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Research Article

COMPARISON OF INTERMITTENT BOLUS AND CONTINUOUS INFUSION OF 0.1% LEVOBUPIVACAINE WITH FENTANYL FOR EPIDURAL LABOR ANALGESIA

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ABSTRACT

Objectives: This study was carried out to compare intermittent bolus and continuous infusion for epidural labor analgesia in terms of total dose requirement of local anesthetic and quality of analgesia as primary objective. Secondary objective was level of sensory block, motor block, hemodynamic variables, mode of delivery, duration of second stage, neonatal outcome, side effects, and postpartum complications.

Methods: Eighty women of ASA physical status I or II, with single pregnancy, cephalic presentation and cervical dilatation 3–5 cm, that is, during active labor were included in the study. Patients were randomly divided into two groups. In Group A, a bolus of 8 ml of 0.1% levobupivacaine (plain) with fentanyl 2 mcg/ml was given every hour and in Group B, an infusion of 0.1% levobupivacaine (plain) with fentanyl 2 mcg/ml at 8 ml/h was given. Pain scores using visual analog scale and verbal rating score, additional bolus requirement and total dose of local anesthetic, motor blockade, fetal and neonatal outcome, mode of delivery, and duration of second stage were recorded and compared. Side effects and postpartum complications if any were documented.

Results: Additional bolus requirement and total dose of local anesthetic were significantly high in Group B (45.60±6.67 mg) as compared to Group A (34.20±5.58 mg). There was no difference in the quality of analgesia, neonatal outcome, mode of delivery, duration of second stage, side effects, and complications.

Conclusion: Intermittent epidural bolus is better in terms of less drug consumption and less number of additional bolus requirement.

Keywords: Levobupivacaine, Labor analgesia epidural, Bolus, Infusion.

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INTRODUCTION

Labor pain results in a stress response in the mother. Lumbar epidural is considered the modality of choice as it provides labor analgesia while preserving the tone of pelvic floor muscles allowing labor to proceed unhindered. Long acting local anesthetics like levobupivacaine have been increasingly used along with adjuvants.

Opioids used as adjuvant have synergistic effects as they act directly on opioid receptors in the spinal cord that reduces the dose of local anesthetic thus decreasing their toxicity [1], provide safe and adequate pain relief during labor [2,3].

Continuous epidural infusions result in a smoother analgesic experience for the parturient, but total local anesthetic doses are usually larger and motor bock may occur [4]. Clinical studies suggest that intermittent boluses technique produces a more uniform block with a reduced requirement of local anesthetic due to lesser rescue boluses [5].

Lim *et al*. found that volume of drug, the speed at which bolus is delivered and pressure generated in epidural space affects dispersion. Epidural bolus through a multiorifice epidural catheter results in wider sensory blockade compared with continuous infusion leading to better quality of analgesia [6]. Primary objective of the study was to compare intermittent bolus and continuous infusion for epidural labor analgesia in terms of total dose requirement of local anesthetic and quality of analgesia. Level of sensory block, motor block, labor, delivery characteristics, neonatal outcome, side effects, and complications were also compared.

METHODS

After approval from the Hospital Ethics Committee, a written informed consent was taken after explaining the procedure to the patient. This prospective and randomized study was conducted on 80 parturients of ASA physical status I and II, with single pregnancy, gestation >37 weeks, cephalic presentation, and in active labor (cervical dilatation of 3–5 cm). Patients having breech presentation, antepartum hemorrhage, severe pre-eclampsia, multiple pregnancies, cephalopelvic disproportions, bleeding disorders, decreased platelet counts, sepsis, aortic stenosis, diabetes, fetal distress, imminent delivery, spinal column deformity, spine surgery, contraindication to epidural analgesia, and history of anaphylaxis to local anesthetics were excluded from the study. Patients were randomly divided into two groups by computer generated random numbers. Visual analog scale (VAS) and verbal rating score (VRS) score were explained to them.

After establishing venous access, patients were preloaded with 300 ml Ringer lactate. Under all aseptic precautions, 2 ml of 2% xylocaine was injected subcutaneously at L2-3 or L3-4 interspace and epidural space was sought and identified by loss of resistance to the air technique with the help of Touhy's needle. Then, 20 gauge epidural catheter was inserted 3–4 cm in the space. All parturients were given an epidural bolus of 10 ml of 0.1% levobupivacaine (plain) with fentanyl 50 mcg. This was considered time 0 (T 0). Then, patients were given the drug as per their group allocation. In Group A, intermittent bolus of 8 ml of 0.1% levobupivacaine (plain) with fentanyl 2 mcg/ml was given every hour till the time of delivery. In Group B, parturients were given epidural infusion of 0.1% levobupivacaine (plain) with fentanyl 2 mcg/

ml at 8 ml/h till the delivery of the baby. An additional 5 ml of 0.1% levobupivacaine (plain) with fentanyl 2 mcg/ml was given to the patient if sensory blockade was not achieved even after 30 min of first dose. A rescue bolus of 8 ml of same solution 0.1% levobupivacaine (plain) with fentanyl 2 mcg/ml was given to the parturient whenever there was breakthrough pain and VAS score was ≥4.

