



SINGLE-DOSE INTRATHECAL ANALGESIA: A SAFE AND EFFECTIVE METHOD OF LABOR ANALGESIA FOR PARTURIENTS IN LOW RESOURCE AREAS

Anaesthesiology

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KEYWORDS

INTRODUCTION

Labor is one of the most painful experiences for a woman during her lifetime, and the experience is different for each woman. The lack of antenatal psychological preparation combined with fear and anxiety greatly enhance the patients' sensitivity to pain. Thus, pain relief not only provides comfort to patient but also attenuates the release of stress hormones and improves fetal nutrition and oxygen supply.[1] An effective labor analgesia leads to better maternal and fetal outcome Whereas intrathecal labor analgesia is more economical as compared to epidural analgesia; hence, single-dose intrathecal analgesia may prove to be a useful method in limited resource areas, especially in rural and peripheral areas where epidural catheterization may not be possible.[2]

Epidurals have long been associated with increased oxytocin use, increased fetal malposition, increased rates of instrumental and caesarean delivery, and longer labors.[4] Spinal block is cheaper as well as less technically challenging. Intrathecal analgesia alone is useful when duration of labor can be reasonably estimated. Opioid combined with a small dose of local anesthetic provides rapid analgesia and dissipates when no longer needed.[3]

Bupivacaine because of its least placental transfer, due to high protein binding and minimal motor block compared to sensory block in lower doses, has become the popular choice for labor analgesia. Addition of neuraxial lipid soluble opioids permitted reduction in the dose and concentration of bupivacaine from 0.5% to as low as 0.065% while maintaining effective analgesia and minimizing potential adverse effects on the progress of labor and lower extremity motor block.

In view of the above, the present study was undertaken to compare the progress of labor as the primary outcome and hemodynamic changes in the mother and fetus as secondary outcome in parturients who received intrathecal labor analgesia using bupivacaine 2.5 mg and fentanyl 25 µg to a matching group C who did not receive neuraxial analgesia during normal vaginal delivery using a partogram.

MATERIALS AND METHODS

60 nulliparous parturients at term pregnancy (American society of anaesthesiologist physical status grade I) were recruited for this prospective study. Only patients with singleton pregnancies and vertex presentation who were in the active phase of labor with a cervical dilatation of >3 cm and normal fetal heart rate (FHR) tracings were enrolled.

Patients in the group SA ($n = 30$) received an intrathecal injection of 0.5% hyperbaric bupivacaine 2.5 mg (0.5 mL) and fentanyl 25 µg (0.5 mL), volume made to 1.5 mL with normal saline, and compared with the matching group C ($n = 30$) who refused to give consent for neuraxial analgesia. The two groups were evaluated with regards to the progress of labor, maternal hemodynamic variations, fetal heart rate, and neonatal outcome during labor in parturient undergoing normal vaginal delivery. Parturients were positioned supine with left uterine displacement. An intravenous line was secured with an 18 G cannula on the non dominant hand and the parturients were preloaded with 500 mL of ringer's lactate solution; oxygen was administered by facemask at 3 L/min. To perform the block, parturients were placed in a sitting

position as anatomical landmarks are easy to identify in the sitting position and performing the block technically easier in this position. The L3-L4 interspace was identified and 25 G spinal needle was used to enter the subarachnoid space. After return of clear cerebrospinal fluid, patients were given a single intrathecal injection of solutions mentioned previously. Then, parturients were repositioned in a supine position with left uterine displacement. No patients were allowed to walk during the study period due to the need for continuous maternal and fetal monitoring for safety reasons. The frequency and intensity of uterine contractions, dilation, and effacement of the cervix, descent of the presenting part, and requirement of oxytocin (when cervical dilation rate was <1 cm/h) were assessed using the standard partogram chart to plot the progress of cervical dilation hourly and uterine contraction per 10 min by the obstetrician. FHR was monitored using an electronic fetal monitor.

STATISTICAL ANALYSIS

Statistical analysis was performed using software Statistical Package for the Social Sciences (SPSS) version 21 (Armonk, NY: IBM Corp). Unpaired and paired student t test was used to analyze the data; P value of 0.05 was considered to be significant.

RESULTS

Both groups were similar in terms of age, weight, and height of parturients. Both groups were comparable in terms of mean cervical dilation and VAS score at the time of study initiation [Table 1].

The mean onset of sensory block and motor block was 2.97 ± 0.615 and 4.00 min, respectively, and mean duration of motor block was 24.0 ± 1.826 min in group SA. The highest level of sensory block attained was T8 in 30%, T9 in 66.7%, and T10 in 3.3% of group SA. The duration of analgesia was 147 ± 22.11 min.

The VAS score was significantly lower in group that was provided intrathecal analgesia at all time intervals as compared to group C ($P < 0.001$) [Table 2].

