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## Obstetric Pain — Diagnosis and Treatment

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**Obstetric pain is one of the most common afflictions a woman has to face during pregnancy. Read on to find out the various modalities that exist for its alleviation.**



## Overview

The **uterus** is a pear-shaped organ made up of three muscle layers:

1. The endometrium (the inner lining that is shed during menses).
2. The myometrium (middle muscle layer).
3. The perimetrium (outer layer providing extra support to the whole structure).

A combination of factors initiates labor, oxytocin, and prostaglandins being the most important biochemical factors (hormones) in stimulating uterine contractions. The

contractions are co-ordinated in such a way that they are of fundal dominance and progress towards the cervix to end up in its effacement and dilatation. The contractions progressively increase in frequency and duration to culminate in successful expulsion of the products of conception.

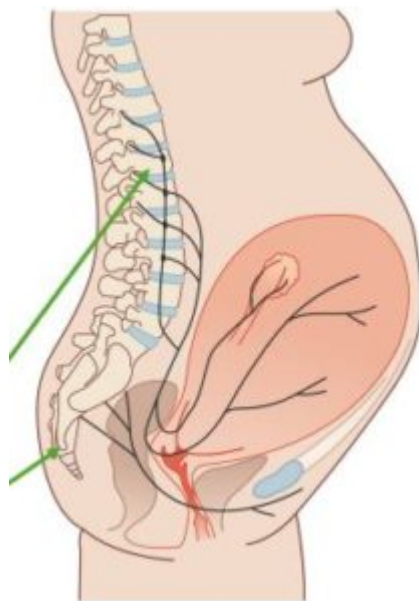
**Labor** is the progressive dilatation of the uterine cervix in association with repetitive contractions. During labor, subjective changes that occur include regular uterine contractions that become stronger, longer and at closer intervals, while objective changes include the cervical changes i.e. descent of the presenting part. Consequentially, there is effacement and dilatation of the cervix and the delivery of the fetus and placenta.

When the uterus begins to contract, labor pain or contractions commence. The experience of labor for every woman is dissimilar. Labor contractions are of two types, true and false contractions.

**True labor contractions** occur at regular intervals and the intensity and discomfort increase steadily. There is a gradual decrease in the interval between the contractions. Usually, there is discomfort in the lower back/abdominal region and the vaginal mucous or bloody discharge increases. The contractions ultimately lead to cervical dilatation. A feature of these contractions is that they do not cease with rest, hydration or medications.

**False labor contractions**, also known as **Braxton-Hicks contractions**, are those which occur at irregular intervals and they do not gradually increase in either intensity or duration. There are long intervals in between two contractions. Pain is mainly described as a feeling of tightening in the lower abdominal region. There is no accompanying vaginal discharge and/or cervical dilatation. The discomfort due to contractions can be completely relieved with the aid of rest and medications.

## Pathophysiology of Labor Pain



"Obstetrical Pain" Image created by Lecturio

Labor pain consists of **visceral and somatic pain**. Visceral pain is the first stage (mediated by T10 - L1) in which there is distension and stretching of the lower uterine

segment. Somatic pain is the second stage (mediated by S2 – S4) in which there is distension of the pelvic and perineal structures and compression of the lumbosacral plexus.

## Clinical Signs and Symptoms

In general, **contractions** are usually felt in the lower middle abdomen. Occasionally, they are felt as **unrelenting low back pain** as well. They often feel like **pre-menstrual cramps** and are very common as the pregnancy comes to an end.

- Painful contractions or tightening that may be irregular in strength and frequency.
- Broken waters i.e. rupture of membranes with spurting of amniotic fluid and brownish or blood-tinged mucus discharge.

## Nerve Supply of the Uterus

**Motor nerve supply** is from the sympathetic divisions T11, T12, and L1, while the **parasympathetic supply** is from S2, S3, and S4.

**Sensory nerve supply for the uterine body** is derived from the pelvic, superior hypogastric and aortic-renal plexus of the D10, D11, D12 and L1 segments of the spinal cord. **Sensory nerve supply of the cervix** is through the pelvic plexus to S2, S3 and S4 segments of the spinal cord.

For the **upper vagina**, the sensory supply is derived from S2, S3, and S4 while, for the lower vagina, it is through the pudendal nerve.

For the **perineum**, both motors, as well as sensory nerve supply is derived from S2, S3, and S4 through the pudendal nerve.

