International Journal of Research in Medical Sciences
Kour G et al. Int J Res Med Sci. 2024 Dec;12(12):4617-4621
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20243716

Original Research Article

Effectiveness of single shot spinal analgesia with 0.2% ropivacaine in comparison to 0.2% levobupivacaine for labour analgesia

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Received: 02 October 2024
Accepted: 23 November 2024

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ABSTRACT

Background: Labour pain results in a maternal stress response that is not beneficial for the fetus or mother. Spinal analgesia may be a valuable alternative for relieving labour pain. Ropivacaine and levobupivacaine are the drugs commonly used in spinal analgesia. Objectives were to study the efficacy of single-shot spinal analgesia in labour regarding the onset, quality and duration of analgesia, motor blockade, and labour outcome by either ropivacaine or levobupivacaine.
Methods: A prospective observational study conducted in SKIMS, Srinagar which included 60 pregnant women who had received labour analgesia. The patients were divided into two groups. In group I, patients received 1 ml of heavy ropivacaine (0.5%) and in group II patients received 1 ml of heavy levobupivacaine (0.5%). Parameters recorded and assessed were the time of onset of analgesia, duration of epidural analgesia, duration of the first and second and total duration of labour, mode of delivery, fetal heart rate, APGAR scores of the newborn, patient complaints after spinal anaesthesia and mean arterial pressure (MAP), heart rate, visual analogue pain scale (VAS) of the subjects.
Results: The two groups showed no statistical difference with respect to different parameters like age, weight, height, gestational age, body mass index (BMI) and cervical dilation before the block. There was statistically significant difference with respect to the time of onset and duration of analgesia, in two groups. No significant difference was seen, in terms of VAS scores across different time periods.
Conclusions: There was comparable efficacy in terms of analgesic characteristics in both the groups, but levobupivacaine has a longer duration of analgesia, which is helpful for the effective functioning of labour and patient's satisfaction.

Keywords: Spinal analgesia, Ropivacaine, Levobupivacaine, Labour pain

INTRODUCTION

Labour pain results in maternal stress, which is beneficial for neither the fetus nor the mother.[1] Labour disorders, such as maternal hypertension, dystocia, meconium staining, and fetal distress are stress-related.[1,2] Hence, maternal pain relief not only benefits the mother, but also her neonate. Ideal labour analgesia should be safe for both sides and there should not be any compromise for the mother or baby in terms of oxygen supply, perfusion or blockade levels.[1] Spinal analgesia may be a valuable alternative for relief from labour pain.[3] It has been suggested that spinal opioids provide adequate analgesia during labour with no adverse impact on the incidence of neonatal complications.[4] The advantage of spinal anaesthesia is that the profound nerve block in the lower half of the body, can be produced by injecting relatively small amount of local anaesthetic. However, to control the spread of local anaesthetic through the cerebrospinal fluid (CSF) and, to provide a block that is adequate for the

proposed surgery without increased risk of complications, is the greatest challenge in spinal anaesthesia.[5] Ropivacaine, a usual local anaesthetic drug that is less cardio-toxic in animals, may also be more discriminatory for sensory fibres. Ropivacaine allows for amplified maternal ambulation and normal progression of labour, which leads to fewer instrumental deliveries and more vaginal deliveries.[6] Levobupivacaine is a typical local anaesthetic, which shows an outline close to that of bupivacaine in terms of commencement, eminence, and period of sensory block, but with slight cardiac and neurotoxic adverse effects. Clinical data have shown the effectiveness and safety of regional anaesthetic techniques with negligible hemodynamic fluctuations.[7]

Aims and objectives

Aims and objectives were to study the efficacy of single-shot spinal analgesia in labour regarding the onset, quality and duration of analgesia, motor blockade, and labour outcome by either ropivacaine or levobupivacaine.

METHODS

The study was conducted in the Department of Anaesthesia, SKIMS, Srinagar, from October 2021 to March 2022 after obtaining ethical permission from the institutional authorities. Sixty subjects who requested analgesia during labour were included in the study after obtaining informed consent.

Study design

It was a prospective observational study.

Inclusion criteria

Patients with primi in labour, ASA grade 1 and 2, singleton pregnancy, 35 weeks of cephalic presentation, and participants in the active stage of labour with cervical dilatation of 4-6 cm were included.

