

ORIGINAL RESEARCH

Intrathecal labor analgesia using fentanyl 25µg alone versus fentanyl 20µg plus bupivacaine 2.5mg on the progress of labor – A Comparative study

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ABSTRACT

Background: Pain relief during labor, in addition to promoting maternal comfort, prevents the undesirable consequences of stress. Neuraxial techniques are accepted as the gold standard for intrapartum labor analgesia. In present study, we compared fentanyl 25µg alone versus fentanyl 20µg plus bupivacaine 2.5mg as intrathecal labor analgesia with regards to progress of labor at a tertiary hospital.

Material and Methods: Present study was single-center, interventional, randomized study, conducted in Pregnant females 20-30 years, Booked antenatal cases, primigravida, full-term, singleton pregnancies, vertex presentation, in active phase of labor with a cervical dilatation of ≥ 4 cm with normal fetal heart rate (FHR) tracings, ASA status grade I/II.

Results: 60 parturients were enrolled in present study, randomly allocated into Group F (fentanyl 25 µg) & group BF (fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg). Cervical dilation at time of entry in study (cm) on admission, Onset time of Labor Analgesia (min), Duration of Labor Analgesia (min), Oxytocin units used till completed second stage, Duration of active 1st stage / 2nd stage (min), Total Duration of labor (min), Rate of cervical dilatation (cm/h), APGAR score (At 1 & 5 min) were comparable in both groups & difference was not significant statistically ($p>0.05$). VAS scores at (60 min, 120 min, 180 min, 240 min, 300 min) were less in group FB as compared to group F, but difference was not statistically significant.

Conclusion: Progress of labor, in pregnant women with intrathecal labor analgesia using fentanyl 25µg alone was comparable with fentanyl 20µg plus bupivacaine 2.5mg.

Keywords: Intrathecal labor analgesia, fentanyl, bupivacaine, progress of labor

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INTRODUCTION

Pain relief during labor, in addition to promoting maternal comfort, prevents the undesirable consequences of stress. Neuraxial techniques are accepted as the gold standard for intrapartum labor analgesia. Multiple randomized controlled trials comparing epidural analgesia with systemic opioids, nitrous oxide, or both have demonstrated lower maternal pain scores and higher maternal satisfaction with neuraxial analgesia.¹

Fentanyl is a synthetic lipophilic opioid with a rapid onset of action and, has faster onset of action, it improves quality of intraoperative analgesia, reduces intrathecal doses of local anaesthetic drugs and is associated with less side effects and good postoperative analgesia.²

Local anesthetics alone or with adjuvants can be used for pain relief in regional techniques. Bupivacaine, has been associated with reduced incidence of cardiotoxicity and motor blockade.³

Fentanyl has been studied extensively and is added during induction of anesthesia to provide analgesia during surgical procedures and to decrease the hypertensive response to intubation.⁴ In present study, we compared fentanyl 25µg alone versus fentanyl 20µg plus bupivacaine 2.5mg as intrathecal labor analgesia with regards to progress of labor at a tertiary hospital.

MATERIAL AND METHODS

Present study was single-center, interventional, randomized study, conducted in labour room & operation theater of obstetrics & gynaecology, conducted under department of anaesthesiology, at XXX medical college & hospital, XXX, India. Study period was from July 2021 to December 2021 (6 months). Study was approved by institutional ethical committee.

Inclusion criteria

- Pregnant females 20-30 years, Booked antenatal cases, primigravida, full-term, singleton pregnancies, vertex presentation, in active phase of labor with a cervical dilatation of ≥ 4 cm with normal fetal heart rate (FHR) tracings, ASA status grade I/II, Willing to participate

Exclusion criteria

- Patients with medical disorders, Pre-existing systemic or neurological disease
- Patients with altered coagulation profile,
- Patients required caesarean section,
- Patients with any obstetrical complications,
- Severe deformity of the spine, local infection on back,
- Patient refusal

Study was explained in local language & written consent was taken. Baseline hemodynamic parameters including maternal pulse rate, non-invasive blood pressure, oxygen saturation, and respiratory rate were recorded. The stage of labor, cervical dilation, and fetal heart rate were also noted. Total 60 labouring women were enrolled for present study.

