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COMPARITIVE STUDY OF LABOUR ANALGESIA USING BUPIVACINE 0.125%VERSUS BUPIVACINE 0.125%+SUFENTANIL 5mcg

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ABSTRACT In our study we compared the effects of 0.125% Bupivacaine and 0.125% Bupivacaine with 5 micrograms sufentanil for labour epidural analgesia.

The parameters studied were : onset of analgesia, degree of sensory blockade, degree of motor blockade, duration of effect after loading dose, duration of stages of labour, incidence of instrumentation, changes in maternal hemodynamics, incidence of side effects and neonatal outcome.

We concluded that epidural labour analgesia with 5micrograms sufentanil added to the Bupivacaine 0.125% gave good analgesia and minimal side effects on the neonate compared to plain Bupivacaine 0.125% used for labour analgesia.

KEYWORDS : Bupivacaine0.125%,Sufentanyl 5mcg, Labour analgesia.

INTRODUCTION :

Pain in labour can be the most intense pain known. Nevertheless, it is not experienced as such by every woman and thus analgesia should be directed at the particular circumstances and resources available.

Apart from the humanitarian reasons for providing pain relief, a painful labour has detrimental effects on the mother and the foetus. The maternal hyperventilation in response to pain shifts the maternal oxyhaemoglobin dissociation curve to the left thus reducing fetal oxygenation. Hyperventilation is followed by hypoventilation between uterine contractions which, combined with decreased uterine blood flow (caused by catecholamine release in response to pain) worsens fetal hypoxemia. Despite transient respiratory alkalosis maternal acidosis supervenes as a result of lactic acid production from skeletal muscle activity and from free fatty acid production due to sympathetic activation. This produces incoordinate uterine action and a prolonged labour. Fetal acidosis is produced. The hypertensive response to sympathetic activation may be particularly detrimental in a mother who is already hypertensive.

The most effective method of analgesia in labour is, undeniably, central neural blockade, most commonly, by epidural route.

Initially, lumbar epidural analgesia was given in boluses through an epidural catheter. Continuous infusions have the advantage of providing a continuous stable anaesthetic level with less fluctuations in pain relief. The commonly used local anaesthetics are lidocaine (1-1.5%) and bupivacaine (0.25-0.5%. Mixtures of epidural fentanyl or sufentanil and bupivacaine are now commonly used during labour. Addition of 50µg of fentanyl or 10 µg of sufentanil to 0.125% bupivacaine in a 10 ml bolus produces more rapid onset and more complete labour analgesia than does bupivacaine alone.

The rationale for combined use of a local anaesthetic and opioid is that these agents work at two distinct sites the local anaesthetic at the nerve axon and the opioid at the spinal cord receptor to eliminate pain via a combined and possibly by a synergistic mechanism. Use of opioid has a local anaesthetic sparing effect which leads to use of lesser concentrations of local anaesthetics, thus decreasing complications with a higher concentration.

Combined spinal epidural analgesia is now gaining popularity. In this technique, opioid given into the subarachnoid space produces a rapid and profound analgesia which is extended by epidural administration of local anaesthetic via a catheter.

INDICATIONS OF EPIDURAL LABOUR ANALGESIA :

Medical Indications

- Mothers with respiratory disease
- Hypertensives
- Raised intracranial pressure
- Heart disease complicating pregnancy
- Diabetic mothers

Obstetric Indications :

- Prolonged labour
- Incoordinate uterine action
- Trial labour

Foetal Indications :

- Prematurity
- Breech presentation
- Multiple pregnancy

ADVANTAGES OF EPIDURAL LABOUR ANALGESIA :

- Provides superior pain relief during first and second stages of labour.
- Facilitates patient cooperation during labour and delivery.
- Provides anaesthesia for episiotomy or forceps delivery.
- Allows extension of anaesthesia for cesarean delivery.
- Avoids opioid induced maternal and neonatal respiratory depression.

AIM :

In our study we compared the effects of 0.125% Bupivacaine and 0.125% Bupivacaine with 5 micrograms sufentanil for labour epidural analgesia.

