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Comparative Study between Lidocaine with levoBupivacaine Versus Lidocaine Bupivacaine mixture for posterior segment surger

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CASE SERIES

Comparative Study Between Lidocaine with Levobupivacaine and Lidocaine-Bupivacaine Mixture for Posterior Segment Surgery

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Abstract

Background: **Local anesthesia relies on patients' comfort, safety, and low complication rates. Nature of proposed surgery, surgeon's preference, and patients' wishes all influence anesthetic need for ophthalmic surgery.**

Objectives: **The aim of this work was to compare lidocaine 2% with levobupivacaine 0.5% versus mixture of lidocaine 2% and bupivacaine 0.5% as low-volume local anesthetic for the eye in posterior segment surgery as double-injection peribulbar anesthesia (supratemporal and infratemporal).**

Patients and methods: **Patients were divided into two groups, with 50 ($n = 50$) patients each, who were randomized using sealed envelopes: group A received lidocaine 2% with bupivacaine 0.5% double-injection peribulbar anesthesia, and group B received lidocaine 2% with levobupivacaine 0.5% in double-injection peribulbar anesthesia.**

Results: **In group A, block failure was reported in two (4%) patients. In group B, no cases of block failure were reported. Supplementary block was required in two (4%) patients in group A and in one (two) patient in group B. No statistically significant difference was found between the two groups regarding block failure or need for supplementary block.**

Conclusion: **Group B had quicker onset, longer duration of action, lower pain scores, and less need for postoperative analgesia. No statistically significant difference was observed between the two groups regarding intraoperative or postoperative problems.**

Keywords: Complication, Levobupivacaine, Lidocaine, Peribulbar anesthesia, Posterior segment surgery

1. Introduction

In developed nations, ophthalmic surgery is the most common surgical procedure needing anesthesia.

Local anesthesia relies on patients' comfort, safety, and low complication rates. Nature of proposed surgery, surgeon's preference, and patients' wishes all influence anesthetic need for ophthalmic surgery.

Eye blocks offer excellent anesthesia for ophthalmic surgery and have good success rates.

Most procedures are carried out under regional anesthesia. Long ago, eye blocks were restricted to retrobulbar anesthesia done by the surgeon with only monitored anesthesia care and no anesthesiologist involved at all. Ophthalmic regional anesthesia is becoming more popular among anesthesiologists.

Once decision to operate is made, anesthetic and surgical processes are clarified to the patients to obtain informed consent. In the operating room, all monitoring and anesthetic equipment should be fully operational. Baseline recordings are acquired by connecting blood pressure, oxygen saturation, and ECG leads. Even though the use of intravenous

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line for topical and subtenon injections has been called into question, intravenous line must be placed before beginning needle block. A secure intravenous line is still considered good clinical practice.

2. Patients and methods

After approval by local ethical committee and informed written consent from each patient, the study was conducted on adult patients of both sexes aged between 40 and 70 years presenting for posterior segment surgery of eye globe under local anesthesia.

Inclusion criteria were 100 adults with ASA I, II, and III, aged from 40 to 70 years, undergoing posterior segment surgery under local anesthesia.

Exclusion criteria were patient refusal, uncooperative patients, patients with coagulation disorders, patients with end-stage liver renal disease, complicated surgery, allergy to amide local anesthetics, extremely high myopia, communication barriers (deafness or languages), intractable cough, and penetrating eye surgeries.

2.1. Groups

Patients were divided into two groups of 50 patients each randomized with a sealed envelope: group A received lidocaine 2% with bupivacaine 0.5% double-injection peribulbar anesthesia, and group B received lidocaine 2% with levobupivacaine 0.5% in double-injection peribulbar anesthesia.

All patients received less than 5 ml of local anesthetic lidocaine with levobupivacaine 0.5% mixture and lidocaine 2% bupivacaine 0.5% mixture.

