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Original Research Article

Comparative Study of 0.2% Ropivacaine, 0.125% Levobupivacaine and 0.125 % Bupivacaine with Fentanyl via Epidural for Painless Labour

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Abstract

Background: Labour pain is one of the most intense experiences for women during childbirth, and effective analgesia is crucial for maternal comfort and safety. Epidural analgesia (EA) is widely considered an effective method for pain relief, using local anaesthetics such as Bupivacaine, Ropivacaine, and Levobupivacaine. However, the comparative efficacy of these agents in managing labour pain requires further evaluation.

Objectives: This study aims to evaluate the anaesthetic efficacy of three commonly used local anaesthetics—Ropivacaine, Bupivacaine, and Levobupivacaine—when combined with fentanyl for epidural analgesia during labour, assessing their effectiveness in pain relief, sensory blockade, and side effects.

Methods: A randomized controlled trial was conducted at Darbhanga Medical College and Hospital, India, over two years, with 90 primigravida women in established labour. Patients were assigned to three groups, each receiving a combination of a local anaesthetic (0.2% Ropivacaine, 0.125% Bupivacaine, or 0.125% Levobupivacaine) with fentanyl (2 mcg/mL). Outcomes were assessed using the Visual Analogue Scale (VAS), heart rate, blood pressure, and mean arterial pressure (MAP), along with the time to onset and duration of analgesia.

Results: Levobupivacaine demonstrated superior pain relief at 5, 15, 30, and 60 minutes post-administration compared to Bupivacaine and Ropivacaine, with statistically significant differences ($p < 0.0001$). Levobupivacaine also resulted in less cardiovascular instability and better sensory-motor differentiation.

Conclusions: Levobupivacaine offers superior analgesia and fewer cardiovascular side effects than Ropivacaine and Bupivacaine, making it a safer and more effective choice for epidural analgesia during labour.

Keywords: Bupivacaine, Epidural analgesia, Labour pain, Levobupivacaine, Ropivacaine

Introduction

Pregnancy and childbirth are recognized as invaluable experiences for women; nonetheless, the apprehension surrounding labour pain frequently induces considerable worry and interest. Labour pain is often regarded as one of the most severe and agonising sensations a woman may face [1]. Efforts to mitigate this discomfort have persisted for millennia, resulting in the advancement of both pharmacological and non-pharmacological pain reduction techniques. Pharmacological analgesic alternatives including inhalational analgesics, opioids, and epidural analgesia (EA). Epidural anaesthesia (EA) is a central nerve blockade method that involves the injection of a local anaesthetic into the epidural region next to the lower spine, inhibiting the nerve signals that convey pain from the uterus and birth canal. This analgesic technique demonstrates efficacy within 10 to 20 minutes post-administration [2].

Epidural analgesia is regarded as one of the most efficient and safest methods for alleviating pain during labour. It provides several benefits: it enables the mother to stay alert and engaged, significantly alleviates labour pain, and may be prolonged throughout the labour process. EA induces little motor blockade, facilitating ambulation, exerts minor influence on the foetus and labour development, alleviates mother stress, and lowers

the haemodynamic consequences of uterine contractions [3,4]. Local anaesthetics utilised in epidural anaesthesia are generally categorised into two primary classes according to their chemical structure: esters and amides. The most often utilised anaesthetics for painless labour within the amide category are Bupivacaine, Ropivacaine, and Levobupivacaine. These pharmaceuticals undergo sluggish metabolism in the liver, leading to extended efficacy [5]. Bupivacaine is commonly utilised during caesarean sections, either alone or in conjunction with opiates such as fentanyl. It offers a significant sensory blockage and aids in the management of hypotension during surgical procedures. The combination of Bupivacaine and fentanyl prolongs analgesia and motor blockage while reducing side effects compared to Bupivacaine used in isolation.

Ropivacaine, a long-acting amide anaesthetic akin to Bupivacaine, is utilised for epidural analgesia during labour and for managing pain post-caesarean section. It provides superior dissociation between sensory and motor blockades compared to Bupivacaine, while it is typically regarded as less efficient for pain relief. Levobupivacaine, a Bupivacaine isomer, offers prolonged sensory blockage and is linked to reduced cardiovascular adverse effects. It is utilised in several anaesthetic operations and is analogous to Bupivacaine regarding analgesic effects, however it induces a lesser degree of motor blockage [6,7]. Levobupivacaine's reduced lipid solubility leads to a more rapid sensory blockade relative to motor blockade, enhancing the sensory-motor differentiation. The mild haemodynamic effects of Levobupivacaine render it a safer option for regional anaesthesia, facilitating patient recovery and mobility [8]. The use of adjuvants like fentanyl or ketamine can decrease the necessary dosage of local anaesthetic and prolong the duration of sensory and motor blockades.