The parameters studied were : onset of analgesia, degree of sensory blockade, degree of motor blockade, duration of effect after loading dose, duration of stages of labour, incidence of instrumentation, changes in maternal hemodynamics, incidence of side effects and neonatal outcome.

MATERIALS AND METHODS :

This study was conducted on 40 parturients aged between 18-35 years. Parturients included both primigravidae and multigravidae witn vertex presentation and were otherwise healthy and normal with ASA grade I and II. They were divided randomly into two groups; Group I and Group II. An informed consent was taken from all the patients.

Group I parturients received 0.125% plain bupivacaine and Group II parturients received 0.125% bupivacaine and 5 micrograms sufentanil by intermittent bolus lumbar epidural technique.

CRITERIA FOR SELECTION OF CASES:

1) **Dilatation of cervix :** Cervical dilatation of 4-5 cms in primigravidae and 3-4 cms in multigravidae is required. The above cervical dilatation in primigravidae and multigravidae confirm the establishment of labour.

2) **Shape of pelvis :** Mothers with adequate gynaecoid pelvis were selected by obstetrician.
3) **Built & Nourishment :** All patients were moderately built and moderately nourished with ASA I and II physical status.
4) **Height and Weight :** Height was above 145 cms and weight above 45 kgs.
5) **Blood pressure and pulse Rate :** Blood pressure was ranging between 100 ± 10 mm Hg of systolic and 70 ± 10 mm Hg of diastolic. Pulse rate was ranging between 70 -100/min.
6) **Bleeding and clotting time :** Bleeding and Clotting time were within normal limits.
7) **Foetal heart rate :** Foetal heart rate ranged between 120-140 beats / minute.
8) **Mothers had no cardiac or respiratory diseases.**

The following observations were made, compared and statistically analysed.
1. Onset of Analgesia.
2. Dermatomal level of blockade.
3. Degree of sensory blockade was assessed by pain score formulated by Dr. W.J. Hawkins. F.R.C.A, (London):

Grade	Subjective reporting
0	Pain free
1	Mild pain
2	Pain at rest
3	Moderate pain
4	Severe pain

O ↔ Comfortable
1,2,3,4 ↔ Uncomfortable

4) Degree of motor blockade was assessed by Bromage scale :
0% No block - full flexion of knees and feet possible
33% Partial - just able to flex knees, still full flexion of feet possible.
66% Almost complete - Unable to flex knees, still flexion of feet possible.
100% Complete - Unable to move legs or feet

5) Blood pressure and pulse rate changes were noted every 10 minutes up to 30 minutes and thereafter for every 1 hour.

6) Foetal heart rates were observed for every 10 minutes.

7) Duration of initial dose was observed and the number of top up doses required was also noted. The duration of effect for each top up was noted.

8) Time at which full cervical dilatation occurred and time at which baby was delivered were noted i.e. duration of first and second stages of labour were noted.

9) APGAR score of babies was noted.

10) Mode of delivery was noted
a) Spontaneous
b) Forceps (Out let / Mid low)
c) Caesarean section
Combination were observed.

DRUGS USED FOR THE STUDY :
Group-1 0.125% plain bupivacaine : 10 ml of loading dose
Group- II 0.125% bupivacaine plus 5 micrograms sufentanil in 10 ml of loading dose 2.5 ml of 0.5% bupivacaine is diluted to 9 ml with distilled water and 1 ml of 5 micrograms sufentanil is added to it making a total of 10 ml. Topup doses of 5 ml were given when the effect of initial dose diminished.

NEEDLES AND EPIDURAL CATHETERS USED :
18 gauge Tuohy needles (Huber pointed) and 18 gauge disposable epidural catheters were used for the study.

SAFETY MEASURES :
All safety measures for cardiovascular and pulmonary resuscitation were kept ready for any complication and they were made available in the labour room r immediate use.

TECHNIQUE :
Whenever a mother in labour fulfilled all the criteria mentioned above sent for epidural analgesia was obtained from her. Degree of dilatation of cervix, the character of labour pain, blood pressure in supine position pulse rate d fetal heart rate were recorded. After securing venous access, 500 ml of Ringerlactate was preloaded. All other infusions like oxytocin drip were stopped temporarily until the procedure was over.