2.1.1. Anesthetic management

Preoperative assessment was done on the preoperative visit, including history talking, examination (vital signs, chest examination and auscultation, cardiac examination, and heart sounds), and performing routine investigation (CBC, INR, and liver and kidney function tests). The patient was then transferred to the OR. Intravenous cannula (gauge 20–22) was inserted, and oxygen supplementation was initiated (nasal cannula 2–3 l/min). Topical anesthesia drops (benox) and intravenous sedation (midazolam 0.03 mg/kg–fentanyl 30 μg) were initiated. Supratemporal and infratemporal block was given.

2.1.2. Measurements

Vital signs included NIBP, heart rate pulse oximetry, and ECG.

Local anesthetic efficacy was measured in terms of onset of action and local measurements.

Eye globe movement scoring was done as follows

Eyelid movement was scored with a maximum score of 3 for full movement, 2 for moderate movement, 1 for flicker movement, and 0 for no movement.

Globe mobility was scored for each direction of gaze in superior, inferior, medial, and lateral directions, with a maximum score of three points for each direction and a total maximum score of Twelve points at 1-, 3-, 5-, and 10-min interval after injection of local anesthetic. The following parameters were assessed: failure of block, need for intraoperative analgesia as a local anesthesia or sedation, duration of action, need for postoperative analgesia, and occurrence of complication.

Retrospective verbal pain score (RVPS): RVPS is measured at start of surgery, intraocular lens implantation, and at end of surgery. RVPS was assigned on a six-point scale: 0 if there is no pain at all, 1 if there is some moderate pain, 2 if always moderate pain, 3 if occasionally severe pain, and 4 if always moderate, occasionally severe pain, and 5 if discontinuation because of ineffectiveness.

Intraocular pressure (IOP) was measured on the day before operation and 5 min after injection of local anesthetic with digits or pad compression.

Statistics data were collected, tabulated, coded, and then analyzed using SPSS abbreviation is (short for Statistical Package for the Social Sciences, and it's used by various kinds of researchers for complex statistical data analysis. The SPSS software package was created for the management and statistical analysis of social science data. It was originally launched in 1968 by SPSS Inc., and was later acquired by IBM in 2009. Computed software version 22.

If numerical variables had normal distribution, Student test was used to compare between groups or else, Mann–Whitney test was used, which was used for ordinal data.

Fisher's exact test was used whenever appropriate to compare between groups regarding categorical variables. *P* value more than 0.05 was considered statistically important, otherwise it was considered nonsignificant.

3. Results

A total of 100 studied cases undergoing posterior segment surgery under peribulbar anesthesia were enrolled in our study. Group A (50 studied cases) received bupivacaine/lidocaine mixture, whereas group B (50 studied cases) received

Table 1. Patient demographic data (N = 100).

	Group A (N = 50)	Group B (N = 50)	P value
Age			0.532[a]
Mean ± SD	46 ± 7.1	47 ± 6.8	
Range	35–60	34–58	
Sex [n (%)]			0.539[b]
Female	18 (36)	21 (42)	
Male	32 (64)	29 (58)	
BMI (kg/m^2)			0.799[a]
Mean ± SD	26.5 ± 3.7	26.7 ± 4.4	
Range	20.3–34.3	19.1–33.8	
ASA grading [n (%)]			0.773[b]
Grade I	5 (10)	7 (14)	
Grade II	11 (22)	12 (24)	
Grade III	34 (68)	31 (62)	
Duration of surgery (min)			0.764[a]
Mean ± SD	112.5 ± 11.7	113.2 ± 10.1	
Range	90–129	95–130	

[a] Independent sample *t* test.
[b] χ^2 test.

levobupivacaine/lidocaine mixture. Table 1 compares the basic characteristics of enrolled patients, including age, sex, BMI, ASA grading, and duration of surgery. No statistically significant difference was found between groups concerning basic demographic data ($P > 0.05$).

Table 2 compares between groups regarding efficacy parameters, including onset of action, globe movement score, failure of block (cold saline test), the need for supplementary block, duration of action, visual analog scale (VAS) for pain, and need for postoperative analgesia. Group B had quicker onset, longer duration of action, lower pain scores, and less need for postoperative analgesia.

