Original Research Article

Comparative Evaluation of Ropivacaine 0.2% with Fentanyl and Levobupivacaine 0.125 % with Fentanyl as Adjunct in Epidural Labour Analgesia: A Randomised Control Clinical Study

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Abstract

Introduction: Labor is described as a series of actions that occur in the genital organs in order to evacuate the viable products of conception from the womb and into the outside world through the vaginal canal. Pain is an unpleasant and painful input that causes pathophysiological responses. **Aims:** To compare the efficacy of labour epidural analgesia with Levobupivacaine 0.125% with Fentanyl 2mcg/ml and Ropivacaine 0.2% with Fentanyl 2mcg/ml. **Materials and methods:** Study was conducted in 60 parturients, of age group 18-35 years admitted to Gandhi Hospital for safe institutional delivery from 2016-2017. They were randomly divided into two groups of 30 each ,Group L: This group of patients received Levobupivacaine 0.125% and Fentanyl 2mcg/ml ,Group R: This group of patients received Ropivacaine 0.2% and Fentanyl 2mcg/ml and Intermittent bolus dose regimen was followed and 5ml of study drug solution given every hourly. Continuous monitoring of SBP, DBP, HR and SPo2 were done and study parameters were be recorded. **Results:** VAS scores between the two groups. Volume of local anaesthetic mixture recorded were 33.6+/- 4.33 ml in Levobupivacaine group compared to 32.8+/- 4.2ml in Ropivacaine group which translates to an approximate of 8.6ml/hour for Levobupivacaine group and 8.28ml/hour for Ropivacaine group. Time for first top-up was observed to be 57.1 +/- 3.98 minutes for Levobupivacaine group and 62.53 +/- 4.9 min for Ropivacaine group. Incidence of pruritus was 8/30 in Levobupivacaine group and 7/30 in Ropivacaine group. Post epidural placement, statistically significant differences were observed in VAS at 5min and 10 min with higher values recorded in Levobupivacaine group and Ropivacaine group.**Conclusion** : Both Levobupivacaine and Ropivacaine are safe in providing labour analgesia via epidural route and that Ropivacaine had a significantly faster onset and only mildly prolonged analgesia.

Keywords: Levobupivacaine, Ropivacaine, Epidural analgesia.

Introduction

Labor is described as a set of actions that occur in the genital organs in order to expel the viable products of conception from the womb and into the outside world via the vaginal canal. Pain is an unpleasant and painful input that causes pathophysiological responses. Hyperventilation occurs in the respiratory system during contraction, increasing the labour of breathing and oxygen consumption. Unresolved stress during labour raises plasma cortisol and catecholamine levels, lowering utero-placental blood flow by 35-70 percent and increasing the effects of hyperventilation on the foetus' oxygen supply. Metabolic acidosis is passed to the foetus as a result of increased metabolic rate, especially in the second stage of labour. There is a delay in both stomach and urine emptying. Thus Effective pain treatment reduces plasma noradrenaline, avoids the rise of 11-hydroxy corticosteroid during the first and second stages of labour, and prevents metabolic acidosis by slowing the rise of lactate and pyruvate. It can reduce maternal oxygen demand by as much as 14%. Hyperventilation and hypocapnia caused by pain can lower uteroplacental blood flow by up to 25%. The respiratory alkalosis affects foeto-maternal gas exchange even more by moving the oxyhaemoglobin dissociation curve to the left, resulting in foetal PaO2 drops of up to 23%[1].

Regional procedures have the advantage of avoiding stomach aspiration, avoiding the use of depressant general anaesthetic medicines, and allowing the woman to remain awake and assist in the delivery process. It has been reported that limiting women to their beds during labour may cause labour to last longer and be more painful, as well as an increase in atypical presentation, instrumental deliveries, and foetal distress. Epidural analgesia, which uses a combination of low-dose local anaesthetics and opioids to offer pain relief during labour, has the disadvantage of a delayed start[2]. Bupivacaine has risks of cardiotoxicity and motor blockade .Levobupivacaine the s-enantiomer of Bupivacaine has less cardiotoxicity and neurotoxicity.

