Dissertation on

“WALKING EPIDURAL ANALGESIA DURING LABOUR - ITS EFFICACY ON PAIN RELIEF, ITS INFLUENCE ON PROGRESS OF LABOUR, OUTCOME OF DELIVERY ”

Submitted in Partial fulfillment of requirements of

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INTRODUCTION

Childbirth is a painful process experienced by almost all labouring women. The labour pain experienced has multiple physiological and psychosocial dimensions and its intensity also varies greatly from one parturient to another (Cambic CR, Wong C 2010). Labour pain involves multiple complex neuro behavioural responses to allogeneic stimuli, it gives a personal and unique experience to individual women. The cause–effect relationship in the labour pain does not always correspond to a clinical response; whatever it matters to understand the labour pain felt by the pregnant woman, it is essential to provide appropriate pain relief (Perevia RR, Franco SC 2011).

In recent years, in Brazil, many pregnant women are increasingly choosing caesarean section in order to avoid labour pain (Perevia RR, Franco SC 2011). Most women in labour request pain relief. Both pharmacological and non-pharmacological interventions are used for this purpose (Cambic CR, WongC 2010).

Pain during parturition produces various physiologic responses in the mother, which affects the fetus in utero. Increased respiration during parturition can cause an increase in the oxygen demand, raises plasma catecholamine levels resulting in increased blood pressure, and pulse rate. Also, it may decrease fetal oxygenation, resulting in non reassuring
patterns and increases the need for operative delivery. Effective analgesia during labour decreases the above physiologic changes and optimizes the uterine blood flow improving the placental circulation and fetal oxygenation. Among variant analgesic forms during labour, epidural analgesia is the better form and more suitable technique considered the “gold standard” in obstetrics.

Traditional epidural technique uses high concentration of local anesthetic agents (0.25% Bupivacaine or 0.2% Ropivacaine), which brings about block in the muscles of the pelvic floor and reduces the bearing down ability of the mothers and prolongs the duration of labour or increases the rate of operative vaginal delivery, or both can happen, compared with low -dose epidural technique. A survey during 2005 and 2006 showed that 22% of all deliveries in UK NHS Hospitals involve an epidural (Richardson 2007). In other countries, for example Canada epidural rates may be even higher. Hence strategies to shorten the second stage of labour and reduce instrumental deliveries are important.

The use of decreased concentration of the drugs in labour analgesia has led to development of the walking or ambulatory epidural, which provides adequate pain relief while eliminating muscle blockade thus overcoming the disadvantages of traditional technique .

With the advancement of low dose epidural techniques also known as ‘walking epidurals, women with an epidural are now being provided
with an opportunity to remain mobile during their labour and to adopt some upright positions such as standing and ambulation which may not be possible for women with a traditional epidural (COMPARATIVE OBSTETRIC MOBILE EPIDURAL TRIAL). Flynn et al concluded that the use of ambulation during labour has been associated with more efficient uterine contractions, shorter duration of labour and aiding the descent of the fetal head through gravitational effort.

The use of low dose epidurals aids the maternal efforts required to give birth through the preservation of motor function (COMET). The increased number of vaginal deliveries seen with this type of analgesia is thought to be due to ability of the women to adopt an upright position during labour. A recent Cochrane review found that the women who assume upright positions during the first stage of labour - such as walking, sitting, standing or kneeling as opposed to lying down - experienced a shorter first stage of labour. The review also found that the women who had laboured in upright positions were less likely to seek pain relief through epidural analgesia.

The Royal College of Obstetricians and Gynaecologists (RCOG) encourages labouring women to mobilise and remain upright as much as possible during the first stage of labour. It is likely that being upright helps fetal head to descend and turn into the right position. The pressure of the fetal head on the cervix may also help to strengthen contractions.
In the past, traditional epidural methods meant that it was impossible for women to walk around. However, most hospitals now offer a mobile epidural, which allows women to walk around and remain upright. A mobile epidural contains a different mixture of reduced dose of local anesthetics, providing pain relief while limiting loss of sensation in the legs. It is thus consequently possible for most women to choose pain relief and to remain mobile during the first stage of labour.

Fetal monitoring need not interfere with the mobility of the parturient. Intermittent monitoring of the baby is recommended for low-risk women, while the high-risk women may require continuous monitoring. Fetal monitoring equipment can be attached by a lead that allows the mother for freedom of movement. All women having a vaginal birth are encouraged to ambulate during the first stage of labour, provided that they feel capable of doing so. The (Royal College of Obstetricians and Gynaecologists) RCOG recommends that the women should be encouraged to assume whatever position is most comfortable to them.

Thus various studies have reported that walking epidural is advantageous for both parturient and the baby
AIM OF THE STUDY

To compare the effect of epidural and walking epidural analgesia in labour on

1. Pain relief

2. Labour progress and

3. Mode of delivery.
REVIEW OF LITERATURE

- A prospective study titled Walking Epidural - An effective method of pain relief by Wg cdr RM Sharma et al was conducted and published in MJAFI 2007:63; 44-46.

  Fifty women with singleton fetus in vertex presentation were included in this study. Initial bolus of 10 ml of 0.1% Bupivacaine and 0.0002% Fentanyl was injected epidurally. 80% of the parturients had excellent to good pain relief with mean VAS score of 1-3. Ten parturients required additional bolus. All parturients were able to walk. The duration of second stage labour was 30-90 minutes. The incidence of caesarean section was 4% and 6% needed assisted vaginal delivery. No major side effects were among the parturients. In all cases the Apgar score was 7-8 at one minute and 8-9 at five minutes. The total dose of bupivacaine used varied from 15-40 mgs.

- The Comparative Obstetric Mobile Epidural Trial (COMET) studied the effect of low dose mobile versus traditional epidural technique on mode of delivery. This Trial demonstrated a reduced instrumental vaginal delivery rate with Combined Spinal Epidural (CSE) and Low-Dose Infusion (LDI), relative to a high-dose epidural technique, in nulliparous women.
• Moreover, a Randomized controlled trial by Wilson et al comparing traditional epidural with two mobile epidural technique have shown that there was no reduction in the efficacy of pain relief.

• A Randomized study conducted by colles et al stated that mobile epidurals result in high maternal satisfaction.

• A study, Reducing the likelihood of instrumental delivery with epidural analgesia conducted by Thorton et al has suggested that a mobile technique should be offered to all women who request epidural pain relief in labour.

• Chestnut DH et al in their study- Continuous epidural infusion of 0.0625% bupivacaine–0.0002% fentanyl during the second stage of labor have shown that low-concentration of bupivacaine–fentanyl have reduced the duration of the second stage of labor and rate of instrumentation.

• A non randomised control trial conducted by Rao ZA et al titled Walking epidural with low dose Bupivacaine plus Tramadol on normal labour in primipara was conducted in Department of Anaesthesia, Military Hospital, Rawalpindi, from August 2004 to July 2007.

The objective was to determine the obstetric outcome in terms of duration of labour and mode of delivery between the walking epidural
analgesia with 0.1% Bupivacaine + 0.5% Tramadol and routine labour practice. 50 primiparous patients, ASA-I, coming to antenatal clinic were included in control group-A, and another consecutive 50 primiparous ASA-I, coming to antenatal clinic and who are requesting for painless delivery were included in group-B. In group-A, only injection Nalbuphine 10mg intramuscular was given when pain was unbearable. In group-B epidural analgesia 15 ml of 0.1% Bupivacaine and 0.5 mg/ml Tramadol was given.

In group-A, first stage duration of labour was 6.72 + or -1.16 hours and in group-B, it was 4.03 + or - 1.00 hours. Second stage of labour in group-A was 0.55 + or - 0.35 hours and in group-B it was 0.67 + or -0.33 hours. Total duration of labour, in group-A was 7.57 + or - 1.13 hours and in Group-B it was around 4.77 + or - 1.21 hours. In Group-A 46/50(92%) patients were delivered spontaneously, while 4/50(8%) had instrumental assistance. In group-B 36/50 (72%) patients were delivered spontaneously and 13/50(26%) had instrumental deliveries. One patient developed fetal distress and landed up with cesarean section in Group B. Patient satisfaction was excellent in 88% of Group-B women.

This study concluded that epidural analgesia using combination of low dose of Bupivacaine with injection Tramadol and mobilization markedly reduces the duration of labour.
DESCRIPTION OF LABOUR PAIN

Most women experience moderate to severe pain during labour process. Donald et al stated that the experience of pain during labour is a complex and subjective interaction of multiple physiologic, psychological and socio-cultural factors on a woman’s individual interpretation of labour stimuli. The severity of labour pain has been previously recognized by Melzack who used a questionnaire developed to assess the intensity and emotional impact to pain (McGill pain rating index). It was observed that among nulliparous women with no prepared child birth training, labour pain was rated to be as painful as digit amputation without anesthesia.²
Mc Gill pain rating index- The labour pain in primipara scored a rate of 40 as painful as amputation of a digit

ACOG(American college of obstetrician and Gynecologist) and ASA(American Society of Anesthesiology) jointly states that ‘Labour results in severe pain for many women. There is no other circumstance where it is considered acceptable for a person to experience severe pain amenable to safe intervention, while under a physician’s care.’

**PHYSIOLOGY OF LABOUR PAIN**

**FIRST STAGE**

The pain during first stage experienced by the parturient is mostly visceral in nature. It mainly arises from the afferents in the uterus and its adnexa during contractions. The painful afferents pass through the superior hypogastric plexus and lumbar sympathetic chain. It enters the spinal cord through the posterior segments of T10-T12. The intensity of pain is related to the strength of uterine contraction and subsequently the pressure generated against the Cervix and Perineum.

Chemical metabolites resulting from neurohumoral pathways or contraction induced ischemia may lead to local stimulation of painful chemoreceptors by several chemical mediators including prostaglandins serotonin, substance P, Lactic acid.
The painful afferents from the lower uterine segment and the Endocervix have their cell bodies located in the thoracolumbar dorsal root ganglia. However the upper vagina and vaginal cervix have cell bodies in the sacral dorsal root ganglia that are mostly comprised of C-fibers. These enter the spinal cord through the dorsal root ganglion and develop a loose net-work of synapses in the ventral and dorsal horn (superficial and deep). Because of the significant convergence of the visceral pain pathways, the pain experienced in this stage of labour is often poorly localized and can be referred to the rectum, lower back, and along the abdominal wall.

As the fetal head descends along the birth canal and into the pelvis, pressure on the pelvic viscera and stimulation of the lumbosacral plexus can lead to perception of pain from L1-S1. This had implications in the provision of neuraxial analgesia, because to achieve effective pain management during this stage, the lumbar and upper sacral nerve roots require effective blockade. Neurons at the level of the dorsal horn transmit afferent information to the contra lateral spinothalamic tract and other ascending pathways to the higher centers of the brain responsible for the localization and effective component of pain.

SECOND STAGE

Pain stimuli from contractions of the uterine body continue, in addition to pain from distension of the lower uterine segment. The
contribution of pain from cervical dilatation slowly diminishes. As the presenting fetus presses on pelvic structures, leads to stimulation of superficial somatic structures and their afferents through the pudendal nerve (S2-S4); pain arises from tearing of ligaments, and pressure on fascia, muscles, bladder, urethra and rectum. The pudendal nerve also supplies the motor fibers to the skeletal muscles of the pelvic floor and perineum.