Table 2. Efficacy parameters (N = 100).

	Group A (N = 50)	Group B (N = 50)	P value
Onset of action			0.000[a]
Mean ± SD	224.6 ± 23.4	204.1 ± 10.7	
Range	180–259	180–220	
Globe movement score [n (%)]	0.12 ± 0.4	0.06 ± 0.3	0.431[b]
0	46 (92)	48 (96)	
1	2 (4)	1 (2)	
2	2 (4)	1 (2)	
3	0	0	
Failure of block [n (%)]	2 (4)	0	0.153[b]
Supplementary block [n (%)]	4 (8)	1 (2)	0.169[b]
Duration of action (min)			0.000[a]
Mean ± SD	166.4 ± 8.2	212.4 ± 16.5	
Range	150–180	183–240	
VAS for pain			0.024[a]
Mean ± SD	0.3 ± 0.7	0.06 ± 0.3	
Range	0–3	0–2	
Postoperative analgesia [n (%)]	10 (20)	2 (4)	0.014[b]
RVPS [n (%)]			0.558[b]
0	48 (96)	49 (98)	
1	2 (4)	1 (2)	

RVPS, retrospective verbal pain score; VAS, visual analog scale.
[a] Independent sample *t* test.
[b] χ^2 test.

In group A, block failure was reported in two (4%) patients. In group B, no cases of block failure were reported (Fig. 1). Supplementary block was required in two (4%) patients in group A and in one (two) patient in group B (Fig. 2). No statistically significant difference was shown between groups regarding block failure or need for supplementary block (χ^2 test, $P > 0.05$).

In group A, the mean VAS was 0.3 ± 0.7, ranging between 0 and 30, where 10 (20%) patients required analgesia in the form of intravenous paracetamol and fentanyl. In group B, the mean VAS was 0.06 ± 0.3, ranging between 0 and 2, where two (4%) patients required analgesia in the form of oral paracetamol. A statistically significant difference was shown between groups regarding VAS for pain and need for postoperative analgesia (independent sample *t* test, $P < 0.05$). As shown in Fig. 3, patients who received levobupivacaine had lower pain levels compared with patients who received bupivacaine; therefore, less analgesic requirement was reported with the levobupivacaine group (Fig. 3).

As shown in Table 3, the complicate rate was 10% in group A and 2% in group B. In group A, two (4%) studied cases had hemorrhage and one (2%) developed myotoxicity. In group B, one (2%) patient had myotoxicity secondary to the local anesthetic and one (2%) reported accidental intravenous injection.

In group A, the mean preoperative IOP was 16.8 ± 3.1 mmHg, which increased to 17.3 ± 3.7 mmHg 5 min after injection. Two (4%) patients showed increased IOP. In group B, the mean preoperative IOP was 17.8 ± 2.9 mmHg which increased to 18.3 ± 3.2 mmHg 5 min after the injection. One (2%) patient had increased IOP.

No statistically significant difference was observed between groups regarding intraoperative or postoperative problems (χ^2 test, $P > 0.05$).

4. Discussion

There is still no agreement on the best esthetican aesthetic to use. Although some research findings claim that bupivacaine gives excellent anesthesia quality compared with lidocaine, others claim that ropivacaine is best option.[1]

In this clinical trial study, patients were separated to two groups with 50 patients each, who were randomized with a sealed envelope. Group A received lidocaine 2% with bupivacaine 0.5% double

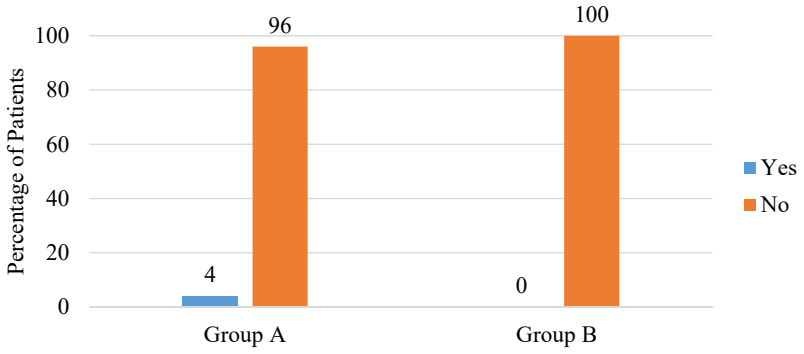

Fig. 1. Failure of block.

