The Basic Mechanisms and Concepts of LABOR
Definition

- The process by which the fetus is expelled from the uterus
- Labor requires regular, effective contractions that lead to dilation and effacement of the cervix
Regulation of Uterine Activity

Inhibitors
- Progesterone
- Prostacyclin
- Relaxin
- Nitric oxide
- Parathyroid hormone-related peptide
  - Corticotropin-releasing hormone
  - Human placental lactogen

Uterotropins
- Estrogen
  - Progesterone
  - Prostaglandins
  - Corticotropin-releasing hormone

Uterotonins
- Prostaglandins
- Oxytocin

Involution
- Oxytocin
- Thrombin

Uterine contractility

Phase 0 (Quiescence)
Phase 1 (Activation)
Phase 2 (Stimulation)
Phase 3 (Involution)

Parturition

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Fetal Contribution to Labor
Cervical Changes During Labor

Before labor
0% effacement

Early effacement
30%

Complete effacement
100%

Complete dilation
Labor Categorizations

- **Phases**
  - Latent - The period between the onset of labor and the point when labor becomes active
  - Active - In general, active labor requires ≥80 percent effacement and ≥4 cm dilation of the cervix

- **Stages**
  - 1st Stage - Labor onset to full dilation
  - 2nd Stage - Full dilation until delivery of the baby
  - 3rd Stage - Delivery of the baby until the delivery of the placenta
The ability of the fetus to negotiate the pelvis during labor and delivery is dependent on the interaction of three variables:

- Uterine activity (Power)
- The fetus (Passenger)
- The maternal pelvis (Passage)
Uterine activity
- Frequency
- Amplitude
- Duration of contraction

Assessment of uterine activity
- Simple observation
- Manual palpation
- External objective assessment techniques
- Direct measurement via intrauterine pressure catheter
Montevideo Units
Calculated by summing the individual contraction intensities in a ten minute period
Generally 200 MVUs are adequate for active phase labor
Normal
- Five contractions or less in 10 minutes, averaged over a 30-minute window

Tachysystole
- More than five contractions in 10 minutes, averaged over a 30-minute window
- Tachysystole should always be qualified as to the presence or absence of associated FHR decelerations
The passage consists of the bony pelvis (composed of the sacrum, ilium, ischium, and pubis) and the resistance provided by the soft tissues
Passage

Gynecoid (Typical Female)

Android (Typical Male)

Anthropoid (Narrow)

Platypelloid (Wide)
Distance from symphysis pubis to the sacral promontory. Approximate length from fingers to sacrum. Adequate > 11.5 cm.
Spines may be prominent or blunt.
Distance between ischial tuberosities
Approximately the width of a fist
Adequate diameter is > 10 cm
# Average and Critical Values for X-Ray Pelvimetry

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Average Value</th>
<th>Critical Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvic Inlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anteroposterior (cm)</td>
<td>12.5</td>
<td>10.0</td>
</tr>
<tr>
<td>Transverse (cm)</td>
<td>13.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Sum (cm)</td>
<td>25.5</td>
<td>22.0</td>
</tr>
<tr>
<td>Area (cm$^2$)</td>
<td>145.0</td>
<td>123.0</td>
</tr>
<tr>
<td>Pelvic Midcavity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anteroposterior (cm)</td>
<td>11.5</td>
<td>10.0</td>
</tr>
<tr>
<td>Transverse (cm)</td>
<td>10.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Sum (cm)</td>
<td>22.0</td>
<td>19.5</td>
</tr>
<tr>
<td>Area (cm$^2$)</td>
<td>125.0</td>
<td>106.0</td>
</tr>
</tbody>
</table>
Passenger

- Fetal size
- Lie
- Presentation
- Attitude
- Position
- Station
Size

- Abdominal palpation
- Ultrasound
  - Subject to large degree of error
  - Macrosomia $\geq 4500$ g – associated with increased risk of failure of trial of labor
Lie

- The longitudinal axis of the fetus relative to the longitudinal axis of the uterus
1. **Fundal grip** - determine the size, consistency, shape, and mobility of the form that is felt.

2. **Umbilical Grip** - attempts to determine the location of the fetal back. The fetal back will feel firm and smooth while fetal extremities (arms, legs, etc.) should feel like small irregularities and protrusions.

3. **Pawlick’s Grip** - determine what fetal part is lying above the inlet, or lower abdomen.

