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Original Article

Comparing Anaesthesia Efficacy Between Bupivacaine and its Levo-Isomer Levobupivacaine in Subarachnoid Block Using Combined Spinal Epidural Anaesthesia Technique for Infraumbilical Surgeries: A Randomized Controlled Trial

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ABSTRACT

Introduction: Combined spinal epidural (CSE) anaesthesia combines the rapid onset of spinal anaesthesia with the flexibility of epidural analgesia, making it suitable for infraumbilical surgeries. Although hyperbaric bupivacaine is the standard intrathecal agent, levobupivacaine, its S(-)-enantiomer, has been introduced because of its improved cardiovascular safety profile while maintaining comparable anaesthetic efficacy. This study compared the efficacy and safety of hyperbaric bupivacaine and levobupivacaine in CSE anaesthesia for infraumbilical surgeries.

Aim: To compare the duration of two segment dermatomal regression following intrathecal administration of (0.5%) hyperbaric bupivacaine versus (0.5%) hyperbaric Levobupivacaine in patients undergoing infraumbilical surgery.

Methods: This prospective, randomized, double-blind comparative trial included 80 ASA I–II patients aged 18–60 years undergoing infraumbilical surgeries. Forty patients in Group B, received 3mL of intrathecal hyperbaric bupivacaine and forty patients in Group LB received 3mL of hyperbaric levobupivacaine. Primary outcomes included Time required for two-segment dermatomal regression., while secondary outcomes included Time to reach T10 sensory block, total duration of anaesthesia, motor block (Modified Bromage score), haemodynamic parameters, time to first analgesic requirement, rescue analgesia requirement and adverse effects.

Results: Baseline characteristics were comparable between groups. Bupivacaine was associated with a significantly longer time to two-segment dermatomal regression than levobupivacaine. Group B vs Group LB (103.28±13.63 vs. 93.03±23.85 min; p=0.020) and total anaesthesia duration (199.35±28.05 vs. 175.90±26.01 min; p=0.001), with lower rescue analgesic

requirement (17.5% vs. 40.0%; p=0.026). However, levobupivacaine showed significantly fewer hypotensive episodes (0% vs. 12.5%; p=0.021) and better haemodynamic stability, while postoperative pain scores and onset of sensory block were comparable.
Conclusion: Both agents provided effective spinal anaesthesia for infraumbilical surgeries. Bupivacaine offered longer anaesthetic duration and reduced rescue analgesic requirement, whereas levobupivacaine demonstrated superior haemodynamic stability with comparable sensory and motor blockade, making it a safer alternative, particularly in patients at risk of hypotension.

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Keywords*: Bupivacaine; Levobupivacaine; Combined spinal epidural anaesthesia; Subarachnoid block; Infraumbilical surgery; Haemodynamic stability.*

INTRODUCTION

Subarachnoid block (SAB), commonly referred to as spinal anaesthesia, is one of the most frequently employed regional anaesthetic techniques for infraumbilical surgeries because of its rapid onset, profound sensory and motor blockade, excellent muscle relaxation, and avoidance of airway manipulation. It is widely used for lower abdominal, pelvic, urological, gynaecological, and lower limb procedures owing to its simplicity, reliability, and favourable safety profile. Despite these advantages, spinal anaesthesia alone has certain limitations, including a fixed duration of action, inability to prolong postoperative analgesia, and the potential for haemodynamic instability, particularly hypotension and bradycardia resulting from sympathetic blockade. Therefore, techniques that improve the quality and flexibility of neuraxial anaesthesia have gained increasing importance in modern anaesthetic practice. [1, 2]

Combined spinal epidural (CSE) anaesthesia integrates the advantages of both spinal and epidural techniques. The spinal component provides rapid and dense anaesthesia, while the epidural catheter offers the flexibility to extend the duration of anaesthesia and provide effective postoperative pain management. This combination allows anaesthesiologists to achieve reliable surgical anaesthesia with the option of supplementing inadequate block or prolonging analgesia without repeated needle punctures. Consequently, CSE has become a preferred neuraxial technique for prolonged infraumbilical procedures and surgeries where postoperative analgesia is desirable. [3, 4]