Parturient was positioned on her right side with neck flexed and knees drawn up as far as possible. Strict sterile precautions like that of a surgical procedure were taken. L3- L4 intervertebral space was identified and the skin and underlying tissues were infiltrated with local anaesthetic in the midline at the midpoint. An 18 G epidural (Tuohy) needle was inserted in the sagittal plane with bevel pointing upwards. After traversing the supraspinous ligament, the needle was then passed into interspinous ligament which griped it tightly. The stylet was removed from tuohy needle and a glass syringe containing air was attached. The Tuohy needle was then advanced slowly using an intermittent movement. Loss of resistance was detected by applying gentle pressure to the plunger of the syringe when the needle was in the ligamentum flavum increased resistance was transmitted to the plunger only to disappear when the epidural space had been entered.

The depth to which the needle had been inserted was noted and the bevel of Ihe needle was turned cephalad. Following negative aspiration for blood and CSF, the epidural catheter, after testing for patency of openings, was passed through the needle up to the epidural space. The length of epidural catheter passed in to the needle corresponds to mark II on catheter upto the bevel of the needle Then catheter was negotiated slowly in to epidural space for 4-5 cms.

Tuohy needle was gently removed holding the catheter firmly. The catheter was fixed to the skin under a transparent adhesive taping. The catheter was brought up to the shoulder of the patient. A test dose of 3 ml of local anaesthetic was given through the catheter and observed for any signs of subarachnoid blockade and intra vascular administration of drug. Then main dose was given in increments after negative aspiration for blood or C.S.F. The mother was made to rest on right lateral position for 5 minutes, and then made to lie on left lateral position. When the cervix was fully dilated ,10 ml of drug was given in sitting position to block S2, 3, 4 segments for II stage of labour.

The onset of analgesia and dermatomal level were measured subjectively by questioning and objectively by pin prick. The degree of analgesia was graded according to pain score. Blood pressure and pulse rate were recorded for every 10 minutes upto 30 minutes. Fetal heart sounds were heard and rate was noted. Motor blockade was also assessed by Bromage scale.

The time at which full cervical dilatation occurred was noted and time of delivery of baby was noted. That is the duration of labour from 4 cms cervical dilatation to 10 cms in I stage was recorded, the duration of II stage i.e from 10 cm | cervical dilatation to expulsion of baby and total period of analgesia were recorded. Any other side effects like shivering, nausea, vomiting, itching, hypotension and inability to stand or walk, were observed.

Mode of delivery was recorded and after delivery baby's APGAR score was noted. Baby was looked for any respiratory depression in Group II.

PRECAUTIONS :
1) Full sterile technique followed.
2) The equipment should be thoroughly checked. Sticky syringes distract the delicacy of the loss of resistance test. Epidural catheter should be tested for its patency. Tuohy needle should also be checked because it may be damaged and it may not allow the catheter to pass.
3) The needle should not be advanced during uterine contraction, because the mother may not be able to cooperate and the epidural veins are distended and pressure is raised. Failure to observe these points may result in haemorrhage.
4) The epidural catheter should not be passed through the touhy needle during uterine contractions due to the risk of puncturing the tense dura or the congested epidural veins. The catheter should be filled with local analgesic solution to prevent clotting of blood.

OBSERVATIONS AND RESULTS

In our study 40 parturients aged between 18-30 years including both primigravidae and multigravidae with ASA I & II physical status were randomly selected for administering intermittent bolus lumbar epidural analgesia. They were divided randomly into two groups- Group I and Group II with varying age groups with mean age of 21.5 ± 2.76 in group I and 21.8 ± 2.18 in group II (table 1) The leans of age in each group are almost equal.

Number of primigravidae and multigravidae in each group as depicted in I table 2, figure 2 showing more number of primigravidae.

Number of parturients in each height group and means of height of group I |(150.45 ± 4.09) and group II (149.75 ± 4.86). The means of height in each group I are almost equal as shown in table 3, figure 3.

Group I parturients were given 0.125% plain Bupivacaine and Group II parturients were given 0.125% Bupivacaine plus 5 micrograms Sufentanil by-intermittent bolus lumbar epidural technique.

