

Levobupivacaine Plus Lidocaine in Peribulbar Block: A Comparative Randomized Study with Bupivacaine Plus Lidocaine

Peribulber Blok İçin Levobupivakain ve Lidokain Kombinasyonu: Bupivakain ve Lidokain Kombinasyonu ile Randomize Karşılaştırmalı Çalışma

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ABSTRACT

Purpose: To compare bupivacaine-lidocaine mixture with levobupivacaine-lidocaine mixture in peribulbar block regarding their effect on quality of block, ocular akinesia, and degree of intraoperative pain and postoperative pain.

Materials and Methods: Sixty-two ASA physical status I-III patients scheduled for elective cataract surgery were included in the study. Patients were randomly allocated to receive peribulbar anesthesia with either 4 ml of a mixture levobupivacaine 0.5% and lidocaine 2% (Group LL) or a 4 ml of a mixture containing equal volume of lidocaine 2% and bupivacaine 0.5% (Group LB). All patients were evaluated with regards to akinesia and pain scores along the surgery pain and sedation scores postoperatively.

Results: Median eyelid movement and akinesia scores were not significantly different between the two groups at any time. There was no need for a supplemental block during surgery in any patient. Sedation scores were significantly higher in group LB than the LL group in study period.

Conclusion: Levobupivacaine plus lidocaine and bupivacaine plus lidocaine can be recommended as an effective analgesics in cataract surgery without serious side effects. However, higher sedation was achieved with combination of bupivacaine and lidocaine.

Key Words: Peribulbar anesthesia, levobupivacaine, bupivacaine, phacoemulsification, cataract.

ÖZ

Amaç: Peribulber blok uygulamasında bupivacaine-lidocaine karışımı ile levobupivacaine-lidocaine karışımını blok kalitesi, oküler akinezi ve intraoperatif ve ameliyat sonrası ağrı derecesi üzerine etkilerini karşılaştırmak.

Gereç ve Yöntem: Elektif katarakt cerrahisi için seçilen 62 hasta bu çalışmaya dahil edildi. Hastalara peribulber anestezi için rastgele 4 ml levobupivacaine %0.5 ve lidocaine %2'nin %50-50 karışımı (Grup LL) veya 4ml lidocaine %2 ve bupivacaine %0.5'nin %50-50 karışımı (Grup LB) uygulandı. Bütün hastaların cerrahi sırasında akinezi ve ağrı skorları ve postoperatif sedasyon skorları değerlendirildi.

Bulgular: İki grup arasında kapak hareketleri ve anestezi skorları bakımından belirgin bir fark yoktu. Hiç bir hastaya ilave bir anestezi gerekmedi. Çalışma süresince sedasyon skorları grup LB de grup LL den daha yüksek olarak bulundu.

Tartışma: Levobupivacaine-lidocaine and bupivacaine-lidocaine katarakt cerrahisinde ciddi bir yan etkisi olmaksızın etkin bir anestetik olarak önerilebilir. Fakat bupivacaine-lidocaine kombinasyonu ile daha yüksek sedasyon elde edilmektedir.

Anahtar Kelimeler: Peribulber anestezi, levobupivacaine, bupivacaine, fakoemüsifikasyon, katarakt.

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INTRODUCTION

Although phacoemulsification cataract surgery is being performed under topical anesthesia not all surgeons are comfortable with this technique. Peribulbar block is widely used in ophthalmic procedures because it has a higher margin of safety than does retrobulbar block.^{1,2} Ocular akinesia with peribulbar block would be a suitable option for surgeons. 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 and ropivacaine.^{3,4}

Bupivacaine-lidocaine mixture is frequently used for ophthalmic regional anaesthesia, as it is perceived as combining the rapid onset of lignocaine with the longer duration of bupivacaine.³ Bupivacaine has potential, however, for cardiac and central nervous system (CNS) toxicity and has been implicated in a number of reports of cardiac arrest and death.^{5,6} The S (-) enantiomer of bupivacaine (levobupivacaine) has been developed for clinical use as a long acting local anaesthetic.⁶ The majority of in vitro, in vivo and human pharmacodynamic studies of nerve block indicate that levobupivacaine has similar potency to bupivacaine. However, levobupivacaine had a lower risk of cardiovascular and CNS toxicity than bupivacaine in animal studies.^{8,9}

The aim of this study was to compare bupivacaine-lidocaine mixture with levobupivacaine-lidocaine mixture in peribulbar block regarding their effect on quality of block, ocular akinesia, and degree of intraoperative pain and postoperative pain.

MATERIAL AND METHODS

The protocol was approved by the hospital ethical committee and written, informed consent was obtained from patients. Sixty-two ASA physical status I-III patients scheduled for elective cataract surgery were included in the study. Exclusion criteria for the study were as follows: Age less than 18 years, previous intra-ocular surgery, patients who had the only eye, coexisting with the advanced open angle glaucoma, pregnant women or those of childbearing potential, patients known to have reduced plasma cholinesterase level and patients with a history of allergy to amide type local anaesthetic.