Fentanyl, a synthetic opioid, is frequently utilised alongside local anaesthetics to augment the analgesic impact. It is 75 to 125 times more powerful than morphine and interacts with opioid receptors, especially the μ receptor, to deliver significant analgesia [9]. The integration of fentanyl with local anaesthetics in epidural injections provides a comprehensive strategy for pain treatment. Considering the array of local anaesthetic agents accessible, it is essential to evaluate the anaesthetic circumstances to choose the most appropriate agent for labour analgesia. This study is to evaluate the anaesthetic efficacy of three frequently utilised local anesthetics—Ropivacaine, Bupivacaine, and Levobupivacaine—in patients in labour. The aim is to identify the most suitable anaesthetic for achieving effective analgesia while ensuring adequate sensory blockage during labour. This study, the inaugural of its sort at DMCH Laheriasarai, Bihar, aims to provide significant insights into the selection of local anaesthetics for analgesic labour.

Methodology

Study Area

This comparative randomised controlled trial was conducted over two years at the Department of Anaesthesiology and Critical Care at Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India. Approval from the institutional ethics committee was obtained before the commencement of the inquiry.

Sample Size

The study had a total sample size of 90 patients.

Inclusion & Exclusion Criteria

This study's inclusion criteria were patients in established labour with cervical dilatation of 3-5 cm, classed as ASA Grade I or II, and primigravida women with a singleton, full-term pregnancy. Participants have to be between 18 and 35 years old and exhibit a cephalic presentation. The exclusion criteria included individuals with pregnancy-induced hypertension (PIH), diabetes mellitus (DM), bleeding problems, or other serious systemic illnesses such as cardiovascular, respiratory, hepatic, renal, or neurological disorders. Further exclusions encompassed individuals who had administered opioid medications or systemic analgesics within the preceding 24 hours, possessed contraindications to central neuraxial techniques, exhibited known allergies to local anaesthetics or other pharmaceuticals utilised in the study, declined regional anaesthesia, or were not categorised as ASA Grade I or II. Patients presenting in a non-cephalic position were also eliminated.

Intervention

Group	Intervention
Group R	Received 10ml of 0.2% ROPIVACAINE 2mcg / m l Fentanyl epidural initial bolus dose which was followed by epidural top up of intermittent bolus dose of 10ml of 0.2% ROPIVACAINE + 2mcg / m Fentanyl when VAS of > 3
Group B	Received 10 ml of 0.125% BUPIVACAINE + 2 mcg/ml Fentanyl epidural initial bolus dose which was followed by epidural top up of intermittent bolus dose of 10ml of 0.125% BUPIVACAINE + 2 mcg/ml Fentanyl when VAS of > 3.

Group L	Received 10 ml of 0.125% LEVOBUPIVACAINE + 2 mcg/ml Fentanyl epidural initial bolus dose which was followed by epidural top up of intermittent bolus dose of 10ml of 0.125% LEVOBUPIVACAINE + 2mcg / m Fentanyl when VAS of > 3.

Procedure

Upon the patient's arrival in the delivery room, an 18G/20G intravenous cannula was placed, and a preload of Ringer's lactate (10 ml/kg) was provided. The maintenance infusion rate was established at 6 ml/kg/hour. Monitoring complied with ASA recommendations, encompassing heart rate, ECG, blood pressure, SpO2, and temperature. The patient was placed in the left lateral or seated posture, and the L2-L3 intervertebral space was located. A 2% Lignocaine solution was employed for dermal infiltration, subsequently followed by the insertion of an 18G Tuohy needle. The epidural space was verified by the lack of resistance and hanging drop methods. An epidural catheter was inserted using a 10 cm needle, secured 6 cm past the loss of resistance point. A test dose of 3 ml of 2% Lignocaine with 1:200,000 epinephrine was given to verify proper placement. Upon confirmation, local anaesthetics were administered according per protocol.