Onset of analgesia was tested subjectively by questioning and objectively by pinprick. Mean of onset of analgesia in Group I was 9.65 ± 1.95 minutes where as in Group II it was 6.5 ± 2.39 minutes. Difference of means is 1.15 and standard error of means is 0.1161, applying t - test, t value = 27.13, |p<0.001 so onset of analgesia was quicker in Group II than in Group I which was itistically highly signifcant. The quick onset of analgesia was due to addition of sufentanil in Group II. (table 4)

Haemodynamic monitoring was done continuously. In Group I mean of fall in systolic pressure was 10.72 ± 2.6 mm Hg where as in Group II mean fall in systolic pressure was 12.72 ± 4.6 mm Hg and mean fall in diastolic pressure as 10.0 + 0 mm Hg. There was no significant difference in both groups, (table 5 and figure 4)

Degree of analgesia was compared in both groups according to Hawkin 's score (table 6), showing the number of parturients who were comfortable and uncomfortable during labour in each group. Applying chi - square test : $\chi 2 = 1.30$. $p<0.1$. Though difference is present in the degree of pain in both groups, it is not found to be statistically significant, which may be due to small sample.

Duration of effect after giving loading dose was assessed by pain score in both groups. It was 46.5 ± 1.37 minutes in Group I and 75.4 ± 2.92 minutes in Group II. (table 7) Difference of means is 2.89 and standard error of means is 1.1699. applying t - test, t value = 24.70. So. $p<0.001$. It was found to be significantly higher in Group II due to the addition 5 micrograms sufentanil to 0.125% Bupivacaine.

Mean duration of II stage in group I 33.4 ± 1.74 minutes, in group II 34.4 2.19 minutes. Difference of means is 1 and standard error of means is 1.0172. applying t - test, t value = 0.9830. So, $p>0.1$ (statistically insignificant) as shown in table 8.

Total period of analgesia in group I 132.25 ± 6.12 minutes and in group II 127 ± 7.01 minutes. Difference of means is 5.5 and standard error of means is 3.6061, applying t - test, t value = 1.525. So $p>0.1$ (statistically insignificant) as shown in table 9

There was no decrease in bearing down efforts in both groups. In our study, the incidence of forceps delivery was similar in both groups as the concentration of local anaesthetic is low and similar in both groups. (table 10 figure 5) The incidence was spontaneous deliveries (80%), forceps deliveries (20%) .

The occurrence of side effects like hypotension, shivering, nausea and vomiting and pruritus was absent in both groups. Urinary retention occurred in 4 parturients in Group II due to the addition of Sufentanil.

Effects on Neonates : Neonates born to parturients belonging to both groups were studied by APGAR scoring 8-10 and were without any respiratory depression. The mean score in group I is 9.45 ± 0 and in group II 9.32±16.(table 12) Hence it can be concluded that addition of epidural opioid like Sufentanil to low concentration of Bupivacaine has no adverse effect on the outcome of neonates.

The data is tabled and depicted in statistics below

TABLE 1. AGE DISTRIBUTION

Age Group (Years)	Group 1(0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
16-20	10	10
21 -25	8	9
26-30	2	1
Total	20	20
Mean of age (Yrs)	21.5+2.76	21.8 + 2.18

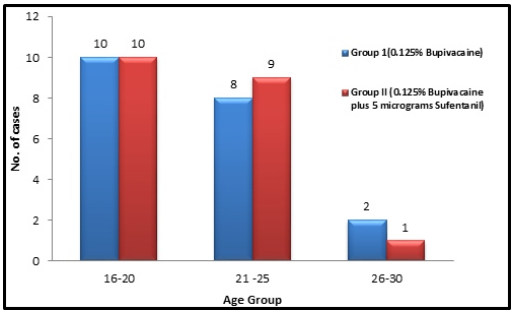

TABLE 2. PRIMIGRAVIDAE / MULTIGRAVIDAE

Parity	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Primigravidae	11	14
Multigravidae	9	6
Total	20	20

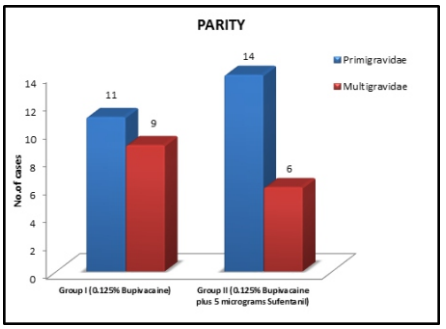

TABLE 3. HEIGHT (Cms.)

