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INTRATHECAL HYPERBARIC LEVO BUPIVACAINE FOR ABDOMINAL AND LOWER LIMB SURGERIES: A CASE SERIES

Anaesthesiology

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ABSTRACT

Introduction: Spinal anesthesia is widely used for lower abdominal surgeries. Levobupivacaine offers a safer alternative to bupivacaine with reduced cardiotoxicity and faster recovery. **Objective:** Evaluate the efficacy, sensory and motor blockade duration, and hemodynamic effects of Hyperbaric Levobupivacaine 0.5% in spinal anesthesia for lower abdominal and limb surgeries. **Materials and Methods:** A prospective study of 30 ASA I and II patients, aged 18-60, undergoing abdominal and lower limb surgeries at Indian Institute of Medical Science & Research, Jalna, with ethical approval. **Results:** Levobupivacaine induces sensory block at T10 in 3.93 minutes, peaks at T6-T8 in 6.66 minutes, and achieves complete motor block in 5.8 minutes. Sensory block regresses by two segments in 127.33 minutes, full motor recovery occurs in 205 minutes, and pain relief lasts 229.3 minutes on average before additional analgesia is needed. **Conclusion:** Levobupivacaine is as effective as bupivacaine for spinal anesthesia, with similar onset and pain relief durations but with a lower incidence of hypotension and bradycardia, making it a safer alternative.

KEYWORDS

Spinal Anesthesia, Levobupivacaine, Abdominal and Lower Limb Surgeries.

INTRODUCTION

Spinal anesthesia, pioneered by August Bier, involves injecting a local anesthetic into the cerebrospinal fluid (CSF) to achieve targeted numbness from the abdomen to the lower limbs. This technique, also known as subarachnoid block (SAB), offers high success rates, patient satisfaction, minimal complications, and effective postoperative pain relief. It supports faster recovery, reduces opioid use, and facilitates smoother postoperative experiences. [1]

Spinal anesthesia ideally provides rapid onset, adequate duration, effective postoperative analgesia, and supports early ambulation and timely voiding, leading to quicker patient discharge.[2, 3] Recent advancements in local anesthetics include bupivacaine, favored for its long action and dense sensory block but limited by cardiotoxicity. [4] Bupivacaine is available as a racemic mixture of its enantiomers: Levobupivacaine (S-isomer) and Dextrobupivacaine (R+-isomer). [5] The R+-isomer is linked to severe adverse reactions, while Levobupivacaine, with its safer profile and reduced cardiac and neurotoxic side effects, offers more predictable drug distribution, less hypotension, and earlier motor recovery. [6,7,8,9]

Aims & Objectives:

The study aims to evaluate the effectiveness of hyperbaric levobupivacaine 0.5% in spinal anesthesia by examining its potency, monitoring intraoperative hemodynamic changes, and assessing its impact on sensory and motor blockade. It also seeks to identify any adverse drug reactions and determine the duration of postoperative analgesia.

Methodology:

Study Design: Prospective, observational.
Setting: Indian Institute of Medical Science & Research, Jalna, approved by the Institutional Ethical Committee.
Population: Patients scheduled for elective abdominal and lower limb surgeries under subarachnoid block.
Duration: August 2023 – September 2023 (2 months).
Sample Size: 30.
Preliminaries: Patients received detailed procedure explanations, gave written consent, and fasted for 8 hours. Identification, surgery type, and site were confirmed, and emergency equipment was prepared.

RESULTS-

A total of 30 patients (42.64 ± 15.82 years old, 43.3% male, 56.7% female) classified as ASA I and II underwent various surgical procedures, including open Appendicectomy, Orchidectomy, Hernioplasty, hysterectomy, arthroscopy, and urology procedures. Each received 4 ml (20 mg) of hyperbaric levobupivacaine intrathecally. The mean surgery duration was 102.63 minutes (±21.86 minutes), with 21 (70%) abdominal and 9 (30%) lower limb surgeries.