Pain scores were assessed every 5 min till 15 min then at interval of 15 min using VAS (0 = no pain and 10 = severe pain) and VRS (0 – no pain, unaware of contraction; 1 – aware of contraction, but no pain; and 2 – contraction painful).VAS ≤3 and VRS ≤1 were considered as adequate analgesia. Motor blockade was assessed using Bromage Scale (Grade 0 – No motor block, Grade 1 – Inability to flex the hip, Grade 2 – Impaired hip flexion, normal knee and ankle, and Grade 3 – Impaired movements at hip, knee, and ankle). Sensory block was assessed by loss of appreciation to pin prick. Onset of analgesia was time taken from injection of first dose up to the time when T10 level of analgesia achieved. Rescue bolus requirement of local anesthetic was recorded for each patient and total dose of LA given to each patient was calculated. Fetal heart rate, APGAR score, mode of delivery, and duration of second stage were recorded and compared. Hemodynamic variables, respiratory rate, and saturation of the parturient were monitored. Side effects and postpartum complications if any were documented.

Statistical analysis

For all data, descriptive statistics were done and suitable statistical tests were applied. The data were analyzed using IBMM SPSS statistics (22.00 version) and Microsoft Excel sheet. Categorical variables were analyzed with Chi-square test and continuous variables were analyzed with unpaired t-test and Mann–Whitney U test. Statistical significance was taken as $p<0.05$. $p>0.05$ was taken as statistical non-significant.

RESULTS

Patients in both the groups were comparable with respect to demographic characteristics (Table 1). Onset of analgesia was comparable in both the groups (Table 2). Mean dose of levobupivacaine consumed was significantly higher in Group B (45.60±6.67 mg) as compared to Group A (34.20±5.58 mg). Rescue bolus requirement of local anesthetic was significantly high in Group B (Table 3). Pain scores were comparable in two groups (Figs. 1 and 2). Motor blockade was not seen in any of the patients in both the groups. Hemodynamic variables were comparable in all the patients during labor analgesia. Mode of delivery, duration of second stage, and APGAR score were comparable in both the groups (Table 4). Side effects were noted and were comparable in both the groups (Table 5). Local infiltration was not required for episiotomy as analgesia was continued in the second stage of labor.

Table 1: Demographic profile of parturients (all values are expressed as mean±SD)

Variables	Group A	Group B	p-value	Significance
Age (years)	24.20±2.90	24.57±3.45	0.12	NS
Height (cm)	154.0±4.06	154.7±4.46	0.53	NS
Weight (kg)	65.80±6.14	64.47±6.04	0.40	NS

Table 2: Onset of analgesia (min)

ONSET	Mean (min)	S.D	p-value	Significance
Group A	13.30	1.44	0.429	NS
Group B	13.05	1.36		

Table 3: Total local anesthetic used and rescue boluses

Variables	Group A	Group B	p-value
Total dose of levobupivacaine used (mg)	34.20±5.58	45.60±6.77	<0.001
Rescue boluses	3 (7.5%)	12 (30%)	0.010

Table 4: Labor and delivery characteristic and neonatal outcome

Variables	Group A	Group B	p-value
Duration of second stage	50.12±19.73 min	58.00±19.11 min	0.074
Instrumental vaginal delivery	5 (12.5%)	6 (15%)	0.745
Spontaneous vaginal delivery	35 (87.5%)	34 (85%)	
LSCS*	0	0	
APGAR 1 min	8.93±0.35	8.90±0.50	0.795
APGAR 5 min	9.0±0.00	9.0±0.00	

*Lower segment cesarean section

Table 5: Side effects and complications

Side effects and complications	Group A (%) n=40	Group B (%) n=40
Nausea	5.0	2.5
Vomiting	2.5	2.5
Pruritus	2.5	2.5
Hypotension	0	0
Urinary Retention	0	0
PPH	0	0