Height (Cms)	Group I (0.125% Bupivacaine) -	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
141-145	3	2
146-150	11	12
151 - 155	5	4
156-160	1	2
Total	20	20
Mean of height (Cms.)	150.45 ±4.09	149.75 + 4.86

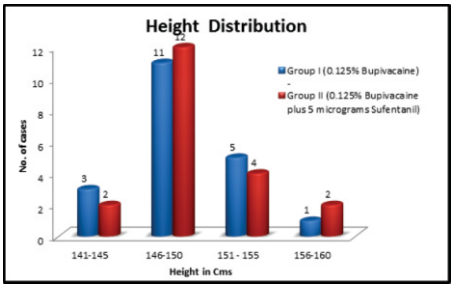

TABLE 4. ONSET OF ANALGESIA (MINUTES)

	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Mean onset of analgesia (minutes)	9.65 ill.95	6.5 ±2.39

TABLE 5. BLOOD PRESSURE CHANGES

Blood Pressure	Group I (0.125% Bupivacaine)		Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)	
Fall in B.P. (mm Hg)	No. of Parturients	Mean Fall in B.P.	No. of Parturients	Mean fall in B.P.

Systolic	2	10.72 ± 2.6	5	12.72 + 4.6
Diastolic	1	-	2	10 ± 0

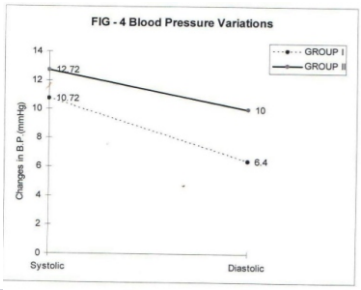

TABLE 6. DEGREE OF ANALGESIA

Pain Score	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Comfortable (0)	14	17
Uncomfortable (1,2,3 or 4)	6	3

TABLE 7. DURATION OF EFFECT AFTER LOADING DOSE (MIN)

	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Mean duration of effect of LD (min.)	46.5 ± 1.37	

TABLE 8. DURATION OF II STAGE

	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Mean duration of II stage (min.)	33.4+1.74	34.4 + 2.19

TABLE 9. TOTAL PERIOD OF ANALGESIA

	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Total period of Analgesia (min).	132.25 ±6.12	127 + 7.01

TABLE 10. MODE OF DELIVERY

Mode of Delivery	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Spontaneous	17	16
Forceps	3	4
LSCS	—	—
Total	20	20

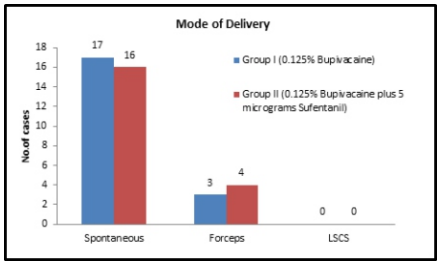

TABLE 11. COMPLICATIONS

Complications	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Shivering	-	-
Nausea & Vomiting	-	-
Urinary retention	-	4
Pruritis	-	-
Bearing down efforts depressed	-	-
Loss of ability to stand	-	-

TABLE 12. APGAR SCORE

Complications	Group I (0.125% Bupivacaine)	Group II (0.125% Bupivacaine plus 5 micrograms Sufentanil)
Mean	9.45 + 0	9.32 ± 1.6

DISCUSSION :

Down the ages the relief of pain during child birth has been of great interest to mankind. Different methods were either alone or in combination have been described for the purpose. None of the methods fulfilled all the criteria but epidural blockade comes close to the ideal and has become an established technique in the management of severe labour pain.

Epidural "per se" is associated with increased incidence of instrumental deliveries but progressively more dilute concentrations of local anaesthetic agents reduced this increased incidence.

