

Study of effect of intrathecal labor analgesia using fentanyl 25µg alone and fentanyl 20µg plus bupivacaine 2.5mg on the progress of labor at a teaching hospital

Vinaysingh Kishansingh Rajput^{1*}, Shashikant Shamrao Dahifalkar², Shalini Shamrao Gadale³,
Suresh Gopalrao Kadam⁴

¹Assistant Professor, Department of Anaesthesia, MGM Medical College, Aurangabad, Maharashtra, INDIA.

²Professor, Department of Anaesthesia} ³Professor, Department of OBGY} Pacific Institute of Medical Sciences, Udaipur, Rajasthan, INDIA.

⁴Associate Professor, Department of Anaesthesia, IQ City Medical College, Durgapur, West Bengal, INDIA.

Email: vrajput214@gmail.com , shalinikarad787@gmail.com , shashikant.dahifalkar@rediffmail.com

Abstract Background: Labour epidurals provide superior analgesia as compared to other forms of pain control during labour. Given the advantage of relatively shorter duration of action and lesser side effects, fentanyl is the most commonly used opioid for analgesia and decreasing awareness intraoperatively. Fentanyl added to levobupivacaine during subarachnoid block offers faster onset of sensory block, prolonged duration of sensory block, and shorter duration of motor blockade. In present study, effect of intrathecal labor analgesia on the progress of labor was compared between fentanyl 25µg alone and fentanyl 20µg plus bupivacaine 2.5mg. **Material and Methods:** Present study was a prospective, randomized study conducted in booked antenatal cases, term pregnancy, vertex presentation, singleton fetus, uncomplicated pregnancy, spontaneous onset of labour, in the active phase of labor with a cervical dilatation of more than 3 cm and normal fetal heart rate (FHR) tracings, ASA grade I/II and willing to participate. Total 60 labouring women were enrolled for present study. Alternate patients were allotted to group F (fentanyl 25 µg) and group FB (fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg). Patients in the group F (n = 30) received an intrathecal injection of fentanyl 25 µg and group-FB received fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg. **Results:** Total 60 labouring women were enrolled and 30 each were allotted to group F (fentanyl 25 µg) and group FB (fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg). Baseline maternal characteristics such as age, weight, height, parity, gestational age, baseline VAS, cervical dilation at time of entry in study were comparable in both groups. 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. **Conclusion:** 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. **Keywords:** intrathecal labor analgesia, fentanyl, bupivacaine, progress of labor

***Address for Correspondence:**

Dr Vinaysingh Kishansingh Rajput, Assistant Professor, Department of Anaesthesia, MGM Medical College, Aurangabad, Maharashtra.

Email: vrajput214@gmail.com

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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. Labour epidurals provide superior analgesia as compared to other forms of pain control during labour.¹ An ideal labour analgesic technique should provide adequate and satisfactory analgesia without any motor blockade or adverse maternal and foetal effects. Major improvements in safe delivery and efficacy of labor epidural analgesia have ensured

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satisfactory birth and delivery experience in parturients; however, the variable percentage of failed or inadequate analgesia ranging from 0.9% to 24% still remains a major barrier to attaining a perfect score in the maternal satisfaction scale. Given the advantage of relatively shorter duration of action and lesser side effects, fentanyl is the most commonly used opioid for analgesia and decreasing awareness intraoperatively.³ Fentanyl causes inhibition of transmitter release along with a direct postsynaptic effect, causing hyperpolarization and reduction in neuronal activity. Fentanyl added to levobupivacaine during subarachnoid block offers faster onset of sensory block, prolonged duration of sensory block, and shorter duration of motor blockade.⁴ It has been well documented that a combination of opioids and local anesthetics administered intrathecally has a synergistic analgesic effect.⁵ More recently there has been a trend to use a lower concentration of local anaesthetic in combination with a variety of opiates; these combinations provide analgesic effect while allowing the woman to maintain some motor function, such as the ability to move during her labour and retain her ability to bear down and avoid an assisted vaginal birth such as the use of forceps.⁶ In present study, effect of intrathecal labor analgesia on the progress of labor was compared between fentanyl 25µg alone and fentanyl 20µg plus bupivacaine 2.5mg.

MATERIAL AND METHODS

Present study was a prospective, randomized study conducted in Department of Anaesthesiology with help of Department of Obstetrics and Gynaecology, MGM Medical College, Aurangabad. Study duration was of 6 months, Study permission was obtained from institutional ethical committee.

