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RESEARCH ARTICLE

EFFECTIVE METHOD OF LABOUR PAIN RELIEF WITH 0.125% BUPIVACAINE

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ABSTRACT

Background: Labour pain can be deleterious for mother and baby. Epidural analgesia relieves labour pains effectively with minimal maternal and foetal side effects. A prospective open label study was undertaken to ascertain effective dosing regime for epidural in labour.

Methods: Hundred women with singleton foetus in vertex position were included. Epidural catheter was inserted in L2-3 / L3-4 interspinous space. Initial bolus of 10-12 ml (0.125% bupivacaine) solution was injected and after the efficacy of block was established, an epidural infusion of the same drug solution was started at the rate of 10 ml/hour.

Results: In first stage of labour 80% of the parturient had excellent to good pain relief (visual analogue scale 1 to 3) with standard protocol while 20% parturient required one or more additional boluses. For the second stage, pain relief was good to fair (VAS 4-6) for most of the parturient. The incidence of caesarian section was 4% and 6% needed assisted delivery. No major side effects were observed.

Conclusion: 0.125% bupivacaine maximizes labour pain relief and minimizes side effects.

INTRODUCTION

The McGill Pain Questionnaire ranks labour pain in the upper part of the pain scale between cancer pain and amputation of a digit [5]. Epidural analgesia is the most effective and least depressant method of intrapartum pain relief in current practice [6].

Bupivacaine continues to be the most widely used local anesthetic for epidural labor analgesia because it provides excellent sensory block during labour and delivery(1). It remains the most widely used local anaesthetic in obstetric analgesia. However, limitations to its usefulness include the potential for motor blockade and central nervous system (CNS) and cardiac toxicity. Its use in increasingly smaller concentrations has drastically reduced the risk of these complications.

Epidural administration of amide local anesthetics in combination with opioids is widely used for pain relief in labour because of the dose minimizing and side effects reducing benefits.[4-6] Bupivacaine is the most widely used long-acting amide local anesthetic. It is a racemic mixture of 2 stereoisomers [2,3].

Low doses of local anaesthetic or opioid combinations are administered to provide a continuous T10-L1 sensory block, during the first stage of labour. Further supplementation may be required, during the late first stage and second stage, to achieve a sacral block [1]. The drugs to be used for this purpose should be quick in onset and long acting with minimum motor blockade and have no significant adverse effects on the mother and fetus. The duration of analgesia may be increased by intermittent top-ups.

MATERIAL AND METHODS

This research was conducted at RMMC&H, Annamalainagar. After ethical approval from the institutional review board and obtaining written informed consent, 100 parturients classified as ASA Grades I and II, who requested epidural labour analgesia, were taken for the study. Participants had singleton pregnancies of greater than 36 weeks of gestation with vertex fetal presentation. All women were in both latent and active phase of labour when epidural catheters were placed. Those who had received opioid or sedative medications were excluded. Other exclusion criteria included patients with breech presentation, multiple pregnancies, APH, aortic stenosis, severe preeclampsia, cephalopelvic disproportion, coagulation defects or anticoagulation therapy, vertebral deformity, chronic backache, local sepsis, and sensitivity to the drug. After intravenous prehydration with 1000 mL lactated ringer solution, patients were placed in flexed sitting position.

