulbar technique (9). However, in this study there was a statistically significant difference between the two groups in terms of block quality in favor of lidocaine-bupivacaine group. Complete akinesia was achieved in three patients in Group 1 and in nine patients in Group 2 ($p<0.05$, Mann-Whitney test). Although inadequate akinesia is an important concern, residual eye movement did not hinder surgery in the ropivacaine group.

The primary advantage of using ropivacaine for cataract surgery is its lowering IOP effect and postoperative pain relief. IOP elevation after peribulbar injection is common (10). This has important implications for patients with glaucoma. Mean IOP values taken after peribulbar block with ropivacaine were lower than those after block with bupivacaine-lidocaine mixture in our study. The different IOP behavior of ropivacaine with a standardized application of oculopression is important. It was suggested that this IOP lowering effect might be largely caused by vasoconstriction induced by ropivacaine leading to a decrease in intraocular and choroid blood volume (11, 12).

There was a statistically significant difference between the two groups in patient-reported postoperative pain in our study. The number of patients with no pain was always higher in the ropivacaine group. Sixty-eight percent of patients in the first group reported no pain and 31% in the second group. This result is comparable with a controlled trial by Gioia et al in which reports of pain were minimal (9).

Although we encountered no complications in any patient, the potential systemic toxicity of ropivacaine compared with bupivacaine is found to be minimal (13, 14), and using one local anesthetic agent is more advantageous.

Peribulbar block with ropivacaine prevented IOP elevation and led to reduced pain levels compared with the lidocaine-bupivacaine group in our study. The results of this study indicate the safety and efficacy of using ropivacaine for peribulbar anesthesia in cataract surgery.

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