Inclusion criteria were Booked antenatal cases, term pregnancy, vertex presentation, singleton fetus, uncomplicated pregnancy, spontaneous onset of labour, in the active phase of labor with a cervical dilatation of more

than 3 cm and normal fetal heart rate (FHR) tracings. ASA grade I/II. Willing to participate in present study.

Exclusion criteria

Patients with medical disorders OR obstetrical complications. Altered coagulation profile, Previous cesarean section, Pre-existing systemic or neurological disease, Severe deformity of the spine. Local infection, Patient refusal.

Study was explained in local language and written consent was taken. Baseline hemodynamic parameters including maternal pulse rate, noninvasive 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. Alternate patients were allotted to group F (fentanyl 25 µg) and group FB (fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg). Patients in the group F (n = 30) received an intrathecal injection of fentanyl 25 µg and group-FB received fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg. With prior preparation, block was given in a left lateral position, in L3-L4 interspace, with 25 G spinal needle. Doses were made to 1.5 ml with normal saline. After return of clear cerebrospinal fluid, a single intrathecal injection of solutions as per group were given. Parturients were repositioned in a supine position with left uterine displacement. 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 partogram chart by attending obstetrician. APGAR scores were recorded by Pediatrician. The requirement for instrumental deliveries or cesarean section was also noted, and such parturients were excluded from the study. The two groups were evaluated with regards to the progress of labor, maternal hemodynamic variations and neonatal outcome. Statistical analysis was performed using software Statistical Package for the Social Sciences (SPSS). Unpaired and paired student t-test was used to analyze the data; P-value of 0.05 was considered to be significant.

RESULTS

Total 60 labouring women were enrolled and 30 each were allotted to group F (fentanyl 25 µg) and group FB (fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg). Baseline maternal characteristics such as age, weight, height, parity, gestational age, baseline VAS, cervical dilation at time of entry in study were comparable in both groups.

Table 1: Maternal characteristics

Characteristics	group F (mean ± SD)	group FB (mean ± SD)
Mean age (years)	22.14 ± 3.22	21.95 ± 4.53
Mean weight (kg)	60.98 ± 7.51	59.86 ± 8.11
Mean height (cm)	156.81 ± 4.77	157.10 ± 5.32
Parity		
Primipara	22 (73%)	21 (70%)
1	8 (27%)	9 (30%)
Gestational age (weeks)	39.1 ± 1.2	38.6± 1.3
Baseline VAS	6.73 ± 1.4	6.91 ± 1.2
Cervical dilation (cm)	3.37 ± 1.3	3.62 ± 1.1

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. Other parameters such as maternal heart rate, mean arterial pressure, fetal heart rate were comparable in both groups.

Table 2: Onset and duration of analgesia

Parameter	Group F (mean ± SD)	Group FB (mean ± SD)	P value
Onset time of Labor Analgesia (min)	4.17 ± 2.72	3.14 ± 1.31	0.33
Duration of Labor Analgesia (min)	232.7 ± 30.51	235.4 ± 28.12	0.32
Oxytocin units used till completed second stage	6.71 ± 2.13	7.02 ± 1.97	0.52
VAS score			
60 min	2.94 ± 0.24	2.78 ± 0.52	0.24
120 min	3.13 ± 0.37	3.01 ± 0.42	0.54
180 min	3.16 ± 0.5	3.09 ± 0.29	0.52
240 min	3.23 ± 0.79	3.22 ± 0.52	0.45
300 min	3.81 ± 0.53	3.68 ± 0.41	0.63

Labour characteristics such as duration of active 1st stage, 2nd stage, total duration of labor and rate of cervical dilatation were comparable in both groups and no statistically significant difference noted.

Table 3: Comparison of the progress of labor

Characteristics	Group F (mean ± SD)	Group FB (mean ± SD)	P value
Duration of active 1 st stage (min)	143.34 ± 23.44	139.54 ± 27.24	0.77
Duration of 2 nd stage (min)	42.6 ± 12.56	43.67 ± 11.37	0.35
Total Duration of labor (min)	187.45 ± 25.84	181.58 ± 27.73	0.27
Rate of cervical dilatation (cm/h)	1.62 ± 0.51	1.71 ± 0.35	0.46
APGAR score 1 min after birth	7.23 ± 1.27	7.51 ± 1.31	0.65
APGAR score 5 min after birth	8.75 ± 0.92	8.46 ± 1.02	0.48

