Original Research Article

A Comparison of Epidural Levobupivacaine 0.75% with Racemic Bupivacaine for Lower Abdominal Surgery

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Abstract

Background: Racemic bupivacaine has been widely used as a local anesthetic because of its long duration of action and beneficial ratio of sensory to motor block when used for epidural analgesia. Levobupivacaine, the isolated S(2) isomer of bupivacaine, has been shown to be less cardiotoxic than bupivacaine. The present prospective study was conducted to compare Epidural Levobupivacaine 0.75% with Racemic Bupivacaine for lower abdominal surgery.**Materials and Methods:** A randomized, double-blind study was carried out on 80 patients. Patients were divided into two groups of 40 patients each. Group A received 20 ml of 0.75% levobupivacaineepidurally, and Group B received 20 ml of 0.75% bupivacaine epidurally and the characteristics of the sensory and motor blockade in both groups were noted.**Results:** In the present study the mean time to onset of sensory block adequate for surgery (T10) for levobupivacaine group was 13.8mins and for bupivacaine group was 14.3mins. Maximum spread for group A was T7.12dermatome and for group B it was T7.56dermatome Time taken to maximum spread for group A was 25.7mins and for group B it was 26.8mins. The time taken to regression to T10 in group A was 378.5mins and for group B it was 356.3mins. The time taken for complete regression was 551.5mins in group A and 504.7mins in group B. Duration for anesthesia in group A was 368.4mins and group B was 325.5mins. 30 mins time taken to reach bromage scale 0 in Group A (N=9) and Group B(N=6). For bromage scale 1 in group A;n=22 and in group B; n=15 whereas for bromage scale 2 in group A; n=6 and for group B; n=9. For bromage scale 3 in group A; n=3 and for group B; n=10. For max.gradebromage scale 0 in Group A; n=6 and Group B;n=11. For bromage scale 1 in group A;n=15 and in group B; n=5 whereas for bromage scale 2 in group A; n=9 and for group B; n=19. For bromage scale 3 in group A; n=10 and for group B; n=5. In group A hypotension was found in 3 patients, bradycardia in 1 patient and nausea and vomiting in 2 patients whereas in group B hypotension was found in 6 patients, bradycardia in 2 patient and nausea and vomiting in 4 patients.**Conclusion:** The present study concluded that the sensory and motor block produced by 0.75% levobupivacaine is equivalent to that of 0.75% racemic bupivacaine.

Keywords: Epidural Levobupivacaine, Racemic Bupivacaine, Lower Abdominal Surgery.

Introduction

Regional anesthesia means the interruption of impulse conduction in the nerves using specific, reversibly acting drugs (local anesthetics)[1].Lower abdominal and lower extremity surgeries can be carried out both under general anesthesia as well as under central neuraxial block. Epidural block results in the sympathetic blockade, sensory analgesia or anesthesia, and motor blockade, depending on the dose, concentration, or volume of local anesthetic[2]. Epidural anaesthesia is instituted by the injection of drugs through a catheter placed into the epidural space. The injection can result in blocking the transmission of signals through nerve fibers in or near the spinal cord. Three modes of delivery of local anaesthetic can be used;1) continuous infusion 2) PCEA patient controlled extradural analgesia 3) intermittent bolus[3].A person receiving an epidural may receive local anaesthetic, an opioid, or both. Lidocaine, mepivacaine, bupivacaine, ropivacaine, and chloroprocaine are the usually used local anaesthetics[4]. Common opioids include morphine, fentanyl, sufentanil, buprenorphine, tramadol and pethidine. Bupivacaine, the widely used local anaesthetic in regional anaesthesia is available in a commercial preparation as a racemic mixture (50:50) of its two enantiomers, levobupivacaine, S (-) isomer and dextrobupivacaine, R (+) isomer. Several central nervous system and cardiovascular adverse reactions reported in the literature after inadvertent intravascular injection or intravenous regional anaesthesia have been linked to the R (+) isomer of bupivacaine. The levorotatory isomers were shown to have a safer pharmacological profile with less cardiotoxic and neurotoxic effects and it is attributed to its faster protein binding rate. The pure S (-) enantiomers of bupivacaine, i.e., ropivacaine and levobupivacaine were thus introduced into clinical anaesthesia practice[5]. The present prospective study was conducted to compare Epidural Levobupivacaine 0.75% with Racemic Bupivacaine for lower abdominal surgery.