## Hormonal Regulation

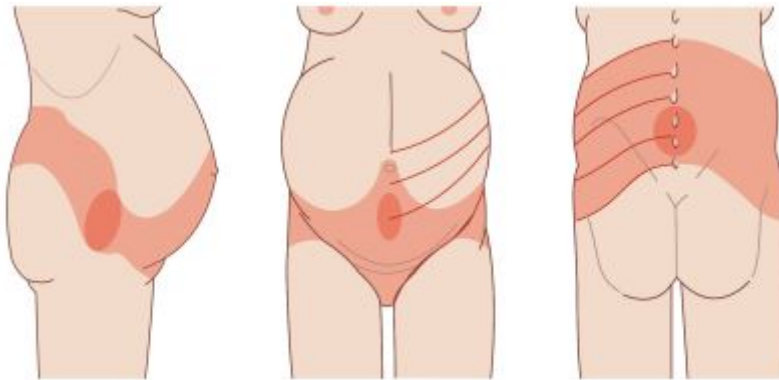
There are three hormones that regulate labor contractions. They include **oxytocin**, **progesterone**, and **adrenaline**.

## Methods to Manage Obstetric Pain

Management of obstetric pain is essential as it causes discernible stimulation of respiration and circulation in the mother, activation of the sympathetic nervous system and mental disturbances such as **postpartum depression and post-traumatic stress disorder**.

In early labor, pain is largely felt in the abdomen above the pubis and the epidural anesthetic concentration is low. In late labor, the pain spreads to the perineum and becomes more severe – a higher concentration of local anesthetic may be necessary.

Epidural analgesia does not slow labor or increase the Cesarean section rate. The local anesthetics are not transferred to the fetus but opiates are and **can cause respiratory depression in the fetus**.



“Management of Pain. Obstetrics” Image created by Lecturio

Basically, there are pharmacologic and non-pharmacologic methods to manage obstetrical pain.

## Non-pharmacologic methods

- Mind-body interventions (psycho-prophylaxis).
- Bioelectromagnetic methods.
- Physical methods: massage, heating pads, warm bath.
- Alternative medications: Acupuncture, hypnosis.

## Pharmacologic methods

- Systemic analgesia: IV, inhalational.
- Regional techniques.
- General anesthesia.
- Patient-controlled analgesia (PCA).
- Transcutaneous electrical nerve stimulation (TENS).

### Psycho-prophylaxis

Psycho prophylaxis implies the **antenatal psychological preparations** of the parents, chiefly the mother aimed to minimize, if not eliminate, labor pain. **Mother-crafting** is a key feature of psycho-prophylaxis wherein the mother is educated about the process of pregnancy and labor progression.

Also, the partner is co-educated which acts as immense **emotional assistance** to the mother. The mother is also taught **relaxation exercises** and an **encouraging environment** is promoted throughout pregnancy.

This method endows benefits, such as enhanced bearing-down efforts, minimal pain during childbirth, and a reduced need for pain management by pharmacotherapy and early ambulation post-partum. It also includes hypnosis, biofeedback, energy yoga, and music therapy.

### Acupuncture

Various acupuncture techniques are widely used in China, both for surgery as well as for pain relief during and after labor.

### Intradermal saline injections

In this technique, a 25G needle is used to administer 0.1 - 0.15 ml injections of sterile

water by the intracutaneous route. It can be administered at either point 1, the Posterior Superior Iliac Spine or point 2 that is 1cm medial and 1 - 2 cm inferior. There is sharp burning pain for 20 - 30 seconds followed by pain relief after 2 minutes which lasts for 45 minutes to 3 hours. There are no side effects.

### **Sedatives or analgesics**

The selection of an appropriate analgesic agent is crucial to **prevent neonatal asphyxia**. The progression of labor has been arbitrarily divided into early and late phases in order to standardize the choice of analgesic agent.

The early phase is when the cervical dilatation is up to 8 cm in primigravida and up to 6 cm in multipara mothers, while the late phase is when the cervical dilatation goes beyond the early phase and up to delivery. While sedatives and analgesics are used in the early phase, inhalation agents are preferred in the late phase of labor.