Bupivacaine has long been regarded as the gold standard local anaesthetic for spinal anaesthesia because of its potent sensory blockade, prolonged duration of action, and predictable clinical profile. It is an amide-type local anaesthetic consisting of equal proportions of R (+) and S (–) enantiomers. Although highly effective, racemic bupivacaine has been associated with dose-dependent cardiotoxicity and central nervous system toxicity, especially following accidental intravascular injection or systemic absorption. The R-enantiomer has been identified as primarily responsible for these adverse cardiovascular and neurological effects, prompting the search for safer alternatives without compromising anaesthetic efficacy. [5]

Levobupivacaine, the pure S (–)-enantiomer of bupivacaine, was developed to reduce the toxic potential while maintaining similar anaesthetic properties. It demonstrates comparable potency and duration of action but exhibits lower affinity for myocardial sodium channels and reduced penetration into the central nervous system, thereby offering a superior safety profile.

Experimental and clinical studies have shown that levobupivacaine produces less myocardial depression, fewer arrhythmias, and reduced neurotoxicity compared with racemic bupivacaine, making it particularly attractive in patients at increased cardiovascular risk. [6,7]

Several clinical studies have compared intrathecal bupivacaine and levobupivacaine for lower abdominal and lower limb surgeries. While both agents provide effective surgical anaesthesia, differences have been reported regarding onset time, maximum sensory block, motor block intensity, duration of analgesia, haemodynamic stability, and recovery profile. Bupivacaine generally produces a slightly denser and longer motor block, whereas levobupivacaine has been associated with earlier motor recovery and improved haemodynamic stability. These characteristics may facilitate earlier ambulation and reduce postoperative complications, particularly in ambulatory and enhanced recovery surgical protocols. [8]

The choice of local anaesthetic in CSE anaesthesia becomes particularly important because the spinal component determines the initial surgical conditions, whereas the epidural component allows subsequent supplementation. An ideal spinal local anaesthetic should provide rapid onset, adequate sensory block, minimal haemodynamic disturbances, predictable duration, and favourable recovery characteristics. Levobupivacaine has emerged as a promising alternative because it may achieve comparable sensory anaesthesia with reduced cardiovascular adverse effects. However, evidence

comparing its efficacy with racemic bupivacaine specifically in the setting of CSE anaesthesia for infraumbilical surgeries remains limited, and published studies have reported variable findings depending on dose, baricity, and patient characteristics. [9]

A comprehensive comparison between bupivacaine and levobupivacaine using the CSE technique is therefore clinically relevant. Parameters such as onset of sensory and motor blockade, maximum block height, duration of anaesthesia, haemodynamic changes, postoperative analgesia, recovery profile, adverse events, and patient satisfaction require systematic evaluation to determine the optimal intrathecal agent. Such evidence can help anaesthesiologists individualise anaesthetic management and improve perioperative safety while maintaining excellent surgical conditions. [10].

MATERIALS AND METHODS

Study Setting:
Department of Anaesthesiology, Central Referral Hospital, Sikkim Manipal Institute of Medical Sciences, Gangtok, Sikkim, India (737102).

Study Design:
Prospective, randomized, double-blind, comparative clinical trial.

Study Duration:
Eighteen months.

Study Participants:
Adult patients of either sex, aged 18–60 years, with ASA physical status I and II, weighing 45–75 kg, who were scheduled to undergo elective or emergency infraumbilical surgeries under Combined Spinal Epidural Anaesthesia (CSEA) with intrathecal administration of the study drug, while the epidural catheter was reserved for rescue anaesthesia if required.

Sample Size: 80

Inclusion Criteria:

- Adult patients aged 18–60 years.
- ASA physical status grade I and II.
- Patients of either sex.
- Patients scheduled for elective or emergency infraumbilical surgeries.
- . Patients who provided written informed consent

Exclusion Criteria:

- Patients who refused to undergo subarachnoid block (SAB) or combined spinal epidural anaesthesia (CSEA).
- Known hypersensitivity or allergy to the study drugs.
- Gross spinal deformity.
- Local infection at the intended injection site.
- Coagulopathy.
- Pre-existing neuropathy.
- Head injury.
- ASA physical status grade III or IV.
- Obstetric patients.