The anterior perineum also receives fibers from the genital branch of the genitofemoral nerve (L1-L2) and the ilioinguinal nerve (L1). The lateral aspect of the perineum is supplied by the posterior femoral cutaneous nerve (S1-S3)\textsuperscript{44,45,46}. Pain in the second stage is often sharply localized. This somatic pain is transmitted through C and A\(\delta\) fibers that enter the spinal cord through the dorsal roots and terminate in synapses in the ipsilateral superficial laminae of the dorsal horn. Provision of appropriate analgesia requires analgesia extending T10 caudally to include the somatic nerves of the perineum (S2-S4).

**THIRD STAGE**

The Third stage of labour commences with the completed delivery of the fetus and ends with the completed delivery of the placenta and attached membranes. The analgesia requirements for the third stage of labour are usually less. If there is delay in the delivery of the placenta or if there is manual removal by the obstetrician, increased doses of
analgesia or anesthesia of the perineum and lower uterus are usually required.

Pathways of labour pain in First & Second stage are summarized as

<table>
<thead>
<tr>
<th>I STAGE</th>
<th>Origination</th>
<th>Cervix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Dull aching pain</td>
<td></td>
</tr>
<tr>
<td>Site</td>
<td>Poorly localized to lower abdomen which is felt as pain in the lower backache.</td>
<td></td>
</tr>
<tr>
<td>Route</td>
<td>T₁₁</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>II STAGE</th>
<th>Origination</th>
<th>Visceral component from uterine musculature somatic from perineum and its muscles of pelvis musculature, structures including joints.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Dull and sharp</td>
<td></td>
</tr>
<tr>
<td>Route</td>
<td>T₁₁ to S₅</td>
<td></td>
</tr>
<tr>
<td>Site</td>
<td>Somatic component Localised to perineum.</td>
<td></td>
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</tbody>
</table>
UTERINE BLOOD FLOW

Uterine blood flow increases progressively throughout pregnancy and reaches a mean value of 500 to 700ml/minute at Term. Uterine vessel blood flow is high, with a low Vascular resistance\textsuperscript{30}.

Pain may play a significant role, as uterine artery flow is dependent on maternal blood pressure and cardiac output. The uterine vessels are maximally dilated during pregnancy, thus no auto regulation is present. Therefore, any factor that interferes with blood flow through the uterus can potentially adversely affect fetal blood flow. Uterine blood flow is determined by following relationship,
uterine arterial pressure - uterine venous pressure
Uterine blood-flow = ------------------------------------------------------------
                        uterine vascular resistance

Factors that reduce uterine blood-flow include maternal hypotension, hypovolemia, hemorrhage, aortocaval compression and sympathectomy. Similarly, conditions that increase the frequency and duration of uterine contractions (uterine hyper contractility /tetany) and changes in hypertension induced increase in vascular tone may also adversely affect blood flow. Sympathetic blockade following neuraxial techniques, using higher concentration of local anesthetics, can produce maternal hypotension and thus reduce uterine blood flow. This can be marked in a fasting and potentially dehydrated parturient with ongoing insensible fluid losses. Fluid preloading prior to proceeding with regional anesthetic technique may reduce the impact of the local anesthetic induced sympathectomy and resulting hypotension. This becomes more important as the concentration of local anesthetic increases and neuraxial analgesia progress to neuraxial anesthesia. Appropriate fluid preloading, with maintenance of maternal cardiac output correlates with the uterine artery pulsatility index and umbilical artery PH. Therefore these can be used as a surrogate index of fetal homeostasis.47,48
STAGES OF LABOUR

Normal labour is the spontaneous onset of regular painful uterine contractions associated with the effacement and dilatation of the cervix and descent of the presenting part, with or without a show or ruptured membranes. This process culminates in the birth of a healthy baby followed by expulsion of the placenta and membranes.2

FIRST STAGE

First stage of labour is divided into two phases – latent phase and active phase

1. **Latent phase**
   Begins with onset of regular uterine contractions to the length of the cervix shortens from 3cm to less than 0.5cm and dilates to 3cm.

2. **Active phase**
   The cervix dilates from 3cm to full dilatation.2

Friedman 1 subdivided the active phase into:

1. Acceleration phase,
2. Phase of maximum slope and
3. Acceleration phase
SECOND STAGE

This stage begins when cervical dilatation is complete and ends with fetal delivery.¹

THIRD STAGE

It extends from the delivery of the baby to the delivery of the placenta. It lasts for around 15 minutes.

PROGRESS OF LABOUR

The basis for the scientific study of the progress of labour was developed by Friedman² who described the labour progress of 100 consecutive primigravida women in spontaneous labour at term. The progress was presented graphically by plotting the rate of cervical dilatation against time. The resulting graph of cervical dilatation forms the basis of the modern partogram, a pictorial representation of the key events in labour presented chronologically on a single page. The maternal and fetal parameter recorded include cervical dilatation, the level of the presenting part (in fifths of the fetal head palpable above the pelvic brim, rather than the station which relates the level of the head to the ischial spines and is measured in centimeter above or below), the fetal heart rate, the frequency and duration of contractions and the colour and quantity of amniotic fluid. Other maternal parameters include
temperature, pulse, blood pressure and drugs used. This pictorial documentation of labour facilitates the early recognition of poor progress.

In order to identify women at risk of prolonged labour, a line of acceptable progress is drawn on the partogram, that is alert line. If the rate of cervical dilatation falls to the right of this line, progress is deemed unsatisfactory. A certain grace period is given before intervention and is based on a line drawn parallel and one to four hours to the right of action line.

**DURATION OF LABOUR**

The latent phase may last for up to eight hours in nullipara and up to six hours in multipara\(^2\).

During the peak of the active phase of labour, the cervix dilates at a rate of 1 centimeter per hour in nullipara (Hendricks *et al*)\(^2\)

Friedman found that multipara progress faster in active phase labour, at a rate of 1.5 centimeter/hour \(^1\)

Descent begins in the later stage of active dilatation, commencing at 7 to 8 cm. in nulliparas and becoming most rapid after 8 cm\(^1\).

Median duration of second stage of labour is approximately 50 minutes for nulliparas and about 20 minutes for multiparas\(^1\).
EFFECTS OF LABOUR PAINS

1. Respiratory effect

Painful uterine contractions initiate hyperventilation leading to maternal hypocarbia, respiratory alkalosis and subsequent compensatory metabolic acidosis. The oxygen dissociation curve is shifted to the left and increases oxygen affinity and thus reduces tissue oxygen transfer, which is already compromised by the increased oxygen consumption associated with labour.

2. Cardiovascular effect

Increased cardiac output and BP through sympathetic activity. Increases risk in cardiac and preeclampsia patients. Increased venous return associated with uterine contractions also contribute.

3. Endocrine effect

Increase in systemic cortisol, beta-endorphins, lipotropins and a increase in serum anti diuretic hormone release. Increased sympathetic stimulation leads to increased gluconeogenesis in the medulla and peripheral norepinephrine effects in the periphery. 5
4. **Gastrointestinal effect**

   Increased Gastrin release and gastric acid secretion as well as decreased gastrointestinal motility can significantly delay gastric emptying.

5. **Metabolic effect**

   Hyperglycemia due to poor insulin response and lipolysis with production of fatty acids, ketones and lactate. These acids cross the placental barrier, leading to fetal acidosis and increase fetal oxygen requirements.

6. **Psychological effect**

   Severe labour pain can produce long term emotional disturbances that impair the mother’s mental health.

**EFFECTS OF LABOUR PAIN ON FETUS**

During labour, the intermittent reduction of intervillous blood flow during the peak of a contraction leads to a temporary decrease in utero-placental gas exchange. This impairment is further aggravated by respiratory alkalosis causing,

1. A shift to the left of the maternal oxygen dissociation curve, which reduces the transfer of oxygen from the mother to the fetus.
3. A reduction in uterine blood flow due to norepinephrine and cortisol.

**EFFECT ON UTERINE ACTIVITY AND LABOUR**

Pain by releasing catecholamines alter uterine activity. Norepinephrine increases it whereas epinephrine and cortical decreases it. Sometimes it causes in coordinate uterine contractions.

**BENEFICIAL EFFECTS OF EPIDURAL ANALGESIA**

1. Pain relief obtained with epidural analgesia prevents the transient period of hyperventilation during a contraction and thus prevents hypoventilation during uterine relaxation, so PaCO$_2$ remains between 28-32mmHg and PaO$_2$ increases to 100 mmHg$^{12}$.

2. By blocking nociceptive input and sympathetic efferents, release of catecholamines, beta-endorphins, Adrenocorticotropic and cortisol is reduced, thereby reducing uterine hyperactivity and in between hypo activity, un coordinated uterine contractions is converted to normal contraction. Improves placental hypo-perfusion.

3. Epidural analgesia decreases the rise in cardiac output, cardiac work and blood pressure in laboring parturient, especially those
with heart disease, pregnancy induced hypertension provide maternal hypotension is avoided.

4. Epidural analgesia blocks the reflex inhibition of gastric motility.

5. Fetal benefits include better apgar score and reduced metabolic acidosis compared with no analgesia or systemic opioid analgesia.

6. Provides anesthesia for episiotomy or instrumental vaginal delivery\(^4\).

7. High maternal concentrations of catecholamines may have a deleterious effect on both mother and fetus in terms of uterine blood flow and effective analgesia in labour is essential to reduce this effect\(^5\).

**EPIDURAL SPACE**\(^{13}\)

**DEFINITION** : It is a potential, elliptical space surrounding the dural sac. It extends from foramen magnum to coccyx. It communicates laterally with the para vertebral space through inter vertebral foramina.

**BOUNDARIES OF EPIDURAL SPACE** \(^{14}\)

**SUPERIORLY** : At the foramen magnum - the periosteal layer of the spinal vertebral canal fuses with dural layer.
INFERIORLY: By the sacrococcygeal membrane.

ANTERIORLY: Posterior longitudinal ligament which covers the posterior aspect of vertebral bodies, inter vertebral disc.

POSTERIORLY: Bodies of the vertebra.

LATERALLY: By inter-vertebral foramina and pedicles of vertebrae.

CONTENTS OF THE EPIDURAL SPACE

Spinal nerve roots, epidural vessels, fat, lymphatics are its contents. The distance of the epidural space from skin in the midline has been studied by Guterrietz. The median distance in normal adult female is 4.7 centimeter at L3-L4 level.

The structures and tissue planes that are to be penetrated to reach the epidural space in a midline sagittal plane are:

1. Skin, subcutaneous tissue
2. Supra spinous ligament
3. Inter spinous ligament
4. ligamentum flavum
The ligamentum flavum is an important landmark for technical identification of epidural space. The first three tissues offer little resistance to the advancing needle but once the ligamentum flavum is reached, the resistance increases. As the needle passes through this tissue, the resistance disappears suddenly. Further little advancement results in subarachnoid penetration.

**Epidural Space entered after Penetrating Skin, Subcutaneous Tissue, Supra and Interspinous Ligaments.**

**EPIDURAL PRESSURE**

There exists a negative pressure in the extradural space. This negative pressure is greatest at points of firm attachments. It is highest in
thoracic region (1-3 centimeter H20), less in lumbar region (1 centimeter H20), least in sacral region (0.5 centimeter H20). This difference in pressure makes hanging drop technique at thoracic region and loss of resistance at lumbar region the better methods of identifying epidural space.

EPIDURAL ANALGESIA

Epidural analgesia resulting in blockade of the lumbosacral plexus has been demonstrated to be a safe and effective technique for the management of labour pain in the parturient \(^49,50,51\).

Epidural analgesia should be performed in a place with appropriate staffing and familiarity with neuraxial blockade is essential. Appropriate resuscitation equipment must be readily available. In addition, ongoing maternal and fetal monitoring should be maintained.