Ropivacaine with its low cardiotoxicity profile and high sensorimotor differential blockade is also an effective choice. Fentanyl adjunct provides more even and an improved quality of analgesia besides reducing total dose requirements of Local Anaesthetics, thus reducing the incidence of motor block also. The present study compares the efficacy of low dose of Levobupivacaine 0.125% and Ropivacaine 0.2% with Fentanyl as an adjunct at a concentration of 2mcg/ml

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Materials and Methods

The study protocol was approved by the Institutional Ethics Committee of Gandhi Medical College and Hospital, Secunderabad. Patients coming to the hospital and accepted for the study were of American society of Anesthesiologists grades l and ll, admitted for safe institutional delivery and requested for labour analgesia. A written informed consent was taken from all the patients.

A clinical study was undertaken to compare the efficacy of Levobupivacaine 0.125% and Ropivacaine 0.2% with Fentanyl as adjuvant at 2mcg/ml concentration in labour epidural analgesia.

Inclusion Criteria: Age group: 18-35 year , ASA grade I and II, Primi, full term with singleton vertex presentation, Adequate gynaecoid pelvis, cervical dilatation 3-4 cm

Exclusion criteria: Patients with pregnancy-induced hypertension, heart disease, anaemia, and other pregnancy problems received opioids within four hours of requesting an epidural. Patients with renal, hepatic, cardiovascular, haemopoetic, pulmonary, gastrointestinal, neurological, or endocrine diseases that are clinically severe. Any disease that precludes epidural anaesthesia, such as an allergy to the study medicines.

Pre-Anaesthetic Evaluation:

Prior to epidural implantation, all patients had a full pre-anaesthetic examination. A clinical examination was performed, as well as a thorough medical history. All of the systems, including the airway, were evaluated. The process was described to the patients, and they were introduced to the Visual Analog Scale (0-100mm; 0-no pain, 100-worst possible pain) and its use in pain evaluation. According to the fasting recommendations, all of the patients were kept nil per oral. An informed written consent was obtained. To counteract Local Anaesthetic Systemic Toxicity, a 20% intra-lipid and emergency cart were maintained on hand.

GROUP L: This group of parturients receive Levobupivacaine 0.125% and Fentanyl 2mcg/ml

GROUP R: This group of parturients receive Ropivacaine 0.2% and Fentanyl 2mcg/ml

Baseline maternal pulse and non-invasive blood pressure were monitored, and a Visual Analogue Pain score (0 mm = no pain, 100 mm = worst pain possible) was recorded after receiving approval from the Institutional Ethics Committee and signed informed consent from the patient. A cannula with a diameter of 18 G was obtained. A multi parameter monitor was used to keep track of everything. Blood pressure (systolic and diastolic), heart rate, and arterial oxygen saturation were measured at the start. 15 minutes before the block was established, all patients were given 10 ml/kg of Ringer's lactate solution. Infiltration of skin with local anaesthetic (2 percent lignocaine) at the L2/L3 level was done in a sitting position under rigorous antiseptic precautions. The epidural space was found utilising the loss of resistance to air technique and a Tuohy's needle of 18G. A 5 cm epidural catheter was inserted and secured into the epidural space. After negative CSF and blood aspiration, a test dose of 3 ml of 2% lignocaine with adrenaline 1:200000 was given. The patients were observed for any signs of unintended intravascular injection or subarachnoid block, both subjective and objective. During epidural injection, patients were asked to report any unexpected subjective sensations, and electrocardiogram (ECG), non-invasive blood pressure (NIBP), arterial oxygen saturation (SpO2), and respiration rate were also examined for objective symptoms (RR). The patient was placed in a supine position while they were away.

5ml of study medication solution was administered every hour on an intermittent bolus dosage regimen. SBP, DBP, HR, and SPo2 were continuously monitored, and research parameters were recorded. Throughout the delivery, indicators of local anaesthetic toxicity, such as brady - arrhythmias, hypotension, and signs of allergy, such as rashes, hypotension, and so on, were carefully monitored.

Statistical Analysis

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.** Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Leven1s test for homogeneity of variance has been performed to assess the homogeneity of variance. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Results

The average age was 23.63+/-3.74 years in group R, and 24.13 ± 3.22 years in group B. Youngest patient in the study group was 18 years and oldest was 30 years. There was no statistically significant difference in age between the two groups.