Statistical Analysis: Data were analyzed using SPSS version 26.0. Continuous variables were expressed as Mean ± Standard Deviation (SD), while categorical variables were expressed as frequencies and percentages. Continuous variables were compared using the Independent Sample t-test, and categorical variables were analyzed using the Chi-square test. A p-value <0.05 was considered statistically significant.

RESULT

TABLE 1: BASELINE CHARACTERISTICS OF THE STUDY PARTICIPANTS

	Variable	Bupivacaine (n = 40)	Levobupivacaine (n = 40)	P-value
Age (years)	Mean ± SD	36.88 ± 14.31	39.15 ± 11.73	0.439
Gender	Male, n (%)	30 (75.0)	26 (65.0)	0.329
	Female, n (%)	10 (25.0)	14 (35.0)	
Weight	Mean ± SD	65.78 ± 5.00	65.83 ± 4.62	0.963

(kg)				
ASA	ASA Grade I, n (%)	29 (72.5)	26 (65.0)	0.469
	ASA Grade II, n (%)	11 (27.5)	14 (35.0)	
Type of surgery	Elective surgery, n (%)	39 (97.5)	39 (97.5)	1.000
	Emergency surgery, n (%)	1 (2.5)	1 (2.5)	

n= No. of Patients

TABLE 2: PRIMARY AND SECONDARY ANAESTHETIC OUTCOMES

Outcome	Bupivacaine (n = 40)	Levobupivacaine (n = 40)	P-value
Time for two-segment dermatomal regression (min), Mean ± SD	103.28 ± 13.63	93.03 ± 23.85	0.020
Time to reach T10 sensory block (min), Mean ± SD	**2.48 ± 53.08**	**3.02 ± 98.63**	**0.074**
Total duration of anaesthesia (min), Mean ± SD	**199.35 ± 28.05**	**175.90 ± 26.01**	**0.001**
Time to first analgesic requirement (min), Mean ± SD	**186.05 ± 25.13**	**175.40 ± 25.79**	**0.065**
Highest sensory level achieved	**T6**	**T6**	**Not Significant**