Exclusion criteria

Patients with breech presentation, ante-partum hemorrhage, severe pre-eclampsia, aortic stenosis, cephalopelvic disproportions, coagulation defects, anticoagulant therapy, vertebral deformity, and local sepsis were excluded.

The patients were divided into two groups - group I subject received 1 ml of heavy ropivacaine (0.5%), that is 5 mg, and group II subjects received 1 ml of heavy levobupivacaine (0.5%), that is 5 mg.

Under complete aseptic conditions the blocks were performed with the patient in a sitting position. Patients received spinal block using a 25-gauge quincke's needle inserted and directed to the middle line to reach the intrathecal space between L3-L4 or L4-L5 intervertebral space. After a successful dural puncture with acceptable cerebrospinal fluid flow, 1 ml of heavy ropivacaine (0.5%) that is, 5mg was injected in group I and 1 ml of heavy levobupivacaine (0.5%) that is, 5 mg was injected in group II. Pre-anaesthesia evaluation was performed on all participants with recording of baseline heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP). The visual analog scale (VAS) along with the mother's vitals (such as HR, SBP, and DBP, which were measured every 5 minutes for 30 minutes, then at 60 minutes and every hour for six hours) was used to assess the efficacy of the study drugs. The modified Bromage scale, and sedation score with four-point sedation scale was used to assess the degree of motor blockade, every one hourly after the institution of labour analgesia and up to six hours post-delivery. The post-delivery APGAR score was assessed at 1, 2, 3 and 5 minutes. The baby was monitored for respiratory distress and neurological symptoms after delivery. Vital monitoring for the parturient was recorded for 24 hours post-delivery. The collected data was recorded in Microsoft excel and statistical analysis was done using statistical package for the social sciences (SPSS) version 22.0.

RESULTS

In our study, a total of 60 patients were included, with 30 patients in each group. Table 1 depicts the mean (SD) age, weight, height, BMI, gestational age and cervical dilation in both the groups. No statistical difference was found between the groups with respect to age, weight, height, gestational age, BMI and cervical dilation prior to the block.

Table 1: Baseline characteristics of both the groups.

Variables	Ropivacaine (0.5%)	Levobupiva-caine (0.5%)	P value
Age (in years+SD)	26.3±2.2	27.7±3.2	0.06
Weight (in kg)	59.08±5.15	59.44±4.88	0.78
Height (in cm)	161.40±4.56	159.96±4.49	0.22
BMI (in kg/m^2)	22.74±2.44	23.27±2.09	0.37
Gestational age (in weeks)	38.72±0.79	38.96±0.89	0.27
Cervical dilatation (in cm)	5.40±0.5	5.4±0.6	0.86

Independent t test as mean±SD, *significant p value

The characteristics of the variables, namely, the labour duration in each stage and total duration were noted. In group I, the mean (SD) during first stage, second stage and total duration was 156.80 (33.72) minutes, 45.40 (11.4) minutes and 202.20 (43.69) minutes, respectively. The mean (SD) of the group II during first stage, second stage and total duration was 155.60 (34.42) minutes, 47.24 (12.37) minutes and 202.84 (44.73) minutes, respectively (Table 2).

Table 2: Comparison of duration of labour among the two groups.

Variables	Ropivacaine (0.5%)	Levobupiva-caine (0.5%)	P value
First stage of labour (in minutes)	156.80± 33.72	155.60± 34.42	0.89
Second stage of labour (in minutes)	45.40± 11.45	47.24± 12.37	0.55
Total duration (in minutes)	202.20± 43.69	202.84± 44.73	0.95

The mean (SD) time of onset of analgesia for group I was 11.36 (1.35) minutes and 15.44 (1.39) minutes for group II, respectively. The mean (SD) duration of analgesia among the two groups was 154.20 (34.15) minutes and 174.04 (39.11) minutes, respectively. The maximum duration of analgesia was 185 minutes in both the groups (Table 3).

Table 3: Comparison among patients with respect to time of onset and duration of analgesia.

Variables	Ropivacaine 0.5%	Levobupiva-caine 0.5%
Time of onset of analgesia (in minutes)	11.36±1.35	15.44±1.39
Duration of analgesia (in minutes)	154.20±34.15	174.04±39.11

Most of the patients in our study had normal labour. In group I, 26 (86.6%) patients had normal labour and in group II, 25 (83.3%) patients had normal labour. In both the groups, two patients underwent cesarean section. Two patients in group I and three patients in group II underwent forceps delivery (Figure 1).