Table 1: Preoperative Hemodynamic Data

	SBP	DBP	HR	VAS	CXDIL
GROUP L	148.3±8.54	94±4.92	100.46±9.25	9.03±0.71	3.5+/-0.57
GROUP R	143.56±9.67	94.16±4.03	100.13±8.6	9±0.64	3.3+/-0.46
p VALUE	0.23	0.93	0.88	0.86	0.14

Sample population in both the study groups were comparable with respect to SBP, DBP, and HR, VAS and cervical dilatation with p value >0.05

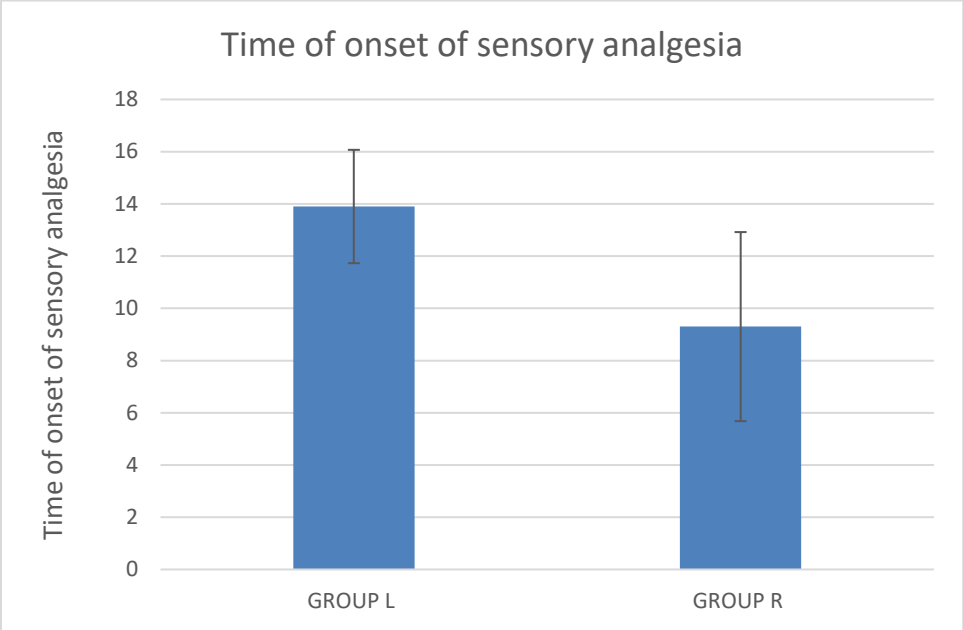

Fig. 1: Time of onset of sensory analgesia

There was statistically significant delay in onset of analgesia in levobupivacaine group.

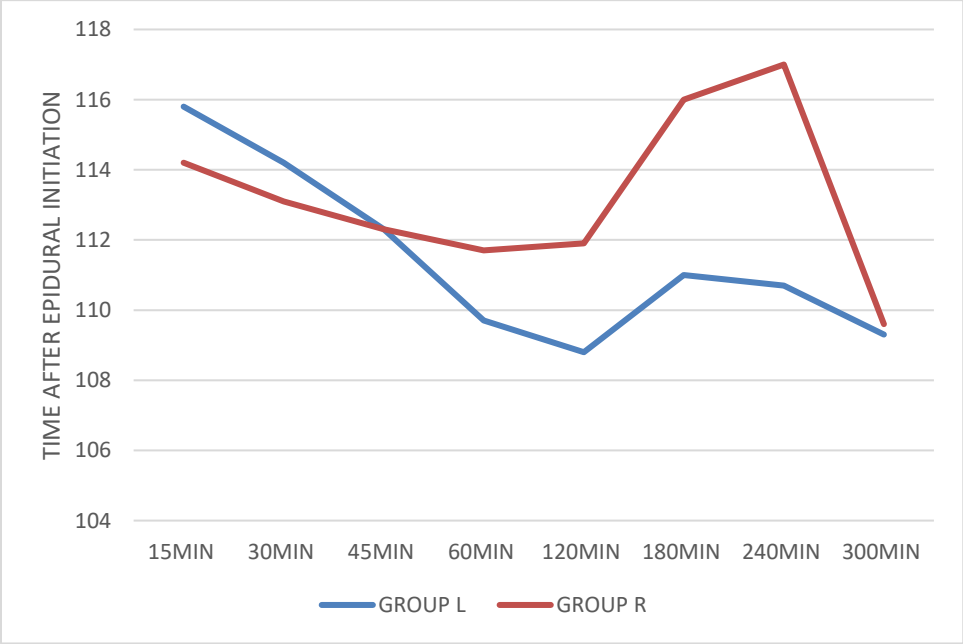

Fig. 2: Systolic blood pressure variations

Intra-operatively the differences in systolic blood pressure were not statistically significant at any time frame. No incidence of maternal hypotension in either group.