n= No. Of Patients

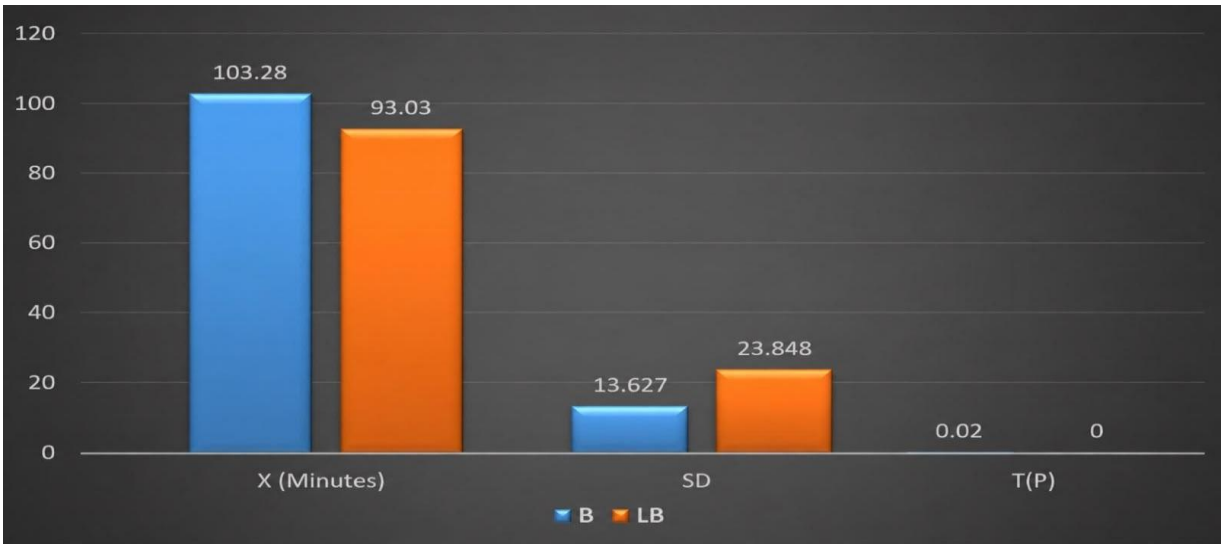

Figure 1: Mean time required to Two Dermatomal Regression in minutes

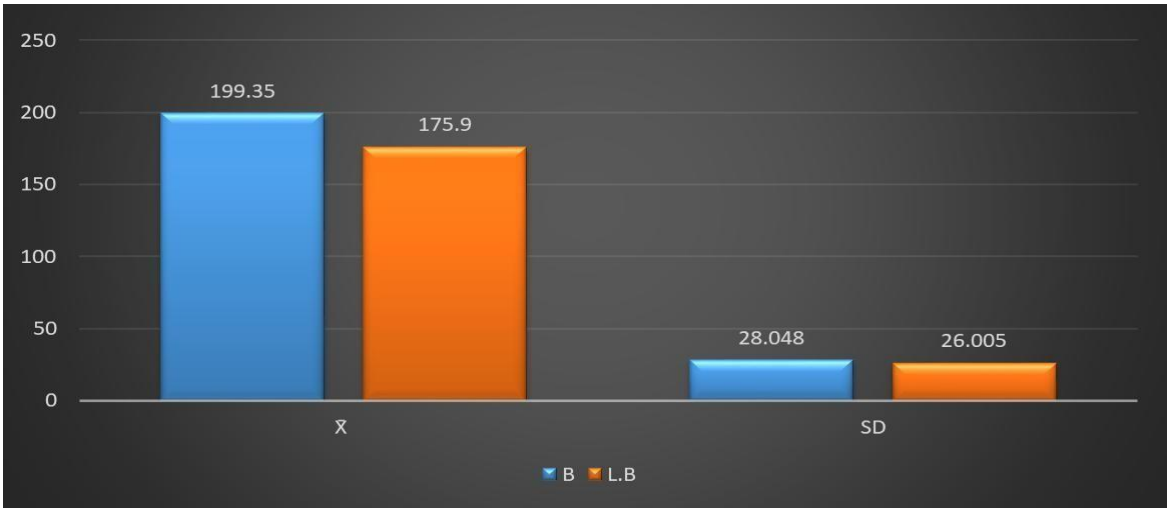

Figure 2 :Mean Total time Duration of Anaesthesia in minutes

TABLE 3: MOTOR BLOCK AND RESCUE ANALGESIA

	Variable	Bupivacainen=40	Levobupivacaine n=40	P-value
Rescue Anaesthesia	Rescue analgesia required, n (%)	7 (17.5)	16 (40.0)	**0.026**
	No rescue analgesia required, n (%)	33 (82.5)	24 (60.0)	
Bromage score	Bromage score at 2 min	1.225	2.400	
	Bromage score at 4 min	1.000	1.500	
	Bromage score at 6 min	0.675	0.725	
	Bromage score at 10 min	0.000	0.400	
	Bromage score at 30 min	0.000	0.000	

n= No. of Patients

TABLE 4: SAFETY PROFILE AND ADVERSE EFFECTS

	Variable	Bupivacaine (n = 40)	Levobupivacaine (n = 40)	P-value
Adverse effects	Shivering, n (%)	7 (17.5)	2 (5.0)	
	Nausea	0	0	
	Vomiting	0	0	
	Neurotoxicity	0	0	
	Arrhythmia	0	0	
Hypotension	Yes	5 (12.5)	0 (0.0)	**0.021**
	No	35 (87.5)	40 (1.0)	

n= No. Of Patients

TABLE 5: POSTOPERATIVE PAIN

Variable	Bupivacaine	Levobupivacaine	P-value
VAS score (Mean ± SD)	1.35 ± 1.35	1.70 ± 1.74	0.318

n= No. Of Patients

TABLE 6: HAEMODYNAMIC PARAMETERS

	Parameter	Bupivacaine (Mean ± SD)	Levobupivacaine (Mean ± SD)	P-value
SBP	Baseline SBP (mmHg)	129.90 ± 5.76	131.00 ± 13.50	0.637
	Lowest SBP (mmHg)	90.85 ± 10.88	110.65 ± 8.92	**<0.001**
DBP	Baseline DBP (mmHg)	90.76 ± 9.52	78.48 ± 11.02	0.243
	Lowest DBP (mmHg)	68.38 ± 9.60	70.53 ± 7.14	**0.001**
MAP	Baseline MAP (mmHg)	93.63 ± 6.32	94.50 ± 9.71	0.636
	Lowest MAP (mmHg)	63.40 ± 9.42*	68.60 ± 9.32*	**<0.001**
HR	Baseline heart rate (beats/min)	90.35 ± 11.99	94.03 ± 17.48	0.270