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Materials and Methods

The present prospective study was conducted to compare Epidural Levobupivacaine 0.75% with Racemic Bupivacaine for lower abdominal surgery. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and written consent was taken from the patient after explaining the study, Patients with ASA physical status I–II, aged 18–60 yr scheduled to undergo elective lower abdominal surgery with epidural anesthesia were included in the study. Patients with known hypersensitivity to amide local anesthetics or a history of severe renal, hepatic, respiratory, or cardiac disease or a neurological, neuromuscular, or psychiatric condition were excluded from the study. Eighty patients were included in the study and divided randomly into two groups. After an IV infusion of 500 mL of lactated Ringer's solution, all patients were premedicated with midazolam (1–5 mg). Lidocaine 1% (3 mL) was used to infiltrate the skin and subcutaneous tissues at the L2-3 or L3-4 interspace. The epidural space was identified while patients were in the lateral decubitus position by using an 18-gauge Tuohy needle and a loss of resistance to saline technique. After negative aspiration, 15 microgram of epinephrine was freshly added to 3 mL of a double-blinded study solution containing either 0.75% levobupivacaine or 0.75% racemic bupivacaine and administered through the needle as a "test dose". When there was no evidence of intravascular or subarachnoid injection (heart rate -100 bpm, systolic blood pressure , 90 mm Hg, or presence of sensory block) after 2 min, an additional 17 mL of doubleblinded study solution without epinephrine (either 0.75% levobupivacaine or 0.75% racemic bupivacaine) were administered incrementally over a 5-min period (6-mL injection, 1-min wait, 6-mL injection, 1-min wait, final 5 mL administered). The initial total volume of study drug administered was 20 mL, providing a total dose of 150 mg. The end of injection of study drug was termed "time 0" for the purposes of subsequent patient assessment. A 20-gauge catheter was advanced 3–4 cm into the epidural space and the needle was removed. Intraoperative sedation was provided with additional midazolam, propofol (2 mg/kg to 2.5 mg/kg), and N2O via a laryngeal mask as needed at the discretion of the anesthesiologist. Two hours after study drug administration, all patients received 3 mg of epidural morphine to provide subsequent analgesia, in anticipation of the block from levobupivacaine or bupivacaine resolving. Adequate block to initiate surgery was defined as a sensory block bilaterally to dermatome T10. The time taken to achieve this level of anesthesia was the primary efficacy measure. Secondary measures included: peak block height, time to reach peak block, time to two-segment regression, time to regression to T10, and total duration of sensory block. Sensory block was measured by using the blunt end of a 27-gauge dental needle at 0, 2, 5, 10, 15, 20, 25, 30, and 60 min post-injection and every 30 min thereafter until complete regression of sensory block was observed. The surgical procedure was not started until 30 min after the end of epidural injection. The onset, degree, and duration of motor block were measured in both legs by using a modified Bromage scale and scored as: zero, no paralysis, full flexion of hips, knees, and ankles; one, inability to raise extended leg, able to move knees; two, inability to flex knees, able to flex ankles; or three, inability to move any portion of the lower limb. Motor block was measured at 0, 10, 20, and 30 min post-dose (presurgery), and every 30 min postsurgery until the patient returned to a score of zero in both legs. All adverse events were recorded throughout the study. The recorded data was compiled and data analysis was done. P-value less than 0.05 was considered statistically significant.

Results

In the present study total patients included were 80 which were divided into two groups and anesthesia was given in two groups double blindly. Group A was Levobupivacaine and group B was Bupivacaine. The mean time to onset of sensory block adequate for surgery (T10) for levobupivacaine group was 13.8mins and for bupivacaine group was 14.3mins. Maximum spread for group A was T7.12dermatone and for group B it was T7.56dermatone. Time taken to maximum spread for group A was 25.7mins and for group B it was 26.8mins. The time taken to regression to T10 in group A was 378.5mins and for group B it was 356.3mins. The time taken for complete regression was 551.5mins in group A and 504.7mins in group B. Duration for anesthesia in group A was 368.4mins and group B was 325.5mins. 30 mins time taken to reach bromage scale 0 in Group A (N=9) and Group B(N=6). For bromage scale 1 in group A;n=22 and in group B; n=15 whereas for bromage scale 2 in group A; n=6 and for group B; n=9. For bromage scale 3 in group A; n=3 and for group B; n=10. For max.gradebromage scale 0 in Group A; n=6 and Group B;n=11. For bromage scale 1 in group A;n=15 and in group B; n=5 whereas for bromage scale 2 in group A; n=9 and for group B; n=19. For bromage scale 3 in group A; n=10 and for group B; n=5. In group A hypotension was found in 3 patients, bradycardia in 1 patient and nausea and vomiting in 2 patients whereas in group B hypotension was found in 6 patients, bradycardia in 2 patient and nausea and vomiting in 4 patients.