The commonly used sedative and analgesic agents are:

- **Opioid narcotics** such as Pethidine, Fentanyl, and Promethazine:

Pethidine has a strong sedative but weak analgesic effect and thus has been used in the first stage of labor with regular and uncontrolled pain and discomfort. It is administered as an IM injection at a dose of 1.5 mg/kg and repeated with the waning of the effects.

The common side effects include nausea, vomiting and delayed gastric emptying. It also crosses the blood placental barrier to cause depression in the newborn.

Fentanyl has a similar profile as pethidine but has limited side effects and rarely affects the baby. However, the drug needs frequent dosing to achieve efficacy.

If the mother is in the active phase of labor and the depressive effects of opioids must be reversed, the administration of naloxone 0.4 mg/kg is recommended, while in babies born with opioid depression, the administration of naloxone at a dose of 10 µg/kg is indicated for resuscitation.

- **Benzodiazepines** - Diazepam

The drug is well tolerated without vomiting. It also has additional effects of cervical dilatation and management of eclamptic seizures. However, it is avoided in labor as it causes the loss of beat to beat variability and hypotonia of the fetus.

Depression from the drug is reversed using flumazenil.

- **Combinations therapy** - Opioids + Promethazine/Metoclopramide/Ondansetron

The combination is thought to potentiate opioids and hence efficacy at lower non-toxic doses.

There are various factors that moderate the dose of sedatives like fetal maturity, parity of the mother, and the level of pain threshold for the mother. At times, there can be certain complications related to this therapy. Nausea and vomiting, delayed emptying of the stomach, respiratory depression of the fetus and neonatal hypotonia are the known complications. However, these can be effectively managed with the use of Naloxone (Opioid antagonist), Flumazenil (Benzodiazepine antagonist), Ranitidine (Antacid for gastric symptoms) or use of combination therapy.

### **Inhalation Agents**

**Entonox** i.e. 50% nitrous oxide and 50% oxygen is the commonly used inhalation agent. It can be self-administered by the mother by slow and deep inhalation which is advised before contractions. Inhalation is stopped as soon as contractions are induced.

However, there are some associated **complications** which include hyperventilation, altered consciousness, hypocapnia, dizziness. **Intra-inhalation monitoring** in the form of arterial blood gas analysis and pulse oximetry is necessary to start early interventions in case of complications.

### **Patient-controlled analgesia (PCA)**

Novel continuous infusion pumps have been developed with the capability to receive patient input and deliver medication on demand. It is a technique wherein the patient herself can administer the drug and can also control the dose.

The agents used here are meperidine, pethidine, and fentanyl. The mother herself can administer the drugs intravenously using a pump. There can be a continuous or intermittent infusion. This method is beneficial as it helps in achieving higher maternal satisfaction and, at the same time, there is no need for the administration of higher doses of narcotics.

There are less unwanted effects such as motor block, hypotension, a reduction in the demands on the staff on the labor floor and, finally, it gives many parturients a feeling of empowerment.

### **Transcutaneous electrical nerve stimulation (TENS)**

In this method, **electrodes** are placed over the region of the spinal cord supplying the uterus i.e. T10 to L1 and S2 to S4. The flow and amount of current are adjusted according to the severity of pain and threshold. The current that flows helps in limiting, as well as ceasing, the neurotransmitter release via synapses. This is a non-invasive procedure which helps in the reduction of the dependence on opioid analgesics. Also, there are no associated systemic side effects.

### **Regional analgesics**

This method includes epidural analgesia, para-cervical nerve block, pudendal nerve block and spinal anesthesia.

These methods ensure total control of pain which is rarely achieved with other methods.

#### ▪ **Lumbar epidural analgesia**

It is the **gold standard technique** for pain control in obstetrics. An epidural needle aids the insertion of a catheter to the epidural space and administration of low doses of local anesthetic or opioid combinations to provide a continuous T10 – L1 sensory block during the **first stage of labor**. It is administered only after the onset of labor and not any time before that. Agents used in this method are local anesthetics; 0.5% bupivacaine or 1% lignocaine.

It is administered with the help of a needle that is inserted to puncture and reach the epidural space between L2 and L3. In order to achieve complete analgesia, it is inserted between T10 to S5, while, for a cesarean section, it is inserted between T4 to S1.

