

Intrapartum Care: Normal and Abnormal Labor, Fetal Heart Rate Tracing and Obstetric Anesthesia

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This course is all about the first stage of labor. It begins with the onset of contractions. This stage of labor can come on gradually or all of a sudden. Labor can begin with intact amniotic fluid membranes or can start shortly after the membranes have ruptured. Topics that will be discussed include normal and abnormal labor, fetal heart tracings, and obstetrical anesthesia, which involve several treatment modalities that help relieve pain during this stage of labor.



Definition

Labor is a sequence of uterine contractions that result in progressive dilatation and effacement of the cervix and voluntary bearing down resulting in successful expulsion of the products of conception via the vagina.

Delivery is the process of expulsion of the fetus and the placenta that may be done surgically or via the vagina.

Characteristics of normal labor

- Occurs at term
- Spontaneous in onset and has a natural termination
- Fetus presents in a vertex
- Involves a single fetus
- Does not have any complications such as undue prolongation or arrest

Stages of Labor

Labor is divided into three stages which include:

1. First stage
2. Second stage
3. Third stage

First Stage of Labor

The first stage of normal labor begins with the **onset of regular contractions**. Some women have no contractions at all and begin having regular contractions signaling the beginning of the first stage of labor.

Other women begin the first stage of labor with irregular contractions that do not change the dilation status of the uterus. These are called **Braxton-Hicks contractions** and can happen for several weeks prior to the actual onset of the first stage of labor. These contractions are a common cause of false labor.

Still, other women will have irregular contractions that do not stop and will go on to have regular contractions that begin to dilate the cervix. The first stage of labor ends when the **cervix is fully dilated**.

Seventy percent of women will have a **vaginal delivery**, meaning that they will have some type of labor prior to giving birth. **The first stage of labor has two divisions:**

1. The **latent phase** of labor occurs when the woman has a cervical dilation status of 0 to 4 cm. The fetal head is high and may or may not be engaged in the pelvis. The contractions are mild to moderate and anesthesia is generally not required.
2. The **active stage** of labor involves the descent of the presenting part of the fetus, which is usually the head. The cervix continues to dilate from 4 to 10 cm. **Anesthesia** is generally requested by the mother during this stage of labor. There are many choices for anesthesia in laboring mothers, which will be discussed in a later part of this course.

Length of Stage 1 of Labor

In general, **primiparous women**, who have not given birth before, have **longer latent phases of labor and active phases of labor** than women who have given birth. The average length of the latent phase of labor in a primiparous woman is 6-11 hours, while the latent phase of labor in a multiparous woman is 4-8 hours.

The active stage of labor in a primiparous woman is 8 hours, while the active stage of labor in multiparous women is 5 hours, although the total hours spent in labor varies greatly from woman to woman.

The **cervix both dilates and effaces** during this stage of labor. A normal external cervical os is 2 cm. During **prodromal labor**, which is prior to actual labor, the pressure of the presenting part can thin the labor slightly so, when active labor begins, the cervical os is shorter. The cervix must go from 2 cm in length to begin paper-thin or 0 cm in length at the end of the first stage of labor. Dilation and effacement often go together and progress in a regular pattern.

	Primiparous	Multiparous
Latent labor	6—11 h	4—8 h
Active labor	1.2 cm/h	1.5 cm/h

Pathophysiology of Stage 1 of Labor

Many women have abnormal labor. This can occur for several reasons such as:

1. **Power:**

The force of the contractions may not be strong enough. Contractions are generally monitored through **external fetal monitoring**; however, if there is a question as to the force of the contractions, an **internal pressure catheter** can be inserted if the cervix has dilated enough to allow for the passage of the catheter and the membranes have ruptured so the catheter can enter the uterine cavity. It can directly measure the intrauterine pressure during contractions.

2. **Passenger/ fetus:**

- Disorders of fetal presentation and size can affect the progress of normal labor.
- If the fetal head is too large and cannot descend into the pelvis, the cervix will not completely dilate.
- If the presenting part is not the fetal head, there may not be enough pressure on the cervix to allow for it to dilate. If the head is presenting but is presenting in an occiput posterior fashion, presenting a part of the head that is not the occiput, or presenting obliquely, there can be a slowing of the first stage of labor.

3. **Passage/ pelvis:**

The size and shape of the female pelvis determine whether she will have a normal labor pattern. **The female pelvis can be grouped into:**

- A **gynecoid pelvis** has a round or slightly oval shape, which is optimal for the descent of the fetal head. It is the most common type amongst most females.
- Other pelvic shapes that are somewhat optimal for the descent of the fetal head are the **anthropoid shape**, and the **platypelloid shape**.
- The **android pelvic shape** has a triangular opening, which is not optimal for fetal descent. This can prolong the first stage of labor.