After raising a midline skin wheal with 2% lidocaine, the epidural space at L2-3 or L3-4 interspace was identified using an 18 G Tuohy needle and by loss of resistance to saline and a multiorifice epidural catheter was inserted about 3-5 cms into the epidural space and secured properly. After the insertion of the catheter, patients were placed in the supine position with left uterine displacement and 30° Reverse Trendelenburg position Three milliliters of lidocaine (1.5%) with 15 g of epinephrine was administered through the epidural catheter as a combined subarachnoid and IV test dose. Once a negative test dose was established, 12 mL of either 0.125% bupivacaine was administered. The injection was given within 5 minutes. In addition to VAS assessment, other data collected included blood pressure, heart rate, fetal heart rate, and sensory level (as determined by pin prick). Blood pressure and heart rate were recorded every 5 minutes for the first 30 minutes after injecting drug and then every 30 minutes. Fetal heart rate was monitored simultaneously with maternal heart rate. Motor blockage was assessed at regular intervals using modified Bromage scale: 0, no motor block; 1, inability to raise the extended leg and ability to move knees and feet; 2, inability to raise the extended leg and to move knees but ability to move feet; 3, complete motor blockage of lower limbs. To further assess motor block, patients with effective analgesia at 30 minutes were asked to do a partial knee bending from a standing position at the bed side. After initiation of the block, pain relief was assessed using a Verbal Pain Scale after each contraction until they attain grade 3 or grade 4 relief.
Verbal Pain Scale. Onset of pain relief is as follows:

1. No pain relief,
2. Little pain relief,
3. A lot of pain relief,
4. Complete pain relief.

A Visual Analogue Scale of 0-10 cm was used to determine baseline pain score prior to initiation of block, at the first contraction and after each 15-minute interval until delivery. The time of completion of first stage of labour (full dilatation with urge to push) and second stage (delivery) and the mode of delivery were recorded. Neonatal evaluation included APGAR score at 1 and 5 minutes. All adverse events observed in patients, fetuses, or neonates were recorded.

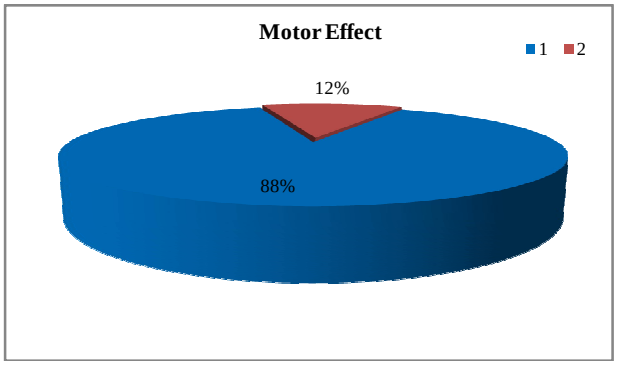
Important Features of the Method Used for the Present Study

RESULTS

At the time of inserting epidural catheter all parturients experienced severe labour pains (VAS 8-10). After initial 10 ml bolus the mean maternal blood pressure and pulse did not vary by more than 10% of pre-epidural values. Oxygen saturation was 98-99% in all the parturients. After 30 minutes of bolus, mean VAS was 0-1 and parturient own assessment was excellent to good pain relief. For the first stage, pain relief was excellent to good and median pain scores were 0-1 for all parturients. For the second stage, pain relief was good to fair with median pain scores 4- 6 for all the parturients. 12% 0f parturients had motor weakness (Bromage Score 1-2), loss of sensations and numbness in lower half of body

Motor Effect	No. of cases	Percentage
1	88	88.0
2	12	12.0
Total	100	100.0

According to Bromag scale, 88 paients had motor block scale of one and 12 patients had scale two



All parturients were not able to walk to second stage room for the delivery. The duration of second stage was 30-90 minutes. Ninty five parturients were able to bear down effectively and delivered vaginally without assistance. The decrease in pain scores during first stage of labour was found to be highly significant. However the motor block and change in hemodynamic parameters were not significant.

Twenty four parturients required caesarian section. For caesarian section 15-20 ml bupivacaine 0.5% was injected through epidural catheter and catheter was left for 48 hours for postoperative pain relief.