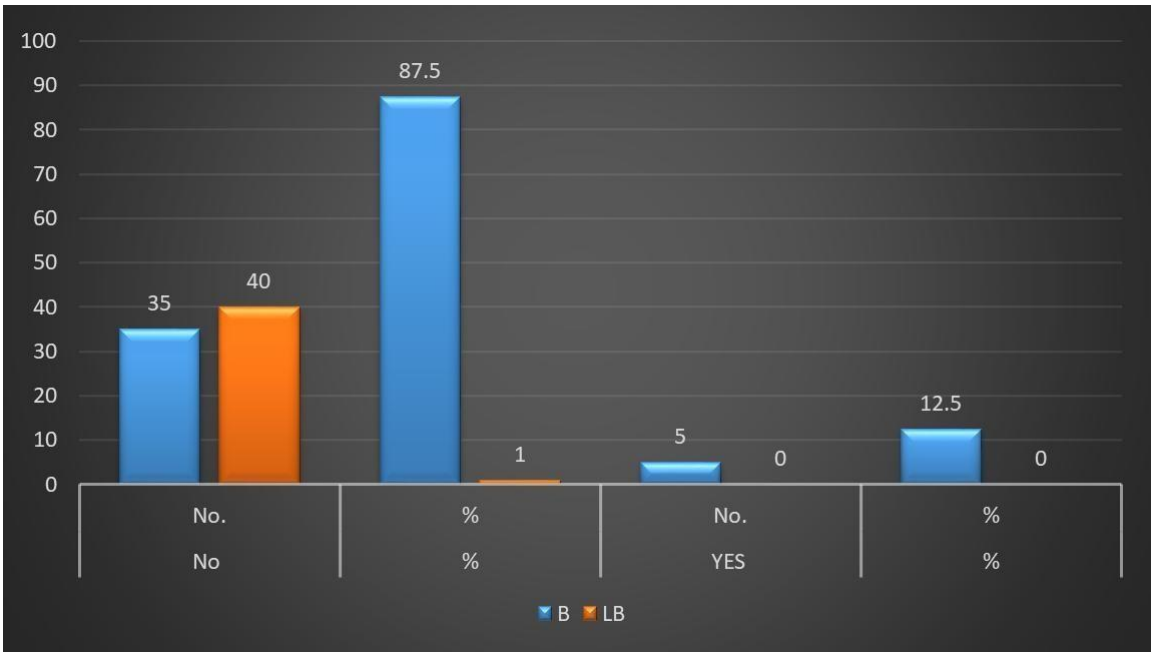

Figure 3:Drug Related Hypotension

A total of 80 patients were included in the study, with 40 patients in the Bupivacaine group and 40 patients in the Levobupivacaine group. The mean age was 36.88 ± 14.31 years in the Bupivacaine group and 39.15 ± 11.73 years in the Levobupivacaine group (p = 0.439). Male patients constituted 30 (75.0%) in the Bupivacaine group and 26 (65.0%) in the Levobupivacaine group, while female patients accounted for 10 (25.0%) and 14 (35.0%), respectively (p = 0.329). The mean body weight was comparable between the groups, being

65.78 ± 5.00 kg in the Bupivacaine group and 65.83 ± 4.62 kg in the Levobupivacaine group (p = 0.963). Regarding ASA physical status, 29 patients (72.5%) in the Bupivacaine group and 26 patients (65.0%) in the Levobupivacaine group belonged to ASA Grade I, whereas 11 patients (27.5%) and 14 patients (35.0%), respectively, were classified as ASA Grade II (p = 0.469). Elective surgeries were performed in 39 patients (97.5%) in each group, while emergency surgeries were performed in 1 patient (2.5%) in each group (p = 1.000). These findings indicate that the two groups were comparable with respect to baseline demographic characteristics, ASA status, and type of surgery, with no statistically significant differences between them (p > 0.05).