Pruritis was noted in 3 patients in group FB and 1 patient from group F, was transient in nature and 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%)
Bradycardia	1 (3%)	1 (3%)
Hypotension	1 (3%)	1 (3%)

DISCUSSION

Transcutaneous electrical nerve stimulation (TENS), continuous support in labour, touch and massage, water bath, intradermal sterile water injections, acupuncture and hypnosis, all may be beneficial for the management of pain during labour. However, the number of women studied has been small and there have been no proven scientific data analysis of the quality of pain relief offered by these techniques.⁷ Fentanyl provides dense blockade with complete intra- and postoperative analgesia without causing hemodynamic instability. It has relatively fewer side effects which are manageable and very well tolerated by the patients.⁸ While because of least placental transfer, due to high protein binding and minimal motor block compared to sensory block in lower doses, bupivacaine has become the popular choice for labor analgesia.⁹ Fentanyl has been used along with bupivacaine for labor analgesia

extensively to decrease motor block, however the addition of opioids to local anesthetics has disadvantages of pruritus and respiratory depression. Palmer *et al.* studied the effect of different doses of fentanyl for labor analgesia and found that at 25 µg dose, the duration of analgesia was 90 min with least maternal and fetal hemodynamic changes.¹⁰ Tomar GS *et al.*,¹¹ found that 2 µg/ml extradural fentanyl is better than 1 µg/ml when combined with bupivacaine in the intermittent bolus technique, as it leads to faster onset, longer duration of analgesia, higher maternal satisfaction, and lesser drug requirement of the local anesthetic with a comparable side effect profile.¹¹ Paddalwar S *et al.*,¹² found that 0.125% Ropivacaine with Fentanyl 2 µg/ml produced excellent labor analgesia, which was clinically indistinguishable from a similar concentration of Bupivacaine and Fentanyl, with the advantage of less incidence of motor block and slightly longer duration of

analgesia, apart from its lesser propensity to cause cardiotoxicity, when used as intermittent doses. Gowrisree K.,¹³ concluded that single shot intrathecal analgesia using fentanyl 25 µg or fentanyl 20 µg +bupivacaine 2.5 mg, is useful when given in the active phase of the first stage of labor, had rapid onset with satisfactory pain relief in both the groups with VAS scores <4 and good maternal and fetal hemodynamics. Similar findings were noted in present study. Minimal motor block was noted in fentanyl 20 µg plus 0.5% hyperbaric bupivacaine 2.5 mg (0.5 ml) group.¹³ In a survey for practice of labor analgesia among anesthesiologists across India, they noted that 64% of the respondents agreed with bupivacaine have the common local anesthetic for neuraxial analgesia which has been used conventionally all over the world.¹⁴ Similarly, a survey conducted in Czech-republic showed that 80% of the anesthesiologists used bupivacaine followed by levobupivacaine for neuraxial analgesia.¹⁵ Fentanyl is the common adjuvant used while administering labor analgesia according to 83.34% respondents. The reason being its short duration and safe for both fetus and mother.¹⁴ Over the ages many techniques to relieve labour pain have been tried like physical, psychological and pharmacological means but none has been so efficacious and successful than the present day's technique of Combined Spinal Epidural (CSE) Analgesia.¹⁶ Boluses of higher concentrations, as used in the earlier years, have been associated with a dense motor block resulting in reduced mobility, decreased pelvic tone and loss of the bearing-down sensations usually experienced in the second stage of labour. Tsen *et al.*¹⁷ demonstrated a faster rate of cervical dilation in women randomized to receive combined spinal epidural analgesia compared with those who received epidural analgesia (2.3 vs 1.3 cm/h, respectively; P = 0.015). The rapid onset of analgesia decreases the maternal catecholamine levels (mainly epinephrine that has been found to have tocolytic action), leading to increase uterine activity. This leads to a decrease in the duration of first stage of labor.¹⁷ Combined-spinal-epidural (CSE) involves a single injection of local anaesthetic or opiate or both into the cerebral spinal fluid, as well as insertion of the epidural catheter. CSE combines the advantages of spinal analgesia (faster onset of pain relief, from the time of injection and more reliable analgesia) with the advantages of epidural analgesia, such as continuing pain relief, potentially maintained throughout the entire duration of labour.¹⁸

CONCLUSION

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. Both regimens were comparable to each other.

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