Symptoms and Signs of Stage 1 of Labor

The **labor pattern** in the first stage of labor **varies widely** from person to person. Rarely do women present with the sudden onset of severe contractions.

The **amniotic fluid membrane** may signal the onset of regular contractions, can precede any contractions, or can happen at any point during the first stage of labor. The

amniotic fluid membrane may be **spontaneously ruptured** in the first stage of labor or can be ruptured using an **Amnihook** that artificially ruptures the membranes.

Contractions are generally mild in the **latent phase** of labor and anesthesia is not necessary. **Contractions are 5-7 minutes apart**, somewhat irregular in timing, and the woman is generally able to ambulate freely during this stage.

The **active phase** of labor involves more **regular contractions** that are **about 2-3 minutes apart**. These are more intense contractions and the woman may wish to have some type of anesthesia in order to control the pain of labor.

Signs that a woman is about to go into labor include the **passage of the mucus plug**, which has been inside the cervix for the entire pregnancy. This mucus plug will dislodge as the cervix thins and dilates. It is sometimes found to have some blood leading to the concept of the bloody show before the onset of labor.

Women may have the passage of a large, slightly bloody glob of mucus that passes all at once. Other women may have this plug gradually exit the uterus and may experience an increase in vaginal secretions but no obvious mucus plug.

The uterus can be palpated during the first stage of labor to see if the contractions are strong enough. Strong uterine contractions will be felt like an extreme tightening of the uterus as can be palpated or picked up on an **external fetal monitor** or **tocodynamometer**.

While strong contractions generally show themselves as high peaks on an external fetal monitor or EFM, the height of the EFM cannot be used to determine whether or not the internal uterine contraction pressure is high enough for active labor. Only an **internal pressure catheter** can accurately predict uterine pressure adequacy.

Special Tests in the First Stage of Labor

There are several tests done in the first stage of labor.

1) Tests to diagnose a preterm rupture of membranes:

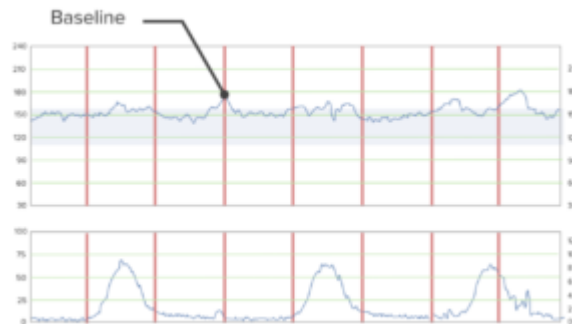
The woman is placed in a **supine position** for several minutes to allow potential amniotic fluid to pool in the vaginal introitus.

- **Pooling test:** there is amniotic fluid accumulation in the introitus with a position of the patient.
- **Nitrazine test:** A sterile speculum is inserted into the vagina and a small number of vaginal secretions are taken with a sterile swab. The swab is used to put some fluid on Nitrazine paper as well as on a microscope slide. If the Nitrazine paper turns blue, it indicates a pH change that may mean the membranes have ruptured.
- **Ferning test:** **some of the fluid is placed on a** microscope slide that is rapidly dried. Under the microscope, a fern pattern of dried secretions is looked for. If the fern pattern is seen, the membranes have ruptured. Urine and other vaginal secretions don't give this pattern.

Labor and delivery must happen within 24 hours of rupture of membranes so as to reduce the risk of uterine and [perinatal infection](#).

2) Non-stress test (NST) for external fetal monitoring

It is part of testing in the first stage of labor. It is generally done using a strap and a Doppler device that picks up the fetal heart rate on the woman's abdomen. The heart rate and mother's uterine contractions are recorded on tracing for interpretation.



The interpretation of a non-stress test can be summarized by the mnemonic **DR C BraVADO** which reminds one of the following features of the test.

DR (define risk):

This is the first step in interpretation to try and determine the indication of the test that would point to likely findings in the tests. Common risks include maternal hypertension, maternal diabetes, multiple gestations, intrauterine growth restriction, congenital anomalies, post date and premature rupture of membranes.

C (contractions)

The number of uterine contractions in a 10-minute window is recorded that should lie between 2-3. They are also assessed for a duration (how long they last) and intensity (done by palpation)

Bra (Baseline heart rate)

The baseline heart rate is estimated over a 10-minute window. The normal fetal heart rate is **about 110–160 beats per minute (bpm)** as a baseline and is irregular, changing with fetal movements. There will be accelerations seen several times a minute, because of fetal movements.

Fetal tachycardia is defined as a baseline heart rate of greater than 160 beats per minute that may arise from fetal hypoxia, fetal tachyarrhythmia, maternal anemia, or hyperthyroidism.

Fetal bradycardia is defined as a baseline heart rate of fewer than 100 beats per minute. It may be due to postdatism, occiput posterior or transverse position.