The mean time for two-segment dermatomal regression was significantly longer in the Bupivacaine group (103.28 ± 13.63 minutes) compared with the Levobupivacaine group (93.03 ± 23.85 minutes) (p = 0.020). The mean time to achieve the T10 sensory block was 148.88 ± 53.08 seconds in the Bupivacaine group and 180.95 ± 98.63 seconds in the Levobupivacaine group; however, this difference was not statistically significant (p = 0.074). The total duration of anaesthesia was significantly longer in patients receiving Bupivacaine (199.35 ± 28.05 minutes) than in those receiving Levobupivacaine (175.90 ± 26.01 minutes) (p = 0.001). The mean time to first analgesic requirement was 186.05 ± 25.13 minutes in the Bupivacaine group and 175.40 ± 25.79 minutes in the Levobupivacaine group, with no statistically significant difference between the groups (p = 0.065). The highest sensory level achieved was predominantly T6 in patients (100%) of both groups, with no significant difference observed between them (NS).

Rescue analgesia was required in 7 patients (17.5%) in the Bupivacaine group compared with 16 patients (40.0%) in the Levobupivacaine group, while no rescue analgesia was required in 33 patients (82.5%) and 24 patients (60.0%), respectively. This difference was statistically significant (p = 0.026), indicating a lower requirement for rescue analgesia in the Bupivacaine group. Assessment of motor block using the Bromage score showed mean scores of 1.225 and 2.400 at 2 minutes, 1.000 and 1.500 at 4 minutes, 0.675 and 0.725 at 6 minutes, 0.000 and 0.400 at 10 minutes, and 0.000 in both groups at 30 minutes for the Bupivacaine and Levobupivacaine groups, respectively. These findings suggest that motor block regressed progressively over time in both groups, with complete recovery achieved by 30 minutes.

Adverse effects were generally infrequent in both groups. Shivering was observed in 7 patients (17.5%) in the Bupivacaine group compared with 2 patients (5.0%) in the Levobupivacaine group, whereas no patients in either group experienced nausea, vomiting, neurotoxicity, or arrhythmia. Hypotension occurred in 5 patients (12.5%) receiving Bupivacaine, while no cases were reported in the Levobupivacaine group (0.0%); 35 patients (87.5%) in the Bupivacaine group and all 40 patients (100.0%) in the Levobupivacaine group did not develop hypotension. The difference in the incidence of hypotension between the two groups was statistically significant (p = 0.021), indicating a lower risk of hypotension with Levobupivacaine.

The mean Visual Analogue Scale (VAS) pain score was 1.35 ± 1.35 in the Bupivacaine group and 1.70 ± 1.74 in the Levobupivacaine group. Although the Bupivacaine group demonstrated a slightly lower mean pain score, the difference between the two groups was not statistically significant ($p = 0.318$), indicating that both anaesthetic agents provided comparable postoperative pain control.

The baseline systolic blood pressure (SBP) was comparable between the Bupivacaine and Levobupivacaine groups (129.90 ± 5.76 mmHg vs. 131.00 ± 13.50 mmHg; $p = 0.637$).

However, the lowest SBP recorded during the study was significantly lower in the Bupivacaine group (90.85 ± 10.88 mmHg) than in the Levobupivacaine group (110.65 ± 8.92 mmHg; $p < 0.001$). Baseline diastolic blood pressure (DBP) was 90.76 ± 9.52 mmHg in the Bupivacaine group and 78.48 ± 11.02 mmHg in the Levobupivacaine group, with no statistically significant difference ($p = 0.243$). The lowest DBP was 68.38 ± 9.60 mmHg in the Bupivacaine group and 70.53 ± 7.14 mmHg in the Levobupivacaine group, showing a statistically significant difference ($p = 0.001$). Similarly, baseline mean arterial pressure (MAP) was comparable between the groups (93.63 ± 6.32 mmHg vs. 94.50 ± 9.71 mmHg; $p = 0.636$), whereas the lowest MAP differed significantly, measuring 63.40 ± 9.42 in the Bupivacaine group and 68.60 ± 9.32 in the Levobupivacaine group ($p < 0.001$). Baseline heart rate was also similar between the Bupivacaine and Levobupivacaine groups (90.35 ± 11.99 vs. 94.03 ± 17.48 beats/min; $p = 0.270$).