Full preprocedure evaluation and preparation of the parturient should be performed. In addition, anesthesiologists and obstetricians are obliged to obtain consent and inform their patient of the risks associated with epidural analgesia. The timing, effectiveness and extent of the consent have been subject of much debate. Some anesthesiologists believe that the forum for obtaining and documenting consent for labour analgesia should be during antenatal preparation of the parturient, as
acute pain may have a impact on the understanding and acceptance of clinical risks.

**PATIENT POSITION**

The technique of epidural insertion in labour differs from standard epidural placement in the non pregnant patient. Pregnancy-related anatomic changes can make positioning and identification of landmarks problematic. Ongoing acute pain and associated distress during contractions can lead to difficulty in positioning the patient and can lead to ongoing physical and emotional stress to both patient and medical staff. Sitting or lateral decubitus postures are used. Evidence suggests that uteroplacental perfusion may be optimum in lateral decubitus position. Also, the potential for the reduction of venous congestion by adopting the lateral recumbent head-down position may be associated with a reduction in the incidence of lumbar epidural venous pressure.

But, the incidence of successful epidural placement may be higher in the sitting position, especially in the obese patients with obese and morbidly obese patients, this posture, may be associated with easy identification of midline and possibly improves respiratory parameters.

A decreased, incidence of the aortocaval compression during the identification of the epidural space was demonstrated in the sitting
position compared to the lateral decubitus position compared to the lateral decubitus position. One report even suggested the use of prone (knee-chest) position had a role in epidural placement.

**ASEPTIC TECHNIQUE**

Strict asepsis is essential in performing the epidural catheter insertion. Several case reports have showed iatrogenic causes of meningitis during central neuraxial procedures. The routine use of face masks in the prevention of iatrogenic contamination by anesthesiologists has shown wide user variation. Surveys of United kingdom obstetric anesthesiologists and of fellows of the Australia and New Zealand college of Anesthetists with a special interest in obstetric practice shows a wide variation in practical standards. In the united kingdom, more than 50% of anesthesiologists did not wear face masks for neuraxial procedures, and this precaution was not seen to be essential in 29% of the latter group.

Disinfection of the skin with chlorhexidine, povidone iodine, is strongly recommended. Standard aseptic precautions, including use of sealed bottles or single-use packets of povidone iodine, have proved to be more effective than multiuse bottles. In vitro studies have shown the effectiveness of iodine products for asepsis, although recent clinical evidence suggests that chlorhexidine in alcohol solution is more efficient as an antimicrobial agent.
DETECTION OF EPIDURAL SPACE

By Negative pressure techniques

1. Hanging drop technique of Guterrietz.


By Loss of resistance techniques

1. Syringe technique.

2. Macintosh balloon technique.

Recent techniques

1. Auditory amplification of the sound made by the epidural needle.

2. Doppler guidance.

3. Pressure transducer guided technique.

Local anaesthetic which is injected into this space acts on the ganglion of dorsal segment of spinal cord and its nerve roots.

In antenatal women, the epidural space identification is difficult due to lordosis and edema. Further the available space in the epidural region is decreased due pressure from the uterus and further the vessels are dilated and engorged. This results in high level of block due to faster
spread of the drug. So the concentration required is relatively low when compared to other individuals.

Following appropriate antiseptic preparation of the lumbosacral spine, the skin is draped and local anesthesia is administered to the skin and inter-spinous ligament. Placement of the epidural needle at the L₃-L₄ inter-vertebral level should provide appropriate coverage of the lumbar and sacral nerve roots required for analgesia during labour and delivery. Use of loss of resistance techniques to both saline and air have been extensively described. Studies have assessed the quality of analgesia in women randomized to either technique¹⁵,¹⁶. Beilin and coworkers found that patients who had epidural placement using a loss of resistance technique to air had a higher requirement for rescue medications following analgesia¹⁵.

The merits of a saline technique include avoidance of pneumocephalus – induced headache, non uniform spread of local anesthetic and nerve root irritation, all of which have been described following injection of epidural air¹⁷,¹⁸.

However, the judicious use of air during the loss of resistance technique should avoid many of these side effects. The use of air when performing a combined spinal epidural technique can be advantageous, as
it allows clear identification of cerebrospinal fluid without introducing any confusion caused by concomitant use of saline.

**SELECTION OF EPIDURAL CATHETER**

Both single–port (uniport) and multi-port (multiple orifice) epidural catheters has been widely described. The proposed advantage of the single–port (open–end) catheter is the delivery of medication to a single anatomic site but associated with reduced spread of medication, leading to incomplete or unilateral blocks. This problem may be reduced through the use of the newly developed flexible–tip single–port catheters, which may be associated with decreased incidence of paresthesias and intravascular placement\(^\text{19}\).

Comparisons between multi and single-port catheters showed that significantly fewer catheters needed replacement in the multi-port group because of inadequate analgesia and that paresthesias were less common in this same group\(^\text{20,21}\). A comparison of multiport, firm–tipped, close-ended epidural catheters with uniport, open-ended, soft-tipped, wire-reinforced catheters showed the softer uniport to have a lower incidence of paresthesias and vascular puncture\(^\text{22}\).

Multiport (closed-end) catheters have consistently been shown to be associated with a reduce incidence of inadequate analgesia and thus
require less manipulation, presumably because of a more even distribution of medication\textsuperscript{19,21}.

A further technique suggested in the prevention of accidental vascular puncture during epidural catheter placement includes injection of 3 to 5ml of saline through the epidural needle prior to advancing the catheter. This is thought to expand the epidural space, possibly decreasing the likelihood of unintentional IV cannulation\textsuperscript{23}.

Technical factors may play a major role in determining the effectiveness of labour analgesia. In a study of 100 labouring women, insertion of multiport catheters to a depth of 5cm was shown to be associated with the highest incidence of satisfactory analgesia and minimal complications at a 7cm depth\textsuperscript{24}.

Change of position from sitting to lateral recumbent can be associated with movement at the catheter of between 1 and 2.5cm, which can lead to inadequate analgesia\textsuperscript{25}.

To minimize the risk of catheter displacement, especially in obese patients, it has been suggested that multiorifice catheters should be inserted to a depth of more than 4cm into the epidural space and secured only upon assuming the lateral position\textsuperscript{26}.
DRUGS USED FOR EPIDURAL ANALGESIA

Current practice advocates a low concentration of local anesthetic with a lipophilic narcotic stated by Hart et al in 2003. The commonly used local anesthetic agents are bupivacaine and newer agents like ropivacaine and levobupivacaine.

The goal during labour analgesia is to provide adequate maternal analgesia and satisfaction along with minimal motor blockade, as advised in the American Society of Anesthesiologist’s obstetric Anesthesia Practice Guidelines.

Attenzar et al in 2008 stated that Bupivacaine is most economical and is as effective as the newer ones.

The concentrations of bupivacaine recommended are 0.0625 percent to 0.1%, both for activation of the epidural analgesia and for maintenance.

The addition of opioids to the local anesthesia solution allows:

- Lower concentration of bupivacaine to be administered.
- Maximal preservation of motor strength.

Bupivacaine is usually mixed with a lipophilic narcotic like fentanyl or sufentanil. Fentanyl is more economical and causes less
respiratory depression. The concentration recommended is 2 micrograms per milliliter.

**BUPIVACAINE**

The use of the amide local anesthetic bupivacaine is well established in obstetric anesthesia. Its prolonged duration of action, differential sensory blockade and relative lack of tachyphylaxis make it an ideal agent for use in epidural and spinal anesthesia.

The degree of drug ionization at physiologic pH and the extent of protein binding determine the degree of placental transfer.

Bupivacaine is highly ionized at physiologic pH (pka of 8.05) and is 95% protein bound

Molecular weight (free base) 342.9 (288.4)

Each vial has 0.5% of bupivacaine with dextrose available as 4ml.

**MODE OF ACTION**

Bupivacaine prevents the generation and the conduction of the nerve impulse. The primary site of action is the cell membrane. It blocks conduction by decreasing or preventing the large transient increase in the permeability of excitable membranes to sodium ions that is normally produced by a slight depolarization of the membranes. It is due to their direct interaction with voltage gated sodium channels.
DOSAGE

i.  For Epidural initiation $^4$ – 10-20ml of 0.0625 – 0.125% along with Opioid.

ii. For Epidural Maintenance $^4$ – 0.0625–0.1%.

The ratio at delivery of the concentration of local anesthetic in blood or plasma from the umbilical vein to the concentration of local anesthetic in maternal blood (UV : MA ratio) for Bupivacaine ranges from 0.31 to 0.44 and is much lower than that of Lidocaine. Bupivacaine has been the subject of concern in relation to its systemic cardiovascular toxicity $^{31,32}$.

Bupivacaine depresses rapid phase of depolarization (V max) in purkinge fibres and ventricular musculature to a greater extent than lignocaine. It also decreases the rate of recovery from a dependent block. This leads to incomplete restoration of v max between action potential at high rate. This explains the arrythmogenic potential of Bupivacaine.

The use of Bupivacaine 0.75% concentration solution in the epidural space has been prohibited in obstetric practice by the U.S.Food and Drug Administration. Bupivacaine consists of two stereoisomers S(-) and R(+), and is racemic mixture of these. The R enantiomer was found to contribute to Bupivacaine’s unwanted toxicity $^{33,34}$. 
FENTANYL

Fentanyl is a synthetic Opioid. It is a phenylpiperidine derivative and structurally related to Pethidine. It is 75-125 times as potent as morphine\(^{35}\). It is highly lipophilic.

Rayburn et al stated that Fentanyl has high potency than that of Morphine and Pethidine. It is more soluble in lipids.

**Mechanism of Action**

Fentanyl has agonistic activity to towards its receptor hence has good analgesic property. It causes hyper polarization of cell membranes. This decreases membrane conductance.

**Dosage**

The addition of Fentanyl to Bupivacaine in epidural analgesia is associated with an opioid sparing effect, provides satisfactory analgesia for labour, preserves motor function and allows parturients to ambulate.

Various workers studied the effectiveness of analgesia provided by different doses of epidurally administered Fentanyl during labour.

Elliot *et al* used 4mg/ml of Fentanyl with 0.125% Bupivacaine. He observed that analgesia was better than with 0.25% or 0.125% Bupivacaine alone\(^{36}\).
James et al used 2mg/ml of Fentanyl with 0.1% Bupivacaine. He observed that analgesia was similar to that obtained with 0.25% Bupivacaine alone but motor block was minimized 37.

Side Effects

Nausea, vomiting, pruritis, urinary retention, respiratory depression due to cephalad spread of Opioid may occur, but is very rare when using lipid soluble opioids.

**DRUGS USED FOR AGUMENTATION OF LABOUR**

**OXYTOCIN**

Oxytocin is used for augmentation of labour. Oxytocin receptors in the uterus increase during pregnancy and labour, so that the uterus may be sensitive to very small dose of administered Oxytocin (Fuchs et al). The drug is best titrated in an arithmetical or geometric manner starting form a low dose. Oxytocin should be administered ideally using a peristaltic infusion pump. Over dosage may lead to uterine hyper stimulation and fetal distress, while a suboptimal dose may lead to failure to progress. In labour, the dangers of uncontrolled infusion to the fetus (Liston and Campbell 1974) and to the mother (Daw 1973) are well documented.
The half-life of Oxytocin is 10-15 minutes (Seitchik et al; 1984). A period of eight hours of augmentation with adequate monitoring, in the absence of gross dis-proportion should result in the majority of nulliparous and multiparous women delivering vaginally with little risk of intrauterine hypoxia or birth injury².

A study conducted by Ramin SM and Howell CJ have shown that epidurals increase the need for Oxytocin acceleration. Various studies have shown that ambulation reduces the need for Oxytocin.

