IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 3 Ver.18 March. (2018), PP 38-42
www.iosrjournals.org

Fetomaternal Outcome With and Without Combined Spinal-Epidural Analgesia in Normal Labour

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Abstract: *The purpose of the study was to compare the maternal outcome in terms of duration of second stage of labour, mode of delivery and neonatal outcome in terms of Apgar score with and without the combined spinal-epidural (CSE) analgesia in normal labour.100 nullipara patients with singleton pregnancy, term gestation, and cephalic presentation, scheduled for normal vaginal delivery were divided into two groups A&B of 50 patients each. Group A received combined spinal-epidural analgesia at 3-5cm cervical dilatation as a method of pain relief with Levobupivacaine 2.5mg and Fentanyl 25µg while Group B didn't receive any analgesia. First stage, second stage, total duration of labourand mode of delivery were recorded in both groups. Patient satisfaction was assessed by interviewing the parturient after delivery. It was observed that total duration of labour remained same in both the groups while second stage of labour was slightly prolonged with analgesia. Also giving analgesia during labour neither increased the incidence of instrumental delivery nor cesarean section. None of the babies in both groups had Apgar score<7. Patient satisfaction was excellent.Thus it was concluded that CSE is an effective method of labour analgesia with no harmful effects on mother and fetus.*

Keywords*: Apgar score, caesarean section,combined spinal-epidural analgesia, instrumental delivery.*

Date of Submission: 15-03-2018 Date of acceptance: 02-04-2018

I. Introduction

Labour pain is the worst imaginable pain in woman´s life. Pain sensation leads to maternal sympathetic activation thus releasing catecholamines like norepinephrine. Catecholamine release is accompanied by increased maternal cardiac output, systemic vascular resistance, and oxygen consumption which may compromise fetal oxygenation [1]. Thus, in the modern obstetrics, labour analgesia has become an important part of the childbirth process. The techniques of labour analgesia have progressed from ether and chloroform to regional analgesia these days. Regional analgesia techniques include spinal analgesia, epidural analgesia and combined spinal-epidural analgesia (CSE). The CSE technique has been introduced since 1937 and is gaining popularity due to its rapidity of onset of analgesia, low dose of spinal anaesthetic being used and simultaneous epidural catheter insertion which permits subsequent doses of analgesia to be given. This is the current analgesia technique being used in our hospital. Combined spinal epidural analgesia (CSE) consists of an initial intrathecal dose of opioids, local anaesthetic or both. Intrathecal administration of combination of local anaesthetic and lipophilic opioid in this technique provides rapid analgesia. Synergism has been demonstrated when a local anaesthetic is administered together with an opioid allowing enhanced pain relief with fewer adverse effects. There have been concerns regarding association of use of regional analgesia with motor blockade, prolongation of labour, increased rates of instrumental deliveries as well as caesarean section and neonatal depression. In contrast, many studies have proved that CSE technique actually enhances the rate of cervical dilatation due to its sympatholytic effect without affecting the obstetric and neonatal outcome [2-3].

The present study compares the fetomaternal outcome of Fentanyl 25 µg with Levobupivacaine 2.5 mg intrathecally along with the successive epidural boluses during labor, with patients in whom no analgesia has been given.

II. Material & Methods

This study was carried out in the department of Obstetrics &Gynaecology at Government Medical College, Amritsar from March 2013 to August 2014 after approval from the institutional ethics committee. 100 patients admitted to our hospital and who were scheduled for normal vaginal delivery was recruited. Informed consent of the patients was taken. The patients were divided into two groups of 50 patients each. Group A included those patients who requested for labour analgesia and received combined spinal-Epidural analgesia as a

method of pain relief in normal labour while Group B included those patients who did not receive any analgesia for pain relief in normal labour. All patients selected were comparable in age, height and weight (Table I).

The inclusion criteria was pregnant women of the age group of 18-35 years with singleton pregnancy, term gestation, cephalic presentation, in active first stage of labour, for first term delivery, getting regular contraction every 2-3 minutes at cervical dilation >3 cm and <5 cm. Patients with presentations other than vertex and with medical disorders were excluded.