Levobupivacaine provides a rapid onset of sensory block, reaching the T10 level in about 3.93 minutes, and peaks at T6-T8 in approximately 6.66 minutes. Complete motor block, defined as Modified Bromage Scale (MBS) 1, is achieved in about 5.8 minutes. Sensory block regresses by two dermatomal segments in around 127.33 minutes, while full motor recovery occurs in about 205 minutes. Effective pain relief lasts an average of 229.3 minutes before additional analgesia is needed. Overall, levobupivacaine offers rapid sensory block onset, effective pain control, and extended relief, making it a valuable option for spinal anesthesia.

(Table 1: Sensory and Motor block)

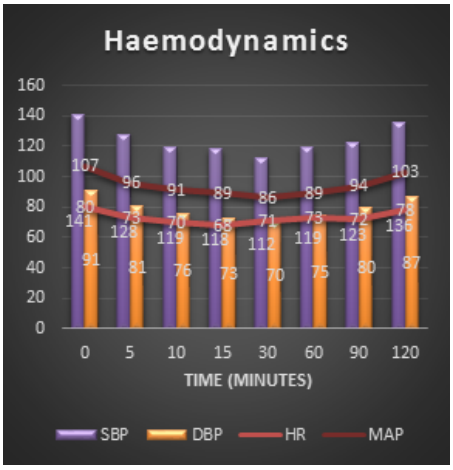
No	VARIABLES	MEAN ± SD (minutes)
1	Onset of sensory block (T10)	3.93 ± 0.46
2	Maximum sensory block (T6/T8)	6.66 ± 0.63
3	Complete motor block (MBS 1)	5.8 ± 0.43
4	Two segment regression	127.33 ± 11.41
5	Complete motor reversal (MBS 5)	205 ± 13.36
6	Duration for Rescue Analgesia (NRS > 3)	229.3 ± 16.35

(Table 2: Mean values of haemodynamic variables)

Parameter	Mean HR (min)	Mean SBP (mmhg)	Mean DBP (mmhg)	Mean MAP (mmhg)
Baseline	80.4±14.36	140.7±19.72	90.9±7.80	107.5±7.31
5 min	72.6±11.25	127.7±20.16	81.3±8.35	96.3±9.58
10 min	70.4±8.85	119.3±15.68	76.21±9.31	90.8±11.16
15 min	67.7±9.61	118.9±13.80	73.43±8.87	89.2±12.47
30 min	71.4±13.20	112.9±14.21	70.4±10.27	86.6±10.17
60 min	73.2±9.17	118.8±12.70	75.7±8.46	89.3±9.57
90 min	71.5±10.26	123.2±16.83	79.7±11.17	94.3±8.74
120 min	78.3±11.34	136.8±12.51	87.4±9.55	103.3±11.17

Spinal anesthesia with levobupivacaine typically causes a drop in heart rate and blood pressure, with the lowest values observed within the first 15 minutes. Both vital signs generally improve and return to baseline levels by around 120 minutes.

Adverse reactions included hypotension in 3 patients (9.9%), defined as a ≥20% drop in systolic blood pressure or <90 mmHg, which was managed with a 6 mg IV dose of Mephentermine. Bradycardia, with a heart rate of 42 bpm in 1 patient (3.3%), was treated with 0.6 mg IV Atropine. There were no cases of nausea, vomiting, pruritus, tachycardia, hypertension, or respiratory depression.



(Figure 1: Haemodynamics intraoperatively)

DISCUSSION:

Regional anaesthesia has revolutionized surgical pain management by reducing stress responses, enhancing hemodynamic stability, minimizing respiratory issues, and lowering the risk of blood loss and thromboembolic events. Bupivacaine, commonly used in spinal anesthesia for its long-acting effects, poses risks such as hypotension, bradycardia, cardiotoxicity, and neurotoxicity. Levobupivacaine, the S(-)-enantiomer of bupivacaine, is emerging as a safer alternative due to its higher protein binding affinity, which reduces the risk of toxicity and decreases cardiovascular and CNS side effects.