Outcome Parameters

Following the administration of epidural anaesthesia (EA), the patient's condition was evaluated, and the subsequent data were recorded: heart rate (HR), blood pressure (BP), SpO2, and respiratory rate at 0, 5, 15, 30, and 60 minutes, along with fifteen-minute intervals thereafter. Further observations encompassed the onset time of analgesia, the degree of sensory blockage (lack of feeling to pinprick), and the duration of analgesia, characterised as the period from the first dosage to the request for the first epidural top-up. Pain levels were assessed by the Visual Analogue Scale (VAS) and the 0-10 Numeric Pain Intensity Scale. Additional documented characteristics were cervical dilatation, delivery method, and the overall time of labour. Analgesia was maintained with the administration of repeated intermittent bolus doses of 10 ml of a local anaesthetic agent mixed with 2 microgrammes per ml of Fentanyl if the VAS score surpassed 3, until the completion of labour. All vital physiological parameters were consistently documented and observed to guarantee stability before to the patient's release from the labour room.

Statistical Analysis

Statistical analysis was conducted with Microsoft Excel 365 and GraphPad. Continuous data (VAS score, commencement of action, length of labour, cervical dilation, blood pressure, and heart rate) were presented as mean ± standard deviation (SD). One-way ANOVA was employed to assess the statistical significance of differences across groups R, B, and L. Categorical data (outcome, age, gender, delivery type, and side effects) were expressed as percentages and frequencies, with comparisons conducted using the chi-square test. A p-value less than 0.05 was deemed statistically significant.

Results

Table 1 presents a comparative analysis of age distribution across three groups: Group R (Ropivacaine), Group B (Bupivacaine), and Group L (Levobupivacaine). In the 18-25 age demographic, patient distribution was comparable across all groups, with 50%, 53.33%, and 60% in Groups R, B, and L, respectively. In the 26-30 years age demographic, the percentages were 40%, 33.33%, and 30% for Groups R, B, and L, respectively. The percentages for the 31-35 years age group were 10%, 13.33%, and 10% throughout the categories. The p-value of 0.92, obtained from the Chi-Square test, signifies that there is no statistically significant variation in age distribution across the three groups.

Table 1. Comparison of Age between Group R (Ropivacaine), B (Bupivacaine), and L (Levobupivacaine)

Age Group	Number of Patients (%)			P Value (Chi-Square test)
	Group R	Group B	Group L	
18-25	15 (50.00)	16 (53.33)	18 (60.00)	
26-30	12 (40.00)	10 (33.33)	9 (30.00)	
31-35	3 (10.00)	4 (13.33)	3 (10.00)	0.92

Table 2 illustrates the comparison of gestational age across three groups: Group A (Ropivacaine), Group B (Bupivacaine), and Group C (Levobupivacaine). In the cohort with a gestational age of less than 40 weeks, the patient percentages were 86.67%, 90%, and 83.33% for Groups A, B, and C, respectively. In the ≤40 weeks group, the percentages for Groups A, B, and C were 13.33%, 10%, and 16.67%, respectively. A p-value of 0.9, obtained from the Chi-Square test, signifies that there is no statistically significant difference in the distribution of gestational age among the three groups.

Table 2. Comparison of Gestational Age between Group A (Ropivacaine), B (Bupivacaine), and C (Levobupivacaine)				
Gestational Age	**Number of Patients (%)**			**P Value (Chi-Square test)**
	Group R	**Group B**	**Group L**	
<40 Weeks	26 (86.67)	27 (90.00)	25 (83.33)	0.9
≤40 Weeks	4 (13.33)	3 (10.00)	5 (16.67)	

Table 3 outlines the anthropometric characteristics (weight, height, and BMI) among three groups: Group R (Ropivacaine), Group B (Bupivacaine), and Group L (Levobupivacaine). The average weight of patients in Group R was 62.02 ± 8.32 kg, in Group B it was 64.13 ± 7.15 kg, and in Group L it was 63.46 ± 9.09 kg, with a p-value of 0.6, signifying no statistically significant difference among the groups. The average height was 1.66 ± 0.12 meters for Group R, 1.65 ± 0.14 meters for Group B, and 1.63 ± 0.18 meters for Group L, with a p-value of 0.73, indicating no significant difference. The average BMI was 23.25 ± 2.49 for Group R, 23.00 ± 2.07 for Group B, and 23.11 ± 2.27 for Group L, with a p-value of 0.91, signifying no significant difference in BMI across the groups. The results indicate that the anthropometric parameters were comparable across the three groups.