V (variability)

The **variability of the fetal heart rate** can help determine fetal health during the first stage of labor. A flat tracing no change in heart rate over a few minutes can signal **fetal distress** but can also mean the **fetus is asleep**.

Minimal heart rate variability is defined as having less than 5 ppm variability. **Moderate heart rate variability** is defined as having heart rate variability of 6–15 bpm. **Marked heart rate variability** is defined as having a baseline that varies

more than 25 bpm over several minutes.

Variability is categorized into:

- Reassuring: 5—25 bpm
- Non-reassuring: less than 5 for 30-50 minutes or more than 25 for 15—25 minutes
- Abnormal: less than 5bpm for more than 50 mins and more than 25 for more than 25 mins

A (Accelerations)

Accelerations are transient rises in fetal heart rate in a term infant at a heart rate of at least 15 beats above baseline lasting at least 15 seconds over two minutes of recording. They generally reflect **fetal movement** and are a good measure of fetal health.



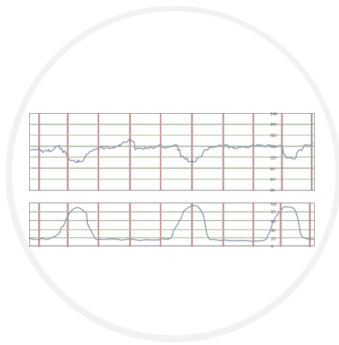
D (Decelerations)

Decelerations can be recorded with an external fetal monitor. There can be early decelerations, which are mild decreases in fetal heart rate of greater than 15 bpm lasting more than 15 seconds occurring at the same time as the contraction. They can be classified into:

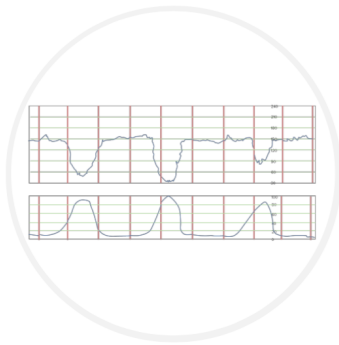
- **Early decelerations:** they begin at the same time when the contraction begins and recover when the contraction stops. They indicate **pressure on the fetal head that causes increased vagal tone** and are not signs of fetal distress.
- **Variable decelerations** are deeper decelerations occurring at the time of maternal contractions. They vary in duration and onset and may not be related to the uterine contractions. They indicate **cord compression** and generally occur late in the first stage of labor. They do not reflect fetal distress but may mean the mother should **shift her position to relieve pressure** on the umbilical cord during a contraction.
- **Late decelerations** are decreases in fetal heart rate beginning at the peak of the contraction and ending after the contraction has stopped. These are generally indicative of fetal distress and **prompt delivery** is warranted. They occur in the setting of fetal hypoxia and acidosis that may result from maternal

hypotension, pre-eclampsia, and uterine hyperstimulation.

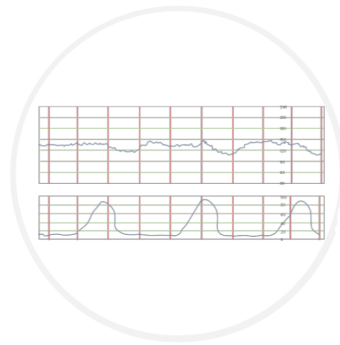
- **Prolonged deceleration** is decelerations that last more than 2 minutes and are also a sign of fetal distress thus warrant immediate delivery.



Early Decelerations:
physiological due to head
compression



Variable Decelerations:
due to cord compression



Late Decelerations:
due to uteroplacental
insufficiency

O (Overall impression)

After the completion of the above, the whole non-stress test is classified as:

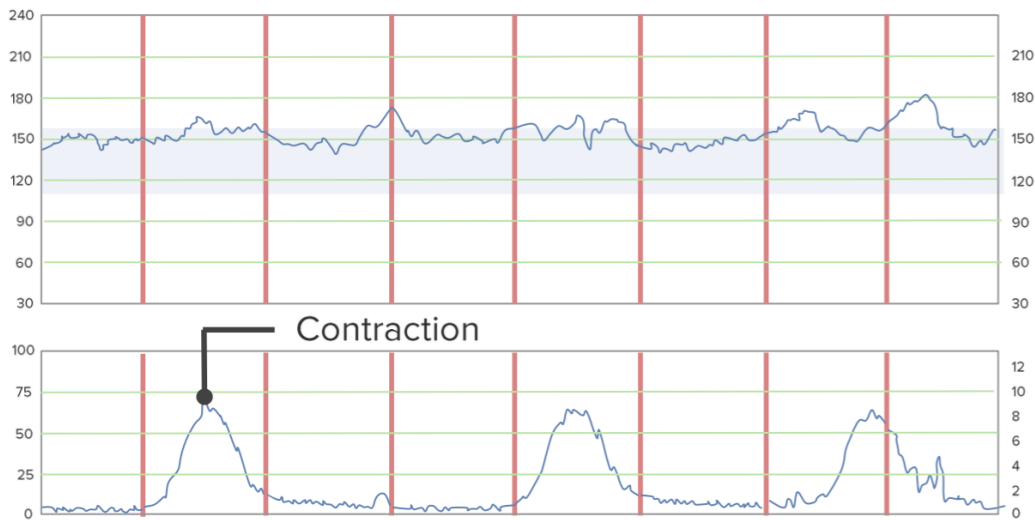
- Reassuring
- Non-reassuring
- Abnormal