Table I: Patient characteristics

Group	Age (years)	Height (cm)	Weight (Kg)
A	23.68 ± 2.736	155.092± 3.785	59.80± 5.500
B	23.72± 3.137	155.905± 3.624	60.28±2.785
p-value	0.946	0.275	0.583

Routine investigations, general physical and systemic examinations of the cardiovascular, respiratory, abdominal and central nervous system were performed. Detailed obstetric examination was done. Before procedure of analgesia, a thorough preanesthetic check-up was performed by the anaesthetist. Patients were kept under observation during latent phase of first stage of labour with monitoring of systolic blood pressures, diastolic blood pressures, heart rates and fetal heart rates. Start of the study was marked with the onset of active phase of labour as soon as the woman had presence of regular uterine contractions leading to progressive effacement and dilatation of cervix with ≥3cm and <5cm of cervical dilatation. The patients who had requested for analgesia were included in group A, shifted to operation theatre and were given combined spinal-epidural analgesia while those who did not give consent for analgesia were included in group B and were shifted to labour room.

1. Anaesthetic technique Intravenous line was secured and patients were preloaded with Ringer lactate 10ml/kg body weight in 20-30 mins. After taking all aseptic precautions, combined spinal-epidural was given in L_{2-3} or L_{3-4} intervertebral space with the help of 18-gauge Touhy's needle using loss of resistance technique and 25-gauge Whitacre spinal needle by the anesthesiologist. Drugs used were intrathecalLevobupivacaine 2.5 mg and Fentanyl 25 µg.

Patients were shifted to labour room after 30 minutes and were encouraged to be ambulatory. Top up boluses were given with Epidural doses of Levobupivacaine and Fentanyl- 0.125% solution made with 5 ml 0.5% Levobupivacaine diluted to 19 ml + 1 ml Fentanyl –made upto 20 ml and were given when the patient complained two consecutive painful contractions. Pain with contraction was assessed by 10 cm Visual Analog Scale (VAS) (where 0 cm represents NO PAIN and 10 cm represents WORST IMAGINABLE PAIN).

2. Progress of labour Progress of labour was noted with a partograph. Uterine contractions were monitored and noted every 30 minutes. Labour was augmented with oxytocin. A10mU/ml solution of oxytocin was made with 5 units of oxytocin in 500 ml of Ringer Lactate and was given in case of ineffective uterine contractions.

3.Monitoring Continuous multiparameter monitoring of pulse rate, NIBP (both systolic and diastolic) were recorded. Fetal heart rate was monitored by a continuous cardiotocograph. Any episodes of fetal bradycardia were observed which were followed by immediate stoppage of oxytocin drip, oxygen inhalation and left lateral tilt to the patient. Assessment for any episode of uterine hypertonicity was done and documented followed by assessment for need of tocolysis. Motor block was assessed by using modified Bromage score. The side effects if any were recorded for 24 hours. Patients received a follow up visit after 24 hours when a satisfaction score was recorded (verbal rating scale 1- 5) along with any complication (Table-II)

Table-II: Patient satisfaction score

Scale	Description	Group A	Group B
5	Excellent	48 (96%)	0
4	Good	2 (4%)	0
3	Satisfactory	0	0
2	Unsatisfactory	0	8 (16%)
1	Terrible	0	42 (84%)

4.Statistical analysis The data from the present study was systematically collected, compiled statistically analyzed to draw the relevant conclusions. The patient characteristics (nonparametric data) were analyzed using the 'chi- square test' while the inter group comparison of the parametric data was done using the 'unpaired t test'. The p–value was determined to finally evaluate the levels of significance. The p value of <0.05 was considered significant at 5% significance level; $p < 0.01$ was considered significant at 1% significance level and a p value of <0.001 was considered highly significant. Power of study was calculated by using power analysis by taking α error 0.05 and it was found to be 98%. The results were then analyzed and compared to previous studies.