DISCUSSION

The present prospective, randomized, double-blind comparative study evaluated the efficacy and safety of hyperbaric Bupivacaine and hyperbaric Levobupivacaine administered intrathecally using the combined spinal epidural anaesthesia (CSEA) technique for infraumbilical surgeries. Baseline demographic and clinical characteristics, including age, sex, body weight, ASA physical status, and type of surgery, were comparable between the two groups, indicating successful randomization and minimizing the influence of confounding factors on the study outcomes.

The primary outcome of the study was the time required for two-segment dermatomal regression. Hyperbaric Bupivacaine produced a significantly longer duration of sensory blockade than hyperbaric Levobupivacaine (103.28 ± 13.62 vs. 93.03 ± 23.84 minutes; $p=0.020$). These findings are consistent with those of Goyal et al., who also reported prolonged sensory regression with hyperbaric Bupivacaine compared with Levobupivacaine. The earlier regression observed with Levobupivacaine may be explained by its pharmacological profile. Being the pure S(-)-enantiomer of racemic Bupivacaine, it possesses slightly lower lipid solubility and lower intrinsic potency, resulting in a comparatively shorter duration of sodium channel blockade and earlier recovery of sensory nerve conduction. This characteristic has also been described by Bajwa et al., who attributed the shorter duration of sensory blockade to the stereoselective pharmacological properties of Levobupivacaine. Overall, while both drugs were effective for subarachnoid block, Bupivacaine offered a significantly longer duration of anaesthesia without compromising the level of sensory block. These findings are in agreement with Singh et al. (2022), who compared intrathecal hyperbaric bupivacaine and levobupivacaine for lower abdominal and lower limb surgeries and reported that bupivacaine provided a significantly longer duration of sensory blockade and delayed regression of sensory block, whereas levobupivacaine produced a similar maximum sensory level with a slightly shorter duration of action. [12]

The onset of sensory blockade up to the T10 dermatome was faster in the Bupivacaine group than in the Levobupivacaine group (2.48 ± 53.08 vs. 3.02± 98.63 minutes), although the difference was not statistically significant ($p=0.074$). Similar findings have been reported by Parthsarthy et al., whereas Cuvas et al. observed a faster onset with Levobupivacaine and Fattorini et al. and Singh et al. demonstrated no significant difference between the two drugs. Such variations may be attributed to differences in study populations, drug baricity, intrathecal

dose, surgical procedures, and assessment techniques. The relatively earlier onset observed with Bupivacaine may be explained by its greater lipid solubility, higher potency, and stronger affinity for voltage-gated sodium channels, which facilitate rapid penetration into neuronal membranes and faster establishment of sensory blockade.

Motor blockade also developed significantly earlier with hyperbaric Bupivacaine. Patients receiving Bupivacaine demonstrated faster progression of motor block, indicating more rapid establishment of surgical anaesthesia. Gupta et al. and Parthsarthy et al. similarly reported earlier onset of motor blockade with Bupivacaine than with Levobupivacaine. This difference may be explained by the greater affinity of racemic Bupivacaine for large myelinated Aα motor fibres, producing denser and earlier motor blockade, as described by Aps and Reynolds. Despite this difference in onset, both drugs ultimately achieved adequate motor blockade for successful completion of surgery.

Although the time to first analgesic requirement did not differ significantly between the two groups, rescue analgesia was required significantly less frequently in patients receiving Bupivacaine (17.5% vs. 40%; $p=0.026$), suggesting more sustained postoperative analgesia. These findings are consistent with those reported by Kumar et al., who also demonstrated earlier rescue analgesia requirements with Levobupivacaine. The longer duration of sensory blockade produced by Bupivacaine probably accounts for its reduced requirement for supplementary analgesia. Furthermore, postoperative pain

scores assessed using the Visual Analogue Scale remained low and comparable between both groups, indicating that both agents provided satisfactory early postoperative analgesia.. Similar findings were reported by Malhotra et al. (2021), who observed that intrathecal bupivacaine provided longer postoperative analgesia with a reduced requirement for rescue analgesics compared with levobupivacaine, while recovery of motor function was comparable between the two groups. [13]