Another testing that can be done in the first stage of labor includes **measuring the intrauterine pressure**. An intrauterine catheter can be placed that will measure the pressure of the fetal heart rate in arbitrary Montevideo units that can tell if the uterine contractions are adequate or not.

If the uterine contractions are not adequate on intrauterine pressure monitoring, the patient requires **oxytocin** by intravenous means in order to enhance the quality of her contractions.

Another test done in the first stage of labor is a **fetal scalp electrode monitor**. A spiral metal electrode is placed on the fetal scalp in order to measure accurately the fetal heart rate. This is done when the fetal heart tones aren't picked up on an external fetal monitor. The electrode is introduced into the vagina and placed on the fetal scalp. An accurate recording of the fetal heart tones can be determined immediately so as to help detect abnormalities in the fetal heart tracing.

Monitoring also includes an **evaluation of the uterine contractions**. A tocodynamometer is placed on the mother's abdomen and held to the abdomen by means of a strap that helps the doctor or midwife determine the frequency of contractions.



Differential diagnosis

Sometimes, a period of time is necessary to see if a woman is in labor or not. **Braxton-Hicks contractions** can be deceiving and can seem as though the woman is in labor. A trial of a half an hour or an hour on the uterine contraction monitor can usually distinguish true labor from false labor or Braxton-Hicks contractions.

Treatment of the First Stage of Labor

The biggest treatment given to patients in the first stage of labor is **anesthesia**. There are several types of anesthesia available. The first type of anesthesia that can be used intrapartum is **inhaled anesthesia**. This involves short inhalations using **nitrous oxide**. The pain relief is not long-lasting and there can be side effects, including lightheadedness, dizziness, and nausea.

Some women prefer **systemic anesthesia**. Narcotics are given by intravenous means and provide a modest degree of pain relief. There can be adverse effects on the fetus, such as depression of respiration if the narcotic is given too close to the time of delivery. Maternal fatigue, nausea, and vomiting are also possible with systemic analgesia.

A **pudendal nerve block** can be given for local anesthesia. Pudendal nerve blocks provide local anesthesia to the perineum and cervix. They are useful if forceps or vacuum extraction is necessary and can be used for repair of episiotomies or lacerations. Adverse reactions such as hemorrhaging can occur if the doctor inserts the needle into the pudendal artery instead of the pudendal nerve.



- Pudendal nerve block can be used for operative vaginal delivery or repair of lacerations/episiotomy
- Provides great pain relief along with the nerve distribution
- Potential hemorrhage if the pudendal artery is accessed instead of the nerve

Adequate regional anesthesia can be given with spinal or **epidural anesthesia**. In epidural anesthesia, the patient has a catheter placed in the epidural space. Analgesic medications, such as fentanyl or morphine are introduced that provide analgesia to the bottom half of the body, including the uterus and perineum. Analgesia with an epidural may not be complete and carries the risk of **maternal hypotension**.

Spinal anesthesia involves a single injection into the spinal fluid at the T 10 level. It is used primarily for **cesarean sections** as it provides complete anesthesia from T 10 to the sacral nerves. It gives complete analgesia for 2-4 hours and carries the side effect of maternal bradycardia and maternal hypotension.

Complications and Prognosis of the First Stage of Labor

The major complication in the first stage of labor is **fetal distress**. This can be detected by **external fetal monitoring** or **internal scalp fetal monitoring**. As mentioned, decelerations can be a normal part of the first stage of labor; however, when the decelerations are late, coming shortly after a contraction, this can indicate fetal distress.

Maternal complications are generally associated with analgesia. **Maternal hypotension** and **nausea** can occur with epidural anesthesia. Local anesthesia does not help with uterine contractions and inhaled analgesia gives only brief periods of analgesia. Systemic analgesia cannot be given if delivery is anticipated within the ensuing four hours and provides only brief respite from contractions.

The prognosis of the first stage of labor is excellent with **70 % of women going on to have a normal delivery** without operative intervention. The major complication is fetal distress and, when this happens, the mother may need to have an **emergency cesarean section** if delivery of the infant is not imminent.

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