**EPIDURAL ANESTHESIA AND THE PLACENTA**

The potential transfer of anesthetic agents across the placenta is a concern in the management of pain in the parturient. Drugs cross the placenta by three main processes: simple diffusion, active transport, or Pinocytosis. The extend of drug transfer is dependent on numerous factors including lipid solubility, molecular weight, protein binding, concentration gradient, and maternal and fetal pH.

The Fick principle governs the rate of transfer of a drug across a membrane

\[
Q/t = \frac{K_A}{D} \frac{(C_m - C_f)}{(C_m - C_f)}
\]
Where $Q/t$ is the rate of diffusion, $K$ is the diffusion coefficient, $A$ is the surface area of membrane available for exchange, $C_m - C_f$ is the concentration gradient between the maternal and fetal circulations, and $D$ is the thickness of the membrane.

The potency and duration of action of local anesthetic agents is determined by their lipid solubility. This leads to the binding of a drug close to its target of action and also to reduced metabolism by liver enzymes and plasma esterases. Local anesthetic agents are weak bases and are poorly water soluble. Structurally, most local anesthetic agents are composed of a benzene ring (lipid-soluble/hydrophobic) and an amine group (water-soluble/hydrophilic), which is ionizable.

Placental transfer is thus more active for lipid-soluble anesthetic agents. Local anesthetics agents bind systemically to tissue and plasma proteins (Albumin and $\alpha_1$-Acid glycoproteins [AAGs]. The protein-bound fraction is pharmacologically inactive, thus increased protein binding leads to reduced transfer of local anesthetic agent across the placenta. High-molecular-weight molecules are less likely to cross the placenta, whereas molecules with weights under 500 daltons will cross easily. Most drugs administered to the parturient in labor have low molecular weight and therefore transfer easily to the fetus.
Highly ionized substances with low lipid solubility (such as non-depolarizing muscle relaxants) have very limited transfer. Fetal pH and serum protein binding directly affect drug disposition in the fetal circulation.

The degree of ionization greatly influences drug transfer because only nonionized portions of the drug can cross the placenta. Bupivacaine has pKa of 8.1 and is only 15% nonionized at physiologic pH.

Pain thresholds may be increased in pregnancy, with a possible corresponding increased sensitivity to local anesthetic agents. Therefore, changes in maternal and fetal acid base status, combined with altered protein binding, can have a major impact on the management and technique of regional anesthesia. Fetal acidosis leads to increased ionization of local anesthetic agents that have crossed the placenta into the fetal circulation. These ionized agents are unable to transfer back (ion trapping) across the placenta into the maternal circulation. Fetal acidosis and systemic insult can lead to increased perfusion of the heart and brain, thus increasing the delivery of drug to these important organs. This can lead to further accumulation of drugs in an already compromised fetus. Although this is a major theoretical concern, the clinical significance of this phenomenon is unclear.
TYPES OF EPIDURAL ANALGESIA

1. Traditional epidural.
2. Combined Spinal- Epidural analgesia
3. Patient controlled Epidural analgesia
4. Continuous Epidural infusion
5. Walking Epidural

COMBINED SPINAL – EPIDURAL ANALGESIA

Effective, rapid onset analgesia with minimal motor block, with the flexibility of prolonging the duration of analgesia required through the epidural catheter. The duration of spinal analgesia with Bupivacaine and Sufentanil has been shown to be dependent on the extent of cervical dilatation and stage of labour at time of placement. Shorter durations of analgesia were associated with advanced labour (7-10cm cervical dilatation). Use of combined spinal epidural analgesia in labour has been associated with a high degree of patient satisfaction compared to standard epidural techniques, possibly because of the rapid onset, reduced motor block, and feeling among patients of having greater self-control.

Intrathecal addition of ‘isobaric’ Bupivacaine to Opioids has been shown to produce excellent and prolonged sensory blockade with minimal motor deficit. Intrathecal doses of Fentanyl 25mg or Sufentanil 10mg were described. However evidence suggests that lower doses of Sufentanil (5mg) or Fentanyl/(15mg) may be sufficient to achieve labour
analgesia. In addition, recent studies have suggested that Ropivacaine and Levobupivacaine can be substituted for in place of Bupivacaine.

The combined spinal-epidural analgesia technique combines the benefits of spinal anesthesia including rapid onset of analgesia and confirmation of correct needle placement (CSF flow) with the benefits of epidural anesthesia. After the spinal anesthesia wears off, the epidural catheter can be dosed in the usual fashion and used for labour analgesia. It provides anesthesia for cesarean delivery and other surgical procedures.

The combined spinal epidural technique can also be performed by placement of a standard epidural needle in the usual manner at L₃–L₄ or L₄–L₅, and then placing a long spinal needle through the epidural needle to enter the subarachnoid space. For labour analgesia, an Opioid such as Fentanyl (10 to 25 micrograms) in combination with a local anesthetic such as Bupivacaine (1 to 2.5mg) to provide pain relief for approximately 90 minutes (range : 20 to 245 minutes) is used.

After the intrathecal dose is administered, an epidural catheter is then placed for further administration of local anesthetic for labor analgesia or instrumental delivery as needed. Epidural infusion initiated with a bolose of Bupivacaine 0.0625% to 0.125% with fentanyl 2 micrograms per milli-liter.
PATIENT CONTROLLED EPIDURAL ANALGESIA

Use of patient controlled Epidural analgesia in labor offers several potential advantages, including improved analgesia, patient satisfaction, reduced dose of Local anesthetic, and fewer physician interventions.

This reduction in local anaesthetic dose was shown to diminish the risk of side effects, including motor blockade and hypotension. Patient satisfaction was shown to be high, personably due to independence and self-control of analgesia.

Options for patient controlled Epidural Analgesia during labor include continuous infusion plus demand dose or demand dose only. Recent study suggested that demand only regimens were not associated with a higher incidence of physician or midwife intervention. A fixed continuous background infusion may allow for a more stable therapeutic analgesic level with improved analgesia and less need for intervention by the anesthesia provider.

CONTINOUS EPIDURAL INFUSION

Labor analgesia is commonly initiated by either conventional epidural or intrathecal medication, is then followed by a continuous epidural infusion technique.
Local anesthetic Bupivacaine in concentrations ranging from 0.0625% to 0.125% have been used alone or in combination with Opioids. Larger concentrations are seldom required and are invariably associated with motor blockade.

Use of epidural infusion in labour should be associated with smooth maintenance of analgesia and allow titration of dose to effect. A systematic review of epidural analgesia using low concentrations of Bupivacaine compared to parenteral opioid analgesia revealed no increase in the rate of cesarean delivery and improved quality of analgesia compared to traditional epidural techniques, continuous infusions were reported to be as effective, and combined spinal epidural techniques superior in terms of pain relief, with reduced incidence of instrumental delivery. When evaluated by the National Institutes of Health, the consensus was that neuraxial analgesia is not associated with increased risk of cesarean delivery.

TRADITIONAL EPIDURAL

Traditional epidurals use bupivacaine in a concentration of 0.25% bupivacaine along with opioids. Anim-Somuah et al in 2005 observed that epidurals result in a longer second stage of labour and more instrumental deliveries. This matters because prolonged second stage of labour may increase the risk of fetal respiratory acidosis and post partum hemorrhage as stated by Watson et al in 1994. The incidence of
instrumental deliveries is also increased. Liebling et al in his study showed that instrumental deliveries are associated with prolapse, urinary, incontinence and dyspareunia.

**WALKING EPIDURAL ANALGESIA**

The walking epidural was developed in response to parturients requests to have effective labour analgesia, who did not require bed rest.

The main difference between a standard and walking epidural is the numbing sensation and the dosage of local anesthetic used for pain relief. A walking epidural allows the parturient to be mobile, whereas standard epidural can often leave the labouring mother confined to delivery bed.

In walking epidural, Low dose Bupivacaine 0.0625% and Fentanyl 10-25 micrograms is given followed by top up doses of 0.0625% bupivacaine and 2 micrograms / milliliter of Fentanyl.

A randomized control trial on Combined Obstetric Mobile Epidural Trial (COMET) published in Lancet by the UK study group concluded that Low dose epidural analgesia resulted in significantly higher vaginal delivery.

The COMET study enrolled 1054 patients in three groups, i.e., epidural with high-concentration Bupivacaine (0.25%), epidural with a low concentration of Bupivacaine (0.0625% -0.125% Bupivacaine
+ Fentanyl 2μg/mL) and combined spinal-epidural analgesia. The investigators found no difference in the incidence of cesarean section, fetal distress. Patients who received combined spinal-epidural and low-dose mobile epidural analgesia had a similar incidence of operative vaginal delivery that was lower than those who received 0.25% bupivacaine.

A randomized controlled trial to compare traditional with two mobile epidural techniques showed that mobile epidural analgesia using low dose local anesthetic-opioid mixture, reduces the impact of epidural analgesia on instrumental vaginal delivery, relative to a traditional technique.

**EPIDURAL DOSAGE REGIMEN**

Elizabeth McGrady *et al* published in British journal of anesthesia the following:

<table>
<thead>
<tr>
<th>Low dose top-ups</th>
<th>Bupivacaine 0.0625% -0.0125% 10ml and Fentanyl 2mg/ml</th>
<th>30 – 60 mts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient controlled Epidural analgesia</td>
<td>Bupivacaine 0.0625% - 0.0125% 3-5ml; and Fentanyl 2mg/ml</td>
<td>10–15 mts lock out</td>
</tr>
<tr>
<td>CSE technique</td>
<td>Intrathecal Bupivacaine 2.5mg and Fentanyl 25mg</td>
<td>8–16 ml / hour</td>
</tr>
<tr>
<td>Low dose Infusion</td>
<td>Bupivacaine 0.04% - 0.125% and 2kg/ml Fentanyl.</td>
<td>8 – 16 ml/ hour</td>
</tr>
</tbody>
</table>
EFFECT OF TRADITIONAL EPIDURAL ANALGESIA ON INSTRUMENTAL VAGINAL DELIVERY:

Eventhough epidural analgesia is the most effective method of pain relief, it can prolong the second stage of labour and increase the need for instrumental vaginal deliveries. Traditional epidurals use high concentration of local anaesthetic nearly 0.5% of Bupivacaine.

Many studies have shown that epidurals increase the rate of instrumental deliveries. It may be due to following factors:

1. Epidurals – relaxes the Pelvic floor muscles and interferes with the rotation of head – increases the risk of malposition of fetal head, in particular the fetal occiput-posterior position, a key factor in instrumental birth and prolonged labour.
2. Decreased release of Oxytocin which results from decreased stress that diminishes the release of epinephrine.
3. Parturient pushing down effect may be reduced during delivery.

Epidurals increase fetal malposition and prolong labour thus increasing instrumental births as observed by Liberman 2005; Martino 2007. Epidurals inhibit sympathetic stimulation interfering with the release of oxytocin as the pelvic floor stretches in the late second stage of labour. This was found in study conducted by Good fellow 1983, Rahm 2002.
In a study conducted at GMERS medical college, Gandhinagar, January 2012 to December 2012, the rate of instrumental delivery with epidural analgesia was 22.5%. It is due to:

1. Mal-rotated fetal head.
2. Fetal distress.
3. High concentration of Bupivacaine was associated with motor block of variable degree.

**EFFECTS OF EPIDURAL ON DURATION OF LABOUR**

Five randomized trials from Parkland Hospital, report that epidural analgesia prolongs labour and increases the use of Oxytocin stimulation\(^1\).