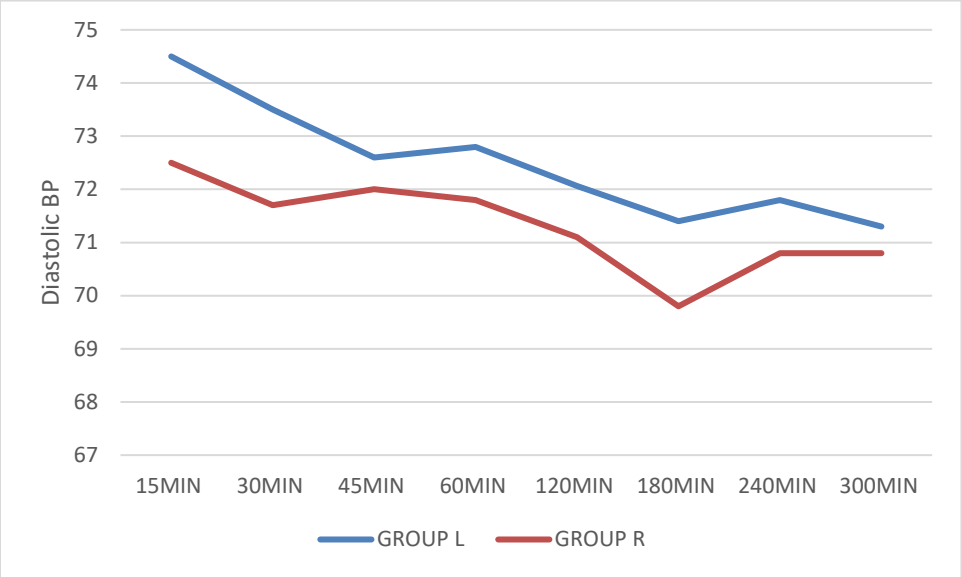

Fig. 3: Showing diastolic blood pressure variations

There were no significant differences in diastolic blood pressures in both the groups.
Throughout all phases of labour.

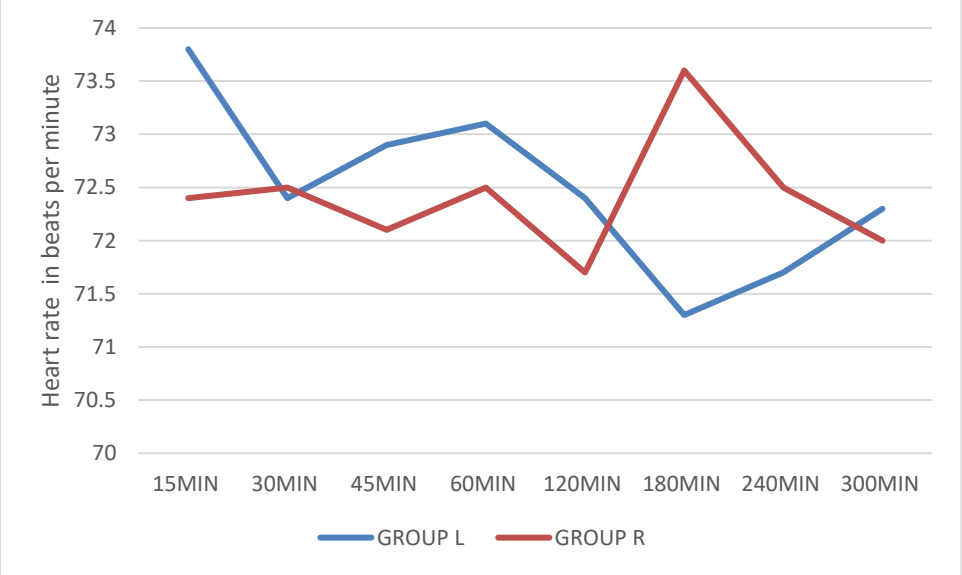

Fig. 4: Maternal heart rate trends

There were no significant differences in heart rate in both the groups during all the phases of labour.

Table 2: VAS Scores after Epidural

VAS			
Time	**Group L**	**Group R**	**P Value**
5 Min	7.23+/-0.62	6.06+/-0.86	<0.05
10 Min	1.83+/-1.55	0.8+/-1.82	<0.05
15 Min	0.83+/-1.4	0.56+/-1.3	0.44
30 Min	0.2+/-0.4	0.1+/-0.3	0.27

There is a significant difference in vas scores for first 10 min(lesser values for group R) after institution of epidural which may correlate with faster onset of analgesia in Ropivacaine group

There was no incidence of motor block at any time frame in both groups L and R.