III. Results

In group-A, the first stage duration of labour was: 555.43±93.057 minutes and in group-B it was: 604.98±69.080 minutes, p =0.005 which was found to be significant. The active phase of first stage of labour in group-A was: 85.07±34.732 minutes and in group-B was: 163.09±41.349 minutes, p< 0.001 which was found to be highly significant. The second stage of labour in group-A was: 135.09±19.144 minutes and in group-B it was: 99.04±17.215 minutes, p<0.001. Total duration of labour in group-A was: 696.66±93.214 minutes and in group-B it was: 710.59±73.769 minutes, p > 0.001 (Table III). In group-A, 39/50 (78%) patients had a normal vaginal delivery, 3/50 (6%) required instrumental assistance, while 8/50 (16%) had to be taken up for caesarean section. In group-B, 44/50 (88%) patients had normal vaginal delivery, instrumental deliveries were 1/50 (2%) and 5/50 (10%) underwent caesarean section (p=0.365). 6 out of the 8 patients in group A who underwent caesarean section were due to fetal distress while in group B, 4 out of 5 patients underwent caesarean section due to fetal distress. 2 and 1 patient underwent caesarean section due to dystocia in group A and group B respectively. Apgar scores of the neonate remained >7 in both the groups at 1, 5 and 10 minutes. Overall labour process satisfaction of patients was excellent (96%) in group-A and it was terrible (84%) in group-B (Table II).

Table-III: Duration of labour mean ± standard deviation in minutes

Stage of labour	Group A	Group B	p-value	Significance
First stage	555.43±93.057	604.98±69.080	0.005	S
Active phase of first stage	85.07±34.732	163.09±41.349	0.000	HS
Second stage	135.09±19.144	99.04±17.215	0.000	HS
Third stage	6.14±1.503	6.57±1.951	0.247	NS
Total duration of labour	696.66±93.214	710.59±73.769	0.433	NS

S: Significant, HS: Highly Significant, NS: Not Significant

IV. Discussion

According to American College of Obstetrics &Gynaecology,"In the absence of a medical contraindication, maternal request is a sufficient medical indication for pain relief during labor" [4]. Ideally pain relief with regional techniques should be produced with the minimum disturbance to the progress of labour or to sympathetic functions, sensory functions (proprioception) and motor functions of CNS. Thus, along with good analgesia other factors which need emphasis are reducing motor block thus making the parturient participate in labour and decreasing instrumental deliveries due to prolonged second stage.

In concordance with the Cochrane data review [5], as there was no significant motor blockade in my study, patients remained ambulatory during labour which increased their sense of self-autonomy which lead to effective progression of labour.

As already described, synergism has been demonstrated when a local anesthetic is administered together with an opioid allowing enhanced pain relief with fewer adverse effects. Local anesthetics are very effective for relieving pain of somatic origin. This is particularly important in the late first and second stages when the visceral pain of the early first stage of labour gives way to somatic pain. The ability of spinal opioids alone to effectively control this somatic pain is limited. It has been demonstrated that the addition of opioid to local anaesthetic significantly improves analgesia with faster time of onset, greater efficacy and longer duration of analgesia.

Tsen et al and Bhagwat et al reported that CSE is associated with an increased cervical dilatation rate [2-3]. Patients randomized to CSE analgesia experienced a doubling of the mean cervical dilation rate and a reduced duration of the first stage of labour as compared to epidural analgesia. Several mechanisms have been proposed to explain these observations. CSE rapidly reduces epinephrine plasma levels. Since epinephrine is tocolytic, CSE quickly enhances uterine activity. Since analgesia and plasma epinephrine lowering occurs much more rapidly than with conventional epidural analgesia, progression of labour could be enhanced. Another explanation is that since high doses of local anesthetics are avoided with CSE, the observations that bupivacaine impairs uterine activity are also avoided.The mean duration of second stage of labour with analgesia was prolonged by 36.04 minutes which was comparable with other studies (Table: IV) [6-9]. However, as shown by Long [7], total duration of labour remained similar in both the groups.