Un-premedicated patients on arrival in the operating room, routine monitors were applied for recording heart rate (HR), noninvasive systolic (SBP), diastolic blood pressure (DBP) and peripheral oxygen saturation (SpO₂). All patients received 0.9% NaCl 1-2 mL kg⁻¹ before peribulbar block application. Patients were randomly allocated to receive peribulbar anesthesia with either 4 ml of a mixture levobupivacaine 0.5% and lidocaine 2% (Group LL) or a 4 ml of a mixture containing equal volume of lidocaine 2% and bupivacaine 0.5% (Group LB). Neither group received hyaluronidase.

In all cases peribulbar block was achieved by one experienced doctor 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. During the injection of the local anesthetic agents, the level of patient discomfort and chemosis and the extent of subconjunctival haemorrhage were noted. The patient was also questioned regarding pain (none/mild/moderate/severe) felt during the surgery and any need for additional analgesia was recorded.

The progression of akinesia for each of the four rectus muscles, orbicularis oculi and levator palpebrae superioris was recorded. Akinesia of each muscle was scored from 0 (no block), 1 (almost full movement), 2 (moderate akinesia), 3 (almost full akinesia) to 4 (complete akinesia). A maximum block in all muscles scored 24 and 18 was deemed adequate for surgery. Intraoperative and postoperative pain scores at the first hour after the surgery were recorded by using visual analogus score (VAS) (0=no pain, 10=unbearable pain).

Sedation was assessed using sedation 5 points test (0=Awake, 1=Mild sedation, 2=Sloping to sleep, 3=Sleeping, but able to wake, 4=Deep sleeping, unable to wake). Patients were seen the next morning in the ophthalmic outpatient clinic.

Any problems including nausea, vomiting and any other complications associated with anaesthesia or surgery were noted. Also, residual akinesia was scored with the same system used before surgery. Qualitative data were analyzed with Pearson X² and Fisher's exact tests. Quantitative data, expressed as mean \pm SD, were analyzed using independent simple t test. A probability <0.05 was considered statistically significant. All analyses were calculated by using SPSS 10.0 (SPSS, Inc, Chicago, IL, USA).

RESULTS

The results did not reveal any significant differences between the two groups in terms of demographic data (Table 1). There were 31 patients in each group and all patients were included in the statistical analysis.

Table 1: Demographic data. Values are given as mean (SD) where appropriate.

	Group LL (n=31)	Group LB (n=31)
Male: female	17/14	19/12
Mean age; years	64 (range 31-82)	65 (range 43-84)
Weight (kg)	61.9 \pm 9.6	62.5 \pm 11.2
ASA physical status		
I	10	8
II	12	13
III	9	10

Table 2: VAS values in groups (Mean±SD).

VAS	Group LL (n=31)	Group LB (n=31)
Intraop. 5 min	0.25± 0.51	0.09± 0.53
Intraop. 10 min	0.61±1.45	0.38±1.02
Intraop. 15 min	0.70±1.50	0.48±1.12
Intraop. 30.min	0.63±2.11	0.00±0.00
Postop. 45 min	0.64±1.37	0.38±1.02
Postop. 60 min	0.73±1.31	0.60±1.30

$p>0.05$ Levobupivacaine plus lidocaine group compared to bupivacaine plus lidocaine group.

Mean age in the levobupivacaine-plus lidocaine group was 64 (range 31-82) year and, 65 (range 43-84) year in the bupivacaine- plus lidocaine group. The male: female ratio was 18:13 in the levobupivacaine-plus lidocaine group and 19:12 in the bupivacaine- plus lidocaine group.

There were no differences between the study groups in regard to hemodynamic variables. During the study period, the SpO₂ remained stable at approximately 96% in all groups, extra oxygen (4 L min⁻¹) was routinely provided via nasal mask.

In addition, none of the patients in either group experienced respiratory depression, or any other drug-related adverse effects. All patients were essentially healthy individuals who had successful cataract surgery with no postoperative complications.

Motor block sufficient for surgery was achieved at 8 minutes after injection in both groups. Median eyelid movement and akinesia scores were not significantly different between groups at any time. VAS scores were similar in two groups during the surgery (Table 2).

The mean pain score during surgery was 0.25-0.70 for the Group LL and 0.00-0.48 for the Group LB. There was no need for a supplemental block during surgery in any patient. Sedation scores were significantly higher in Group LB than the Group LL in study period ($p<0.05$), (Table 3). Postoperative pain scores were similar between groups in the first postoperative hour. There were no significant differences in the incidence of postoperative adverse sequelae (Table 4).

DISCUSSION

Ophthalmic procedures such as cataract extraction with phacoemulsification can be performed with either topical or regional anesthesia .

We therefore carried out a prospective, double-blind study to compare mixture of levobupivacaine 0.5% with lidocaine 2% with our standard mixture of bupivacaine 0.5% with lidocaine 2% for peribulbar anaesthesia in those patient whom underwent anterior segment ophthalmic surgery. A mixture of bupivacaine and lidocaine is the most frequently used local anaesthetic; Lidocaine providing rapid onset and bupivacaine a long duration

Table 3: Sedation scores in groups (Mean±SD).