Seven parturients in group L (7/30) and 5 parturients (5/30) in group R required additional 5ml bolus to achieve adequate pain relief and dermatomal level of T 10.

No significant difference in volumes of LA –Fentanyl mixture required to maintain analgesia throughout the process of delivery between both the groups.

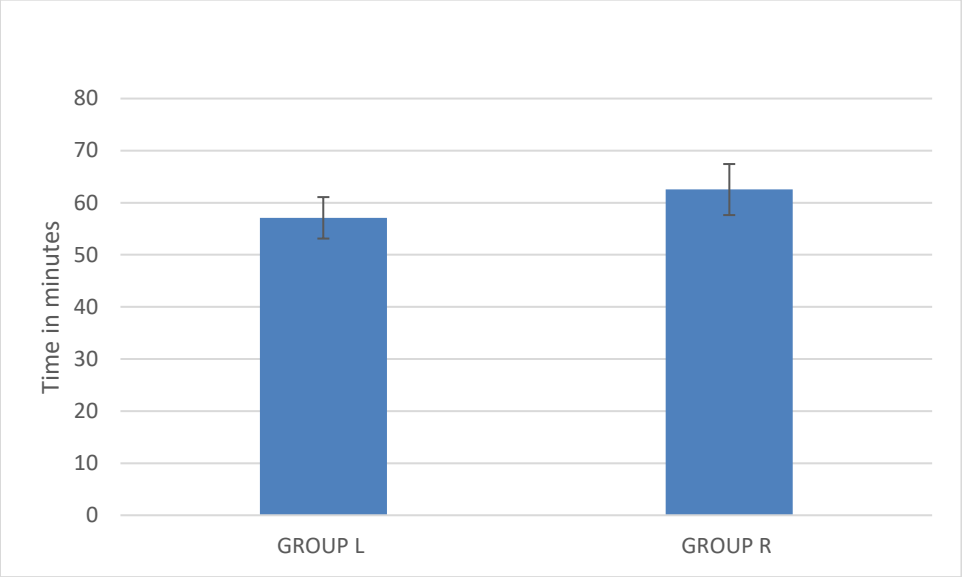

Fig. 5: Time for first top up dose

No significant differences in time for first top-up requirement in both the groups.

No signs of local anaesthetic toxicity, allergy were noted. Pruritus was the only notable maternal complication attributable to the use of opioids.

No incidence of fetal heart rate abnormalities or low APGAR scores was observed in both the groups during the study.

Discussion

In an ideal world, pain management from localised procedures would cause the least amount of disruption to labour progress, sympathetic functions, sensory functions (proprioception), and motor functions of the CNS. Thus, it is appealing to the obstetric anaesthetist to establish a balance between patient satisfaction by providing adequate analgesia, reducing motor block and allowing the parturient to engage in labour, and reducing instrumental births due to the prolonged second stage[3]. Local anaesthetics are extremely useful in the treatment of somatic discomfort. This is especially crucial in the late first and second stages of labour, when the visceral agony of the first stage gives place to somatic discomfort.

In the present study efficacy of Ropivacaine 0.2% and Levobupivacaine 0.125% with Fentanyl 2mcg/ml as adjunct have been compared in terms of total volumes of local anaesthetics required , incidence of motor blockade , duration of analgesia , time for first epidural top up, hemodynamic stability, maternal satisfaction using VAS scores. 5ml of prepared LA mixture is given as a bolus if analgesia is inadequate with level < T10 or VAS> 3mm. In the resent study onset of analgesia was 13.53+/- 1.73min (mean+/-standard deviation) in group l and 7.63+/-0.92 in group r ($p<0.05$). Motor block has not been observed in any parturient of any group. In the studies by Linda s Polley et al[4] and NL Puride et al[5] observations were similar, however concentration of LA was 0.1%.in their studies. In present study no incidence of maternal bradycardia and hypotension was observed in any of the parturients.