Table 3. Comparison of Anthropometric Parameters between Group R (Ropivacaine), B (Bupivacaine), and L (Levobupivacaine)				
Parameters	**Parameters in Mean ± SD**			**P Value (One Way ANOVA)**
	Group R	**Group B**	**Group L**	
Weight in kg	62.02 ± 8.32	64.13 ± 7.15	63.46 ± 9.09	0.6
Height in meter	1.66 ± 0.12	1.65 ± 0.14	1.63 ± 0.18	0.73
BMI in kg/m^2	23.25 ± 2.49	23.00 ± 2.07	23.11 ± 2.27	0.91

Table 4 highlights a comparison of the ASA (American Society of Anaesthesiologists) status among Group R (Ropivacaine), Group B (Bupivacaine), and Group L (Levobupivacaine). In Group R, 46.67% of patients were categorised as ASA I, while 53.33% were categorised as ASA II. In Group B, 50.00% were classified as ASA I, and 50.00% as ASA II. In Group L, 43.33% were classified as ASA I, while 56.67% were classified as ASA II. The p-value of 0.87 from the Chi-square test signifies no substantial difference in the distribution of ASA status across the three groups, implying that the groups exhibited comparable proportions of patients categorised as ASA I and ASA II.

Table 4: Comparison of ASA Status between Group R (Ropivacaine), B (Bupivacaine), and L (Levobupivacaine)				
ASA	**Number of Patients (%)**			**P Value (Chi Square test)**
	Group R	**Group B**	**Group L**	
ASA I	14 (46.67)	15 (50.00)	13 (43.33)	0.87
ASA II	16 (53.33)	15 (50.00)	17 (56.67)	

Table 5 examines the mode of delivery among Group R (Ropivacaine), Group B (Bupivacaine), and Group L (Levobupivacaine) at baseline. In Group R, 12 patients underwent normal birth, 10 underwent caesarean section, 5 experienced vacuum-assisted delivery, and 3 had forceps-assisted delivery. In Group B, 10 patients underwent normal birth, 13 underwent caesarean section, 4 underwent vacuum-assisted delivery, and 3 underwent forceps-assisted delivery. In Group L, 16 patients underwent normal birth, 9 underwent caesarean section, 3 underwent vacuum-assisted delivery, and 2 underwent forceps-assisted delivery. The p-value of 0.81, obtained from the Chi-square test, signifies no substantial variation in the method of delivery across the three groups, indicating a comparable distribution of delivery types across all groups.

Table 5. Comparison of Mode of Delivery between Group R (Ropivacaine), B (Bupivacaine), and L (Levobupivacaine) at Baseline

Mode of Delivery	Number of Patients (%)			P Value (Chi Square test)
	Group R	Group B	Group L	
Normal	12	10	16	0.81
Caesarean	10	13	9	
Vacuum	5	4	3	
Forceps	3	3	2	

Table 6 illustrates a comparison of the Visual Analogue Scale (VAS) scores among Group R (Ropivacaine), Group B (Bupivacaine), and Group L (Levobupivacaine) at different time intervals. At baseline, the VAS ratings were comparable among the groups, exhibiting no significant difference ($p = 0.92$). At 5, 15, 30, and 60 minutes post-administration, Group L (Levobupivacaine) consistently exhibited the lowest VAS values, signifying superior pain management relative to Group B (Bupivacaine) and Group R (Ropivacaine). Statistically significant differences ($p < 0.0001$) were noted at 5, 15, 30, and 60 minutes, indicating that Levobupivacaine offered enhanced pain alleviation relative to the other two groups at these intervals.

Table 6. Comparison of VAS Score between Group R (Ropivacaine), B (Bupivacaine), and L (Levobupivacaine)

Time	VAS in Mean ± SD			P Value (One Way ANOVA)
	Group R	Group B	Group L	
Baseline	6.49 ± 0.88	6.44 ± 0.59	6.51 ± 0.58	0.92
5 Minutes	4.96 ± 0.56	3.52 ± 0.21	2.96 ± 0.49	<0.0001
15 Minutes	3.27 ± 0.47	3.95 ± 0.26	2.47 ± 0.36	<0.0001
30 Minutes	2.05 ± 0.39	2.11 ± 0.36	1.72 ± 0.21	<0.0001
60 Minutes	2.65 ± 0.38	2.41 ± 0.29	2.03 ± 0.32	<0.0001

Table 7 displays a comparison of heart rate (HR) across the three groups (Ropivacaine, Bupivacaine, and Levobupivacaine) at different time intervals. At baseline, the heart rate readings were comparable among all groups, exhibiting no significant difference ($p = 0.24$). Significant changes were noted at 5, 15, 30, and 60 minutes post-administration ($p < 0.0001$). Group L (Levobupivacaine) had elevated heart rate values relative to Group R (Ropivacaine) and Group B (Bupivacaine) at all measured intervals, with Group B exhibiting the lowest heart rate values. These results indicate that Levobupivacaine may elicit a more pronounced elevation in heart rate compared to Ropivacaine or Bupivacaine within the initial hour post-administration.