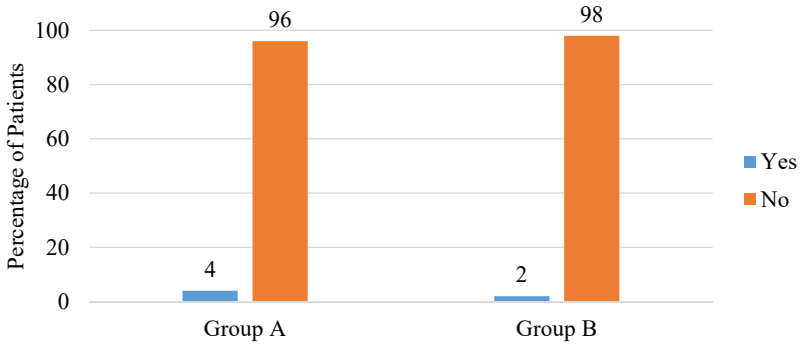

Fig. 2. Need for supplementary block.

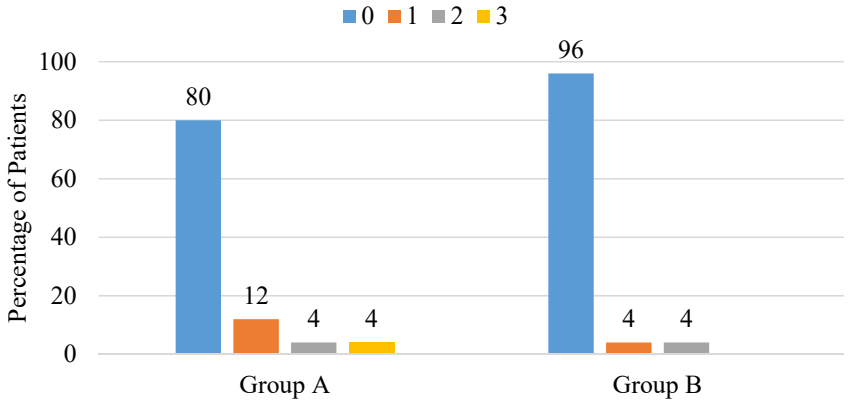

Fig. 3. VAS for pain. VAS, visual analog scale.

injection peribulbar anesthesia, and group B received lidocaine 2% with levobupivacaine 0.5% in double-injection peribulbar anesthesia. All patients received less than 5 ml of local anesthetic lidocaine with levobupivacaine 0.5% mixture and lidocaine 2% bupivacaine 0.5% mixture. The duration of the study ranged from 6 to 12 months.

Comparing the basic characteristics of enrolled patients, including age, sex, BMI, ASA grading, and duration of surgery revealed no statistically significant difference between the groups regarding ($P > 0.05$).

There was only one previous research to compare lidocaine 2% levobupivacaine 0.5% versus mixture

Table 3. Safety parameters (N = 100).

	Group A (N = 50)		Group B (N = 50)		
	Frequency	Percentage	Frequency	Percentage	P value[a]
Complications	5	10	1	2	0.092
Trauma	0	0	0	0	–
Hemorrhage	2	4	0	0	0.153
Myotoxicity	1	2	1	2	1.000
Brainstem anesthesia	0	0	0	0	–
Accidental IV	0	0	1	2	0.264
High IOP	2	4	1	2	0.143

IOP, intraocular pressure.
[a] χ^2 test.

of lidocaine 2% bupivacaine 0.5% as low volume local anesthetic for the eye.[2]

In accordance with our results, the research of Ahmad et al.[2] noted that the research cohort consisted of 150 studied cases aged 40–75 years. Patients were given levobupivacaine 0.5% (group A) and bupivacaine 0.5% (group B) local anesthetics in combination with lidocaine 2% in 3 : 3 volume ratio with hyaluronidase five like adjuvant to raise mixture's absorption and spread. Demographic and descriptive information is provided. Age, BMI, sex, operated eye, ASA classification, axial length of studied eye globe, and surgery duration were not significantly different between groups.