Table 1: Effectiveness of sensory block

Variable	Group A Levobupivacaine Mean±SD	Group BBupivacaine Mean±SD	p-Value
Onset to T10 (min)	13.8±4.8	14.3±10.3	<0.05
Maximum spread (dermatomes)	7.12±1.67	7.56±2.12	
Time to maximum spread (min)	25.7±9.8	26.8±10.7	
Regression to T10 (min)	378.5±85.6	356.3±96.7	
Time to complete regression (min)	551.5±84.9	504.7±70.4	
Duration (min)	368.4±87.6	325.5±93.4	

Table 2: Lower extremity motor block (Bromage score) after 30 min and max. grade

Bromage score	Group A No. of patients		Group B No. of patients	
	After 30 mins	Max. grade	After 30 mins	Max. grade
0	9	6	4	11
1	22	15	9	5
2	6	9	21	19
3	3	10	6	5

Table 3: Side effects between two groups

Side effects	Group A	Group B
Hypotension	**3**	**6**
Bradycardia	**1**	**2**
Nausea & Vomiting	**2**	**4**

Discussion:

Epidural anaesthesia is widely practiced regional anaesthesia technique for many lower abdominal and lower limb surgeries. Beneficial effects of epidural anaesthesia over spinal anaesthesia are decreased frequency of hypotension, extended duration of surgery and effective postoperative analgesia.The local anaesthetic drugs currently available for epidural anaesthesia offer a varied degree of efficacy, from drugs of low potency such as Procaine to drugs eight to ten times potent such as Etidocaine and Bupivacaine. Unfortunately, as the potency of local anaesthetics increases so does their toxicity. Bupivacaine, one of the most widely utilized local anaesthetics, has been the subject of intense investigation because of sudden cardiovascular collapse in some patients[6-8]. Levobupivacaine is a new amino-amide local anaesthetic agent similar in structure to Bupivacaine. Levobupivacaine is prepared as the s-isomer rather than a racemic mixture such as Bupivacaine. Previous studies involving the isomers of local anaesthetics suggest that the systemic toxicity of the S-isomer of various compounds may be less than that of racemic preparations.Bupivacaine (1-butyl-2,6-pipecoloxylidide) was synthesized by Ekenstam *et al*. 1957 and was first introduced into clinical use in 1963[9]. Bupivacaine is the most commonly used drug for the central neuraxial blockade. Bupivacaine is a racemic mixture of equal amounts of the optic isomers levobupivacaine and dextrobupivacaine, which is known as S(−) and R(+) enantiomers[10].Cox CR et. al who conducted a study comparing Levobupivacaine with Bupivacaine found no significant differences in the onset time of sensory block[11].

CasatiA et. al concluded that Levobupivacaine 0.5% produces an epidural sensory block of similar onset as that produced by the same volume of 0.5% Bupivacaine.[12]

Kopacz et al conducted a study and found that Levobupivacaine and Bupivacaine showed equivalent efficacy for the time taken to reach sensory block adequate for surgery. Sensory block at T10 was achieved within 15 minutes of administering the epidural injection and both groups and the maximum spread of sensory block was observed within 30 minutes.[13]

Bergamaschi *et al*[14]observed a slower onset of the motor blockade with levobupivacaine compared to bupivacaine, which was similar to our findings. He also observed hypotension in 66.7% of levobupivacaine patients and 43.5% of bupivacaine patients. This could be due to his study population, where the study patients were parturient posted for a lower segment cesarean section.

De Negri *et al*.[15] concluded that bupivacaine had significantly higher motor block compared to the levobupivacaine and ropivacaine groups.

Locatelli *et al*.[16] also showed higher motor blockade in the bupivacaine group compared to levobupivacaine, unlike our study.

Casati *et al*.[17] conducted a double-blind study and observed that the onset time of sensory block and two-segment regressions in his study.

Kopacz et al, reported that hypotension was the most common side effect and was experienced by a similar proportion of patients in both treatment groups at the start of surgery (21% levobupivacaine, 18% bupivacaine) and during surgery (32% in both treatment groups).[13]

Conclusion

The present study concluded that the sensory and motor block produced by 0.75% levobupivacaine is equivalent to that of 0.75% racemic bupivacaine.

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