Table 7. Comparison of HR between Group R (Ropivacaine), B (Bupivacaine), and L (Levobupivacaine)

Time	HR (bpm) in Mean ± SD			P Value (One Way Anova)
	Group R	Group B	Group L	
Baseline	81.31 ± 9.04	80.79 ± 8.50	82.71 ± 7.35	0.24
5 Minutes	80.29 ± 9.01	78.41 ± 9.69	85.65 ± 8.58	<0.0001
15 Minutes	80.18 ± 9.62	76.89 ± 9.80	87.15 ± 8.69	<0.0001
30 Minutes	80.30 ± 9.86	77.01 ± 9.53	83.14 ± 8.42	<0.0001
60 Minutes	80.61 ± 8.36	76.53 ± 8.61	84.59 ± 7.95	<0.0001

Table 8 delineates the mean arterial pressure (MAP) across the three groups (Ropivacaine, Bupivacaine, and Levobupivacaine) at different temporal intervals. At baseline, MAP levels were comparable among all groups, with no statistically significant difference ($p = 0.21$). Notable changes were detected at 5, 15, 30, and 60 minutes following injection ($p < 0.0001$). Group B (Bupivacaine) exhibited a significant decrease in MAP relative to Groups R (Ropivacaine) and L (Levobupivacaine) at all measured intervals, with Group R sustaining the highest MAP values. The results demonstrate that Bupivacaine induces a more significant reduction in MAP with time relative to Ropivacaine and Levobupivacaine.

Table 8. Comparison of MAP between Group R (Ropivacaine), B (Bupivacaine), and L (Levobupivacaine)

Time	MAP (mmHg) in Mean ± SD			P Value (Chi Square test)
	Group R	Group B	Group L	
Baseline	94.27 ± 4.46	95.44 ± 6.36	94.17 ± 5.62	0.21
5 Minutes	96.19 ± 3.96	86.25 ± 5.22	86.54 ± 4.07	<0.0001
15 Minutes	97.43 ± 3.31	80.24 ± 4.47	83.67 ± 3.42	<0.0001
30 Minutes	95.73 ± 2.94	79.08 ± 4.10	83.33 ± 3.27	<0.0001
60 minutes	96.05 ± 2.73	79.21 ± 3.26	84.65 ± 2.96	<0.0001

Discussion

This comparative randomized controlled experiment examined the impact of EA on labour, as well as maternal and newborn outcomes. While comparing the effectiveness and adverse effects of EA among several medications.

This study's findings indicate that levobupivacaine yields better labour outcomes with less respiratory depression, whereas ropivacaine demonstrates greater haemodynamic stability. The duration of labour and analgesia was substantially longer in the levobupivacaine group. The onset time of analgesia was substantially shorter in the levobupivacaine group. The levobupivacaine group had much superior cervical dilation. The levobupivacaine group had a higher incidence of normal vaginal deliveries. Instances of central sensitisation were more prevalent in the bupivacaine group. The levobupivacaine group had markedly reduced pain intensity ($p<0.0001$). Heart rate and mean arterial pressure exhibited greater stability in the ropivacaine group. The respiratory rate and SpO2 levels exhibited greater stability in the levobupivacaine group. In early labour, "Camorcia and Capogna" also compared "0.1% ropivacaine, 0.0625% levobupivacaine, and 0.0625% bupivacaine" in conjunction with sufentanil [10]. The primary focus was the duration of analgesia maintained using a bolus, with no significant differences in motor block seen across subjects.

Supandji et al. conducted an investigation comparing the effects of boluses containing 0.2% ropivacaine and 0.2% levobupivacaine on sensory and motor block, revealing no significant differences. Despite variations in the local anaesthetic dosage ranging from 0.0625% to 0.2%, the degree of motor and sensory block appears to be relatively comparable [11]. Two trials indicated that pregnant women administered ropivacaine 0.25% experienced a reduced incidence of motor blockade or instrumental deliveries compared to those receiving bupivacaine 0.25%. Nevertheless, several studies see these drugs as clinically analogous and suggest that the diminished motor blockade associated with ropivacaine or levobupivacaine may stem from their lower efficacy compared to bupivacaine [12-14]. Consequently, the purported benefits of ropivacaine and levobupivacaine regarding blockage sparing or toxicities require re-evaluation in light of their relative potency. Despite extensive study comparing the efficacy of bupivacaine with ropivacaine or levobupivacaine, the results remain inconclusive.