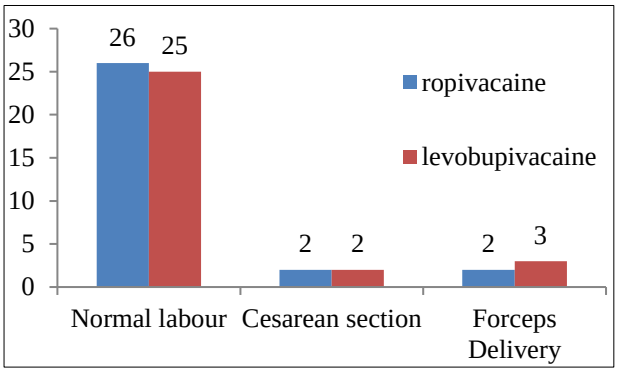

Figure 1: Mode of delivery among the study groups.

There was no difference in terms of the APGAR at 1 minute and 5 minutes in both groups (Table 4). There was no significant difference in VAS score across different time periods except for the VAS score at 30 minutes in both groups. The cumulative analgesia score was higher in the levobupivacaine group than in the ropivacaine group (Table 5).

Table 4: Comparison of APGAR (at 1 minute and 5 minutes) among the two groups.

APGAR	Ropivacaine (0.5%)	Levobupiva-caine (0.5%)	P value
At 1 minute	8.16±0.37	8.20±0.41	0.69
At 5 minutes	9.44±0.51	9.36±0.49	0.53

Independent t test as mean±SD, *significant p value

Table 5: Comparison of VAS score among the two groups at different time periods.

VAS at different time periods	Ropivacaine (0.5%)	Levobupiva-caine (0.5%)	P value
0 minute	9.27±0.542	9.30±0.535	0.82
15 minutes	6.54±1.94	6.0± 1.50	0.23
30 minutes	4.47±1.84	3.42±0.94	0.0072
45 minutes	3.95±1.34	3.29±0.871	0.02
60 minutes	3.59±1.37	3.41±0.70	0.52
120 minutes	4.15± 0.99	3.79±0.70	0.109
180 minutes	4.33±0.58	4.00±0	0.002

P value was obtained from independent sample t-test

There was a significant difference in terms of mean arterial pressure at 5 and 30 minutes in both groups (Figure 2). The mean arterial pressure (MAP) was not significantly different at other time periods in both groups.

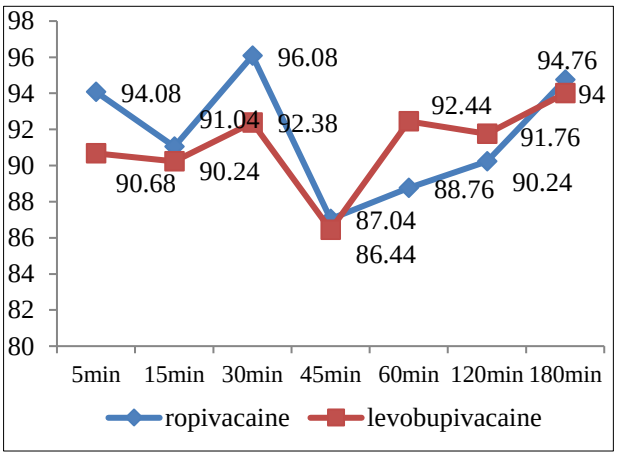

Figure 2: Comparison of MAP among the two groups at different time periods.

In our study, there was a significant difference in terms of the heart rate at 60 minutes in both groups. Moreover, the heart rate was not significantly different at other time periods, in both groups (Figure 3).

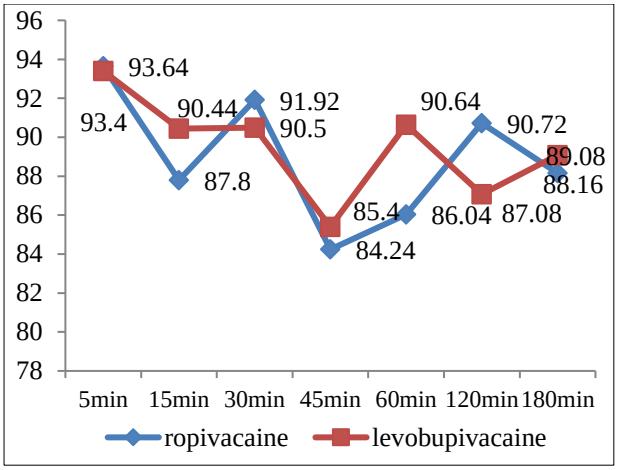

Figure 3: Comparison of patient's heart rate at different time periods.