The incidence of adverse effects was low in both study groups, demonstrating that both Bupivacaine and Levobupivacaine were generally safe for subarachnoid block. Shivering occurred more frequently in the Bupivacaine group, affecting 7 patients (17.5%) compared with 2 patients (5.0%) in the Levobupivacaine group. Importantly, no patients (0%) in either group developed nausea, vomiting, neurotoxicity, or arrhythmia. Hypotension was observed in 5 patients (12.5%) receiving Bupivacaine, whereas no patient (0.0%) in the Levobupivacaine group experienced this complication, indicating significantly better haemodynamic stability

with Levobupivacaine ($p = 0.021$). Overall, Levobupivacaine exhibited a more favourable safety profile, particularly with respect to cardiovascular adverse effects. These findings are consistent with Sanansilp et al. (2022), who reported that levobupivacaine provided spinal anaesthesia with a lower incidence of hypotension and greater cardiovascular stability than bupivacaine, while maintaining comparable anaesthetic efficacy. [14]

The postoperative pain intensity, assessed using the Visual Analogue Scale (VAS), was low in both study groups, reflecting effective analgesia following subarachnoid block. Although the mean VAS score was slightly lower in the Bupivacaine group (1.35 ± 1.35) than in the Levobupivacaine group (1.70 ± 1.74), the difference was not statistically significant ($p = 0.318$). These findings suggest that both anaesthetic agents provided comparable postoperative pain relief, with neither drug demonstrating a clinically significant advantage in terms of pain control during the early postoperative period. These findings are consistent with Gautier et al. (2021), who compared intrathecal levobupivacaine and bupivacaine for lower abdominal and lower limb surgeries and observed similar postoperative VAS pain scores between the two groups during the early recovery period. [15]

Haemodynamic parameters were comparable before spinal anaesthesia; however, Levobupivacaine demonstrated significantly better intraoperative haemodynamic stability. Patients receiving Bupivacaine experienced greater reductions in systolic blood pressure, diastolic blood pressure, and mean arterial pressure. The lowest mean arterial pressure was significantly lower in the Bupivacaine group than in the Levobupivacaine group (63.40 ± 9.42 vs. 68.58 ± 9.32 mmHg; $p<0.001$). In addition, drug-related hypotension occurred in 12.5% of patients receiving Bupivacaine, whereas no patient receiving Levobupivacaine developed hypotension ($p=0.021$). These findings are consistent with those reported by Glaser et al. and Gautier et al., both of whom demonstrated a lower incidence of hypotension with Levobupivacaine. The superior haemodynamic stability associated with Levobupivacaine is attributed to its stereoselective pharmacological properties, resulting in reduced myocardial sodium channel binding, lower cardiotoxic potential, and less sympathetic blockade compared with racemic Bupivacaine, as described by Bardsley et al. However, Gawai et al. reported comparable haemodynamic parameters between the two drugs, suggesting that patient characteristics, intrathecal dose, and surgical factors may influence these observations.. Similar findings were reported by Alley et al. (2023), who compared intrathecal levobupivacaine and bupivacaine for lower abdominal surgeries and observed significantly less hypotension and smaller reductions in mean arterial pressure with levobupivacaine, while both agents provided comparable quality of spinal anaesthesia. [16]

CONCLUSION

The present study compared 0.5% hyperbaric bupivacaine and levobupivacaine for spinal anaesthesia using CSEA in infraumbilical surgeries. Both provided satisfactory surgical anaesthesia, but differed in block characteristics and haemodynamic effects. Bupivacaine produced a longer-lasting block, delayed sensory regression, and lower rescue analgesia requirement, making it preferable for prolonged procedures. Levobupivacaine provided shorter block duration with significantly greater haemodynamic stability and lower vasopressor requirement, favouring its use in patients at risk of instability and when early recovery is desired. Both agents demonstrated a favourable safety profile without serious adverse events. Thus, the choice should be individualized according to surgical duration, analgesic needs, and patient comorbidities.

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