DISCUSSION

Our primary objective was to compare total dose requirement of local anesthetic and quality of analgesia in the two groups. Secondary objectives included comparison of sensory block, motor block, duration of second stage, mode of delivery, neonatal outcome, and complications. We chose 0.1% of levobupivacaine (plain) with fentanyl 2 mcg/ml in this study to achieve adequate pain relief with minimal motor blockade so as to lower the incidence of instrumental vaginal delivery. We found that total dose of local anesthetic in parturients receiving intermittent epidural bolus for labor analgesia was less as compared to those who received continuous epidural infusion. Mean dose of levobupivacaine used was 34.20±5.58 mg in Group A and 45.60±6.77 mg in Group B (Table 3). This finding was similar to many studies showing lower consumption of local anesthetic in intermittent epidural bolus group [7-11]. This could be due to more uniform spread of local anesthetic in epidural space with high injectate pressure. Shankar *et al*. conducted a study and found that higher driving pressure generated with the intermittent boluses associated with greater surface area of diffusion, results in better spread of local anesthetic in epidural space [12]. However, Lim *et al*. found comparable local anesthetic requirement in both the groups in their study which might be due to lesser volume of intermittent bolus used [6].

There was no significant difference in pain scores as assessed by VAS and VRS scale at different time intervals. This could be due to increased number of rescue boluses given to the patients in continuous epidural infusion group which might have masked the difference of pain scores between the two groups. The number of parturient who required rescue bolus at different time interval was 3 in Group A and was 12 in Group B with p=0.01. Motor blockade was not seen in any of the patients in the two groups. This could be due to low concentration of levobupivacaine (0.1%) and rate of epidural infusion or bolus used, as the degree of motor block depends on the dose of local anesthetic and concentration of local anesthetic used.We observed no difference in fetal, neonatal outcome in terms of FHR, and APGAR score and results were favorable in both the groups. In Group A, 12.5% parturients had instrumental vaginal delivery while in Group B, 15% had instrumental vaginal delivery and rest of the parturients in both the groups had spontaneous vaginal delivery. We used same concentration of local anesthetic for rescue

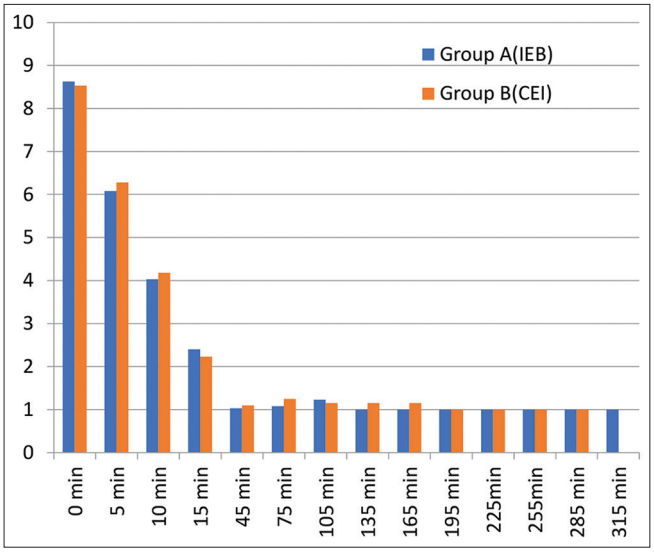

Fig. 1: Visual analog scale at different time intervals

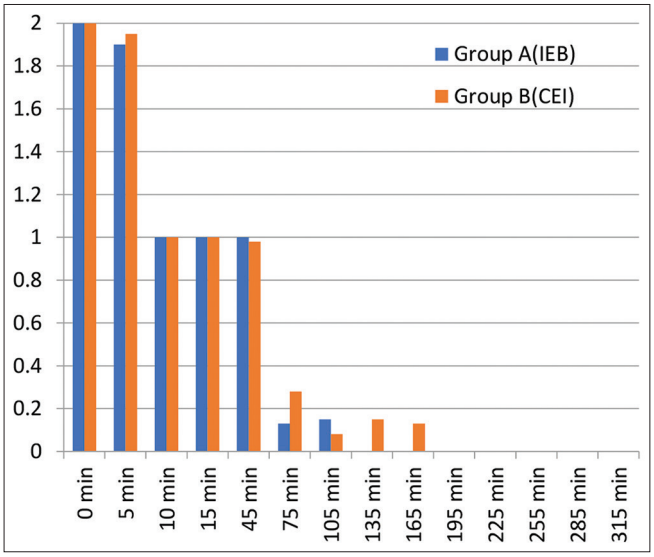

Fig. 2: Verbal rating score at different time intervals

boluses, that is, 0.1% levobupivacaine which was sufficient to block the pain stimulus resulting in pelvic floor muscles relaxation which, in turn, causes cervical dilatation and descend of fetal head.

CONCLUSION

In this study, total dose of levobupivacaine was less in intermittent bolus group with reduced requirement of additional rescue doses as compared to continuous epidural infusion group. However, pain scores, mode of delivery, duration of second stage, neonatal and fetal outcome, and hemodynamic variables were comparable in both the groups.

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