Moreover, in the study by Birt and Cummings,[3] 60 studied cases were needed for research, and all of them completed it. Patients were assigned to one of two groups at random in blocks of 10 from computer-generated series. The first group was given 0.75% levobupivacaine, and the second group was given 0.75% bupivacaine, both with seventy five units/ml hyaluronidase. Both groups shared similar demographic characteristics.

The present research assessed efficacy parameters between the groups. Regarding onset of action, in group A, the mean time to block was 224.6 ± 23.4 s, ranging between 180 and 259 s, and in group B, the mean time to block was 204.1 ± 10.7 s, ranging between 180 and 220 s. A statistically significant difference was shown between groups regarding onset of action (independent sample t test, $P = 0.000$). No statistically significant difference was shown regarding globe movement score (χ^2 test, $P = 0.701$). No statistically significant difference was shown between groups regarding block failure or need for supplementary block (χ^2 test, $P > 0.05$). In group A, the mean duration of action was 166 ± 8 min, ranging between 150 and 180 min, and in group B, the duration of action was 212 ± 16 min, ranging between 183 and 240 min. A statistically significant difference was shown between groups regarding duration of action (independent sample t test, $P = 0.000$).

Outcomes were maintained by a research by Ahmad et al.[2] They found that the primary volume of inferotemporal injection and total volume of local anesthetic did not differ significantly between groups. The mean akinesia score at 2, 5, and 10 min did not differ significantly between groups. The amount of supplementary intraoperative injection requited and supplementary topical anesthetic were comparable between groups.

In the study of Birt and Cummings,[3] the time to onset of block sufficient for surgery was the primary efficacy variable. Findings were summarized. According to statistical analysis, odds of levobupivacaine taking longer to accomplish adequate peribulbar block were nearly twice that of bupivacaine. Even after, at this sample size, variation was not statistically important. Operational conditions were generally very good, with no significant difference in quality between the two groups. In the levobupivacaine group, two studied cases needed extra injections to block orbicularis oculi.

However, in the study by McLure et al.,[4] the onset time to akinesia score of four was displayed. Eyelid opening was still visible in 28 (64%) of lidocaine studied cases and 39 (83%) of levobupivacaine studied cases when extra-ocular muscle motion was scored four and less. At same time, 16 (36%) of lidocaine studied cases and 22 (47%) of levobupivacaine studied cases could close their eyes. Surgeon had no trouble with eyelid motion.

Lai et al.[5] reported that combination of bupivacaine 0.75% and lidocaine 2% produced more akinesia than combination of levobupivacaine 0.75% and lidocaine 2%. As a result, anterior injection of anesthetics increases safety while maintaining block quality.

Need for supplemental injection to ensure satisfactory anesthesia was similar in both groups in this research. Similar outcomes were found by Asku et al.[6] when comparing variation concentrations of levobupivacaine with bupivacaine for retrobulbar and peribulbar blocks.

In addition, Shah and Bhatt[7] stated that all studied cases were randomly assigned to one of two groups: group B received injection bupivacaine 0.5% +lignocaine 2%+hyaluronidase, and group L received injection levobupivacaine 0.5%+lignocaine 2%+hyaluronidase for peribulbar block by akinetic. Total volume of local anesthetic and primary volume injected in inferotemporal region were not significantly different between groups ($P = 0.78$ and 0.79, respectively). Akinesia score at 2, 5, and 10 min did not vary between groups ($P = 0.24$, 0.26, and 0.23, respectively). Number of studied cases that needed supplementary injections and topical anesthetics intraoperatively was comparable between groups. ($P = 0.83$ and 0.54, respectively).