Obstetricians have always feared that labour analgesia would increase the rate of caesarean section and instrumental deliveries. Factors contributing to instrumental delivery include diminished pain sensation from uterine contraction leading to diminished Fergusson's reflex, the perception of the need to push at full dilatation, reduced motor force due to weakened abdominal musculature and inadequate rotation of the presenting part due to weakened pelvic floor musculature. There was no difference in the mode of delivery in both the groups. Similar results were obtained in study done by Lian [6] where CSE analgesia did not increase the caesarean rates when compared with the control group. Also in the study done by Long [7], caesarean rates were not increased with CSE analgesiabut rather decreased. A study was in Iran also showed that the incidence of

caesarean delivery between the two groups of with and without analgesia was not significantly different with p value of 0.26 [10].

The indication of performing caesarean section in both groups was assessed and it was observed that 6 out of the 8 patients in group A who underwent caesarean section were due to fetal distress while in group B 4 out of 5 patients who underwent caesarean section were due to fetal distress. 2 and 1 patient underwent caesarean section due to dystocia in group A and group B respectively. The results were compared and were found to be statistically insignificant. These were in concordance with the study done at Iran where indication of performing caesarean section was fetal distress in 4% patients in whom analgesia was given and 3% in whom no analgesia was given. Dystocia was an indication of performing caesarean in 6% patients in whom analgesia was given and 2% in whom no analgesia was given [10]. Neonatal outcomes as assessed by Apgar score remains unaffected similar to other studies [6, 11-13].

Table IV: Comparison of duration of second stage of labour with various studies

Study	Second stage of labor prolonged by	p value
Long[7]	23 minutes	<0.05
Lian [6]	31 minutes	<0.05
Malvasi [8]	26 minutes	<0.01
Khurshid R [9]	11 minutes	<0.05
My study	36 minutes	<0.05

As FHR was being monitored by a continuous cardiotocograph throughout labor, a transient fall of FHR during first 10 minutes of application of combined spinal-epidural analgesia was observed in 5(10%) patients in group A. The drop in FHR was observed to be up to 100 beats per minute. However, this drop in FHR was only transient and spontaneously recovered with oxygen inhalation and 15º left tilt relieving pressure from Inferior Vena Cava without affecting the Apgar scores. None of the patients in whom fetal bradycardia was seen, was associated with uterine hypertonicity. Neither of them had to be taken up for caesarean due to fetal distress and the Apgar scores were also not affected. Fetal bradycardia observed immediately after analgesia is frequently attributed to the use of opioids associated with the local anaesthetic in combined spinal epidural. This could be explained as the fast relief of pain would decrease the concentration of plasma epinephrine, the patient would lose the tocolytic effect of epinephrine, developing uterine hypertonia and fetal bradycardia. Similar results were observed in a study done at Belgium [14] where fetal bradycardia within the first 10 min after the spinal injection with Levobupivacaine and Fentanyl was registered in six patients but none required emergency cesarean delivery. Three patients of the six had uterine hypertonia as well, but tocolysis was not required. Instrumental delivery, caesarean delivery rate, neonatal birth weights, Apgar scores, and umbilical artery pH values were similar for both groups.

When body experiences pain, heart responds in a reflexive manner to the pain by increasing heart rate. In an evolutionary sense, this "fight or flight" response prepares the body to deal with the source of the pain. The mean baseline heart rate and systolic blood pressure in both groups were without any significant difference. The difference between the two groups was significant ($p< 0.05$) after the establishment of combined spinal epidural analgesia with patients having tachycardia and higher systolic blood pressure in which no analgesia was given. None of the patients had backache, bladder or bowel dysfunction.

V. Conclusion

It is concluded that with CSE analgesia, patients were hemodynamically stable. It significantly shortened the active phase of first stage of labor without any adverse effect on maternal and fetal outcome. Thus, CSE is an effective method of labor analgesia.

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Dhingra Nishu "Fetomaternal Outcome With and Without Combined Spinal- Epidural Analgesia in Normal Labour."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 3, 2018, pp 38-42.