Atienzar et al[6] in their study using 0.125% Levobupivacaine and Ropivacaine 0.2% observed hypotension in 15% of parturients in Levobupivacaine and 14.7% of parturients in Ropivacaine group. However it was continuous epidural infusion. Sienster et al 58 in their study using 0.25% Ropivacaine observed motor block in 36% of patients. Significant VAS >3cm was recorded in first 5min in all parturients,5/30 and 6/30 at 10 and 15min in group r and group L respectively, requiring additional bolus of 5ml at 15min. VAS scores were significantly different in first 10 min between Levobupivacaine and Ropivacaine group with higher values recorded in Levobupivacaine group which related to faster onset of analgesia in group R. Though vas scores are slightly high in group l at 15 min the difference is not significant. David c Campbell et al[5,9] in their study observed that vas became insignificant at 12.4+/-4min (0.08%+2mcg/ml Fentanyl mixture) . In the study by Neera Shah et al[7] The time to achieve T10 sensory level and patient comfort was Ropivacaine (9.35 F 4.96 min) and Levobupivacaine (9.56 F4.71 min). Volumes of LA mixture recorded were 33.6+/-4.33 in Levobupivacaine group, and 32.8+/-4.2 in Ropivacaine group, which translates to an approximate of 8.6ml/hr and 8.28ml/hr respectively. David C Campbell et al[8] in their study found the requirements of Ropivacaine to be 7.8+/-3.4 ml/hr (0.08%+2mcg/ml Fentanyl mixture). Boulier et al[9] in their MLAC study recorded the la requirements as 13.3+/-5.8mg/hr in Ropivacaine group and 14.4+/-9.7mg/hr that translates to 6.5+/-3ml/hr and 6+/-4ml/hr respectively. (20ml bolus 0f 0.2% Ropivacaine and 0.25% Levobupivacaine.)

It was observed to be 57.1+/-3.98 min for Levobupivacaine and 62.53+/- 4.9min for Ropivacaine which may suggest a longer duration of analgesia by Ropivacaine, however the difference was not significant . Linda S Polley et al[4] in their study observed analgesia offset time to be 63+/- 17.9min and 75+/-24.4 min respectively in groups Levobupivacaine and Ropivacaine. Nl Puride et al[5] observed the duration of initial dose was 35 min and 34 min in Levobupivacaine and Ropivacaine group respectively.

Incidence of pruritus is 8/30 and 7/30 in Levobupivacaine and Ropivacaine group respectively. No incidence of nausea, hypotension, bradycardia and PDPH was observed in any of the parturients. Sienstra et al[10] in their study that the Hemodynamics were stable throughout the process of labour (0.25% Ropivacaine). Atienzer et al[6] in their study hypotension was noted in 15% of

parturients in Levobupivacaine group and 14.7% in Ropivacaine group (0.125%Levobupivacaine, 0.2% Ropivacaine), nausea was 0% and 8.8% respectively. Hypotension was taken as 90 mm of Hg SBP or 20% below baseline where as in the present study it was taken as <100 mm of Hg.

No incidence of fetal heart rate abnormalities or low APGAR scores was recorded during the study. Atienzar et al[6] in their study observed incidence of APGAR <7 at 1min in 3.1% of the patients in Levobupivacaine group and 0% in Ropivacaine group. However there were instrumental and caesarian deliveries included in the study. Linda S Polley et al[4] did not report any abnormal fetal heart rate abnormalities among the study groups.

Low concentrations of the drugs have been used; scope for use of ultralow dose mixtures is present. Plasma levels of Levobupivacaine or Ropivacaine haven't been measured; however there were no signs of local anaesthetic toxicity. Any parturient going for caesarian section was excluded from the study and incidence of instrumental delivery hasn't been recorded. Only term primipara were included ,hence utility of labour analgesia in multigravida has not been studied. PCEA or Continuous infusion techniques were not used. Duration of stages of labour hasn't been quantified, which might have indicated any prolonged stage attributable to labour analgesia if any. Ambulation was not allowed in any of the parturients, thus effectiveness of present concentrations for ambulatory analgesia hasn't been studied.

Conclusion

From the present study, VAS scores were significantly different in first 10 min between Levobupivacaine and Ropivacaine group with higher values recorded in Levobupivacaine group which related to faster onset of analgesia in Ropivacaine group. No signs of local anaesthetic allergy and toxicity were observed. No effects on fetal outcome as observed using FHR and APGAR scores. No incidence of motor block were observed in both drugs.

It is concluded that both Levobupivacaine and Ropivacaine are safe in providing labour analgesia via epidural route and that Ropivacaine had a significantly faster onset and only mildly prolonged analgesia.

Conflict of Interest: Nil
Source of support:Nil

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