Table 1: Parturients characteristics

	G+roup SA (n=30) Mean±SD	Group C (n=30) Mean±SD
Age(Years)	22.15±2.319	20.32±1.189
Weight(kg)	55.65±2.25	52.32±3.32
Height (cm)	152.31±2.35	158±3.20
Cervical dilation (cm)	4.25±0.50	4.10±0.47
Use of Oxytocin	6(20%)	7(23.33%)
Baseline VAS score	7.60±0.62	7.27±0.69

Table 2: Mean visual analog scale score

Time (min)	Group SA (Mean±SD)	Group C (Mean±SD)	P value
0	7.50±0.56	7.17±0.49	0.051
4	1.17±1.10	7.07±0.59	<0.001
10	0.00±0.001	7.07±0.59	<0.001
20	0.00±0.001	7.07±0.59	<0.001
30	0.00±0.001	7.37±0.59	<0.001
60	0.00±0.001	8.56±0.89	<0.001

90	0.12±0.56	8.79±0.65	<0.001
120	1.12±.55	9.15±0.67	<0.001
150	2.13±1.02	9.78±0.76	<0.001
180	3.28±0.78	10.0±0.00	<0.001

Table 3- Comparison of progress of labor

	Group SA (Mean±SD)	Group C (Mean±SD)	P value
Duration of active phase of first stage(min)	110±25.33	132±20.04	0.005
Duration of second stage (min)	18.02±6.17	10.10±4.19	<0.001
Total duration of labor (min)	130±25.53	142.12±20.35	<0.001
Rate of cervical dilation (cm/h)	3.021±0.524	2.345±0.302	<0.001

Thus, parturients in group SA received excellent pain relief throughout labor and VAS score remained less than 4 till delivery as compared to group C, in which VAS score was more than 7 at all time. Rate of cervical dilation was significantly faster and duration of active phase of first stage of labour was observed to be significantly shorter in parturients who received intrathecal analgesia when compared to control group [Table 3].

No intervention was required in any of the parturients with regards to hemodynamic changes in either of the groups. There were no significant changes in FHR as compared to the baseline in both the groups, and none resulted in intervention for fetal compromise. APGAR score at 1 minute remained between 6 or 7 and at 5 minute remained between 7 and 9 in all neonates of both the groups. No neonatal respiratory depression was noted. Nausea was reported in 8% parturients in group SA and 12% parturients in group C; 9% parturients in group SA complained of pruritus. Hypotension, bradycardia, vomiting, and fetal distress were not found in either group.

DISCUSSION

Because single shot intrathecal labor analgesia attempts to achieve a 4h window of ambulatory pain control for laboring women.[4] Hence, it was administered in the active phase of labor (>3 cm cervical dilation) in our study. Palmer *et al.*[5] had compared 5–50 µg fentanyl in parturients for labor analgesia, and found that at 25 µg dose, duration of analgesia was 90 min with least maternal and fetal hemodynamic changes. Bupivacaine was added to relieve somatic pain.[4] The somatic pain of the second stage of labor cannot be effectively blocked by fentanyl alone, however, local anesthetic can effectively block them. Thus, 0.5% hyperbaric bupivacaine 2.5 mg was used in our study. Palmer *et al.*[6] studied different doses of bupivacaine with fentanyl and found that the duration of analgesia in only fentanyl group was 92 ± 23 min, in fentanyl and bupivacaine 1.25 mg group was 94 ± 25 min, and in fentanyl and bupivacaine 2.5 mg group was 108 ± 20 min. Potdar *et al.*[7] reported a similar result in bupivacaine and fentanyl group. In our study, the mean duration of the active phase of first stage of labor was reduced by 19 min in group SA as compared to group C. The mean rate of cervical dilation in active phase of first stage of labor was faster in group SA as compared to group C. Bindu *et al.*[8] reported a decrease in duration of first stage of labor in the epidural group by 20.95 min as compared to the control group. Van de Velde *et al.*[8] reported that 24% of the patients in the high dose intrathecal sufentanil and fetal heart rate abnormalities compared to 11% in the lower dose intrathecal sufentanil and 12% in the epidural group. There were no significant changes observed in the APGAR scores at 1 and 5 min. No neonatal respiratory distress was found in either group. Most common side effect was pruritus which was seen in 3 parturients of group SA, which was mild and no intervention was required. In group SA, 2 parturients complained of nausea as compared to 3 parturients of group C.

CONCLUSION

Due to non-availability of epidural catheters, infusion pumps, multiparameter monitors, and trained staff in low resource areas, we need to rethink about single-shot spinal analgesia as an alternative to epidural labor analgesia. In conclusion we found that single shot intrathecal analgesia using fentanyl 25 µg and bupivacaine 2.5 mg when given in the active phase of first stage of labor had rapid onset with satisfactory pain relief and minimal motor block. It was associated with faster cervical dilation rate and no delay in the progress of labor, without significant maternal and fetal hemodynamic variation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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