	Group LL (n=31)	Group LB (n= 31)
Intraop. 5 min	0.00±0.00	0.00±0.00
Intraop. 10 min	0.00±0.00	0.06±0.24*
Intraop. 15 min	0.00±0.00	0.06±0.24*
Intraop. 30.min	0.00±0.00	0.09±0.39*
Postop. 30 min	0.00±0.00	0.18±0.60*
Postop. 60 min	0.00±0.00	0.00±0.00

* $p<0.05$ Levobupivacaine plus lidocaine group compared to bupivacaine plus lidocaine group.

Table 4: Side effects in groups.

	Group LL (n=31)	Group LB (n= 31)
Nausea	3	4
Dizziness	3	2
Diplopia	7	9

$p>0.05$ Levobupivacaine plus lidocaine group compared to bupivacaine plus lidocaine group.

of action.³ Bupivacaine 0.75% plus lidocaine 2% or ropivacaine 1% provides anaesthesia comparable with in terms of onset, degree of akinesia and duration of action, fulfilling some of the criteria of the ideal agents for anterior segment ophthalmic surgery.¹⁰

Levobupivacaine is a long acting local anesthetic.⁷ Randomised, double-blind clinical studies established that the anaesthetic and/or analgesic effects of levobupivacaine were largely similar to those of bupivacaine at the same dose. The onset of action is ≤ 15 minutes with various anaesthetic techniques.

Sensory block tended to be longer with levobupivacaine than bupivacaine, approximately 2 hours with peripheral nerve block. With epidural administration, levobupivacaine produced less prolonged motor block than sensory block. This differential was not seen with peripheral nerve block.

Conditions satisfactory for surgery and good pain management were achieved by use of local infiltration or peribulbar administration of levobupivacaine.⁷ Akinesia is important for the surgeon as it facilitates safe completion of surgery. Analgesia is important for the patient as well as the ophthalmologist as a lack of this leads to an unpleasant experience for the patient and a potential for unexpected complications due to withdrawal movements by the patient due to pain.¹¹

Pain during injection of the local anaesthetic is one of the patient's principal concerns. Although, the pain scores we recorded were high; 0.66 and 0.2 for levobupivacaine and racemic bupivacaine during injection of the local anaesthetic, respectively. However, postoperative pain scores were similar between two groups.

Lai F et al., showed that a mixture of bupivacaine 0.75% and lidocaine 2% provides faster onset time than a mixture of L-bupivacaine 0.75% and lidocaine 2%.¹²

In our study, we used the same volume of anaesthetic agents and the same surgical technique in all patients. Motor block sufficient for surgery was achieved at 8 mins after injection in both groups and provided sufficient operating conditions without any need for supplementary anaesthesia. Nicholson et al., reported that ocular movement scores were significantly lower in the bupivacaine and lidocaine mixture group than ropivacaine group.¹³ Di Donato et al., compared levobupivacaine 0.5% with ropivacaine 0.75% and showed that levobupivacaine had a more rapid onset and longer duration of motor blockade than ropivacaine.¹⁴ Similarly, Borazan M et al., demonstrated that levobupivacaine 0.75% lower pain scores and ocular movement scores than our ropivacaine group.¹⁵ Our results showed that akinesia and ocular movement scores were similar in our patients received levobupivacaine plus lidocaine compared with bupivacaine plus lidocaine.

In human volunteers, levobupivacaine had less of a negative inotropic effect and, at intravenous doses >75 mg, produced less prolongation of the QTc interval than bupivacaine.^{7,9} In our study, hemodynamic variables were similar between two groups in each study period after recovery. SpO₂ remained within the normal range throughout the study period, with no differences between groups.

Local anaesthetics also have a general anesthetic effect, induced by both the rostral spread of subanesthetic concentrations of bupivacaine within the cerebrospinal fluid and the indirect effects of deafferentation.¹⁷⁻¹⁹ Fewer changes indicative of CNS depression on EEG were evident with levobupivacaine. One of the secondary objectives of this research was to record the level of sedation between treatment groups. Our results showed that sedation scores were significantly higher in Group LB than Group LL in study period.

Reduced cardiovascular toxicity is strongly desirable in patients undergoing cataract surgery, most of whom are elderly and have comorbid cardiovascular disease. The reported incidence of local anaesthetic-induced systemic toxicity in ophthalmic regional anaesthesia is low because of the very small doses injected. Results from investigations showed that levobupivacaine and ropivacaine were less toxic than bupivacaine. We did not detect any serious side effects a difference between levobupivacaine plus lidocaine and the bupivacaine plus lidocaine.

In conclusion, although pain scores were higher in group levobupivacaine plus lidocaine than the other group during surgery, levobupivacaine plus lidocaine and bupivacaine plus lidocaine offered an effective analgesia and adequate operating conditions and highly acceptable for the patients undergoing cataract surgery without any side effects.

However, combination of bupivacaine-lidocaine resulted in higher sedation compared with levobupivacaine plus lidocaine group. Therefore, as levobupivacaine have low cardiotoxic and neurotoxic effects, may be reliable in elderly patients with coexisting disease.

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