Literature search	:	Databases searched: Medline/ PubMed, Embase, Scopus, CINAHL, Ovid SP, EBSCO, Cochrane library, and Google Scholar; MeSH terms and keywords: bupivacaine, analgesia, anesthesia, labour, delivery, neuraxial, epidural, efficacy, side effects, motor block, sensory block, and randomized trial. Major search strategy is given in supplementary material. Search encompassed original research papers published before October 2017.
Type of studies	:	RCTs that carried out comparative evaluations of bupivacaine as epidural analgesia for labour pain relief.
Participants	:	Women requiring epidural analgesia for labour pain relief after VAS for pain assessment.
Interventions included	:	Epidural analgesia with bupivacaine for pain relief in labour for the comparative evaluation of efficacy and safety.
	:	Studies administering analgesia intrathecally; single-arm studies examining BUPIVACCINE as labour analgesia studies intervening cesarian section or postdelivery analgesia only;
Outcomes of interest	:	Adequate pain relief was assessed with Visual Analogue Score (VAS) for pain, incidence of motor blocks, incidence of instrumental and cesarean deliveries, APGAR score of newborn.
VAS for pain definition	:	VAS for pain is a measure of pain intensity in adults by which patient points pain severity (0– 100 ¼ low to high) on a paper having 10 cm line with 100 divisions.
Modified Bromage Score definitions used	:	Modified Bromage Score Score Criteria 1.Ability to raise extended legs 2.Inability to raise extended legs and decreased knee flexion, but full extension of feet and ankles present 3.Inability to raise legs or flex knees, but flexion of ankles present 4.Inability to raise legs, flex knees or ankles or move toes

Six parturients needed outlet forceps assisted delivery, one parturients required vacuum assisted delivery. When interviewed next day, all patients were satisfied with pain relief and none complained of backache. All were willing for labour epidural for subsequent pregnancy.

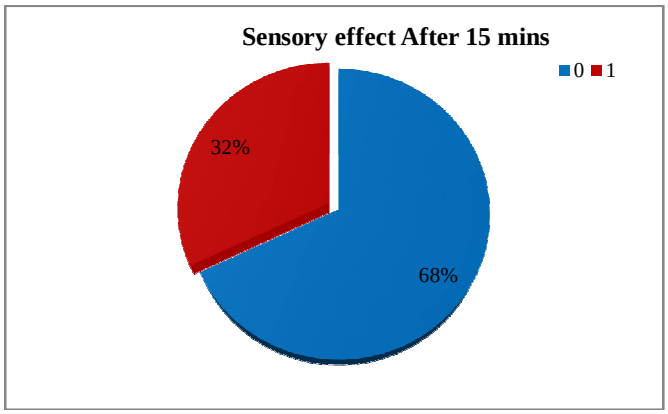
DISCUSSION

In our study all parturient had excellent to good pain relief (median VAS 0-1) within 15 minutes of bolus.

Sensory effect after 15 mins

Motor Effect	No. of cases	Percentage
0	68	68.0
2	32	32.0
Total	100	100.0

After 15 minutes of epidural analgesia, 68 patients had no pain,32 patients had score of one in visual analogue scale



After about an hours of bolus, 100 parturient had increased pain (VAS 8-10) and were given 10 ml bolus through the infusion pump and intermittent bolus. This bolus brought down the VAS to 0-1. Pain relief for second stage was not satisfactory for most. Second stage pain results from foetal descent and distension of vagina and perineum. Second stage pain relief requires higher concentration of bupivacaine which could result in motor weakness. All parturients could feel the uterine contractions and psychological satisfaction of participating in the process of labour. There was no incidence of hypotension, desaturation. The incidence of caesarian section (24%) and instrument assisted deliveries (7%) were observed in our study. Walking epidural was difficult with 0.125% bupivacaine due to numbness in lower limbs.

Neuraxial analgesia fulfils many of these characteristics. Epidural analgesia provides significantly more analgesia, as measured by visual analog scale in both the first and second stage of labour, [8],(Leighton BL,2002). While parenteral opioids may provide sedation, relaxation, and comfort, there is strong evidence to suggest that morphine and meperidine do not decrease pain intensity,[7] (Olofsson C 1996)

Safety

While side effects can occur, the incidence of permanent maternal injury is low. Neuraxial analgesia results in less neonatal depression than parenteral opioids. [8].(Leighton BL,2002)