1) In our study, the onset of sensory block with levobupivacaine at the T10 level occurs in about 3.93 minutes. This is consistent with Girish B K et al [11], who reported onset times of 1.5 to 4 minutes for bupivacaine and 2 to 5 minutes for levobupivacaine at the T12 level, as well as findings by Gulen Guler et al [8] and J.F. Luck et al [10]. Ramakrishna Reddy et al [12] also found no significant difference in onset times between levobupivacaine and bupivacaine. The maximum sensory block, reaching T6 to T8, is achieved in approximately 6.66 minutes.

2) In our study, complete motor block (MBS 1) is achieved in about 5.8 minutes. Girish B K et al [11] reported shorter times for levobupivacaine (4.21 minutes) and bupivacaine (3.58 minutes). Ramakrishna Reddy et al [12] found a similar duration of 6.24 ± 1.64 minutes, while Guler et al [8] and Vanna et al [14] reported mean times of 4.10 ± 0.88 minutes and 3.90 ± 1.71 minutes, respectively. Ajay et al [13] observed 4.3 ± 1.7 minutes for MBS Grade 2.

3) In our study, sensory block regresses by two segments in about 127.33 minutes. Girish B K et al [11] reported similar durations for levobupivacaine (130 minutes) and bupivacaine (132 minutes), while Ajay et al [13] found 133.5 ± 15.8 minutes for levobupivacaine and 137.4 ± 12.3 minutes for bupivacaine. These findings indicate that the regression of sensory block with levobupivacaine is comparable to bupivacaine.

4) In our study, motor function fully recovers to MBS Grade 5 in approximately 205 minutes. Girish B K et al [11] reported recovery times of 188.50 ± 12.39 minutes for bupivacaine and 182 ± 12.3 minutes for levobupivacaine. Similarly, J.F. Luck et al [10] observed comparable durations. Ajay et al [13] noted 185.9 ± 20.3 minutes for levobupivacaine and 196.4 ± 21.2 minutes for bupivacaine. These results align closely with our findings, indicating similar motor recovery profiles for levobupivacaine and bupivacaine.

5) In our study, effective pain relief from anesthesia lasts approximately 229.3 minutes before rescue analgesia is needed, demonstrating the prolonged efficacy of levobupivacaine. Girish B K et al [11] found that the mean duration of postoperative analgesia was 194 minutes for levobupivacaine, compared to 211 minutes for bupivacaine. Ajay et al [13] reported that the duration of postoperative analgesia for levobupivacaine was 238.2 ± 19.1 minutes, while for bupivacaine it was 243.9 ± 13.8 minutes. These results are similar, indicating comparable durations of effective pain relief between the two anesthetics.

6) In our study, we recorded 2 cases of hypotension and 1 instance of bradycardia. Ajay et al [13] noted a higher incidence of hypotension with bupivacaine compared to levobupivacaine. Levobupivacaine has a safety margin of 1.3, meaning toxic effects occur only after a 30% concentration increase, and it requires higher levels to cause cardiac or neurotoxic effects than bupivacaine. This enhanced safety profile makes levobupivacaine a preferable choice, offering similar efficacy with better safety.

CONCLUSION:

In conclusion, levobupivacaine demonstrates comparable efficacy to bupivacaine in spinal anaesthesia, with a relatively slower but similar onset time for sensory and motor blocks, and comparable durations for sensory block regression and pain relief. Notably, levobupivacaine offers a safer profile, with a lower incidence of hypotension and bradycardia, and a higher safety margin against toxicity. This combination of robust performance and enhanced safety makes levobupivacaine a compelling choice for spinal anaesthesia, offering a safer and equally effective alternative to bupivacaine.

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