When this method is used, the **mother is conscious** and able to experience childbirth. There is easier control of post-partum pain and a reduced risk of aspiration-related complications. Simultaneously, there is a **significant improvement in the newborn**

## APGAR score.

**Complications:** Some complications associated with epidural anesthesia include:

1. **Hypotension** due to the blocking of sympathetic plexus. This can be avoided with appropriate **hydration** of the mother, either with isotonic saline or Hartmann's fluid.
2. **Back pain** due to persistent catheter insertion.
3. **Post dural puncture headache due to** accidental injection into the subarachnoid space and the leakage of cerebrospinal fluid from the puncture site.
4. **Nerve and vessel injury.**

**Contra-indications** for this method include postural hypotension, coagulation disorders, kyphoscoliosis, hypovolemia, and local infection.

### ▪ Para-cervical nerve block

This method can be used at the **end of the first stage of labor**. It minimizes the urge to bear down before the onset of the second stage. A para-cervical block reduces the pain of only uterine contractions and has no role in relieving perineal pain.

**1% lignocaine with adrenaline** is the agent used in this method. Bupivacaine is avoided due to its cardiotoxic properties. A 15 cm or longer needle is used to administer the agent in the lateral fornix of the cervix at the 3 o'clock and 9 o'clock position. A similar procedure is repeated on the other site. This method should be avoided in cases of established placental insufficiency. **Fetal bradycardia** is a common incidence.

### ▪ Pudendal nerve block

In this technique, there is no effect on the pain from uterine contractions, but perineal pain is relieved. Co-administration is done at the vulva and perineum. It can be administered through trans-vaginal and trans-perineal routes at the level of the ischial spines. There can be complications such as injection into vessels, hematoma or local infection.

### ▪ Spinal anesthesia

This is a preferred method of pain relief **during delivery or at the third stage of labor**. Hyper-baric bupivacaine, lignocaine, and fentanyl are commonly used agents for the early onset of action and morphine are used for pain control.

It is administered in the subarachnoid space between L3 and L4 vertebrae. For normal or forceps delivery, it is given between T10 to S1 while, for cesarean delivery, it is extended up to T4. In this technique, there is a relatively bloodless field, as well as a reduced incidence of fetal hypoxia. Most complications resemble that of epidural analgesia.

**Some complications specific to spinal analgesia are:**

- Respiratory depression.
- Urinary retention.
- Chemical meningitis.
- Paralysis.
- Total spinal block.
- Failed block.
- Septic meningitis.



# Infiltrative analgesia

## This method is used:

- **During episiotomies**, 8-10 mls of 1% lignocaine is infiltrated in a fan-like manner and aspiration to avoid intravascular injection is done. The episiotomy is then carried out 2-5 minutes after the infiltration.
- **For forceps or ventouse delivery**, a perineal and labial infiltration is recommended. 20ml of 1% lignocaine is needed and infiltration is done in the introitus in a fan-like manner and then the genital branch of the genitofemoral nerve is blocked along each side of the vulva.
- **For local abdominal cesarean delivery**, the skin along the site of incision is infiltrated with 2% lignocaine mixed with normal saline. The layers are exposed and infiltrated as the surgery proceeds; thus, has been abandoned due to its time-consuming nature and erratic local distribution of the drug.

## General anaesthetics

This is a commonly employed technique for emergency or elective cesarean section delivery. When this technique is to be used, pre-operative preparation with sedatives or opioid narcotics is to be avoided as these agents may precipitate **fetal respiratory depression**. Different agents are used for the induction of anesthesia, maintenance, relaxation and post-partum.

The agent used for induction is intravenous 2.5% thiopentone sodium; for maintenance is 50% nitrous oxide, 50% oxygen and 0.5% Halothane; for relaxation is vecuronium or atracurium and, for post-partum use, is nitrous oxide concentration increased to 70% and intravenous narcotics. **Mendelson's syndrome** is a complication in which there is the aspiration of the contents of the stomach. There can also be **chemical pneumonitis** and **delayed gastric emptying**.

## Important precautions during this procedure include:

During elective procedures, a 6-8 hour fasting period is recommended to avoid the risk of aspiration that may lead to aspiration pneumonitis and Mendelson's syndrome. There can also be delayed gastric emptying.

Some drugs may pass the blood placental barrier to cause depression in the fetus.

Other agents, such as ether and halothane, may diminish uterine contractions.

The time interval from uterine incision to the delivery of the baby is directly proportional to fetal acidosis and hypoxia.

The longer exposure to the anesthetic agent, the lower the APGAR score.

## References

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