In this study, regarding postoperative pain and analgesia in group A, the mean VAS was 0.3 ± 0.7, ranging between 0 and 30, where 10 (20%) patients required analgesia in the form of intravenous paracetamol and fentanyl. In group B, the mean VAS was 0.06 ± 0.3, ranging between 0 and 2, where two (4%) patients required analgesia in the form of oral paracetamol. A statistically significant difference was shown between groups regarding VAS for pain and need for postoperative analgesia (independent sample t test, $P < 0.05$). Therefore, less analgesic requirement was reported with the levobupivacaine group.

However, in the study of Ahmad et al.,[2] verbal pain score at different times and studied cases' and surgeon's satisfaction are displayed. VPS did not differ significantly between groups immediately after block, at end of surgery, or 4 h later. There was no significant difference between groups in surgeon or studied case satisfaction.

In the study of Birt and Cummings,[3] seven studied cases in each group reported some pain during injection, but only one studied case reported some pain afterward, and no studied cases reported significant pain. Using Fisher's exact test, this outcome was found to be nonsignificant ($P = 1$). There were no substantial variations in time to first postoperative analgesia between groups ($P = 0.63$).

However, McLure et al.[4] revealed that generally, with no big variation in pain scores, both local anesthetic agents gave excellent situations for studied cases. Even so, in lidocaine group, there was a nonsignificant trend toward enhanced perioperative pain.

However, Borazan et al.[8] found no variation in verbal pain scale between studied cases receiving perioperative combination of bupivacaine 0.5% and lidocaine 2% and levobupivacaine 0.75%.

In the study of Botros and Boulos,[9] a total of 30 (75%) studied cases in group L required postoperative pain medication in first 24 h compared with 20 (50%) studied cases in group LD, and this was statistically important ($P = 0.036$). The time to first request of analgesia was significantly longer in patients of group LD (321.54 ± 76.71 min) compared with those in group L (181.3 ± 87.2 min) ($P < 0.0001$). The intramuscular ketorolac consumption was less in group LD (39 ± 17.137 mg) compared with the patients of group L (46 ± 21.909 mg), but it was statistically insignificant ($P = 0.00.235$).

In addition, Shah and Bhatt,[7] noted that verbal pain scores at different times are introduced, as well as studied case and surgeon satisfaction scores. There was no significant difference in verbal pain scale between two groups immediately after block, at end of surgery, and 4 h later ($P = 0.59$, 0.54, and 0.32, respectively). There was no significant difference in surgeon satisfaction and studied cases' satisfaction between groups.

Our results showed that the complicate rate was 10% in group A and 2% in group B. In group A, two (4%) studied cases had hemorrhage and one (2%) developed myotoxicity. In group B, one (2%) patient had myotoxicity secondary to the local anesthetic and one (2%) reported accidental intravenous injection. In group A, the mean preoperative IOP was 16.8 ± 3.1 mmHg, which increased to 17.3 ± 3.7 mmHg 5 min after injection. Two (4%) patients showed increased IOP. In group B, the mean preoperative IOP was 17.8 ± 2.9 mmHg, which increased to 18.3 ± 3.2 mmHg 5 min after the injection. One (2%) patient had increased IOP. No statistically significant difference was observed between groups regarding intraoperative or postoperative problems (χ^2 test, $P > 0.05$).

Outcomes were in line with the research by Ahmad et al.,[2] as they noted that no significant block-related problems happened during the research's duration.

Moreover, McLure et al.[4] demonstrated that there was small conjunctival hemorrhage in 26% of lidocaine studied cases and 36% of levobupivacaine studied cases ($P = 0.26$). Chemosis was observed in 21% of lidocaine studied cases and 18% of levobupivacaine studied cases ($P = 0.79$). There was no statistically significant difference between groups in terms of intraoperative and postoperative problems.

4.1. Conclusion

Group B had faster onset, longer duration of action, lower pain scores, and required less postoperative analgesia. There was no statistically significant difference between groups in terms of intraoperative and postoperative problems.

Conflict of interest

There are no conflicts of interest.

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