4. **Pelvis grip** - attempt to locate the fetus’ brow. The side where there is resistance to the descent of the fingers toward the pubis is greatest is where the brow is located.
The fetal part that directly overlies the pelvic inlet:

- Cephalic/Vertex
  - Occiput (vertex)
  - Chin (mentum)
  - Brow
- Breech
  - Frank
  - Complete
  - Incomplete
- Funic
Variations of the breech presentation

Complete breech

Incomplete breech

Frank breech
Attitude

- The position of the head with regard to the fetal spine (the degree of flexion and/or extension of the fetal head)
Position

.presentation of the fetal presenting part to the maternal pelvis
Asynclitism occurs when the sagittal suture is not directly central relative to the maternal pelvis.
Station

- A measure of descent of the bony presenting part of the fetus through the birth canal
Cardinal Movements in labor

- Engagement
- Descent
- Flexion
- Internal Rotation
- Extension
- External Rotation
- Expulsion
Engagement

- Passage of the widest diameter of the presenting part to a level below the plane of the pelvic inlet

With a cephalic presentation, engagement is achieved when the presenting part is at 0 station (at the level of the maternal ischial spines) on vaginal examination.
Descent

- The downward passage of the presenting part through the pelvis

Descent of the fetus is not continuous; the greatest rates of descent occur during the deceleration phase of the first stage of labor and during the second stage of labor.
Flexion

- Occurs passively as the head descends owing to the shape of the bony pelvis and the resistance offered by the soft tissues of the pelvic floor.

Complete flexion usually occurs only during the course of labor.
Internal Rotation

- Rotation of the presenting part from its original position as it enters the pelvic inlet (usually OT) to the anteroposterior position as it passes through the pelvis.

As the head descends, the occiput of the fetus rotates towards the symphysis pubis allowing the widest portion of the fetus to negotiate the pelvis at its widest dimension.
Extension

- The fetal head is delivered by extension and rotates around the symphysis pubis

The forces responsible for this motion are the downward force exerted on the fetus by the uterine contractions along with the upward forces exerted by the muscles of the pelvic floor.
External Rotation

- The return of the fetal head to the correct anatomic position in relation to the fetal torso

This is a passive movement resulting from a release of the forces exerted on the fetal head by the maternal bony pelvis and its musculature.
The anterior shoulder is delivered in much the same manner as the head, with rotation of the shoulder under the symphysis pubis. After the shoulder, the rest of the body is usually delivered without difficulty.
Freidman Curve
## Durations of 1\textsuperscript{st} and 2\textsuperscript{nd} Stage of Labor

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>95%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nulliparas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latent phase</td>
<td>7.3-8.6 h</td>
<td>17-21 h</td>
</tr>
<tr>
<td>1\textsuperscript{st} stage</td>
<td>7.7-13.3 h</td>
<td>16.6-19.4 h</td>
</tr>
<tr>
<td>1\textsuperscript{st} stage epidural</td>
<td>10.2 h</td>
<td>19 h</td>
</tr>
<tr>
<td>2\textsuperscript{nd} stage</td>
<td>53-57m</td>
<td>122-147m</td>
</tr>
<tr>
<td>2\textsuperscript{nd} stage epidural</td>
<td>79m</td>
<td>185m</td>
</tr>
<tr>
<td><strong>Multiparas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latent phase</td>
<td>4.1-5.3 h</td>
<td>12-14 h</td>
</tr>
<tr>
<td>1\textsuperscript{st} stage</td>
<td>5.7-7.5 h</td>
<td>12.5-13.7 h</td>
</tr>
<tr>
<td>1\textsuperscript{st} stage epidural</td>
<td>7.4 h</td>
<td>14.9 h</td>
</tr>
<tr>
<td>2\textsuperscript{nd} stage</td>
<td>17-19 m</td>
<td>57-61 m</td>
</tr>
<tr>
<td>2\textsuperscript{nd} stage epidural</td>
<td>45 m</td>
<td>131 m</td>
</tr>
</tbody>
</table>
# Abnormal Labor Indicators

<table>
<thead>
<tr>
<th>Indication</th>
<th>Nullipara</th>
<th>Multipara</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged latent phase</td>
<td>&gt; 20 h</td>
<td>&gt; 14 h</td>
</tr>
<tr>
<td>Average second stage</td>
<td>50 min</td>
<td>20 min</td>
</tr>
<tr>
<td>Prolonged second stage without (with) epidural</td>
<td>&gt; 2h (&gt;3h)</td>
<td>&gt; 1h (&gt;2h)</td>
</tr>
<tr>
<td>Protracted dilation</td>
<td>&lt; 1.2 cm/hr</td>
<td>&lt; 1.5 cm/h</td>
</tr>
<tr>
<td>Protracted descent</td>
<td>&lt; 1 cm/hr</td>
<td>&lt; 2 cm/h</td>
</tr>
<tr>
<td>Arrest of dilation</td>
<td>&gt; 2h</td>
<td>&gt; 2 h</td>
</tr>
<tr>
<td>Arrest of descent</td>
<td>&gt; 2h</td>
<td>&gt; 1 h</td>
</tr>
<tr>
<td>Prolonged third stage</td>
<td>&gt; 30 min</td>
<td>&gt; 30 min</td>
</tr>
</tbody>
</table>
Abnormalities of Labor

![Graph showing cervical dilation in nulliparas and multiparas](image-url)

- **Average**: 3.0 cm/hour
- **5th Percentile**: 1.2 cm/hour
- **Secondary Arrest**: 5 cm/hour

- **Combined Disorder**
- **Primary Dysfunctional Labor**

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