Alexander and associates (2002) examined the effects of epidural analgesia on Friedman labor curve. Compared with Friedman’s original criteria, epidural analgesia prolonged the active phase of labour by 1 hour.

Epidurals prolong second stage approximately by 25mts as observed by Z hang and co-workers in 2001.

Chestnut *et al* states that epidural analgesia increases the need for operative vaginal instrumental delivery because of prolonged second labour, but importantly without adverse neonatal effects\(^1\).
Howell et al found that epidural analgesia is associated with longer second stage of labour and an increased incidence of malposition, leading to higher rates of instrumental delivery².

A recent meta-analysis of 10 trials comparing parturients of mixed parity randomized to epidural analgesia noted a prolongation of the first and second stages of labour by 42 minutes and 14 minutes respectively³.

**EPIDURALS AND CESAREAN SECTION RATE**

A systematic review by Leighton and Halpern, concluded that epidural analgesia does not increase the incidence of cesarean sections similarly, Liu and Sia found that epidural analgesia using low concentration infusions of bupivacaine is unlikely to increase the risk of cesarean section².

Epidural administration of dilute anesthetic solutions did not increase cesarean delivery rates as studied by chest nut; Thompson et al¹. An ideal labour analgesia should fulfill the following criteria

- Excellent relief of pain.
- Should be safe for both mother and baby.
- Progress of labour and outcome labour should be affected to a less extent.
• Good maternal satisfaction.
• No or minimal motor weakness.

The above characteristics are fulfilled by walking epidural analgesia.

POSITION OF THE PARTURIENT DURING LABOUR

It is wellknown that most of the laboring mother remain immobile during the process of labour which is associated with many complications such as decreased blood-flow to the baby due compress of the great vessels in the abdomen by the uterus, impairs with descent of the fetus hence prolonging the duration of labour and increasing the need of instrumentation. With the advancement in technology such as continous fetal heart rate monitoring, use of Oxytocin for agumentation, use of traditional epidural technique, increasing body mass index of the mother and other antenatal complication associated makes the parturient less mobile.

EFFECTS OF MATERNAL UPRIGHTPOSITIONING IN LABOUR

1. Decreases maternal pain
2. Facilitates maternal-fetal circulation
3. Improves quality of uterine contractions
4. Decreases length of labour
5. Facilitates fetal descent

6. Decreases perineal trauma and fewer episiotomies.

Numerous studies have shown that a supine position in labour may have adverse physiological effects on the condition of the women and her baby on the progression of labour. The weight of the pregnant uterus can compress the abdominal blood vessels, compromising the mother’s circulatory function including uterine blood flow as studied by Abitbol 1985; Huovinen 1979; Marx 1982; Veland *et al* and this may negatively affect the blood flow to the placenta stated by Cyna 2006; Robert 1989; Rook 1999; Walsh 2000. The effects of woman’s position on the frequency and intensity of contractions have also been examined by aldeyro –Barcia 1960; Lupe 1986; Mendez –Bauer 1980; Robert 1984. The findings indicated that contractions increased in strength in the upright or lateral position compared to the supine position and were often negatively affected when a labouring women lay down after being upright or mobile. This effect can often be reversed if woman restores an upright position. Effective contractions are vital to aid cervical dilatation and fetal descent observed by Roberts and Walsh 2000 and therefore have an important role in helping to reduce dystocia.

Alber *et al* stated that moving about can increase a women’s sense of control in labour in providing a self regulated distraction from the challenge of labour. Support from another person also appears to
facilitate normal labour as studied by Honnet et al. Studies suggest that upright positions in the first stage of labour may increase women’s comfort.

In women without an epidural, a number of observational studies have suggested that delivering in an upright position results in shorter labours, lower incidence of instrumental deliveries and episiotomies and more comfortable birth position (Bodher-Adler). Some small Randomized Control Trials (Chen) and two systematic reviews have confirmed this. Chen et al stated that these benefits are due to a higher resting intrauterine pressure which contributes to the downward birth force and bearing down forces, as well as contractions of greater intensity as observed Bymendez - Bauer 1975.

So labouring women following epidural analgesia so be given an opportunity to be remain mobile and ambulant. This is possible with walking epidural analgesia.

LABOUR EPIDURAL ANALGESIA MONITORING

1. Informed consent is obtained, and the obstetrician consulted.
2. Monitoring includes the following:
   - Blood pressure every 1 to 2 minutes for 15 minutes after giving a bolus of local anesthetic.
• Continuous maternal heart rate monitoring during analgesia induction.

• Continuous verbal communication.

3. Hydration with 500ml to 1000ml of lactated Ringer solution.

4. The women assume a lateral decubitus or sitting position.

5. The epidural space is identified with a loss of resistance technique.

6. The epidural catheter is threaded 3 to 5 cm into the epidural space.

7. A test dose of 3ml of 1.5% Lidocaine with 1 : 200,000 Epinephrine or 3ml of 0.25% Bupivacaine with 1 : 200,000 Epinephrine is injected after careful aspiration to avert intravascular injection and after a uterine contraction. This minimizes the chance of confusing tachycardia that results from labor pain with that of tachycardia from intra-venous injection of the test dose.

8. If the test dose is negative, bolus dose of Bupivacaine are injected to achieve a sensory T10 level.

9. After few minutes, the block is assessed using loss of sensation to cold or pin prick. If no block is evident, the catheter is replaced. If the block is asymmetrical, the epidural catheter is withdrawn 0.5 to 1cm and an additional 3 to 5ml of Bupivacaine is injected.

10. Subsequently, maternal blood pressure is recorded every 5 to 15 minutes. The fetal heart rate is monitored continuously.
11. Check sensory level and adequacy of analgesia regularly. Increase concentration of local anesthetic or add Opioid, if block is not adequate.
12. Level of pain is assessed using visual analogue scale.
13. Ability of the patient to lift legs should be checked regularly to monitor motor block.
14. Level of analgesia and intensity of motor blockade are assessed at least hourly.
15. Diminishing analgesia may indicate intravascular migration. A repeat test dose should be administered before any bolus injections.
16. Development of dense motor block may indicate subarachnoid migration. Catheter location should be verified by aspiration, careful sensory motor examination.

**TIMING OF EPIDURAL CATHETER PLACEMENT**

In several retrospective studies, epidural placement in early labor was linked to an increased risk of cesarean delivery as studied by Lieberman 1996, Rogers 1999’, Seyb 1999. These observations prompted at least five randomized trials, which showed that timing of epidural placement has no effect on the risk of cesarean birth, forceps delivery or fetal mal-position as observed by Chestnut, Wong, 2005, 2009 and all their associates).
Previously American college of obstetrics and Gynaecology (2000) had suggested that epidural analgesia may be delayed until a cervical dilatation of 4-5cm is reached in nulliparous women in a study published by Thorpe et al.

Halpen and Abdullah found that early administration of neuraxial block does not increase the duration or incidence of operative delivery.

Wong et al in their landmark Randomized Control Trial of nearly 750 primigravidae women in early labour, concluded that there was no difference in the operative delivery or cesarean delivery rates, when neuraxial analgesia was administered early in labour 2cm versus a group where epidural analgesia was administered late in labour (4-5cm).

**ASSESSMENT OF MOTOR BLOCK USING MODIFIED BROMAGE SCALE:**

The level of motor block in walking epidural analgesia is measured using Modified Bromage scale. This is the convinent and most commonly used method.

The level of block should be assessed in both the limbs as sometimes there may be asymmetrical block which interferes with the mobility of the parturient. Previously Bromage scale had four gradations but now for more précised measurement two gradations have been added resulting in six gradations. The motor level of block should be measured intermittently.
<table>
<thead>
<tr>
<th>Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complete block (unable to move feet or Knees).</td>
</tr>
<tr>
<td>2</td>
<td>Almost complete block (able to move feet only).</td>
</tr>
<tr>
<td>3</td>
<td>Partial block (just able to move knees).</td>
</tr>
<tr>
<td>4</td>
<td>Detectable weakness of hip flexion while supine (full flexion of knees).</td>
</tr>
<tr>
<td>5</td>
<td>No detectable weakness of hip flexion while supine.</td>
</tr>
<tr>
<td>6</td>
<td>Able to perform partial knee bend.</td>
</tr>
</tbody>
</table>

**CRITERIA FOR SAFE AMBULATION**

Douglas suggested the following criteria for safe ambulation:

1. No obstetrical contraindication for ambulation.
2. Change in blood pressure is less than 10% in sitting and lying posture.
3. Ability to perform straight leg raise test in both legs.
4. Ability to perform knee bends in both legs.
5. Having paramedical staffs and attenders to accompany them.
INTENSITY OF PAIN MEASURED USING VISUAL ANALOGUE SCALE

Labour pain is real, with subjective and objective manifestations. It has been described as severe, very severe and intolerable in both parous (46%) and nulliparous women (61%). Use of the McGill pain questionnaire are valid and reliable, their interpretation can be limited by a patients previous experience of pain, and researchers continue to look for an accurate, reliable and reproducible tool for pain measurement. The combination of muscle electromyography combined with Visual Analogue Scale (VAS) has been used to assess the adequacy of pain management in labour. Attempts to find diagnostic markers in the measurement of pain, such as cerebrospinal levels of the proteinase inhibitor cystatin C, showed no difference between laboring and non labouring women.

The development of functional magnetic resonance imaging, positron emission tomography and neurophysiologic techniques have allowed researchers to examine cortical representation of painful stimuli and to establish the role of the brainstem, descending pathways and multiple locations in pain processing. However, the use of these in the parturient has not been established.
Pain intensity was evaluated using a visual analogue scale (VAS), that tries to measure a characteristics or attitude that is believed to range across a continuum of values and cannot easily be directly measured. For example. The amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient perspective this spectrum appears continuous – their pain donot take discrete jumps.

Visual analogue scale consists of a two-sided rule with a 10 cm vertical or horizontal line linking two points, at one extreme indicating a total absence of pain and at the other the worst pain imaginable. The women were required to mark a spot on the line corresponding to the intensity of their pain at that particular time on a possible scale of 0 to 10.
CONTRAINDICATION FOR EPIDURAL ANALGESIA

American College of Obstetrics & Gynecologists practice bulletin 36 states that Epidural analgesia is contraindicated in the following conditions:

1. The presence of actual or anticipated serious maternal hemorrhage,

2. Refractory maternal hypotension,

3. Maternal coagulopathy,

4. Untreated bacteremia.

5. Raised intracranial pressure caused by mass lesion,

6. Skin or soft tissue infection at the site of the epidural placement, and

7. Maternal use of once daily dose of low molecular weight heparin within 12 hours.

Epidural analgesia is also contraindicated in cases of patient refusal or inadequate practitioner training and experience.

As exacerbation of neurological diseases might be attributed without cause to the anaesthetic agent, many clinicians avoid regional anaesthesia in its presence.
Relative Contraindications:

1. Maternal heart disease such as aortic stenosis.

2. Pulmonary hypertension.

3. Right-to-left shunts.

Only Opioids could be used for labour analgesia in these situations, as they do not decrease systemic vascular resistance.

For patients with mitral stenosis, epidural analgesia is the preferred method.

In women with severe preeclampsia, analgesia is controversial.

• Obstetrical concerns from regional analgesia include hypotension induced by sympathetic blockade, danger from pressor agents given to correct hypotension, and potential for pulmonary edema following infusion of large volumes of crystalloid.

• Conversely general anesthesia with tracheal intubation may result in severe sudden hypertension, further complicated by cerebral or pulmonary edema or intracranial hemorrhage. Over the past 2-3 decades, most obstetric anesthesiologists have come to favor epidural blockade for labour analgesia in women with severe preeclampsia.
COMPLICATIONS

- As with spinal blockade, it is imperative that close monitoring, including the level of analgesia, should be performed by trained personnel.