60 parturients were enrolled in present study, randomly allocated by computer generated serial numbers, in 2 groups of 30 each.

- 1) Group F - received an intrathecal injection of fentanyl 25 µg
- 2) Group BF - received intrathecal injection of fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg (0.5 ml)

Under all aseptic precautions & with prior preparation, block was given in a left lateral position, in L3-L4 interspace, with 25 G spinal needle & drugs were given as per group allocation.

The frequency and intensity of uterine contractions, dilation and effacement of cervix, descent of presenting part, fetal heart rate, and requirement of oxytocin were assessed using partograph by attending obstetrician. APGAR scores were recorded by paediatrician. The two groups were evaluated with regards to the progress of labor, maternal hemodynamic variations and neonatal outcome.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

RESULTS

Baseline maternal characteristics such as age, weight, height & gestational age were comparable in both groups ($p>0.05$).

Table 1: Maternal characteristics

Characteristics	group F (mean \pm SD)	group FB (mean \pm SD)
Mean age (years)	24.22 \pm 4.01	23.95 \pm 4.53
Mean weight (kg)	62.38 \pm 8.14	64.61 \pm 10.11
Mean height (cm)	157.81 \pm 6.47	157.1 \pm 6.32
Gestational age (weeks)	39.3 \pm 0.4	39.6 \pm 1.0

Cervical dilation at time of entry in study (cm) on admission, Onset time of Labor Analgesia (min), Duration of Labor Analgesia (min), Oxytocin units used till completed second stage, Duration of active 1st stage / 2nd stage (min), Total Duration of labor (min), Rate of cervical dilatation (cm/h), APGAR score (At 1 & 5 min) were comparable in both groups & difference was not significant statistically ($p>0.05$). Other parameters such as maternal heart rate, mean arterial pressure, fetal heart rate were comparable in both groups.

Table 2: General characteristics

Parameter	group F (mean \pm SD)	group FB (mean \pm SD)	
Cervical dilation (cm) on admission	4.6 \pm 1.3	4.2 \pm 1.1	0.72
Onset time of Labor Analgesia (min)	4.93 \pm 1.91	3.62 \pm 1.15	0.41
Duration of Labor Analgesia (min)	221.2 \pm 41.24	251.2 \pm 38.45	0.21
Oxytocin units used till completed second stage	4.71 \pm 2.13	5.02 \pm 1.97	0.52
Duration of active 1 st stage (min)	171.56 \pm 35.22	169.81 \pm 27.93	0.67
Duration of 2 nd stage (min)	42.6 \pm 12.56	43.67 \pm 11.37	0.52
Total Duration of labor (min)	187.45 \pm 25.84	178.58 \pm 27.73	0.29
Rate of cervical dilatation (cm/h)	1.62 \pm 0.51	1.51 \pm 0.35	0.63
APGAR score			
At 1 min	8.72 \pm 1.27	8.51 \pm 1.31	0.65
At 5 min	8.75 \pm 0.92	8.46 \pm 1.02	0.48

VAS scores at (60 min, 120 min, 180 min, 240 min, 300 min) were less in group FB as compared to group F, but difference was not statistically significant.

Table 3: VAS scores

VAS score	group F (mean \pm SD)	group FB (mean \pm SD)	P value
Baseline VAS	5.91 \pm 1.2	6.11 \pm 1.2	0.61
60 min	2.39 \pm 0.54	2.57 \pm 0.59	0.24
120 min	2.93 \pm 0.57	2.62 \pm 0.42	0.54
180 min	2.16 \pm 0.67	2.13 \pm 0.29	0.52
240 min	2.56 \pm 0.79	2.32 \pm 0.52	0.45
300 min	2.78 \pm 0.65	2.38 \pm 0.41	0.63

Pruritis was noted in 3 patients in group FB & 1 patient from group F, was transient in nature & managed conservatively. No sedation, post-dural puncture headache (PDPH) were noted.