In our study, complications were reported in both the groups. In group I, complications were reported in 20 percent of the patients while in group II, complications were reported in 10 percent of the patients. Most common complication was hypotension, reported in three patients in group I and two patients in group II (Table 6).

Table 6: Complications after the administration of drug.

Complications	Ropivacaine 0.5%	Levobupivacaine 0.5%
Vomiting	2 (6.66%)	1 (3.33%)
Hypotension	3 (9.99%)	2 (6.66%)
Pruritus	0	0
Urinary retention	0	0
Respiratory depression	0	0
Bradycardia	1 (3.33%)	0

DISCUSSION

This study compared ropivacaine (0.5%) and levobupivacaine (0.5%) opioids for spinal analgesia in labour regarding the onset, quality and duration of analgesia, motor blockade, and labour outcome. The study was done among 60 subjects, with 30 in each group. In our study, no statistical difference was found between the groups with respect to age, weight, height, gestational age, BMI and cervical dilation before the block. The findings of our study are consistent with the study by Cheng et al.[8] The results are also comparable to those of Purdie et al and Das et al.[9,10] In group I, the duration of labour during the first stage, second stage and total duration was 156.80 (33.72) minutes, 45.40 (11.4) minutes and 202.20 (43.69) minutes, respectively. In contrast, it was 155.60 (34.42) minutes, 47.24 (12.37) minutes and 202.84 (44.73) minutes, respectively in group II. Furthermore, the time of onset of analgesia for group I was 11.36 (1.35) minutes and for group II was 15.44 (1.39) minutes. The mean (SD) duration of analgesia among the two groups was 154.20 (34.15) minutes and 174.04 (39.11) minutes, respectively. The maximum duration of analgesia in both groups was 185 minutes. In a study by Kumar et al, the mean onset of analgesia with ropivacaine was 21.43±2 minutes and with levobupivacaine, it was 23.57±1.71 minutes, significantly shorter analgesia with ropivacaine.[11] The duration of analgesia with ropivacaine was 60±14 minutes, and with levobupivacaine was 68±11 minutes, which was significantly shorter analgesia with ropivacaine. In terms of not perceiving pain and uterine contraction during labour analgesia, levobupivacaine produced a better quality of analgesia. Still, it was associated with an increased incidence of instrumental delivery of about 37 per cent. The findings of our study are also comparable to those of Rahmati et al.[12] In our study, most subjects had normal labour in both groups. It was found that both groups had two patients who underwent caesarean section, whereas in group II, three (10%) of the subjects delivered by forceps delivery. Furthermore, there was no difference in the APGAR score at 1 minute and 5 minutes in both groups. Chetty et al in their study, also found comparable maternal expulsive efforts, instrumental delivery and fetal outcomes.[13] In the study by Chethananand et al no significant difference was observed between the two groups regarding maternal satisfaction, mode of delivery, incidence of instrumentation and fetal outcome.[14] Our study showed a significant difference in MAP at 5 minutes and 30 minutes. In contrast, at other time periods, the MAP was not significant between the groups. There was a significant difference in heart rate at 60 minutes, while, at other time periods, the heart rate was not significant between the two groups. There was no significant difference in VAS score at different time periods, except for the VAS score at 30 minutes. The cumulative analgesia score in the levobupivacaine group was higher than in the ropivacaine group. The results of our study are consistent with the findings of Cheng et al and Viitanen et al.[8,15] In group I, complications were reported in 20 per cent of the patients, while in group II, complications were reported in 10 per cent. These findings are consistent with those of Viitanen et al and Kuczkowski et al.[15,16]

CONCLUSION

The study concluded that both groups of analgesics have comparable efficacy in terms of analgesic characteristics. Still, levobupivacaine has a longer duration of analgesia, which is helpful for the effective functioning of labour and patient satisfaction.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kour G, Sharma S, Singh G. Effectiveness of single shot spinal analgesia with 0.2% ropivacaine in comparison to 0.2% levobupivacaine for labour analgesia. Int J Res Med Sci 2024;12:4617-21.