TOTAL SPINAL BLOCKADE

Dural puncture with inadvertent subarachnoid injection may cause total spinal blockade. Sprigge and Harper cited an incidence of 0.91 percent recognized accidental dural punctures at the time of epidural analgesia in more than 18,000 women.

Several possible mechanisms exist for high spinal blocks. Compression of the spinal canal may result from the presence of epidural injectate, with a reduction in intradural volume. This may precipitate excessive cephalad spread of inthalcal drug and rising levels of blockade. Transfer of local anesthetic across the dura from the epidural space through a dural hole may also occur. In addition, dose requirement may be reduced in the presence of partial epidural blockade\textsuperscript{38}.
ACCIDENTAL DURAL PUNCTURE

A relatively common and problematic complication of epidural placement in the antenatal women is that of accidental dural puncture. This complication can lead to the development of postdural puncture headache in 70% of cases.\(^{39}\)

Orthostatic positional headache following dural puncture is pathognomonic of postdural puncture headache. Technical factors related to this relationship include needle size, needle tip characteristics and the orientation of the tip on dural penetration.\(^{40,41}\)

A direct relationship exists between the degree of CSF leakage and the size of the dural puncture.

Generally, postdural puncture headache is initially treated conservatively with increased intake of oral or intravenous fluid, often with supplemental administration of caffeine and regular analgesics. Bed rest gives good symptomatic relief but with little therapeutic benefit.

Drugs that have been used to treat postdural puncture headache include caffeine (Methylxanthines), Vasopressin, Theophylline, Sumatriptan and Adrenocorticotropic hormone. Caffeine is a central nervous stimulant and has cerebral vasoconstrictor activity. The benefit of caffeine in the management of postdural punctural headache appears to be transient.
INEFFECTIVE ANALGESIA

Using continuous epidural infusion regimens such as 0.125 percent Bupivacaine with 2mg/ml Fentanyl, 90% of women rate their pain relief a good to excellent (Sharma and colleagues). Alternatively a few women find epidural analgesia to be inadequate for labour. Hess and associates found that approximately 12 percent complained of three or more episodes of pain or pressure. Risk factors for such breakthrough pain included nulliparity, heavier fetal weight and epidural catheter placement at an earlier cervical dilatation.

Presner and colleagues reported that epidural analgesia was more likely to fail as body mass index increased.

HYPOTENSION

Sympathetic blockade from epidurally injected analgesic agents may cause hypotension and decreased cardiac output. In normal pregnant women, hypotension induced by epidural analgesia, usually can be prevented by rapid infusion of 500 to 1000ml of crystalloid solution. Danilenko – Dixon and associates showed that maintaining a lateral position minimized hypotension compared with the supine position.
CENTRAL NERVOUS STIMULATION

Convulsions are an uncommon but serious complication, Smarkusky and co-workers described acute onset of intrapartum headache due to postdural pneumocephalus.

MATERNAL FEVER

Fusi and associates observed that the mean temperature increased in labouring women given epidural analgesia, a number of randomized and retrospective cohort studies have confirmed that some women develop intrapartum fever following this procedure. Many studies are limited by inability to control for other risk factors, such as length of labour, duration of ruptured membranes and number of vaginal examinations (Yancey and co-workers). The frequency of intrapartum fever associated with epidural analgesia was found by Lieberman and O1 Donoghue (2002) to be 10-15 percent above the baseline rate.

The two general theories concerning the etiology of maternal hyperthermia are maternal fetal infection or disregulation of body temperature.

Although no established U.S. National guidelines exist on infection– control precautions for neuraxial techniques, strict attention to aseptic technique should reduce risk of infection42,43.
BACK PAIN

An association between epidural analgesia and back pain has been reported by some, but not all (Breen, 1994; Howell 2001; Mac Arthur, 1997). In a prospective cohort study, Butler and Foller reported that back pain after delivery was common with epidural analgesia. However, persistent pain was uncommon. Based on their systematic review, Lieberman and O’Donoghue concluded that available data do not support an association between epidural analgesia and development of de novo, long-term backache.

BLADDER DYSFUNCTION

Although bladder dysfunction is seen postpartum in a small percentage of women due to several reasons, epidural can be a contributory factor. Mothers receiving epidural narcotic and local anesthetic can have difficulty in voiding urine. Bladder distension may not be recognized by these. Mothers, resulting in an over-distended bladder which may lead to postpartum bladder dysfunction. Checking for bladder distension and encouraging women in labour to void urine best prevents this problem.
FETAL HEART RATE

Epidural analgesia can decrease beat to beat variability and can cause transient bradycardia, especially with an intrathecal narcotic: However this is much less compared to Pethidine. More importantly, epidural analgesia has no effect on the Apgar score. Based on their systematic review of eight studies, Reynolds and co-workers reported that epidural analgesia was associated with improved neonatal acid–base status compared with Meperidine.
MATERIALS AND METHODS

DESIGN OF THE STUDY:

Non-randomised controlled clinical trial.

SAMPLING METHOD:

Convenient sampling technique

PERIOD OF STUDY:

January 2014 to August 2014

SAMPLE SIZE:

GROUP A: Epidural group - 25

GROUP B: Walking epidural group - 25

STUDY PLACE:

Department of Obstetrics and Gynaecology,
Government Rajaji Hospital,
Madurai
STUDY GROUP:

INCLUSION CRITERIA:

Antenatal women with,

1. Gestational age 37 weeks or more.
2. Singleton pregnancy
3. Vertex presentation with no CPD.
5. Body weight <90 kgs.
6. American Society of Anaesthesiologists (ASA)
   Physical status I or II
7. Well motivated women with desire to ambulate.

EXCLUSION CRITERIA:

Antenatal women with,

1. Refractory maternal hypotension.
2. Coagulopathy.
4. Skin infection over the site of needle placement.
5. Increased intracranial pressure caused by mass lesion.
6. Fixed cardiac output states such as aortic stenosis and complex cyanotic heart disease.

7. ASA >2.

8. Fetal distress and suspicion of fetal malformation or intrauterine fetal growth restriction.

9. History of allergic to local anaesthetic drug.

**STUDY METHODOLOGY**

Antenatal women who crossed 37 weeks of gestation attending Obstetrics and Gynaecology Department, Govt. Rajaji Hospital, Madurai, fulfilling the inclusion criteria who were willing to participate were enrolled. Procedure was explained to the patient and Informed consent was obtained. After proper clinical examination and confirming the fetal wellbeing using cardiotocogram, pre anesthetic assessment was done. The parturients are preloaded with 500-1000ml of ringer lactate. Under aseptic precautions, 25 antenatal women in group A are given 0.25% bupivacaine and 50 micrograms of fentanyl epidurally. 25 antenatal women in group B are given 0.0625% Bupivacaine and 25 micrograms of Fentanyl. Adequate level of analgesia was obtained and time of onset of analgesia was recorded. The vitals and fetal heart rate were monitored frequently. Pain relief was assessed using Visual analogue scale on 1-10 scale. Motor blockade assessed using Modified Bromage score. During first stage of labour the parturients in group A remained recumbent and
parturients in group B were allowed to sit in the bed or walk around the bed with support on both sides. Progress of labour was monitored using partograph. Outcome of delivery was recorded. Parturient were monitored frequently for any complications.

DATA COLLECTION:

Age, Parity, occupation, socioeconomic status, duration of marriage, past obstetric history, history of allergic to any drugs, history of any bleeding disorder, history of any spinal deformity, past obstetric history, general systemic examination, obstetric examination, blood investigation, pre-anaesthetic assessment, epidural records, partograph.
OBSERVATIONS

Table no 1: Distribution of parturients according to age

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean Age</th>
<th>Standard Deviation</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>25.60</td>
<td>3.855</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking Epidural.</td>
<td>25</td>
<td>25.98</td>
<td>3.605</td>
<td>0.202</td>
<td>0.654</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>25.79</td>
<td>3.713</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The mean age in walking epidural is 25.98 and in epidural, mean age is 25.60. The p-value is 0.654. This is statistically insignificant indicating there is equal distribution in both groups.
Table no 2: Distribution of parturients according to BMI

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>21.63</td>
<td>2.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>21.31</td>
<td>1.77</td>
<td>0.5864</td>
<td>0.5604</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>21.47</td>
<td>1.88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In epidural group, the mean BMI is 21.63 and in walking epidural group the mean BMI is 21.31. p-value is 0.5604. There is no statistical significance in Body Mass Index.
Table no 3: Distribution of parturients according to gravida

<table>
<thead>
<tr>
<th></th>
<th>Primi</th>
<th>Multi</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>19</td>
<td>6</td>
<td>25</td>
<td>1.00</td>
</tr>
<tr>
<td>Percentage</td>
<td>76%</td>
<td>24%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Walking Epidural</td>
<td>19</td>
<td>6</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>76%</td>
<td>24%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

In both the groups there is equal distribution of parturients among primigravida. P-value is 1.00 which is statistically insignificant.
Table 4: Distribution of parturients according to the period of gestation

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean gestation</th>
<th>Standard deviation</th>
<th>‘t’ value</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>38.73</td>
<td>1.109</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking Epidural</td>
<td>25</td>
<td>38.65</td>
<td>0.975</td>
<td>0.103</td>
<td>0.749</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>38.69</td>
<td>1.038</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In epidural group, the minimum period of gestation is 37 week and maximum period is 41 weeks. In walking epidural the minimum period of gestation is 37 weeks and maximum is 40 weeks. The ‘p’ value is 0.749, there is no difference between two groups.
Table 5: Distribution of parturients in relation to cervical dilatation at the time of administration of drug

<table>
<thead>
<tr>
<th>Cervical Dilatation</th>
<th>Epidural</th>
<th>Walking epidural</th>
<th>Total</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>24</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>16</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>60</td>
<td>14</td>
<td>56</td>
</tr>
</tbody>
</table>

In epidural analgesia, 40% of the parturients are administered drug before 4 cm of cervical dilatation and in walking epidural 44% of the parturients are administered drug before 4 cm of dilatation. ‘p’ value is 0.93 which is statistically insignificant.
Table No 6:- Distribution of parturients as per the pulse rate after 15 minutes of drug administration.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>80.76</td>
<td>3.57</td>
<td></td>
</tr>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>82.68</td>
<td>3.49</td>
<td>0.060</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>81.76</td>
<td>3.63</td>
<td></td>
</tr>
</tbody>
</table>

In Epidural group the mean pulse rate is 80.76 and in walking epidural group it is 82.68.
Table No 7:- Distribution of parturients as per the Systotic Blood pressure after 15 minutes of drug administration.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>106.56</td>
<td>4.41</td>
<td></td>
</tr>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>121.04</td>
<td>4.65</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>113.80</td>
<td>8.58</td>
<td></td>
</tr>
</tbody>
</table>

The mean blood pressure is 106.56 mm Hg in parturients among epidural group. Among the walking epidural parturients, the mean blood pressure is 121.05 mmHg. ‘p’ value is 0.001 which statically significant. The incidence of hypotension is negligible among walking epidural group. So most of the parturients are able to ambulate.
Table No 8:- Distribution of parturients as per the diastotic blood pressure after 15 minutes of drug administration.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>71.52</td>
<td>2.203</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>81.60</td>
<td>1.825</td>
<td></td>
</tr>
</tbody>
</table>

The mean diastotic BP among epidural and walking epidural is 71.52 and 81.6 respectively.
Table no 9:- Descriptive statistics of the time of onset of analgesia in minutes.