Table 4: Side-effects

Side-effects	group F (n=30)	group FB (n=30)
Pruritis	1 (3%)	3 (9%)
Nausea and vomiting	1 (3%)	1 (3%)

DISCUSSION

The level of pain experienced and the effectiveness of pain relief may influence a woman's satisfaction with labour and the birth and may have immediate and long-term emotional and psychological effects.⁵ Labour analgesia techniques is the most widely practiced procedures of pain management performed by an anaesthesiologist and are requested by the obstetrician colleagues as well as the parturient mothers.

Complete pain relief achieved with epidural analgesia prevents the transient period of hyperventilation during a contraction and prevents hypoventilation during relaxation, thereby maintaining maternal normocarbida.⁶ Fetal benefits include better Apgar score and reduced metabolic acidosis compared with no analgesia or systemic opioid analgesia.⁷

Regional techniques present the most flexible, effective, and least depressant options when compared with parenteral and inhalation techniques. Spinal analgesia provides short duration of action.

In study by Aradhna S.,⁸ they noted that shortest time of onset of analgesia in Fentanyl group was 60sec and in Bupivacaine group was 40sec which was statistically significant ($p < 0.05$). The average duration to reach maximum analgesia in Fentanyl Group was 5.93 ± 1.68 min and in Bupivacaine Group was 5.30 ± 1.31 min. Also duration of analgesia was 54 ± 15.16 minutes in Fentanyl Group whereas 73.5 ± 14.74 minutes in Group Bupivacaine, difference was statistically significant. A small dose of Fentanyl is preferable to a similar small dose of Bupivacaine for the initial intrathecal administration as a part of Combined Spinal Epidural labour analgesia technique as muscle weakness prevents the mother from taking active part in second stage of labour and hypotension is undesirable.

In a similar study by Gowrisree K,⁹ duration of the active phase of first stage of labor was slightly shortened in group A (intrathecal labor analgesia with fentanyl 25 μ g) as compared to group B (fentanyl 20 μ g plus bupivacaine 2.5 mg).. They concluded that, rapid onset with satisfactory pain relief, VAS scores < 4 and good maternal and fetal hemodynamics in both the groups and minimal motor block in group-B. Similar findings were noted in present study.

Mathur P et al.,¹⁰ noted that, mean duration of second stage of labor was significantly prolonged in labour analgesia group (18.03 ± 8.27 min) as compared to control group (10.13 ± 5.89 min) & difference was statistically significant ($P < 0.001$). Possible reason for a prolonged second stage could be relaxation of the abdominal wall musculature secondary to neuraxial local anesthetic resulting in decreased effectiveness of maternal expulsive efforts. Mathur P et al. concluded that single shot intrathecal analgesia using fentanyl 25 μ g 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, associated with faster cervical dilation rate and no delay in the progress of labor, without significant maternal and fetal hemodynamic variation.

Vinaysingh K R et al.,¹¹ noted that onset and duration of labor analgesia, oxytocin units used till completed second stage, VAS score (60 min, 120 min, 180 min, 240 min, 300 min) were comparable in both groups. We did not noticed any significant difference for above parameters. VAS scores were less in group FB as compared to group F, but difference was

not statistically significant. Excellent and longer pain relief with minimal side effects, maternal satisfaction, no adverse neonatal outcome and no delay in the progress of labor were noted in labouring women who received intrathecal labor analgesia using fentanyl 25µg alone and fentanyl 20µg plus bupivacaine 2.5mg. Similar findings were noted in present study.

The local anaesthetic bupivacaine combined with a lipophilic, rapidly absorbed and removed, and therefore short-acting opioid, usually fentanyl or sufentanil, are common drugs used for spinal analgesia during labour.¹² The addition of fentanyl to hyperbaric bupivacaine improves the quality of intraoperative and early postoperative subarachnoid block.¹³

Limitations of present study were, small sample size, ASA grade I/II patients only. Larger studies are required to confirm present study findings.

CONCLUSION

Progress of labor, in pregnant women with intrathecal labor analgesia using fentanyl 25µg alone was comparable with fentanyl 20µg plus bupivacaine 2.5mg. Also, VAS scores at 60 min, 120 min, 180 min, 240 min, 300 min were less in fentanyl plus bupivacaine as compared to fentanyl group, but difference was not statistically significant.

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