The addition of epidural opioids to local anaesthetic solutions appears to improve the analgesic efficacy of low dose Bupivacaine regimens which hitherto had demonstrated a reduction in the instrumental delivery.

Accordingly in the present study an attempt has been made to evaluate clinically between 0.125% plain Bupivacaine and 0.125% Bupivacaine and 5 micrograms Sufentanil given by intermittent bolus lumbar epidural technique during child birth in terms of onset of analgesia, degree of sensory blockade, degree of motor blockade, effect on the duration of labour and mode of delivery.

In this study 40 parturients aged between 18-30 years including both primigravidae and multigravidac with ASA I & II physical status were randomly selected for administering intermittent bolus lumbar epidural analgesia They were divided randomly into two groups- Group Land Group II.

Opioids administered in combination with local anaesthetic as it is shown in our study that opioids have a synergistic effect with local anaesthetic agents. In clinical practice this has been taken as an advantage for usage in obstetrical practice.

The use of low concentrations of 0.125% Bupivacaine selectively blocks the sensory fibers but spares the patient from motor block. The addition of 5 micrograms of sufentanil, a potent opioid analgesic to Bupivacaine 0.125% as in our study greatly increases the early onset of sensory block.

The duration of analgesia is prolonged with addition of sufentanil, the reason could be lipophilic nature of opioid analgesic. The prolonged analgesic effect decreased repeated administration of local anaesthetic. The quality of pain relief was better with sufentanil, added to local anaesthetic.

In the present study there was no significant change in the arterial pressure which is attributable to very low dose and low concentration of bupivacaine 0.125% which have minimal sympathetic block. Preloading and left lateral position can prevent the fall of blood pressure. Jouppila CR et al also failed to observe hypotension36 and significant changes in the heart rate as in our study. It has been suggested that, in the patient who have more motor block increase the chance of instrumentation. Adding Sufentanil 5micrograms gave more analgesia but did not abolish perineal muscle tone.In group II urinary retention was seen in four patients.

One of the factors implicated in the association between epidural analgesia and increased rate of operative delivery is motor block from epidural local anaesthetic. Motor block is minimised by reducing the concentration of local anaesthetic there by rate of vaginal delivery is increased.

In our study, the incidence of forceps delivery was similar in both groups as the concentration of local anaesthetic is low and similar in both groups (table 10).The incidence was spontaneous deliveries (80%) vs forceps deliveries (20%) in both groups are depicted in figure 5.

Pramila Bajaj et al. (1994) in their study of Epidural Bupivacaine and buprenorphine for labour analgesia concluded that addition of opioid minimized chances of forceps application for delivery4 . Our study also corresponds to their conclusion.

Pruritis17. as a common complication is documented in the literature was not seen in our study probably due to low dosage of sufentanil.

Several factors could account for the lower Apgar scores, differences in use of oxytocin, and more motor block with prolongation of the second stage of labour resulting from decreased maternal expulsive strength with a possible resultant increase in the incidence of instrumental deliveries. In our study the Apgar score was normal in two groups. There were no untoward effects in the newborn. This may be due to low concentrations of Sufentanil 5micrograms used in the study.

The synergistic effect of epidural opioids and low concentrations of local anaesthetics is a well known fact. Addition of epidural sufentanil prolongs the duration of analgesia without affecting the sympathetic and motor block produced of analgesia without affecting the sympathetic and motor block produced by local anaesthetics. Epidural sufentanil significantly improves the quality of block and prolongs duration of block produced by the local anaesthetic agents.

SUMMARY AND CONCLUSION :

The following are conclusions from the present study " comparision of the effects of 0.125% Bupivacaine and 0.125% Bupivacainc with 5 micrograms Sufentanil" by a intermittent bolus lumbar epidural technique in producing labour analgesia. Sufentanil added as adjuvant to 0.125% Bupivacaine

- Will speed the onset of sensory block.
- Minimises motor block.
- Decreases the analgesic requirements with fewer top up doses
- Minimal changes in the bloodpressure and heart rate
- Decreased incidence in instrumentation, thus allows spontaneous vaginal delivery
- No adverse effect on the outcome of neonates.

We conclude that Epidural analgesia with Sufentanil gives good analgesia with minimal side effects on the neonate.

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