<table>
<thead>
<tr>
<th></th>
<th>4 mts</th>
<th>5mts</th>
<th>6mts</th>
<th>7mts</th>
<th>‘p’value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>1</td>
<td>0.53</td>
</tr>
<tr>
<td>Walking epidural</td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>17</td>
<td>17</td>
<td>1</td>
<td>0.53</td>
</tr>
</tbody>
</table>

In epidural group the minimum time of onset is 4 mts and maximum time of onset is 7 mts. In walking epidural group the minimum time of onset is 4 mts and maximum time of onset is 6 mts. ‘p’value is 0.53 which is statically insignificant, which indicates that the duration of onset of analgesia does not varies in both groups.
Table No:- 10 Distribution of parturients as per visual analogue score pain score at 15 mts, 1 hour, 2 hour and 3 hour of drug administration

<table>
<thead>
<tr>
<th>Time</th>
<th>N</th>
<th>mean</th>
<th>SD</th>
<th>‘p’value</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 mts</td>
<td>Epidural</td>
<td>25</td>
<td>1.73</td>
<td>0.506</td>
</tr>
<tr>
<td></td>
<td>Walking epidural</td>
<td>25</td>
<td>1.25</td>
<td>0.815</td>
</tr>
<tr>
<td>1 hour</td>
<td>Epidural</td>
<td>25</td>
<td>2.68</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Walking epidural</td>
<td>25</td>
<td>2.70</td>
<td>0.96</td>
</tr>
<tr>
<td>2 hour</td>
<td>Epidural</td>
<td>25</td>
<td>3.00</td>
<td>0.751</td>
</tr>
<tr>
<td></td>
<td>Walking epidural</td>
<td>25</td>
<td>2.40</td>
<td>0.496</td>
</tr>
<tr>
<td>3 hour</td>
<td>Epidural</td>
<td>25</td>
<td>3.48</td>
<td>0.509</td>
</tr>
<tr>
<td></td>
<td>Walking epidural</td>
<td>25</td>
<td>2.08</td>
<td>0.640</td>
</tr>
</tbody>
</table>

After 15 minutes of drug administration, the level of pain was around 1 in most of parturients in both the groups. There was excellent pain relief in both the groups. At 1 hour of drug administration, there was increase in pain level with a score of around 3 in both groups, almost all parturient required top up doses.
Table no: 11 Distribution of the parturients as per the mean Modified Bromage Scale at one hour of drug administration.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean MBS</th>
<th>Standard Deviation</th>
<th>‘p’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>1.48</td>
<td>0.509</td>
<td></td>
</tr>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>5.8</td>
<td>0.408</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>3.64</td>
<td>2.22</td>
<td></td>
</tr>
</tbody>
</table>

In epidural group the level of motor block was around score of 1 to 2, none were able to ambulate. But in walking epidural the score was around 5 to 6, all the parturients were able to ambulate.
Table no 12: Distribution of parturients depending on the duration of ambulation in walking epidural group.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Minimum duration</th>
<th>Maximum duration</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>10 mts</td>
<td>20 mts</td>
<td>15.96</td>
<td>3.12</td>
</tr>
</tbody>
</table>

The maximum duration of ambulation in walking epidural is 20 minutes and minimum duration is 10 minutes.
Table no 13 : Distribution of the parturients as per the number of top up doses required.

<table>
<thead>
<tr>
<th>No of topup doses</th>
<th>Epidural</th>
<th>Walking epidural</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>_</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>20</td>
<td>17</td>
<td>68</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>64</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>16</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

In walking epidural 20% of parturients required only one topup dose. But 17% of parturients required only two doses and 12% of the parturients required fourth topup dose. None required fourth top up dose. But in Epidural group, all required one topup dose. 16% of the parturients required fourth top up dose. Statistically significant p value infers that more number of topup doses are required in epidural group than walking epidural group which infers that the duration of labour is more in epidural group when compared to walking epidural group.
### Table no 14: Distribution of the parturients as per dose of bupivacaine used among the parturients Epidural group and walking epidural group.

<table>
<thead>
<tr>
<th>Dose of Bupivacaine in mgs</th>
<th>Epidural No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5 mgs</td>
<td>25</td>
<td>100%</td>
</tr>
<tr>
<td>25 mgs</td>
<td>25</td>
<td>100%</td>
</tr>
<tr>
<td>37.5mgs</td>
<td>20</td>
<td>80%</td>
</tr>
<tr>
<td>50mgs</td>
<td>16</td>
<td>64%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dose of Bupivacaine in mgs</th>
<th>Walking epidural No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.25mgs</td>
<td>25</td>
<td>100%</td>
</tr>
<tr>
<td>12.5mgs</td>
<td>25</td>
<td>100%</td>
</tr>
<tr>
<td>18.5mgs</td>
<td>17</td>
<td>68%</td>
</tr>
<tr>
<td>25mgs</td>
<td>3</td>
<td>12%</td>
</tr>
</tbody>
</table>

Dose of Bupivacaine is more in epidural group maximum of 50 mgs compared to walking epidural group where the maximum dose is 25mgs.
Table no 15: Distribution of the parturients as per the need for oxytocin acceleration.

<table>
<thead>
<tr>
<th>Oxytocin requirement</th>
<th>Epidural</th>
<th>Walking epidural</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>required</td>
<td>No 20</td>
<td>% 80</td>
<td>No 10</td>
<td>% 40</td>
</tr>
<tr>
<td>not required</td>
<td>5 20</td>
<td>% 20</td>
<td>15</td>
<td>% 60</td>
</tr>
</tbody>
</table>

80% of the parturients in epidural group required oxytoxin acceleration where as only 40 % in walking epidural group required oxytocin acceleration. This indicates that in walking epidural group the oxytocin requirement for acceleration is less compared to epidural group.
Table no 16:- Distribution of parturients as per the duration of First stage of labour in minutes.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean Duration mts</th>
<th>Standard deviation</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>308.6</td>
<td>45.60</td>
<td>0.363</td>
</tr>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>296.76</td>
<td>45.66</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>302.68</td>
<td>45.56</td>
<td></td>
</tr>
</tbody>
</table>

The mean duration of first stage of labour in epidural group is 308 minutes and the mean duration in walking epidural group is 296 minutes. Insignificant ‘p’ value of 0.363 indicates that there is no difference in the duration of first stage of labour in both groups.
Table no :-17 : Distribution of the parturient as per the duration of second stage of labour in minutes in both groups.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean Duration mts</th>
<th>Standard deviation</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>24</td>
<td>90.83</td>
<td>22.24</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Walking epidural</td>
<td>24</td>
<td>51.20</td>
<td>16.09</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>71.02</td>
<td>27.74</td>
<td></td>
</tr>
</tbody>
</table>

The mean duration of second stage of labour in epidural group is 90.83 minutes and in walking epidural group mean duration is 51.20 minutes. Significant ‘p’ value indicates that the duration of second stage of labour is prolonged in epidural group compared to walking epidural group. In both the groups one parturient delivered by LSCS hence a total of 24 in each group.
Table no :-18  Distribution of the parturients as per the duration of third stage of labour in minutes in both groups.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Mean Duration in Mts</th>
<th>Standard deviation</th>
<th>‘p’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>25</td>
<td>7.64</td>
<td>2.018</td>
<td></td>
</tr>
<tr>
<td>Walking epidural</td>
<td>25</td>
<td>7.76</td>
<td>2.067</td>
<td>0.5818</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>7.70</td>
<td>2.022</td>
<td></td>
</tr>
</tbody>
</table>

The statistically insignificant ‘p’ value indicates that the duration of third stage of labour is same in both groups.
Table no 19:- Mode of delivery of the patients in both groups.

<table>
<thead>
<tr>
<th></th>
<th>SVD</th>
<th>LSCS</th>
<th>Forceps</th>
<th>Vacumm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Epidural</strong></td>
<td>18</td>
<td>1</td>
<td>6</td>
<td>-</td>
<td>25</td>
</tr>
<tr>
<td>Epidural</td>
<td>72%</td>
<td>4%</td>
<td>24%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Walking epidural</strong></td>
<td>22</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Walking epidural</td>
<td>88%</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

In Epidural group, the rate of instrumental delivery was 24% and in walking epidural group the rate of instrumental delivery was 8%. The high incidence of instrumental delivery in epidural group is due to poor maternal forces leading to prolonged second stage due dense motor blockade. The rate of LSCS in both the group is 4% indicating that the incidence of LSCS is not affected by both the epidural analgesia and walking epidural analgesia.
Table 20:- Shows the indication of Instrumental deliveries and LSCS.

<table>
<thead>
<tr>
<th></th>
<th>Failure of Secondary maternal forces</th>
<th>Fetal distress</th>
</tr>
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<tbody>
<tr>
<td>Epidural - instrumental</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Epidural - LSCS</td>
<td>-</td>
<td>1</td>
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<tr>
<td>Walking epidural instrumental</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Walking epidural - LSCS</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

4 of the parturients in epidural group had instrumental delivery indication being failure of secondary maternal forces and 2 of parturients in epidural group had instrumental delivery indication being fetal distress. In walking epidural group, the indication of instrumentation among one parturient is failure of secondary maternal forces and another parturient the indication being fetal distress.
Table 21:- Distribution of the parturients by Apgar score at First and Fifth minute.

Apgar Score at First minute

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard deviation</th>
<th>‘p’value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>6.12</td>
<td>0.78</td>
<td>0.0809</td>
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<tr>
<td>Walking epidural</td>
<td>6.40</td>
<td>0.86</td>
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</table>

Apgar score at Fifth minute

<table>
<thead>
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<th>Mean</th>
<th>Standard deviation</th>
<th>‘p’value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>7.52</td>
<td>0.65</td>
<td>0.421</td>
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<tr>
<td>Walking epidural</td>
<td>7.64</td>
<td>0.63</td>
<td></td>
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</tbody>
</table>

The insignificant ‘p’value of First and fifth minute APGAR score indicates that the APGAR score is not affected by the type of epidural analgesia. Babies of three parturients in epidural and two parturients in walking epidural group were admitted in NICU due to low Apgar scores and discharged after recovery. All other babies had good apgar score in both groups.
Table No.22:- Distribution of parturients by Complications during labour

<table>
<thead>
<tr>
<th>Complication</th>
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<th>Walking Epidural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
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<tr>
<td>Present</td>
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<td>Absent</td>
<td>5</td>
<td>20</td>
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<tr>
<td>Type</td>
<td></td>
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<tr>
<td>Pruritis</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Headache</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Nausea vomiting</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Bladder catherisation</td>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>

80% of epidural group had complications but only 40% of walking epidural group had complications. The bladder catherisation was more epidural group (40%) than the walking epidural (8%).
DISCUSSION

Labour pain experienced by women is so severe and it is as painful as amputation of digit which holds a score of 40 in MC Gill pain rating index.

The international association for the study of pain (IASP) 2007-2008 declared that the “Global year against pain in women – real women, Real pain. Epidural analgesia is the gold standard for pain relief in labouring women.

In this study conducted at Madurai. Madurai College, group A- comprising 25 parturients were given epidural analgesia and group B comprising 25 parturients were given walking (Low dose) epidural analgesia.

In this study, both the groups had no statistical difference with respect to demographic data such as age, body mass index, gravida and period of gestation.