Choice of local anesthetics

In North America, bupivacaine and ropivacaine are commonly used for labour analgesia. Bupivacaine was superior to the older local anesthetics, because of its increased duration of action, reduced incidence of tachyphylaxis, and reduced intensity of lower limb motor block. Ropivacaine was synthesized in order to reduce the cardiotoxicity associated with bupivacaine and to reduce motor block further.[9], (Albert *et al*,1975)

The use of bupivacaine and ropivacaine in labour has recently been reviewed.[10], (Beilin Y *et al* 2010) considering the low doses used for labour, toxicity is rarely associated with either drug. Both are effective analgesics, with little or no difference in maternal satisfaction or effect on labour. There is some evidence to suggest that ropivacaine may produce less motor block in prolonged labours,[11], (Halpern *et al* 2003)

Characteristics of ideal labour analgesia

- Effective pain relief
- Safe
- Minimal effects on progress or outcome of labour
- Minimal effects on the fetus or newborn
- Minimal maternal side effects
- Lower limb motor block
- Pruritus
- Nausea

Choice of concentration of local anesthetic

Traditional epidural analgesia was initiated with 0.25%- 0.5% bupivacaine and maintained with intermittent bolus doses of similar anesthetic solutions. Dense motor block of the lower extremities resulted in dissatisfaction with the technique. Collis *et al*[12] conducted a randomized controlled trial that compared bupivacaine 0.25% to 0.1% with fentanyl for maintenance of labour analgesia. Using post-partum questionnaires, they found that women who received 0.1% bupivacaine felt that they had better self-control (P =0.001), less lower limb weakness, and more mobility than the control group. It is also possible that drug concentration may affect mode of delivery. While the cesarean section rate is not affected, COMET (Comparative Obstetric Mobile Epidural Trial) investigators in the UK found an increase in operative vaginal delivery rate in women assigned to maintenance of analgesia using 0.1% bupivacaine compared with those maintained with 0.25%[13]. In both of these trials, there was no difference in the quality of analgesia. These large randomized trials provide sufficient evidence to suggest that low concentrations of local anesthetics provide excellent analgesia and superior maternal satisfaction compared with higher concentrations.

Maintenance of analgesia

The use of continuous epidural catheters allows maintenance of labour analgesia for prolonged periods of time. Intermittent boluses (by physician or midwife) can provide satisfactory analgesia, but require constant availability of a clinician capable of providing analgesia. Continuous infusions of low concentrations of local anesthetic result in less variability in the quality of analgesia, and require clinician boluses only for breakthrough pain. More recently patient-controlled epidural analgesia has become the preferred technique for maintenance of labour analgesia. This technique has proven to be safe and effective when used with dilute solutions of local anesthetics, with or without a lipid-soluble opioid, such as fentanyl or sufentanil. Clinicians set the bolus dose and lockout interval, and may choose a continuous infusion rate. Compared with continuous infusion alone, patients who receive patient-

controlled epidural analgesia require fewer clinician interventions, a reduced dose of local anesthetic, and have less motor block of the lower extremities. Patient- controlled epidural analgesia superimposed on a continuous infusion further reduces the need for clinician interventions without increasing the incidence of motor block.(Halpern SH 2009) There are a wide range of patient-controlled epidural analgesia settings that result in excellent analgesia with minimal motor block. The bolus dose can be set between 4 and 12 mL, with the most common settings between 5 and 8 mL. The lockout interval can be varied, bearing in mind it takes about 10 minutes for the patient to experience pain relief. There is also a wide range of appropriate settings for the background infusion. Low background rates result in more control by the parturient. A recent review discusses these issues in detail. (Halpern SH 2009)[14].

CONCLUSION

0.125% bupivacaine bolus followed by continuous epidural infusion, provided a faster onset of analgesia with a long lasting effect. The parturient remains pain free and less side effects, but walking epidural was difficult with 0.125% bupivaccine due to numbness in lower limbs, it would be further interesting to evaluate the effect of varying the dose of administered drugs according to the stages and intensity of labour, which could further regulate the requirement of drugs and provide more effective analgesia

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