“For instance, individual studies utilising the up-down sequential allocation design to ascertain the epidural minimum local analgesic concentration (MLAC) indicate that ropivacaine is forty percent less efficacious than bupivacaine for labour pain relief.” Conversely, levobupivacaine has equivalent or marginally greater efficacy than bupivacaine in labour analgesia. Buyse et al. conclusively determined the "potency hierarchy" of three anaesthetics by directly comparing them using the MLAC method: "bupivacaine > levobupivacaine > ropivacaine" [15]. Despite almost identical trial designs, levobupivacaine has been shown to be comparable to, or maybe more efficacious than, ropivacaine in epidural anaesthesia [16,17]. Consequently, "levobupivacaine and bupivacaine" seem to neutralise one another regarding their efficacy for analgesia during epidural labour. The limitations of MLAC research include the supply of data that emphasises only the EC50, neglecting the shape of the concentration-response curve and the EC95, which is a more clinically relevant metric. Consequently, applying these findings directly in a therapeutic context is difficult.

“Moreover, multiple clinical trials have demonstrated that ropivacaine and bupivacaine, or ropivacaine and levobupivacaine, with or without opioids, exhibit equivalent efficacy in delivering pain relief during epidural labour when administered at identical concentrations.” This indicates that the three local anaesthetics may be equally efficacious in alleviating epidural labour pain. The research by Wang LZ et al. involves selecting concentrations of bupivacaine, ropivacaine, and levobupivacaine ranging from 0.05% to 0.15%, along with the addition of sufentanil at a concentration of 0.5 µg/ml [18]. Predictably, although the EC50 and EC95 values of bupivacaine were somewhat lower than those of the two other anaesthetics, there was insufficient clinical evidence to validate this difference. No statistically significant variations were seen in pain levels, the quantity of effective analgesia, hourly usage of local anaesthetic, or maternal satisfaction with analgesia across the groups.

The duration of the beginning stage of labour was decreased by about two hours with ropivacaine 0.1% in comparison to bupivacaine 0.1%. The degree of motor blockade resulting from epidural analgesia is determined by the particular medicine used and the overall dosage of the local anaesthetic. Further research may be required to see if the difference in motor blockage becomes apparent at higher levels. Moreover, Wang LZ et al. identified decreased EC50 values for 3 LA in comparison to most previously reported data. These inequalities may be ascribed to differences in technique, patient demographics, obstetric practices, and the notion of effective analgesia [18]. The use of sufentanil in the local anaesthetic may affect the associated ratios of local anaesthetic potency. Opioids reduce the requirement for regional anaesthesia in a dosage-dependent way, complicating the comparison with

findings from studies utilising basic local anaesthetic formulations.

Moreover, it is essential to note that the concentration of commercially available levobupivacaine is specified for its base form, whereas the concentrations of bupivacaine and ropivacaine are specified for their hydrochloride salts. Consequently, the former has 13 percent more concentrated anaesthetic than the bupivacaine preparation [18]. Furthermore, the reduced molecular mass of ropivacaine signifies a 4 percent greater quantity of molecules relative to bupivacaine. The implications for comparisons are that the volume (in millilitres) of local anaesthetics administered does not equate to the dose of the active local anaesthetics. Consequently, it is likely that levobupivacaine and ropivacaine possess somewhat lower potency than the observed result.

Conclusion

In conclusion, the comparative analysis of Ropivacaine, Bupivacaine, and Levobupivacaine for epidural analgesia in labour revealed key differences in their effectiveness and side effect profiles. Levobupivacaine demonstrated superior pain relief, as evidenced by significantly lower Visual Analogue Scale (VAS) scores at various time points, while maintaining a favorable safety profile with reduced cardiovascular effects. Bupivacaine, although effective, induced more pronounced reductions in mean arterial pressure, suggesting a higher incidence of haemodynamic instability. Ropivacaine, while offering adequate pain control, did not perform as well as Levobupivacaine in terms of both analgesic efficacy and safety. These findings contribute valuable insights for optimizing labour analgesia.

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