In various studies, epidural analgesia, was initiated at various stages of cervical dilatation. A study conducted by Thorpe et al published in an article in ACOG – 2000 had suggested that epidural analgesia, may be delayed till 4-5cm cervical dilatation, whereas in 2006 ACOG (American College of obstetrics and gynaecology) and ASA (American society of Anaesthesiologists) jointly emphasised that there is no need to arbitrarily wait till 4-5cm cervical dilatation had occurred.
In Wong et al, study in 2005, it is established, that there is no increase in cervical dystocia and caesarean section, if epidural is given early in labour and it should not be delayed till 5cm dilatation. In our study also 40% of the parturients were administered drug before 4cm cervical dilatation in epidural group and 44% of the parturients were administered drug before 4cm cervical dilatation. Out of the 10 parturients in epidural and 11 parturients in walking epidural group who received drug before 4cm of cervical dilatation none needed instrumentation or caesarean delivery.

Epidural analgesia may cause hypotension, In Simson’s et al Cochrane database systematic review 2007 which describes hypotension as systolic pressure <100mmHg Incidence of hypotension following epidural analgesia was 10% whereas in our study no parturient had blood pressure below 100mmHg.

In a comparative study conducted by M.A. Kasraz et al “Ambulatory epidural anaesthesia and the duration of labour” published in International journal of Gynaecology and obstetrics volume 80, Feb 2003 – showed that no women had hypotension in both groups.

In our study also, no women in both the groups experienced hypotension. The mean blood pressure in walking epidural group is 121.04mmHg and in epidural group recorded as 106.56mmHg.

In our study, minimum and maximum time of onset of analgesia in both the groups are 4 minutes and 7 minutes respectively. After 15
minutes of drug administration pain score was around 1-2 indicating excellent to good pain relief in all the parturients in both groups.

A study conducted by Wilson MJ et al – “Randomized controlled trial comparing traditional with two mobile epidural technique” shows that pain score reported by women receiving low dose epidural were similar to those in the traditional group after administration of drug.

In a study conducted M.A Karraz et al, women in the ambulatory group were allowed to walk after fulfilling 3 condition, acceptable analgesia (VAS<3); acceptable systolic BP> 100mmHg and ability to stand on one leg. In this study, all women in ambulatory group were able to stand on one leg without assistance and the score was 6. In this study, intermittent epidural injection was given, which allowed the women to walk for 20 minutes.

By contrast, a study conducted by Nageotte et al, women were encouraged to walk 1 hour after epidural insertion and only 66% of the parturients were encouraged to walk. In a study conducted by Vallejo only 42.6% of them were able to ambulate.

Frenal et al in a randomized control trail of ambulation versus recumbent women with epidural analgesia showed that 85% of the parturient in the ambulatory group were able to walk.

In our study, the parturients in the walking epidural group had a modified Bromage scale score of 5-6 and most of them were able to ambulate.
In a study conducted by Vallejo et al the mean duration of walking in the ambulatory group was 25 minutes, in our study the minimum duration of ambulation was 10 minutes and maximum duration was 20 minutes.

In our study the number of top up doses used in epidural group was relatively more than walking epidural group, as the duration of labour was more in epidural group 16% of the parturients in epidural group required fourth top up dose.

In a study conducted by Vallejo et al the use of oxytocin was 36% in ambulatory group and 40.8% in non ambulatory group.

A study Epidural anesthesia for labour in an ambulatory patient by Breen Twet al showed that ambulation reportedly reduces the use of oxytocin for labour augmentation.

In our study 80% of the parturients in epidural group required oxytocin augmentation and only 40% of the parturients in walking epidural group required oxytocin augmentation.

A case control study conducted by Adela chapelde et al – Impact of walking epidural analgesia on obstetric outcome of Nulliparous women where walking epidural group received 0.0625% of bupivacaine for epidural analgesia who remained recumbent. Here the walking epidural group walked for a mean of 60 minutes; ranging from 20-75 minutes.
The mean total duration of labour was shorter – 58 minutes in 0.0625% group and 99 minutes in 0.25% group significantly fewer walking epidural group required instrumental delivery than control group.

A Randomized control trial “Effect of low dose mobile versus traditional epidural technique on mode of delivery; COMET study group UK published in Lancet July 2001 showed that normal vaginal delivery was 35% in women receiving traditional epidural and 43% in low dose mobile epidural group. In this study, the rate of instrumental vaginal delivery was 37% in traditional and 28 to 29% with low dose mobile epidural group. And also, the rate of caesarean delivery was equal in both groups. The low dose epidural group had second stage duration of 60 minutes or less than in traditional epidural group.

In our study, the mean duration of second stage of labour in epidural group is 90.83 minutes and in walking epidural group is 51.20 minutes. But the duration of first and third stage of labour is same in both groups.

In our study, the rate of instrumental delivery is 24% in epidural and 8% in walking epidural group. The low incidence of instrumental delivery in walking epidural is due to use of low dose epidurals which results in negligible motor blockade and good maternal bearing down efforts. The rate of LSCS in both the group is 4% indicating epidurals dose not affect the rate of caesarean delivery.
In our study, 80% in epidural and 40% of the parturients in walking epidural have complications.

Herman et al study revealed that pruritis is the most common side effect and it constitutes about 30% in studies conducted by Cohen et al and Chestnut et al the incidence of pruritis was 26-32% and 7-12% respectively.

In a study conducted by Paddalwar et at the incidence of pruritis was 3.3% and vomiting was 3.3%.

In our study the incident of pruritis was 20% in epidural and 12% in walking epidural. Incidence of headache and nausea, vomiting was 8% and 12% respectively in both groups.

The incidence of bladder catheterisation was 40% in epidural and 8% in walking epidural group in our study.

Christine Jih et al in his studies showed that the fetal heart rate abnormalities contributed 6-12%.

In our study 8% of the babies in walking epidural and 12% of the babies in epidural group had been admitted in NICU due to low APGAR score and all were discharged after recovery.
SUMMARY

- This study included 25 parturients in group A (epidural group) and 25 parturients in group B (walking epidural group).
- Both the groups had no statistical difference with respect to demographic data.
- In both the groups drug was initiated at different stages of cervical dilation.
- There was no hypotension recorded in both the groups. All parturients had mean Systolic BP of more than 100mmHg.
- All the parturients in both the groups had excellent to good pain relief with a pain score of around 1 to 2 after 15 minutes of drug administration.
- All the parturients in walking epidural group had a modified Bromage scale of 5 or 6 and all the parturients ambulated for a period of around 10-20 minutes.
- The number of topup doses required was more in epidural group than walking epidural group.
- The mean duration of first stage of labour was 308 minutes in epidural and 296 minutes in walking epidural group.
• The mean duration of second stage of labour was 90 minutes and 51 minutes in epidural and walking epidural group.

• The mean duration of third stage of labour was 7 minutes in both the group.

• The rate of instrumental delivery was 24% in epidural and 8% in walking epidural group.

• The rate of LSCS was same in both the groups.

• The incidence of complications were more in epidural compared to walking epidural group.
CONCLUSION

There is significant reduction in pain perception in the parturients receiving walking epidural analgesia. There is no undue prolongation of second stage of labour in walking epidural group. Also walking epidurals do not increase the rate of instrumental deliveries, so, labouring women opting for epidural analgesia, should be explained about the benefits of walking epidural and offered a chance of choosing walking epidural analgesia.
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4. Shinder and Levinson; Anesthesia for obstetrics; Fifth edition.
5. Cousin and Bridenbaugh; Neural Block in Clinical Anesthesia and Pain Medicine; 23rd edition


28. Chestnut DH, Laszewski LJ, Pollack KL, et al. Continuous epidural infusion of 0.0625% Bupivacaine–0.0002% Fentanyl during the second stage of labor, Anesthesiology 1990; 72: 613-618.


31. Albright G; Cardiac arrest following anesthesia with Etidocaine or Bupivacaine. Anesthesiology 1979; 51: 285-287.


40. Ahmed SV, Jayawarna C, Jude E. Post dural puncture headache : Diagnosis and management. Post graduate Medicine journal; 2006; 82 (973) : 713-716.


52. Schneeberger PM, Janssen M, Vossa, Alpha hemolytic Streptococci. A major pathogen of iatrogenic meningitis following lumbar puncture. Case reports and a review of the literature. Infection 1996;24;29-35.

### PROFORMA

#### EPIDURAL ANALGESIA DURING LABOUR

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<tbody>
<tr>
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<td>Address :</td>
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<tr>
<td>I P No.:</td>
<td>Occupation :</td>
</tr>
<tr>
<td>Age :</td>
<td>Socio-Economic Status :</td>
</tr>
<tr>
<td>Obstetric Code :</td>
<td>Booked &amp; Immunised :</td>
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<tr>
<td>No. of AN Visits and Location :</td>
<td></td>
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<td>Referral, if any :</td>
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<tr>
<td>LMP:</td>
<td>EDD:</td>
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<td>Married Since :</td>
<td>Yrs; Cong. / Non-Cong</td>
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<td>Past Obstetric History :</td>
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<td>Last child birth:</td>
<td>Birth Weight:</td>
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<td>Mode of Delivery:</td>
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<td>Present Pregnancy:</td>
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</tr>
<tr>
<td>Labour Pains:</td>
<td>Onset : Spontaneous / induced:</td>
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</table>

- 108
PAST HISTORY:
Drug allergy : Yes/No (Details if any)

Bleeding diathesis : Yes/No

GENERAL EXAMINATION:
Height:             Weight:             BMI:
Fever:             Hydration:
Anemia:            Pedal edema:         Thyroid:
Spine:             Gait:

SYSTEMIC EXAMINATION:
VITALS :           PR:              BP:
CVS:               RS:
P/A :
P/V :

INVESTIGATIONS
Haemoglobin        Blood sugar
Serum Urea         Serum Creatinine
Urine Routine      PPTCT
BT                CT
Antenatal USG
**EPIDURAL RECORD**

Patient assessed under ASA Physical Status

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<th>% Fentanyl-</th>
<th>µg.</th>
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<td>LA conc%</td>
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<td>Pain score</td>
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</table>
Time of onset of Analgesia : 

Duration of 1st stage of labour : 

Duration of 2nd stage of labour 

Duration of 3rd stage of labour:

Time of delivery : 

Type of Delivery : 

Duration of ambulation (each hour) : 

Details of the Baby : 

Apgar Score : 

Complications (if any) : 

- 111
PARTOGRAPH

Name
Gestational Age
Para
Hospital number

Date of admission
Time of admission
Ruptured membranes
hours

Fetal heart rate
150
140
130
120
118
110
100
80
60

Amniotic fluid molding

Cervix (cm) (Pitocin)
10
9
8

Alert
Action

Descent of head (Plat O)
3
2
1
0

Hours
Time

Contractions per 10 mins
5
4
3
2
1

Oxytocin U/L, drip schedule

Drugs given and IV fluids

Pulse
180
160
140
120

BP
90
80
70
60

Temp °C

Urine
proteins
acetone
volume

-
## EPIDURAL

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<th>Stage II (m)</th>
<th>Stage III (m)</th>
<th>No. of top ups</th>
<th>Duration of anaesthesia (Minute/hr)</th>
<th>VAS</th>
<th>MIS at 1 hr</th>
<th>Modality of delivery</th>
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KEY TO MASTER CHART

1. cm - Centimeter
2. Kg - Kilogram
3. BMI - Body Mass Index
4. PR - Pulse Rate
5. SBP - Systolic Blood Pressure
6. DBP - Diastolic Blood Pressure
7. hr - Hour
8. mts - Minutes
9. VAS - Visual Analogue Scale
10. MBS - Modified Bromage Scale
11. LN - Labour Naturalis
12. LSCS - Lower Segment Cesarean Section
VISUAL ANALOGUE SCALE

Faces Pain Rating Scale

0-10 Numeric Pain Intensity Scale
MODIFIED BROMAGE SCORE

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